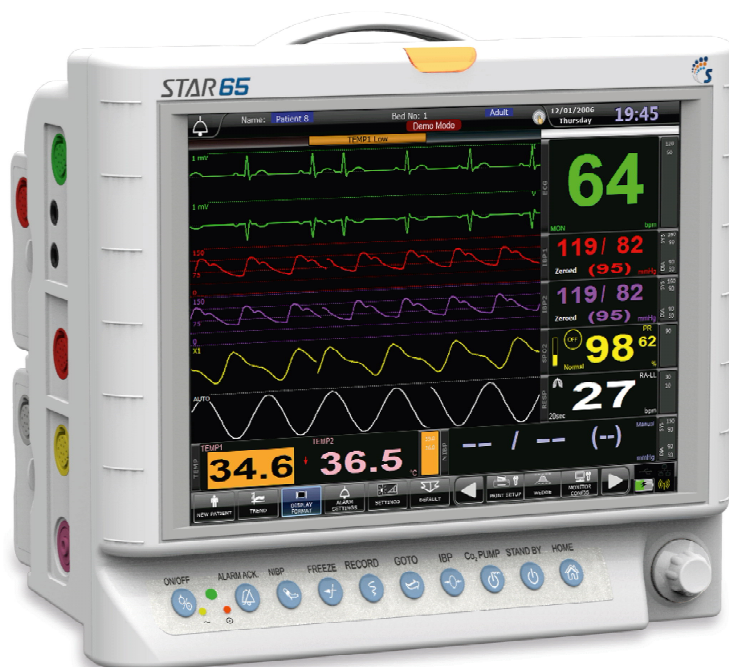




STAR65

OPERATING MANUAL

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Introduction

Congratulations on becoming one of the proud customers of SKANRAY's Multiparameter Touch Screen Monitor Star 65.

Star 65 is a multi-parameter semi-modular patient monitoring system for continuous monitoring of the physiological parameters like ECG (3/5 lead), Arrhythmia, ST Analysis, Respiration, NIBP, IBP, Temperature, SpO₂, CO₂, Cardiac Output (CO), & Anesthesia Gas Monitoring (AGM) Module (Optional). The modular parameters are IBP, CO and CO₂.

Star 65 is a 8 channel monitor with 12.1" LED display with touch screen capable of displaying and monitoring ECG, Respiration, SpO₂, CO₂, IBP, and O₂ digital values of HR/PR, SpO₂, RR, Non-Invasive Blood Pressure (Systolic, Diastolic & Mean), Invasive Blood Pressure (Systolic, Diastolic & Mean), Temperature, EtCO₂, FiCO₂, IPI, CO, N₂O, O₂, EtAA, and FiAA readings.

Star 65 has 240 Hours tabular and graphical vital trend. Star 65 has a NIBP trend of last 240 readings. Star 65 has Alarm Recall facility with last 48 'Patient Alarms' details.

Star 65 has communication features like USB for Thumbdrive, Printer, Bar code scanner interface, Ethernet for CNS & Bed to Bed connectivity, HDMI output for External monitor connectivity, External Port for AGM 55 interface, IR for Remote, Wi-Fi for CNS, Bed to Bed & Network Printer connectivity. The device permits patient monitoring with adjustable alarm limits as well as visible and audible alarm signals, high priority alarms are indicated by red colour, medium priority alarms are indicated by yellow colour & low priority alarms are represented by blue colour.

Star 65 has got Drug calculator & Hemodynamic calculator software package to display drug dosage applied / to be applied for the standard Medicines.

Parameters

Parameter	Standard	Optional
ECG 3L	*	
ECG 5L	*	
Resp	*	
NIBP	*	
IBP 1	*	
IBP 2	*	
IBP 3		*
IBP 4		*
Temperature 1	*	
Temperature 2	*	
SpO ₂	*	
CO ₂ with IPI		*
CO		*
AGM		*
Basic ST Analysis	*	
Basic Arrhythmia	*	

Salient Features

SKANRAY offers a monitoring solution optimized for Surgical, Cardiac, Medical and Neonatal Care Environments. Combining patient surveillance and data management, it allows multi-measurement monitoring by linking separate modules with “Plug-and-Play” convenience.

Star 65 stores data in trend, event, and recall databases. User can see tabular trends and graphical trends (vital signs) and document them on a local or remote printer or store it in a thumb drive.

User can view fast-changing measurement trends with a minimum of 30 sec resolution. Event surveillance enhances documentation and review of physiological significance and practical situations.

Style with Safety

Ergonomics which enhances the overall appearance built with environment care and safety also designed by increasing hygiene and decreasing maintenance.

Versatile

Suited for usage in different care areas due to easy upgradability to advance parameters such as: CO, Capnography, Anesthesia Gas Module and IBP which can be plugged externally on demand by the user.

Tailored to Suit

Designed to blend to a watchful side of an operation theatre on a table top or adapt on a wall with an ingenious wall mounting option.

Perceive a Touch

Getting away with the tactile sensation couldn't get any better with integrated Touch Display.

Custom Tiled

Designed to suit the need of a patient and, the vitals monitored for him, the monitor is display configurable by the user. For the present day busy doctor there is an auto display format which readjusts itself as and when devices plug and play are connected.

Summon to Return

Detailed analysis and progress of the patient can be monitored and viewed through an ingenious display of graphical and tabular trend backed with a wide storage of 240 hrs trend. The trend can be zoomed to a maximum of 1 hr or a minimum of 30 sec resolution. Detailed analysis can be done with the waveform recall strip storage of Arrhythmia, ECG, ST, Event and Alarm recall. 24 hrs ECG & IBP waveform disclosures is an added advantage of Recall option.

Intelligent Auto Set

System can automatically set alarm limits for any individual parameter or all monitored parameters using Autoset option.

Connected

Wide range of connectivity options which include wired and wireless connections to CNS and network printers. USB printers and USB thumb drives to print and store trend and recall data.

Go Green

Star 65 is an environmental friendly monitor. It has done away with the need for a paper based printer and replaced it with USB storage, where the user can store and archive soft copies of the vital data. Also it has overcome the disadvantage of the print fading away in the print outs of the thermal printer.

Bird's Bed Eye View

Star 65 Bed to Bed feature empowers the busy doctor to keep a bird's eye watch on his patients from a distant bed.

On Your Finger Tips

Patient's vitals are available on the go by the touch of a button on the officious doctor's mobile powered by "Skyline M"

A Good Night's Sleep

Star 65 is a patient monitor sensitive to a patient's need for a Good Night's rest. It intuitively dims the display and beep volume.

Formulation is Calculation

Star 65 Drug Dose Calculator, Haemodynamic Calculator and Mathematical Calculator come in handy to the doctor giving him an extra edge.

Discharged Hale and Hearty

Documenting and storing details of the discharged patient just couldn't get any easier with the Patient discharge report download to USB and the Trend download to USB options.

Prevent Errors without Hassles

Admission details of a patient got faster and error free with the Star 65's patient entry through a bar code scanner which connects to the USB port.

Appearance

Front View



Figure i

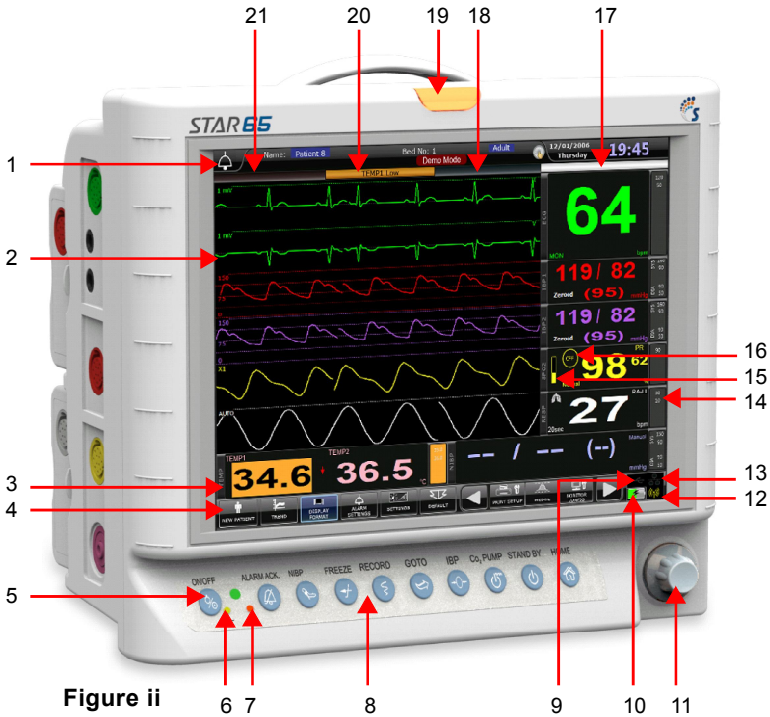


Figure ii

Front Panel Description

Label	NAME	DESCRIPTION
1	Alarm Pause	This will indicate the status of alarm suspend.
2	Waveform Field	Display Waveforms.
3	Digital Field	To Display Digital Value.
4	Menu display area	Displays Main Menus.
5	Monitor ON/OFF	This key is used to Switch ON/OFF/ monitor.
6	Mains ON indicator	Amber colour LED turns ON when monitor is connected to Mains.
7	Monitor ON indicator	Green LED ON indicates Monitor ON. Amber LED OFF and Green LED ON indicates unit is ON in battery operation mode.
8	Keypad	Dome Keypad for selecting various functions.
9	USB	Displays the status of USB.
10	Battery Status Area	Displays the status of Battery.
11	Optical Encoder	This is a special rotating knob used for multipurpose functions. Rotating the optical encoder in clockwise or anti-clockwise direction, moves the cursor (highlighted block) right or left in the Menu area of the screen. Pressing optical encoder selects the particular function.
12	Wi-Fi	Displays the status of Wi-Fi.
13	Ethernet	Displays the status of Ethernet.
14	Alarm Bar	Displays the alarm limits and status of alarm.
15	Plethbar	This will indicate the signal strength of SpO2.
16	Clock	SatSeconds Clock.
17	White Message Area	Displays other information messages in black text with white background.
18	Blue Message Area	Displays error messages in white text with blue background.
19	Alarm Indication	Blue: Gives flashing Blue colour indication for cable / accessory related alarms like cable coming off patient. Yellow: Gives flashing Yellow colour indication for medium priority patient related alarms. Red: Gives flashing Red colour indication for high priority patient related alarms.
20	Yellow Message Area	Displays error messages in black text with yellow background.
21	Red Message Area	Displays critical error messages in black text with red background.

Alarm Frequency

Audio frequency:

Red alarm : 560 Hz

Yellow alarm : 590 Hz

Visual alarm frequency:

Red alarm : 1 Hz

Yellow alarm : 1Hz

Keyboard Controls

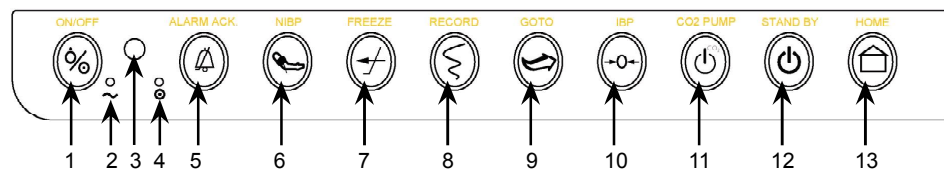


Figure iii

1	Monitor ON/OFF Button
2	Mains ON Indicator
3	IR Receiver
4	Monitor ON Indicator
5	Alarm suspend/Acknowledge
6	NIBP Start/Stop
7	Freeze/Defreeze
8	Graphical Recorder
9	Goto
10	IBP Zeroing
11	CO2 Pump
12	Stand By
13	Home

Rear View

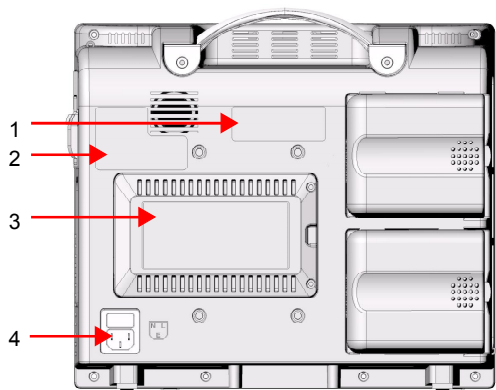


Figure iv

- 1. Serial no. label
- 2. Product label
- 3. Battery cover
- 4. Mains connector

Leftside View

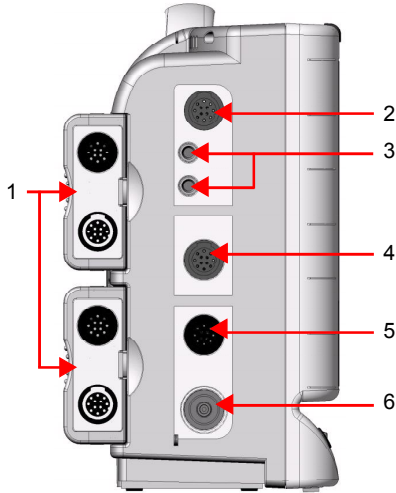


Figure v

- | | |
|----|-----------------------------|
| 1. | External Modules (optional) |
| 2. | ECG Connector |
| 3. | Temperature Connectors |
| 4. | IBP Connector |
| 5. | SpO2 Connector |
| 6. | NIBP Connector |

Rightside View

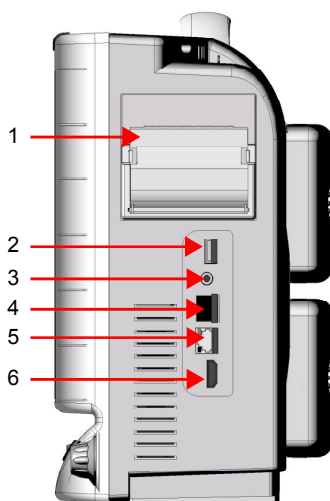


Figure vi

- | | |
|----|-----------------------|
| 1. | Recorder |
| 2. | USB Port |
| 3. | ECG Output |
| 4. | AGM 55 Interface Port |
| 5. | Ethernet Port |
| 6. | HDMI Port |

Note

Time base option is provided for both Permanent & non Permanent display (i.e. Print out, soft copy print, external monitor etc.).

Exemptions

SKANRAY's liability under this warranty does not include any transportation damage or other charges or liability for direct, indirect or consequential damages or delay resulting from improper use or application of the product or the substitution upon it of parts or accessories not approved by SKANRAY.

Copyright

SKANRAY owns all rights to the manual and intends to maintain this manual as confidential. SKANRAY also seeks to maintain this manual as a copyright. This manual is to be used solely for the purpose of reference, operation and maintenance of SKANRAY equipment.

The contents of this manual are proprietary. Reproduction or distribution of any part of this manual in any form is prohibited.

Due to continuous updating of technology, the specifications, as well as information in this manual, are subject to change without prior notice.

All information in this manual is believed to be correct. SKANRAY shall not be liable for errors contained herein with the performance or use of this manual.

Standards

This equipment has been designed to meet the following International standards:
Class 1 equipment requirement of IEC 60601-1.

EMI/EMC requirements as per IEC 60601-1-2.

IEC 60601-2-27 requirements for ECG.

IEC 80601-2-30 requirements for NIBP.

IEC 60601-2-34 requirements for IBP.

IEC 60601-1-8 requirements for alarm systems.

IEC 60601-1-6 requirements for basic safety & essential performance.

IEC 60601-2-49 requirements for multifunction patient monitor systems.

ISO 80601-2-61 requirements for SpO₂.

ISO 80601-2-55 requirements for RGM (CO₂, O₂ and Anesthesia gases).

ISO 80601-2-56 requirements for Body Temperature Measurement.

Regulatory Requirement



Disposal Instructions

- Follow the local regulations and procedures for the disposal of unit and battery.

Conventions Used In This Manual



Cautions are intended to alert you to the importance of following correct operating procedures to prevent the risk of damage to the system.



Warnings are intended to alert you to the importance of following correct operating procedures where risk of injury to the patient or system user exists.

Notes Emphasizes important Information.

Read all the Cautions, Warnings and Notes provided throughout the Operating Manual before using the monitor.

Caution

Cautions are intended to alert you to the importance of following correct operating procedures to prevent the risk of damage to the system.

- Electrical installation of the room or the building in which the equipment is to be used, should comply with regulations specified by the country in which the equipment is to be used.
- If earthing arrangements are suspected, the monitor must be connected to a mains line with proper earth connection to ensure correct readings.
- The equipment should be used in accordance with the "instruction for use" provided by SKANRAY and as specified on the rear panel of the monitor.
- To avoid noise interference, use grounding cable and ensure monitor is grounded properly.
- If any function of the monitor fails, then consult SKANRAY authorized service engineer. After modification, appropriate inspection and testing must be conducted to ensure continued safe use of equipment by service engineer.
- Failure to meet ventilation requirement may cause equipment failure and intern jeopardies the functions of automated monitoring. Do not place equipment in an enclosed area that could restrict heat dissipation from the front or rear of the unit.
- Keep PACEMAKER PATIENTS under close observation. Rate meters may continue to count the pacemaker rate during cardiac arrest.
- This equipment is meant for use by qualified medical personnel only.
- Use only SKANRAY approved accessories.
- For the disposal of battery after its life, follow the local regulations and procedures.
- Federal (USA) law restricts this device to sale by or on the order of a physician, dentist, or other licensed practitioner.
- Arrhythmia and ST segment analysis is not intended for use with Neonatal patients.
- Do not disconnect thumbdrive while uploading/ downloading data from unit.
- To clean/wipe the monitor lock keyboard, by pressing home key and print key together for 3 seconds.
- Power down time stamp log of Star 65 or any of its sub-system is not maintained.

WARNING

WARNINGS are intended to alert you to the importance of following correct operating procedures where risk of injury to the patient or system user exists.

- All modifications and repairs should be carried out by authorized SKANRAY personnel or authorized agents.
- Alarms:
Adjusting the alarm volume to a low level or switching OFF alarms during patient monitoring may result in alarm conditions going unnoticed. Hence do not rely fully on audible alarm.
The most reliable method of patient monitoring combines close personal surveillance with correct operation of monitoring equipment.
- When 'low battery' indication comes on screen or during Low Battery Audible Alarm, connect the monitor to main supply and keep the unit for charging for 8.5 hours.
- Use only SKANRAY approved battery.
- Use of monitor is restricted to one patient at a time.
- Do not use damaged cables/sensors, cuffs and contaminated accessories.
- Do not rely fully on No breath and alarms.
- When several equipment of different companies/makes are interconnected through the same mains power distribution line, the summation of the resulting leakage currents may exceed the maximum limits.
- Explosion hazards are possible if used in the presence of flammable anesthetics.
- For continued protection against fire hazard, use fuses of only specified type and rating.
- 'Electrical shock hazard'. Do not remove cover. Refer to qualified personnel for servicing.
- Patient safety and performance of this unit when connected to patients undergoing magnetic resonance diagnostic procedures is unknown. It is advice that all sensors and cables used with this unit should be removed from patient during such procedures.
- SKANRAY does not assume responsibility for damage to the equipment caused by improperly ventilated cabinets, improper or faulty power or insufficient wall strength in case of wall mounted units.
- Do not use the machine with nuclear spin tomography (MRT, NMR, NMT) as the function of the machine may be disturbed.
- Protection is not provided in the system to avoid burns or any hazard caused by High Frequency (HF) surgical equipment.

- Conductive parts of sensors and connectors should not come in contact with other conductive parts, including earth.
- Do not touch the patient, or table, or instruments, during defibrillation.
- Observe extreme caution when a defibrillator is used on a patient. Do not touch any part of patient, table or monitor when a defibrillator is in use.
- After defibrillation, monitor recovers within 10 seconds if the correct electrodes are used and applied in accordance with the manufacturers instructions.
- ECG cables can be damaged when connected to a patient during defibrillation. Check cables for functionality before using them again.
- These transducers and accessories are designed to have special protection against electric shocks (particularly regarding allowable leakage currents), and are defibrillator proof.
- Setting alarm limits to extrem values, can render the alarm system useless.
- For patient safety and correct usage of alarms system, do not disable or audio off the alarms.

Unpacking

Check for any signs of transportation damage after removing the Patient Monitor from the packing carton. Verify the material in the packing carton as per the packing list sent along with the monitor.

Preserve the packing carton as it may be required/useful for future use.

Ensure that the battery is removed from unit and kept separately while packing or repacking.

Intended Use

Star 65 multi-parameter Patient Monitoring system is intended to monitor a single Adult, Pediatric or Neonatal patient's vital signs at the bedside or during intra-hospital transport with the appropriate accessories mentioned / supplied with the unit. Vital signs parameters include ECG (3 lead /5 lead), SpO₂, and Respiration, Temperature, Invasive Blood Pressure (Systolic, Diastolic and Mean), Capnography (CO₂), Cardiac Output (CO) & AGM module.

In addition Star 65 has got Arrhythmia and ST detection from 3L/5L ECG measurements. The Arrhythmia and ST analysis module is intended for use with Adult & Pediatric patients and is not intended for use with Neonatal patients.

The user, responsible to interpret the monitored data made available, will be a professional health care provider. The device permits patient monitoring with adjustable alarm limits as well as visible and audible alarm signals. The monitor is not intended for home use. It shall be used only by trained clinicians.

Handling Precautions

This monitor is intended for use by only qualified medical personnel.

Please read these precautions thoroughly before attempting to operate this monitor.

1. For effective use of monitor , operation of the unit must be fully understood.

2. While installing or storing the monitor, take the following precautions.

- Avoid moisture or contact with water, extreme atmospheric pressure, excessive humidity and temperatures, poorly ventilated areas and dusty air.
- The monitor should be placed on flat surface. Vibration and mechanical shock should be avoided even during transport.
- Avoid placing in an area where chemicals are stored or where there is danger of gas leakage.
- The power line source connected to the monitor should be as per specifications

3. Before Operation

- Check that the monitor is in perfect operating order.
- Check that the monitor is grounded properly.
- Check that all accessories are connected properly.
- Pay extra attention when the monitor is in combination with other instruments to avoid misdiagnosis or other problems.
- All connections from the monitor to the patient should be checked thoroughly.
- Check that the unit is not indicating low battery.

4. During Operation

- Both the monitor and the patient must receive constant, careful attention.
- Turn power OFF or remove electrodes and cables when necessary to assure patient's safety.
- Avoid direct contact between the monitor and the patient.
- Extra care should be taken when the monitor is in use with the HF Surgical Equipment.

Note

The applied parts of NIBP and CO₂ are protected against HF surgical burns and the applied parts of ECG, SpO₂, IBP and Temperature are not protected.

5. To Shutdown After Use

- Turn power OFF with all controls returned to their original positions.
- Remove all accessories gently, do not use force to remove them.

Battery Handling

- Do not plug in or plug out battery when patient monitor is connected with AC Mains.
- Whenever patient monitor is connected to mains power batteries recharge automatically.
- Battery performance may differ based on geographies (temperature conditions) & extent of usage.
- Battery status information on the Main Screen, helps to keep track of the battery power status. The indicators always show the remaining capacity in relation to the battery's actual maximum capacity, which may reduce as the battery ages.
 - a. E.g. If three and a half section is filled, this indicates that approx 70% battery power remains.
 - b. If no batteries are detected & no data is available from the batteries, cross marks are shown in the status bar. Replace battery pack with a fully charged battery pack.
- Battery Capacity is specified for typical conditions. It will differ based on the system load (display brightness, module configurations, number of measurements like NIBP, and number of recordings you carry out) and the age of the battery.
- If the grounding integrity of the line cord or AC receptacle is in doubt, operate on battery only.
- Call SKANRAY authorized service personnel for battery replacement.

Optimizing Battery Performance

- The performance of rechargeable batteries may deteriorate over time. Battery maintenance as recommended here can help to slow down this process.
- If a partially charged battery pack is used, a full charge is recommended before its next use. Repeated use after partial charging will quickly diminish the battery's capacity, thereby shortening its life.
- It's always recommended to use the batteries at room temperature. High variation in temperatures adversely affects battery backup & battery life.

- A battery should not remain inside the monitor if it is not used for a longer period of time. The battery will discharge over time if it is stored inside a monitor without AC power connection. Do not install the battery into the device when storage may exceed 90 days. Battery damage may occur.
- Batteries must be charged using patient monitor model for which battery is supplied.
- Battery pack capacity will diminish if left in a discharged state for extended periods.

Storage Temperature

- The storage temperature has a huge impact on the life of the battery.
 - a. E.g. If the max temp of storage is 20 degree C, then the shelf life can be 1 year.
 - b. If the max storage temperature is 45 degree C, the shelf life can be 3 months.
 - c. If the temperature is more than 60 degree C, shelf life may further reduce to 1month.
- The permanent capacity loss is related to the storage temperature as well as the charge level of the battery. Higher the charge level of the battery, higher is the capacity loss. Hence it is recommended to leave the charge at 40 to 50% level during the storage.

Battery Operating Temperature

- Charge : 0 to 45 Degree C
Discharge : -20 to 60 Degree C

Safety

- Do not open batteries, or dispose off them in fire, or cause them to short circuit. They may ignite, explode, leak or heat up, causing personal injury. Dispose off used batteries promptly and in an environmentally-responsible manner. Do not dispose of the battery in normal waste containers. Consult your hospital administrator to find out about local arrangements & local regulations.
- Keep batteries out of the reach of children and in their original package until you are ready to use them.
- If battery leakage should occur, use caution in removing the battery. Avoid contact with skin. Refer to qualified service personnel.
- If you spill liquid on the equipment, battery, or accessories, or they are accidentally immersed in liquid, contact your service personnel or service engineer. Do not operate the equipment before it has been tested and approved for further use.
- Retain the original packing of Li-Ion battery for storing & transportation of stand alone battery.

Symbols

	Monitor ON/OFF
	Alarm Acknowledge / Global Alarm Suspension
	NIBP Measurement Start/Stop
	Freeze/Defreeze
	Graphical Recorder
	Home Key
	Parameter Alarm Enable
	Parameter Alarm Disable
	Parameter Alarm Paused
	Audio Alarm Paused
	Audio Alarm Enable
	Audio Alarm Disable
	LAN
	AGM
	Touchscreen Enable/Disable
	CO2 Pump ON / OFF
	IBP Zeroing
	Home
	Stand By

	Logo
	Mains 110 / 230 Volts ON indicator
	Unit ON indicator
	Attention, refer to manual
	Defibrillation-Proof type-CF of Applied Part
	Defibrillation-Proof type-BF of Applied Part
	Indicates valid QRS/Pulse detection
	Indicates detection of PR from Plethysmograph
	Indicates detection of PR from NIBP/IBP
	Indicates detection of RR from ECG
	Indicates detection of RR from CO2
	Dispose of the unit as special waste in conformity with applicable local regulations
	Manufacturer
	Goto
	USB
	WIFI
	User must consult instructions for use
	Do not reuse
	General warning sign

Acronyms and Abbreviations

SpO ₂	Peripheral capillary oxygen saturation
HR	Heart Rate (derived from ECG)
BPM	Beats Per Minute (HR/PR)
BPM	Breaths Per Minute (RR)
FLT	Fault
SYS	Systolic Blood Pressure
DIA	Diastolic Blood Pressure
MEAN	Mean Blood Pressure
PR	Pulse Rate
RR	Respiration Rate
EtCO ₂	End Tidal Carbon dioxide
FiCO ₂	Fractional Inspired Carbon dioxide
CVP	Central Venous Pressure
LVP	Left Ventricular Pressure
IBP	Invasive Blood Pressure
ICP	Intracranial Pressure
PAP	Pulmonary Artery Pressure
LAP	Left Atrial Pressure
RAP	Right Atrial Pressure
ART	Arterial Blood Pressure
DPI	Dot Per Inch
CNS	Central Nursing Station
PA	Physiological Alarm

TA	Technical Alarm
NIBP	Non Invasive Blood Pressure
CO	Cardiac Output
CI	Cardiac Index
SV	Stroke Volume
SVI	Stroke Volume Index
SVR	System Vascular Resistance
SVRI	System Vascular Resistance Index
LVET	Left Ventricular Ejection Time
VI	Velocity Index
ZO	Basal Impedance
ICVG	Impedance Cardio Vaso-Graph
CAL	Calibration Mode
MAC	Minimum Alveolar Concentration
EtN2O	End Tidal Nitrous Oxide
FiN2O	Fractional Inspired Nitrous Oxide
EtO2	End Tidal Oxygen
FiO2	Fractional Inspired Oxygen
AA	Anesthetic Agent
IPI	Integrated Pulmonary Index
AO	Aorta Blood Pressure
PCWP	Pulmonary Capillary Wedge Pressure
BT	Blood Temperature
AGM	Anesthesia Gas Module

IT	Injectate Temperature
DVI	Digital Visual Interface
HDMI	High Definition Multimedia Interface
IR	Infra Red
USB	Universal Serial Bus
SD	Secure Digital
LAN	Local Area Network

Operations & Mains Screen

Switching ON the Monitor

- Connect the unit to a mains supply socket with a proper ground / earthing connection.
- Plug in the power cord into the power socket on the rear panel of Star 65 to Switch 'ON'. Amber colour indicator (LED) on the front panel turns 'ON'.
- Press ON/OFF key to switch on the monitor, so that green indicator turns ON, unit runs the self-test and displays main (home) screen.

Initial Settings

i Plugging Batteries & Charging Before Use

Ensure the battery is charged 100% before using the unit in battery.

ii Date & Time Settings

Initially to set Date & Time user has to select Monitor Setting --> System Configuration, a password popup window will appear where user has to enter password (4321) and select OK.

By selecting OK a warning window will pop up, selecting OK will allow the user to enter System Configuration Menu. Select Cancel to exit.

In System Configuration Menu select Date Setup option for date format will appear. The options for Date Format are:

1. DD/MM/YYYY
2. DD/MMM/YYYY
3. MM/DD/YYYY

User can enter Year, Month, and Date details through numeric keypad. Entering this and exiting from the monitor settings window, changes will appear in the Main screen.

iii Alarm, Beep and Speech Volume

Select Settings using optical encoder or touch. Selecting Settings System Settings window will open.

In Settings window user has to select Volume. Selecting Volume a Volume Setup window will open where user can set Alarm, Beep and Speech Volume from 1 to 10steps. User can set the values optical encoder or touch.

User can also Mute Beep Volume & Speech Volume.

iv Parameter Colour

Select Settings using optical encoder or touch. Selecting Settings System Settings window will open.

In System Settings window user has to select Parameter Colour. Selecting Parameter Colour will display list of parameter. Select the parameter whose colour has to be change. After selecting parameter, Colour Change Menu will open where user can select the colour using optical encoder or touch.

v Mounting Options

- Table Mount (Standard)
- Wall mount with GCX (Optional)
- Pole mount with GCX (Optional)

Note

For more details on mounting option contact Skanray.

Application Guide

ECG

ELECTRODE PLACEMENT (3 LEAD):

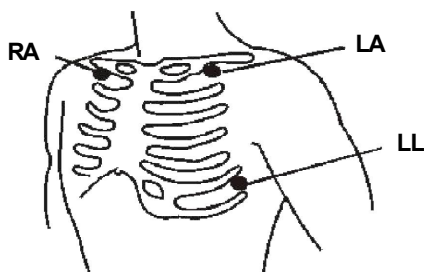


Figure 2.1

Position	Symbol AAMI(IEC)	IEC Colour Coding	AAMI Colour Coding
Right infraclavicular fossa	RA (R)	Red	White
Left infraclavicular fossa	LA (L)	Yellow	Black
Between 6th and 7th intercostal space on the left midclavicular line	LL (F)	Green	Red

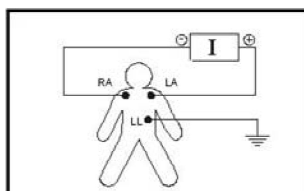


Figure 2.2 Lead I

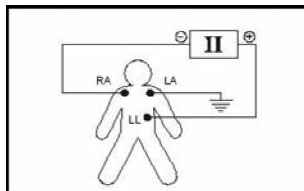


Figure 2.3 Lead II

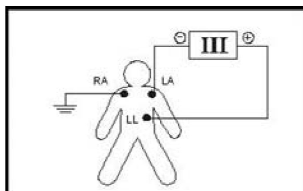


Figure 2.4 Lead III

ELECTRODE PLACEMENT (5 LEAD)

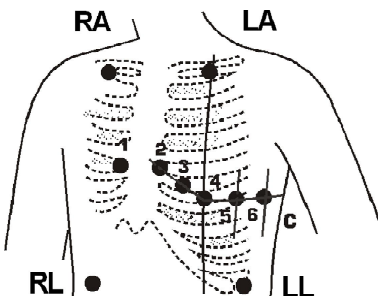


Figure 2.5

Chest electrode positions

- C1 (V1) : Fourth intercostal space at the right border of the sternum
- C2 (V2) : Fourth intercostal space at the left border of the sternum
- C3 (V3) : Halfway between C2 (V2) and C4 (V4)
- C4 (V4) : Fifth intercostal space of the left midclavicular line.
- C5 (V5) : Left anterior axillary line at the same level as C4 (V4).
- C6 (V6) : Left midaxillary at the same level as C4 (V4).

Position	Symbol AAMI(IEC)	IEC Colour Coding	AAMI Colour Coding
Right infraclavicular fossa	RA (R)	Red	White
Left infraclavicular fossa	LA (L)	Yellow	Black
Between 6th and 7th intercostal space on the left midclavicular line	LL (F)	Green	Red
Between 6th and 7th intercostal space on the right midclavicular line	RL (N)	Black	Green
Any of the chest electrode positions (C1 TO C6)	C1-C6(V1-V6)	White	Brown

Bipolar Limb Leads

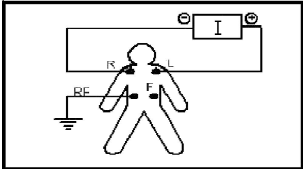


Figure 2.6 Lead I

Unipolar Limb Leads

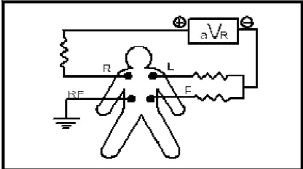


Figure 2.7 Lead aVR

Unipolar Chest Leads

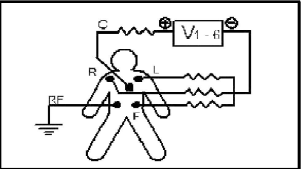


Figure 2.8 Lead V1-6

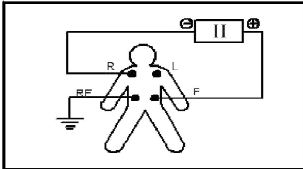


Figure 2.9 Lead II

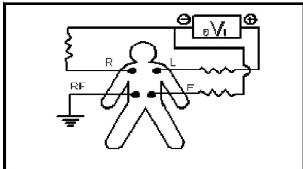


Figure 2.10 Lead aVL

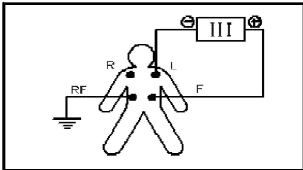


Figure 2.11 Lead III

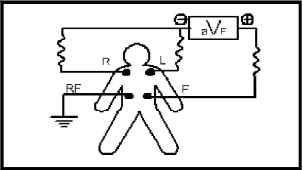


Figure 2.12 Lead aVF

ELECTRODE PLACEMENT (12 LEAD)

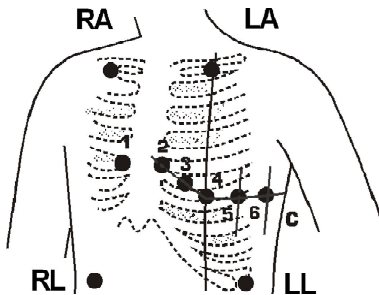


Figure 2.13

Position	Symbol AAMI(IEC)	IEC Colour Coding	AAMI Colour Coding
Right infraclavicular fossa	RA (R)	Red	White
Left infraclavicular fossa	LA (L)	Yellow	Black
Between 6th and 7th intercostal space on the left midclavicular line	LL (F)	Green	Red
Between 6th and 7th intercostal space on the right midclavicular line	RL (N)	Black	Green
Chest electrode	C1 (V1)	White/Red	Brown/Red
Chest electrode	C2 (V2)	White/Yellow	Brown/Yellow
Chest electrode	C3 (V3)	White/Green	Brown/Green
Chest electrode	C4 (V4)	White/Brown	Brown/Blue
Chest electrode	C5 (V5)	White/Black	Brown/Orange
Chest electrode	C6 (V6)	White/Violet	Brown/Violet

Note

Place the electrodes on the patient before the electrode cable is plugged into the monitor.

Note

Special consideration should be given to electrode placement when an electrosurgical unit is to be used. The active electrodes should be equidistant from the proposed cutting line, but situated as far away as possible. The conductive parts of Electrodes and associated connectors for applied parts, including the Neutral Electrode, should not contact other conductive parts including Earth. Care should be taken to ensure that the diathermy return plate is clean and makes good contact with patient. Though spikes may be observed in the ECG trace when diathermy is used on the patient, there is instantaneous recovery of the ECG trace when diathermy electrodes are removed from the patient.

Note

Always ensure ECG cables are properly placed to avoid which may cause interference signals resembling cardiac waveforms, from other equipment.

Note

Poor ECG trace can occur due to dry electrodes. To rectify, remove the electrodes, apply gel and reattach with new tape (Replace incase of disposable electrodes). This monitor meets the safety requirements for direct cardiac monitoring.

Heart rate is computed using Moving Window averaging algorithm. 4 peaks averaging is done for $HR < 60$ and 12 peaks averaging is done for $HR > 60$.

Steps for application of ECG electrodes :

Proper skin preparation is necessary for good quality signal pick up and display. Please follow the guidelines as listed below:

1. Wash electrode site and shave surface hair.
2. Gently rub skin surface with a prep pad to remove outer epidermal layer.
3. Thoroughly clean site with soap and water, depending on your patient's skin type and sensitivity.
4. Allow site to dry thoroughly.
5. Check the expiry date on the electrode package. Ensure that the electrode gel is fresh before placing the electrode on the patient.
6. Use one electrode brand for all electrodes placed on a single patient. Mixing electrode brands may cause a fuzzy base line or a lead fault message.
7. Place an electrode on a flat, nonmuscular area to avoid motion artifact.
8. Procedure for applying the electrodes may vary with the type of electrode:
 - Wet gel type-press down along the edge of the electrode so that all edges adhere firmly to the skin. Do not press central contact area of electrode.
 - Solid gel type-begin by pressing on the gelled area, then apply pressure toward outside of electrode.
9. Replace the electrodes at least every 48 hours.
10. Reusable ECG electrodes can be applied after applying a little bit of ECG gel on the cup of the electrodes and then securing the electrode at site using sticking tape or suitable adhesive tape.
11. Fasten the electrode leads with surgical tape (with an extra length of wire between the tape and the electrode) as shown in the Figure 2.14.
12. In operation theatres, please ensure that the disinfecting/cleaning solutions do not come in contact with ECG electrodes.



Figure 2.14

Clinical Limitations :

- Shivering patients or patients giving exceptionally low signals can be difficult to monitor.
- Although the monitor is provided with exceptionally good filters against the effects of electrosurgery, this technique can affect readings.
- Defibrillation causes temporary disruption of the waveform display.
- Patients with burns may need special needle electrodes.

Star 65 has 3/5 lead ECG options for monitoring ECG. SKANRAY offers either of these cables:

- 3 lead ECG cable (I, II, III)
- 5 lead ECG cable (I, II, III, aVR, aVL, aVF, V)

Four Type of ECG Complex

a. Ventricular bigeminy

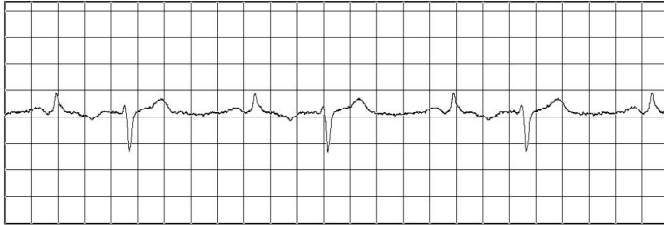


Figure 2.15

Ventricular bigeminy: the total duration for the double complex is 1 500 ms; the rate is 80 1/min if all QRS complexes are counted and 40 1/min if only the larger R waves or S waves are counted.

b. Slow alternating ventricular bigeminy

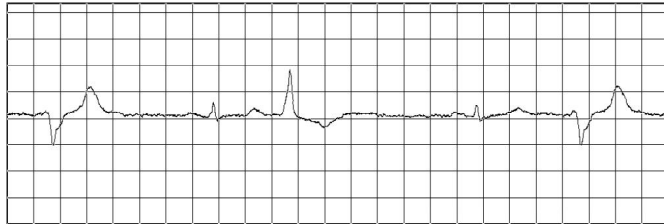


Figure 2.16

Slow alternating ventricular bigeminy: the rate is 60 1/min if all QRS complexes are counted and 30 1/min if only the large complexes are counted.

c. **Rapid alternating ventricular bigeminy**

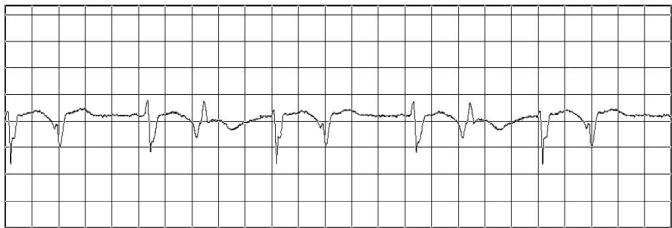


Figure 2.17

Rapid alternating ventricular bigeminy: the rate is 120 1/min if all QRS complexes are counted.

d. **Bidirectional systoles**

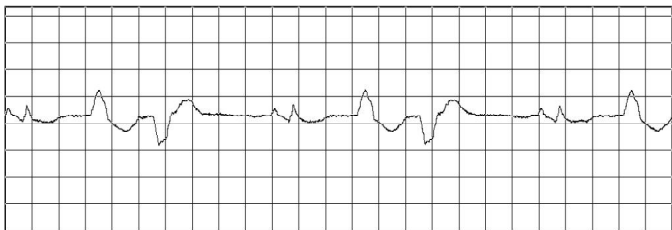


Figure 2.18

Bidirectional systoles: the rate is 90 1/min if all QRS complexes are counted and 45 1/min if only the large complexes are counted.

Response time of heart rate meter to change in heart rate is as per (clause **201.7.9.2.9.101**) IEC 60601-2-27 is less than 10 seconds.

Ventricular tachycardia alarm time as per (clause **201.7.9.2.9.101**) IEC 60601-2-27 is less than 45 seconds.

Warning

Do not rely only on the audible alarm system for patient monitoring. Adjusting alarm volume to a low level or off during patient monitoring may result in patient danger. Remember that the most reliable method of patient monitoring is close personal surveillance with correct operation of monitoring equipment.

ST Segment Analysis

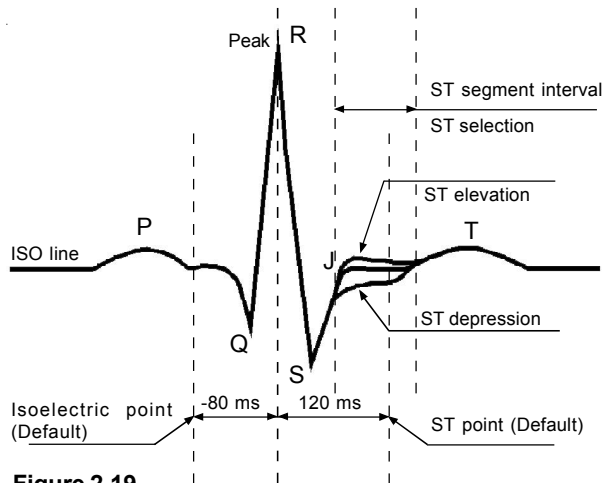


Figure 2.19

ST segment indicates elevation and depression of ST segment from ISO electric baseline which reflects the vital information of patient's cardiac function for myocardial ischemia (i.e. imbalance between oxygen supply and requirement in myocardium) ST elevation or deviation more than 1.0 mm requires immediate medical attention.

Why ST segment analysis only?

ST segment is the phase between the ventricular contraction (depolarization) and relaxation (repolarization).

Flow in coronary arteries occurs mainly in diastole, when the ventricular muscles are relaxing (repolarization). If the oxygen delivery is not sufficient, it may result in myocardial ischemia.

Why Multi-lead ST monitoring ?

Simultaneous processing of signals from 3 channels of ECG provides a multidimensional view of cardiac function, detecting changes that may not be visible in a single lead. Continuous monitoring is ensured, even if one of the leads is noisy.

ST analysis with 3 lead ECG cable

3 lead ST segment analysis will display analysis of any one of the selected leads out of three (I, II, III).

Lead II gives maximum information, therefore it is preferred.

ST analysis with 5 lead ECG cable

Simultaneously any three selected leads can be analyzed out of seven (I, II, III, aV_R, aV_F, aV_L, V). Lead II and V gives maximum information therefore lead II and V is preferred.

ISO point

It is ISO electric point which provides the baseline for the measurement. By default ISO electric point is 80 ms from R peak.

ST point

ST point is the measurement point where ST analysis is required. By default ST point is measured at 120 ms from R peak.

Note

The algorithm used in ST segment analysis is tested for the accuracy of the ST segment data. Clinician has to determine the significance of the ST segment changes.

RESPIRATION

(When sourced from ECG cable)

Tests of respiratory functions are carried out for various reasons, including the assessment of lung disease, monitoring the condition of patients under anesthesia or under intensive care and the investigation of normal lung physiology.

The body, in particular the brain requires a constant supply of blood with dissolved oxygen and carbon dioxide of around 100 and 40 mmHg respectively. For maximum efficiency, perfect matching of air and blood flow is required in each of the lungs' alveolar compartments, with overall ventilation rate of 18-20 breaths per minute.

There are several ways to measure respiration. In Star 65, respiration can be measured either through Capnography or ECG. Priority is given to Capnography. If Capnography option is not provided then respiration is measured from ECG. When measured from ECG, respiration measurement is based on impedance pneumography. This method comprises of passing a low current, high frequency carrier signal between two ECG electrodes on either side of the chest wall. The impedance or resistance of the chest changes as the lungs expand and contract and as the volume of air in the lung changes. The change in impedance creates a change in voltage across the carrier signal which is interpreted as a breath and displayed as an analog waveform. Respiration Rate is displayed as a digital value.

The ECG electrodes are to be placed as shown in the diagram below. However, in order to improve the respiration measurement, it is found useful to move the Right Arm electrode (R) within the area shown in the Figure 2.15.

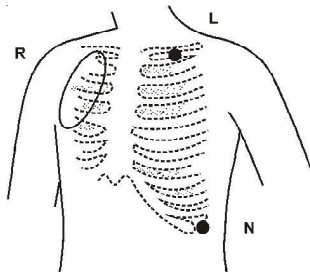


Figure 2.20

Respiration can be monitored through same ECG cables (3/5 lead) or through Capnography. Priority for respiration is given to Capnography, if the option is installed.

TEMPERATURE

Temperature is one of the important parameters of multiparameter monitor. SKANRAY offers dual temperature monitoring facility in Star 65 series. It is a useful diagnostic tool when differential temperatures needs to be monitored. e.g.:

- Body temperature of premature baby and temperature of the incubator.
- Core temperature (oral and esophageal) and temperature of periphery (skin).
- Temperature difference between oral and rectal readings (for e.g., if suspected appendicitis)

Although temperature is an extremely easy parameter to monitor, for realistic interpretation of data, it is important to bear in mind the influence of factors such as:

- Part of body, where temperature is monitored. (Extremities are always at lower temperature than core temperature.)
- Body temperature change throughout the day.
- Menstrual cycle. A rise of about 0.3 °C takes place during ovulation.

The three zones most commonly used for measuring temperature are:

1. Rectal (typically 37°C)
2. Oral (typically 37°C)
3. Axillary (underarm) (typically 36°C)

Preference is given to rectal measurement since it is the most accurate, being least subject to patient movement. Axillary is least favored.

SKANRAY Star 65 is compatible with YSI 400 series of temperature probes.	
YSI 401	: Rectal / Esophageal temperature probe (Adult).
YSI 402	: Rectal / Esophageal temperature probe (Neonatal).
YSI 409A	: Tape-on skin probe.

Note

Apply gauze piece and sticking plaster to cover temperature sensor of YSI 409A (tape-on skin) for better results.

PULSE OXIMETRY

PRINCIPLES OF SpO₂ OPERATION

Star 65 monitor provides continuous, non-invasive, automatically calibrated measurements of both functional oxygen saturation of hemoglobin and pulse rate.

The instrument combines the principles of spectrophotometric oximetry and plethysmography. It consists of an electro-optical sensor that is applied to the patient and a microprocessor based monitor that processes and displays the measurements. The electro-optical sensor contains two low-voltage, low intensity light-emitting diodes (LEDs) that serve as light sources and one photodiode as a light receiver. One LED emits red light (approximately 920nm).

When the light from the LEDs is transmitted through the blood and the various tissue components, a portion of it is absorbed. The photodiode in the sensor measures the light that is transmitted, and this measurement is used to determine how much light was absorbed.

With each heart beat, a pulse of oxygenated arterial blood flows to the sensor site. This oxygenated hemoglobin differs from deoxygenated hemoglobin in the amount of red and infrared light that it absorbs. Star 65 measures absorption of both red and infrared light and uses those measurements to determine the percentage of functional hemoglobin that is saturated with oxygen.

Initially, light absorption is determined when the pulsatile blood is not present. This measurement indicates the amount of light absorbed by tissue and nonpulsatile blood absorption that does not change substantially during the pulse. This is analogous to the reference measurement of a spectrophotometer. Absorption is then measured when the pulsatile blood is present. In that measurement, light absorption at both wavelengths is changed by the presence of the pulsatile, arterial blood. Star 65 then corrects the measurement obtained during the pulsatile flow for the amount of light that was absorbed at the initial measurement. The ratio of the correct absorption at each wavelength is then used to determine functional oxygen saturation.

SpO₂ SENSORS

WARNING

Use only SKANRAY approved sensors. Use of sensors by other manufacturers may result in improper oximeter performance.

Incorrect application or use of a sensor may cause tissue damage or improper operation of Star 65. Carefully read the “WARNING” section of this manual and the directions for use provided with the sensor.

SELECTING A SENSOR

Each sensor is designed for application to a specific site(s) on patients within a designated weight range. To select the appropriate sensor, consider the patient's weight and which sensor application sites are available, as well as the level of patient activity, whether sterility is required, the anticipated duration of monitoring, and the adequacy of the patient's perfusion.

- DS 100™ (DURA SENSOR) from NELLCOR for adults above 40 Kg.
DURA - Y™ for patients above 1 Kg to 80 Kg.
- Prepare the application site, remove nailpolish, clean surface area of contact and apply the oxygen transducer using the sensor application guide of pulse oximetry transducer.
- The perfusion indicator fills up the bar and plethysmographic waveform will be displayed accompanied by an audible beep and numerical values of SpO₂ and PR (pulse rate) are displayed on the screen (In case ECG is not connected).
- SpO₂ sensor comprises of two parts :
 - (a) Patient end (Main Sensor)
 - (b) Monitor end (Extension Cable)

Note

Do not connect the SpO₂ sensor and non-invasive blood pressure cuffs to the same limb of the patient.

PERFORMANCE CONSIDERATION

To ensure optimal performance, use an appropriate sensor. Apply the sensor as per the manufacturer's instructions. Keep the sensor site at the level of the patient's heart and observe the Warnings and Cautions indicated in the sensor's booklet (manufacturer's instructions booklet).

If excessive ambient light is present, cover the sensor site with opaque material. Light sources that can affect performance includes surgical lights, especially those with a xenon light source, fluorescent lights, infrared heating lamps and direct sunlight.

In case of disturbed waveform (if waveform is noisy or patient is unstable), evaluate the following possible solutions:

- Check whether the sensor is properly placed on the patient.
- Use a new sensor with fresh adhesive backing.
- Move the sensor to a most stable site.

Although Star 65 is designed to minimize any effects of electrosurgical interference, if such interference gives a problem, evaluate the following solutions:

- Move the cables of Star 65 and the cautery unit as far as possible.
- Plug Star 65 and cautery unit into different mains socket.
- Move the sensor away from the cautery site and ground plate as much as possible to avoid electric interference.
- Check whether the sensor is dry and firmly attached.
- Avoid criss-crossing of Cautery cables with Star 65 monitor cables

Accessories for Pulse Oximeter

- DURA SENSOR for adults application (patients above 40 Kg).
- DURA - Y SENSOR for universal application (patients above 1 Kg. to 80 Kg.)

Caution

Injected dyes such as methylene blue or intravascular dyshemoglobins such as methemoglobin and carboxyhemoglobin may lead to inaccurate measurements.

WARNING

Inspect the application site every 2 to 3 hrs to ensure skin quality and correct optical alignment. Change the application site at least every 4 hrs.

SAT SECONDS

SatSeconds is a feature of the Nellcor which is intended to manage Nellcor's high incidence of what they refer to as "clinically insignificant" nuisance and false alarms. SatSeconds attempts to reduce false alarms caused by the weakness of their algorithm. Nellcor asks the clinician to assume the responsibility of deliberately adding delays between desaturation events and audible alarms in the hope that the pulse oximeter will eventually recover.

In order to use SatSeconds, Nellcor instructs clinicians to evaluate the clinical conditions of the patient and then program a SatSeconds alarm, which is described as "the product of the magnitude and time a patient exceeds SpO2 alarm limits."

As the clinician sets the SatSeconds higher, the potential is increased that a deeper desaturation or a higher over saturation will be masked. A longer delay of potentially critical alarms is possible. SatSeconds has a built-in safety feature that sounds an alarm whenever three SpO2 violations of any amount or duration occur within a 60 sec period.

SatSeconds Clock

SatSeconds is visible on the monitor and represented by a clock. The full clock represents the SatSeconds setting. The clock may be set to 10, 25, 50 and 100 SatSeconds.

SatSec = SpO2 Reading Deviation x Time in Seconds

Example 1:

The patient's SpO2 drops to 90% and the duration of the event is 10 seconds before the saturation returns above the Low Alarm Limit of 91%.

$$\begin{array}{r} 1\% \text{ drop below the Low Alarm Limit} \\ \times 10 \text{ second duration} \\ \hline 10 \quad \text{SatSeconds} \end{array}$$

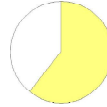


Because the SatSeconds Alarm Limit is set at 25 and the actual number of SatSeconds equals 10, there is no audible alarm.

Example 2:

The patient's SpO2 drops to 84% and the duration of the event is 2 seconds before the saturation returns above the Low Alarm Limit of 91%.

$$\begin{array}{r} 7\% \text{ drop below the Low Alarm Limit} \\ \times 2 \text{ second duration} \\ \hline 14 \quad \text{SatSeconds} \end{array}$$

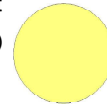


The total SatSeconds for this event are 14; therefore, no audible alarm will be heard because the SatSeconds alarm limit is set at 25.

Example 3:

During this event, the patient's saturation drops to 81% which is 10% below the Low Alarm limit of 91%. Since the patient does not return within 2.5 seconds, there is an audio visual alarm.

$$\begin{array}{r} 10\% \text{ drop below the Low Alarm Limit} \\ \times 2.5 \text{ seconds (maximum time allowed)} \\ \hline 25 \quad \text{SatSeconds} \end{array}$$



At this level of saturation, the event would only be able to last for 2.5 seconds. However, the patient's saturation did not return within that amount of time. Therefore, an audio visual alarm just under 3 seconds into the event.

Lower SpO2 alarm limit: 91%

Set up SatSeconds clock: 25

SatSeconds alarm management allows user to:

- Customize alarm settings to suit the conditions of individual patients.
- Minimize clinically insignificant desaturation alarms by more than 90% without affecting patient safety.
- Regain control of their time and activity.
- Eliminate false alarms that could cause unnecessary stress to patients and their families.

INTEGRATED PULMONARY INDEX

Integrated Pulmonary Index (IPI), a Smart Capnography algorithm from Oridion, clinicians can quickly and easily assess a patient's ventilatory status and monitor a patient's changing condition, thus facilitating more timely interventions to improve patient outcomes.

The IPI algorithm utilizes the real time measures and interactions of four parameters - end tidal CO₂, respiration rate, pulse rate, and SpO₂ to provide an uncomplicated, inclusive assessment of the patient's ventilatory status (pediatric and adult). The ventilatory status, or IPI, is displayed on a scale from 1-10, where 10 indicates a normal respiratory status.

Integrated Pulmonary Index (IPI) precisely incorporates four parameters (End-tidal CO₂, Respiratory Rate, Pulse Rate and Pulse Oximetry) into a single index. A group of medical experts (anesthesiologists, nurses, respiratory therapists, and physiologists) evaluated cases with varying parameter values and assigned an IPI value to a predefined patient status. A mathematical model was built using patient normal ranges and around the expertise of these professionals.

Predefined Patient Status:

IPI	Patient Status
10	Normal
8-9	Within normal range
7	Close to normal range; requires attention
5-6	Requires attention and may require intervention
3-4	Requires intervention
1-2	Requires immediate intervention

NON INVASIVE BLOOD PRESSURE

Preparation for NIBP monitoring :

1. Place the patient in supine position and connect the BP cuff to the arm.
2. If the cuff is not placed at level of the heart then the pressure values obtained will not reflect the true physiological pressure.

Note

Accuracy of NIBP performance / results depends on patients pre clinical condition and the technique used (oscillometric method of calculating NIBP).

Precautions with automatically cycled BP cuffs :

1. Place the limb in such a way to minimize stretching and avoid weight exertion on affected nerves.
2. Select a measurement interval that provides adequate venous drainage during cuff deflation.
3. The limb on which the cuff is connected must be inspected periodically in order to detect venostasis.
4. An accurate BP determination might be difficult if the patient has irregular cardiac rhythm.
5. Cuff size selection is a very important criteria to get accurate blood pressure readings.
6. Avoid compression or restriction of the NIBP pressure tube.

Note

Cuffs become soft after use. They sometimes develop folds which are permanent and hence leave temporary marks on the limb. Any cuffs that exhibit this effect should be replaced.

Note

If NIBP is used with SpO₂, (PR) Pulse Rate is derived from SpO₂ sensor.

Note

If NIBP, SpO₂ and ECG all three are connected to patient; then heart rate (HR) is derived from ECG.

Note

Do not measure NIBP continuously, as it might result in prolonged impairment of the blood circulation of the patient.

Caution

Extreme caution must be taken when NIBP is set to STAT mode for all types of patients. Reports have been made of nerve injury occurring during use of automatically cycled blood pressure measurements.

Caution

For NIBP measurements :

- The cuff selected must fit the upper limb properly and must overlap to encircle the limb on which it is applied. There should not be any air gap in between the cuff and the limb. It can be fastened using the VELCRO strap.
- The usual application sites of the cuff is the brachial artery. The right size of cuff should be wrapped around the arm to achieve the best result.
- The cuff is designed to inflate only when it is wrapped on the limbs. Do not inflate the cuff when not supported by the extremity.

WARNING

The cuff should not be applied on a limb being used for an intravenous infusion.

NIBP basic configuration comprises of following accessories:		
• Adult	(14 cm x 37 cm)	(Reusable)
• Child	(9 cm x 27 cm)	(Reusable)
• Neonate	(3 cm x 9 cm)	(Disposable)

INVASIVE BLOOD PRESSURE

The results of IBP are observed to be the more accurate, when compared with indirect technique (NIBP) there are some distinct advantages of IBP over NIBP like accessibility of various locations for measuring pressure in body.

IBP is a time proven technique for real time BP measurement. Invasive BP measurement is also known as direct method of BP measurement.

Patient preparation :

Note

The following actions apply to Medex make 'Logical' transducers only. (For other transducer types, refer to the manufacturers recommended assembly instruction).

1. Turn ON the monitor and plug in the pressure cable, or cables in case of double pressure option.
2. It is vital that blood clots are not allowed to form in the catheter. This is achieved by continuous flushing with the saline solution. The rate of flow is limited to 3 to 5 ml/hr by a flushing device, which does not alter the pressure being recorded. Prepare the pressure line and transducer by flushing saline solution through the system. Ensure that the system is free of air bubbles. (Even small bubbles will distort reading)
3. The fluid to be infused should be in a pressure bag. Inflate this to 300 mmHg.
4. Connect the patient catheter to the pressure line, making sure that no air is trapped.
5. Position the transducer so that it is in line with site at which blood pressure is to be measured. Usually this is where the catheter tip is placed. (For eg., in centrally located catheters, the tip is generally considered to be in the mid-chest position. The transducer level is then set to corresponding to the patient's mid-chest level).

6. Close the pressure line to the patient and open the transducer venting stopcock to atmosphere. Zero the monitor by pressing zero soft key ().
7. Select appropriate averaging time from SETUP menu. SLOW, NORMAL and FAST options are provided.
8. Close the venting stopcock to atmosphere, and open the stopcock to the patient.
9. You are now ready to start monitoring.

Following accessories can be used for measuring IBP:

- Disposable Blood Pressure Transducer.
- Reusable Blood Pressure Transducer.
- Reusable Interface Cable.

The IBP setup is as shown in Figure 2.21.

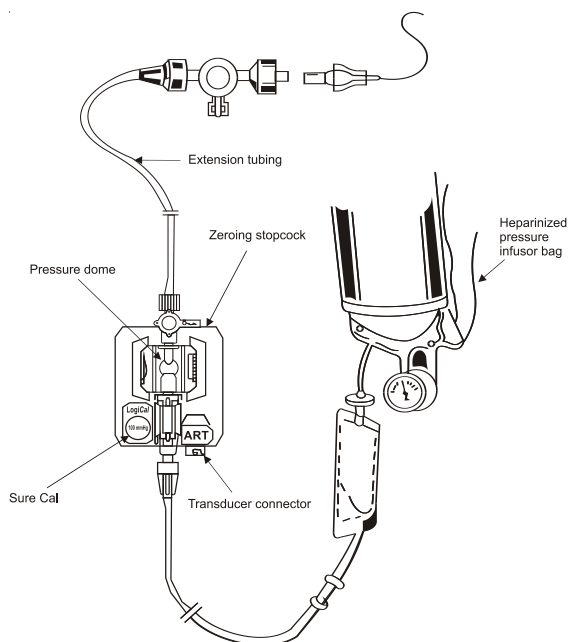


Figure 2.21

CAPNOGRAPHY

Theory of operation

The principle of Capnography is based on the absorption of infrared radiation by CO_2 . The technique is known as non-dispersive infrared absorption technique. The spectral region is particularly appropriate for measuring carbon dioxide because it has a strong absorption band in the near Infrared wavelength. CO_2 selectively absorbs specific wavelengths of Infrared light. The main part of the system is CO_2 bench, which consist of one IR source and detector. A sample of patient's expired gas that consists of CO_2 , Water vapors, Nitrogen, Anaesthetic Agents, etc. is drawn from a lightweight T-piece through a sample line into the CO_2 bench. Expired air is aspirated into measuring chamber (CO_2 bench) by a small pump. The amount of light passing through a sample cell varies according to the concentration of CO_2 in the sample cell. When concentration of CO_2 in sample cell is high, more light is absorbed by the sample and therefore a small amount of light reaches the detector as compared to low concentration of CO_2 . The amount of light absorbed is proportional to the concentration of CO_2 . The CO_2 concentration measured by the monitor is usually expressed as end tidal concentration of CO_2 (EtCO_2), expressed in terms of mmHg or percentage (%) or Kilopascal (Kpa).

Capnogram - Nature of Waveform

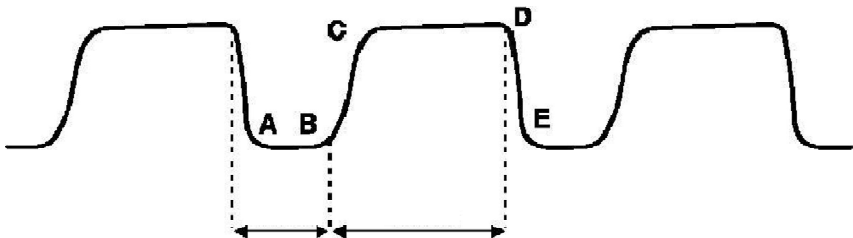


Figure 2.22

CO_2 waveform (Refer Figure 2.17) reflects various stages in breathing. Capnograph is an important diagnostic tool because its shape is virtually identical in all basically healthy people..

End tidal CO_2 is the concentration of CO_2 measured at the end of tidal volume expired (Point D in above diagram).

- A - B : The baseline i.e. the level of minimum CO_2 concentration, observed immediately after inspiration.
- B - C : The expiration phase of respiration cycle.
- C - D : The expiratory plateau i.e. the period during which the level of CO_2 in the lungs ceases to increase significantly.
- D : The end-tidal concentration point i.e. the point at the end of the expiration phase, at which EtCO_2 is measured.
- D - E : The onset of the inspiration phase of the respiration cycle.

The production, transportation and elimination of CO_2

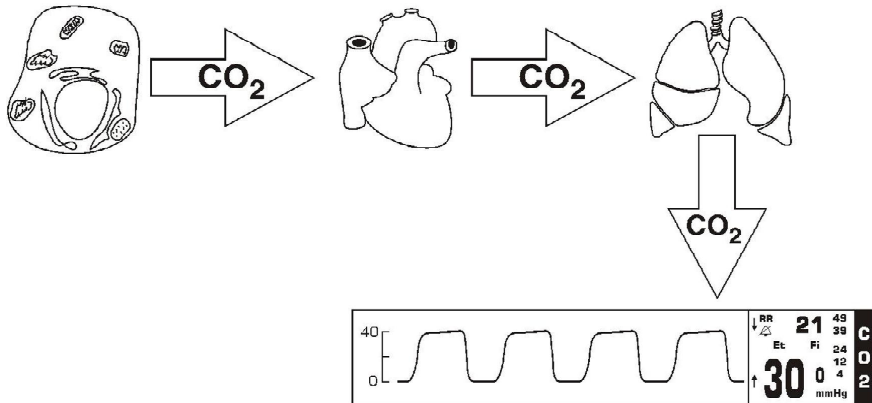


Figure 2.23

CO_2 is produced by all the cells in all the tissues in body as a by-product of metabolism. From the cell, CO_2 diffuses into capillary blood, from where CO_2 is transported into venous circulation. During contraction of heart, venous blood is pumped through pulmonary circulation to the lungs for gas exchange. Lungs are made up of millions of alveoli, which permits easy gas diffusion

from pulmonary blood to alveolar gas space. CO_2 diffuses into this space because continuous breathing keeps CO_2 concentration in alveoli lower than that in pulmonary circulation. During exhalation, gas leaving lungs mixes thoroughly, so Capnograph measures average concentration of CO_2 from all the alveoli.

Capnography gives an excellent pictures of respiratory process.

Arterial to alveolar difference of CO_2

Although end tidal CO_2 closely follows blood CO_2 level, they are not exactly same, Normally, the arterial blood CO_2 level (PaCO_2) is higher by 3-4 mmHg. Than the alveolar CO_2 (PACO_2). The aADCO_2 is due to a mismatch of ventilation and perfusion of the alveoli in the lungs. (Even in healthy patient, there are some part of lungs which are not perfused as well as they are ventilated). In such case when patient exhales, CO_2 gas from the unperfused part of the lungs will dilute the CO_2 rich alveolar gas coming from rest of the lungs, lowering the EtCO_2 , hence aADCO_2 increases. This is known as alveolar dead space ventilation.

Arterial Blood CO_2 : PaCO_2

Alveolar CO_2 : PaCO_2

Arterial to alveolar difference aADCO_2 which is normally 3-4 mmHg.

Technology Used

Capnography measurement is done with the help of microstream technology in this unit.

Microstream Capnography

In microstream capnography method, the optical sensor is incorporated in the module. Gas sample is aspirated from the patient at a flow rate of 50 ml/min with the help of FilterLine (connected to endotracheal tube with the help of 'T' connector or directly from nose with the help of Nasal prongs) and is given to module. The CO_2 measurement takes place at the CO_2 bench. After the measurement, the waste gas exhausted from the rear panel.

Respiration Rate

The respiration rate is defined as the average rate of the patient's last 8 significant measured breaths. During the first 8 breaths the respiration rate is calculated by averaging the available data. The module measures the RR in range of 0 to 150 bpm.

Initialization Time

The module requires a typically a time of 30 seconds before entering into the first operating mode. During this time, the module completes self test and initialization procedures required for proper operation of the module.

"Auto Zero" Interval

The Auto zero process is performed only during measurement mode. The module updates the ambient pressure that is measured during auto zero process. the auto zero is triggered.

- During the first hour after entering measurement mode, periodically for durations of typically 15 seconds at a rate which limits the total time consumed by auto zeros to less than 2% of the time in which active measurements are taken. Following the first hour after entering measurement mode, periodically for durations of typically 15 seconds at a rate of at most once per hour.
- If a change of 8°C from the last auto zero is detected.
- If a pressure change of 20 mmHg relative to the last auto zero (less than the purge threshold) for a period of 30 seconds is detected. The module will be able to detect a real change in the ambient pressure and a pressure change due to partial blockage of the FilterLine.

The module prevents the triggering of an auto zero in the following situations:

- In case of purging until the end of this state.
- 20 seconds to 3 minutes from the last detected breath.
- While wait up to 5 minutes for host auto zero enable command.

Leak Tightness

The leak rate of the module flow system is less than 40 mBr per minute when a 30% vacuum is invoked on the flow system.

FilterLine Recognition Safeguard (FRS)

The "FRS" enables the module to detect the presence of the FilterLine at startup and in normal operation. The pump doesn't draw in gas from the input port when a FilterLine is not connected. While in normal operating mode the "FRS Lock" detection time is no longer than 1 second.

Purge

The module performs a purging whenever it detects an occlusion in the FilterLine or in the airway adapter. The module informs the host of the purge situation by setting the "Purging in progress" bit in the Wave Message While purging, the CO₂ values are invalid. The duration of the purging is up to 30 seconds.

The module recovers from occlusion when FilterLine is replaced. The module then shifts to initialization mode for typically less than 5 seconds and then goes to normal measurement mode.

Definitions

- Breath

: A rise and fall in the carbon-dioxide concentration of at least one percent carbon-dioxide is no less than 0.4 seconds.
One inhalation + One exhalation = One Breath.
- Respiration Rate (RR)

: Number of Breaths per Min.

End Tidal Carbon-dioxide (EtCO₂) : The level of CO₂ in the airway at the end of expiration. In SKANRAY's Capnography one breath is the sampling interval, therefore monitor will report the CO₂ level at the end-respiration point of each breath.

Fractional Inspired Carbon-dioxide (FiCO₂) : The amount of CO₂ inspired during inspiration i.e rebreathing of CO₂.

Machine Preparation

1. Switch ON the unit.
2. Make sure the patient connection to the unit with the help of FilterLine and T Connector.
3. Machine takes approx. 30 seconds for its initialization. During this time sensor gets warm up and 'INITIALIZING MODULE' message will appear on the screen.
4. Then monitor will perform Auto Zero (if required) and 'AUTO ZERO' message will appear on the screen.
5. Monitor is ready for Capnography monitoring.

Patient Preparation

1. Prepare the patient (Refer Figure 2.19 and Figure 2.20) for CO₂ measurement. Use recommended accessories.
2. Screw up one end of the 'T' Connector to the unit through Filter Line. Use proper types for adults and neonatal accessories.

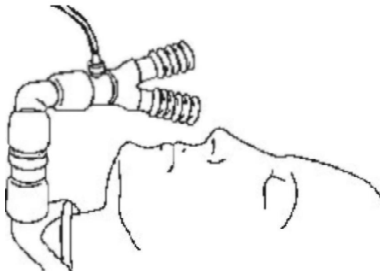


Figure 2.24 Patient with 'T' connector connected to Endotracheal tube.

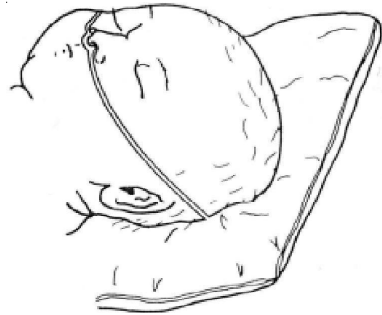


Figure 2.25 Patient with Nasal Prong (Adult & Paediatric nasal prongs are available).

Caution

- Do not strain the FilterLine during the measurement. Connection should be done in such-a-way that FilterLine will not surround any part of the body.
- Ensure that the FilterLine does not have blockage or occlude with moisture before use.

Following accessories are provided for Capnography along with Star 65 monitor.

- Capno Line
 - Adult
 - Paediatric
 - Infant - Neonate
- Filter Line
 - Adult / Paediatric
 - H set Adult / Paediatric
 - H set Infant / Neonatal

WARNING

CO₂ accessories are for single use only, use new accessories for new patients.

CARDIAC OUTPUT

Cardiac output (CO) is an important measure of cardiac performance. It measures the volume of blood pumped into the circulatory system by the heart per minute. Cardiac output is closely related to the blood pressure. Several methods can be used for determining cardiac output. The method used by SKANRAY patient monitoring system is the thermodilution method. With thermodilution, cardiac output is measured as the liters of blood pumped per minute into the pulmonary artery by the right ventricle of the Heart.

Concepts

Cardiac output is determined by heart rate and stroke volume, as defined below.

Heart rate - The number of times heart beats in one minute.

Stroke volume - The amount of blood pumped per beat.

Cardiac index - A measure of individual cardiac output adequacy, calculated by dividing the cardiac output by the body surface area.

Measurement Principle

The thermodilution method is based on the principle that the flow rate of an unknown quantity of liquid can be determined by adding a known quantity of indicator and measuring its concentration downstream. Thermodilution involves injecting a cooled solution at known temperature into the heart. The injected solution mixes with and cools the warmer surrounding blood. When the blood leaves the heart, its temperature as a function of time indicates the rate of blood flow.

Measurement Acquisition

The measurement is taken with a pulmonary artery (PA) swan ganz catheter.

The catheter is inserted into the heart, with the proximal lumen opening positioned in the right atrium for introducing the injectate and the thermistor, used for monitoring temperature, positioned in the pulmonary artery. A small amount of thermal indicator introduced into the right atrium, the indicator mixes with the right ventricle and approaches temperature equilibrium. When the diluted blood reaches the Pulmonary artery, the thermistor measures the decrease in blood temperature over time.

The temperature of the injectate solution can be measured either Indirectly or directly. Indirectly, the temperature of the cooling bath is measured.

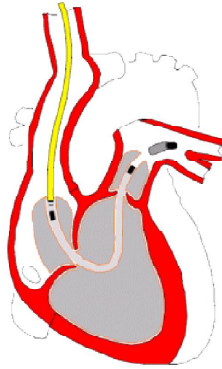


Figure 2.26

Criteria for proper Measurement

Factors affecting accurate measurement of cardiac output include:

- Physiology conditions : Variation in cardiac rate rhythm, cardiac abnormalities or patient anxiety or movement can cause errors in measurement.
- Catheter conditions : A damaged or incorrectly positioned catheter, or prematurely inflated balloon will cause measurement errors.
- Injectate factors : Inaccurate timing. Volume, or temperature of injectate, as well as use of the wrong catheter port will result in errors.

Typical Curve

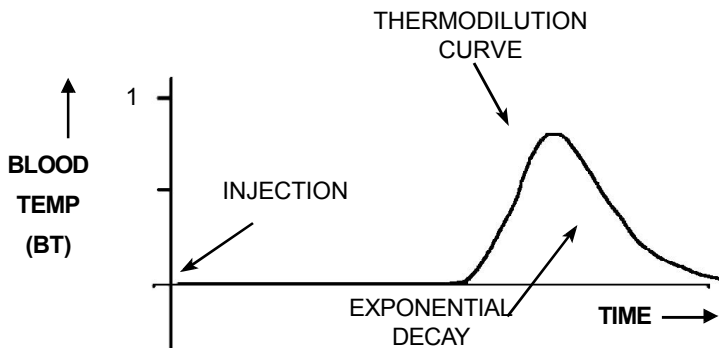


Figure 2.27

Output

The temperature/time curve resulting from the measurement resembles a bell shaped curve, except that it has an exponential decay. The data are integrated to calculate area beneath the curve. By convention, the Y-axis of the graph shows decreasing temperature.

Operating Principle

Measurement of C.O. with a right heart catheter is done using the thermodilution technique:

- A known volume of D5W (injectate) that is colder than blood temperature is injected into the right atrial port of the catheter.
- The injectate solution temperature is measured prior to injection.
- The blood temperature is measured in the pulmonary artery.
- The D5W injection enters the right atrium and lowers the right atrial blood temperature.
- The cooler right atrial blood is ejected to the pulmonary artery, where the temperature change is detected by the thermistor in the pulmonary artery.
- A temperature curve over time is created as the pulmonary artery temperature initially falls, then rises back to normal as warmer blood replaces the cooled injectate solution (the “Y” axis plots temperature in decreasing increments).
- The monitor knows the volume, temperature and catheter lumen size by the computation constant that is entered. Based on this information, the cardiac output program can calculate the amount of blood pumped per minute for a given temperature change over time.

$$CO = \frac{(V (T_b - T_i) K_1 K_2)}{(T_b(t) dt)}$$

Cardiac Output

The Cardiac Output (CO) can be calculated using the Stewart-Hamilton equation

Where :

- CO = Cardiac Output
- V = Volume of injectate
- T_b = Blood Temperature
- T_i = Injectate Temperature

- K1 = Catheter constant
- K2 = Apparatus constant
- Tb (t) dt = Change in Blood Temperature over a given Time

Hemodynamic Parameters

Stroke Volume (SV), Stroke Index (SI)
 Cardiac Output (CO), Cardiac Index (CI)
 Systemic Vascular Resistance (SVR), SVRI
 Pulmonary Vascular Resistance (PVR), PVRI
 Left Cardiac Work (LCW), LCWI
 Right Cardiac Work (RCW), RCWI
 Left Ventricular Stroke Work (LVSW), LVSWI
 Right Ventricular Stroke Work (RVSW), RVSWI
 Body Surface Area (BSA)
 Pulmonary Capillary Wedge Pressure (PCWP)
 Arterial Blood Pressure (ABP)
 Blood Temperature (BT)
 Injectate Temperature (IT)
 Mean Artrial Pressure (MAP)
 Right Artrial Pressure (RAP)
 Pulmonary Artrial Pressure (PAP)
 Pulmonary Artery Occlusion Pressure (PAOP)
 Central Venous Pressure (CVP)

Vascular Resistances

The systemic vascular resistance (SVR) is a measure of LV after load and is an important determinant of the performance of the left heart.

$$\text{SVR} = (\text{ABP}_{\text{mean}} - \text{CVP}_{\text{mean}}) / \text{CO} \times 80.$$

The pulmonary vascular resistance (PVR) is a measure of RV afterload and is calculated as follows:

$$\text{PVR} = (\text{PAP}_{\text{mean}} - \text{PCWP}) / \text{CO} \times 80$$

Body Surface Area

The Body Surface Area (BSA) can be calculated using following equation

$$BSA = (\sqrt{\text{Height} * \text{Weight}}) / 60$$

Where :

BSA = Body Surface Area

Cardiac Index

The Cardiac Index (CI) can be calculated using following equation

$$CI = \frac{CO}{BSA}$$

Where :

CI = Cardiac Index

CO = Cardiac Output

BSA = Body Surface Area

Stroke Volume

The Stroke Volume (SV) can be calculated using following equation

$$SV = \frac{CO * 1000}{HR}$$

Where :

SV = Stroke Volume

CO = Cardiac Output

HR = Heart Rate

Stroke Index

The Stroke Index (SI) can be calculated using following equation

$$SI = \frac{SV}{BSA}$$

Where :

SI = Stroke Index

SO = Stroke Output

BSA = Body Surface Area

Functional Description

The module in the unit is designed to be used with adult patients in an ICU or OT environment. It uses the thermodilution method to generate the measurement. The CO module produces a thermodilution curve together with numeric for the calculation of cardiac output, cardiac index.

Theory of Operation

The module has two separate circuits for measuring blood and Injectate temperatures. The signals progress through the module as follows:

- **Blood Channel**

The temperature sensor distal. BT, in the Catheter is connected to a reference switching matrix that continuously compares the input to reference resistors to continuous calibration of the measurement. The sequentially produced voltages across the reference and sensor resistor are amplified before being input to a low pass filter. The filtered signals are passed through the multiplexer to the analog-to-digital converter. This data is then passed to the main board for further processing.

- **Injectate Channel**

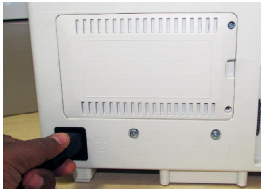
The temperature sensor, TI (injectate) is connected to a separate reference switching matrix on its own circuit. The matrix compares the signals to a set of reference resistors to generate corresponding voltages. The output is amplified, filtered, and then multiplexed with the blood temperature signal before the signals are digitized for the microcontroller. These digitized signals are also sent to the main board.

The main board receives the BT and IT data and then processes it accordingly to plot a *thermodilution curve*. Cardiac output and cardiac index value is calculated using this curve. There is also a provision for the calculation of other related hemodynamic parameters and add them to a *haemodynamic table*.

Connection & Disconnection

Procedure To Connect And Disconnect The Detachable Connectors

Power Cord

Connect	Disconnect
a) Switch OFF the unit. b) Hold the unit with one hand and insert the power cord into the slot provided on the rear panel of the unit as shown in Figure 3.1.  Figure 3.1	a) Switch OFF the unit. b) Hold the unit with one hand and gently pullout the head of the power cord from the unit as shown in Figure 3.2.  Figure 3.2

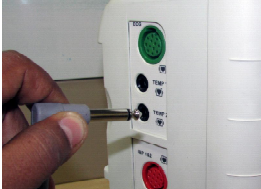
ECG

Connect	Disconnect
Align the notch of the ECG cable connector with the connector slot on the side panel of the Unit and insert the cable as shown in Figure 3.3.  Figure 3.3	Hold the unit with one hand and gently pullout the ECG cable connector as shown in Figure 3.4.  Figure 3.4

Note

Follow similar procedure to connect/disconnect SpO₂, IBP, and CO connector to/from their respective slots on the side panel of the unit

Temperature

Connect	Disconnect
Insert the temperature connector in the slot (Temp 1/Temp 2) provided on the side panel of the unit as shown in Figure 3.5.  Figure 3.5	Gently pullout the temperature connector as shown in Figure 3.6.  Figure 3.6

NIBP

Connect	Disconnect
Insert the NIBP connector in the slot provided on the side panel of the unit as shown in Figure 3.7.  Figure 3.7	Press the NIBP connector on the side panel of the unit and remove connector as shown in Figure 3.8.  Figure 3.8

CO₂

Connect	Disconnect
Align the CO₂ connector with the connector slot on the side panel of the unit as shown in the Figure 3.9.  Figure 3.9	Rotate the knob in anti-clockwise direction and remove the connector as shown in Figure 3.10.  Figure 3.10

Display Format

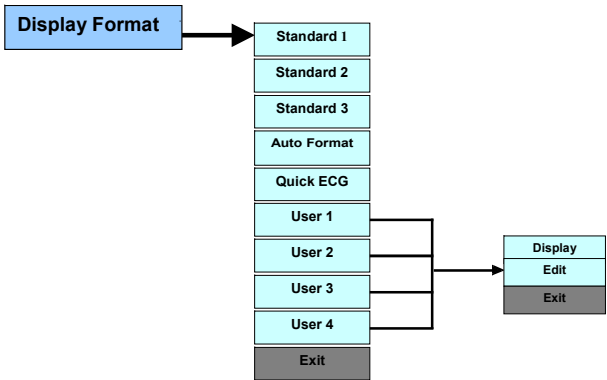
Display Format

Display Format allows the user to configure real time display according to the User Requirement.

Display Format can be selected using Optical Encoder or Touch. Initially cursor position will be at “Standard 1”.

There are 9 Display Formats available

- 3 Standard Formats (Standard 1, Standard 2 & Standard 3)
- 1 Auto Format
- 1 Quick ECG Format
- 4 User Formats



Standard Formats

Standard Formats can not be edited by the user. All fields in Standard Formats are fixed.

User Formats

All the fields in User Formats are User Configurable. User can configure display formats and replace waveforms or numeric fields in the real time display.

In User Formats, whenever Reminder Alarm is enabled in the “Utility” menu, Clock with Reminder Alarm Option will appear in the Numeric Field in Display User Edit Format as well as in Numeric Field in the real time display.

Parameter available for selection in Waveform and Numeric Fields other than ECG. ECG shall be selected always in the initial waveform channels (depending on number of ECG waveforms selected for display).

- Standard Waveform Parameters are ECG, ST, SpO₂, Resp, IBP1 & IBP2.
- Standard Numerical Parameters are HR, ST, SpO₂, Resp, IBP1 & IBP2, Temp, Temperature & NIBP.
- Optional Waveform Parameters are IBP3 & IBP4, CO₂, AA (AGM), and O₂ (AGM).
- Optional Numerical Parameters are IBP3 & IBP4, CO₂, AA (AGM), O₂ (AGM), N₂O (AGM), CO and IPI.

Note

Optional parameter modules are detected, only then the module related parameters will appear for selection in Display Format Configuration.

Note

When AGM is detected through CO₂ source, it will be indicated in the screen as “CO₂ Source AGM”.

Note

Whenever AGM is detected parameters like CO₂, AA, O₂ and N₂O will appear for selection in the Display Format Configuration.

Standard 1

Standard 1 Display Format will be as shown in figure 4.1.

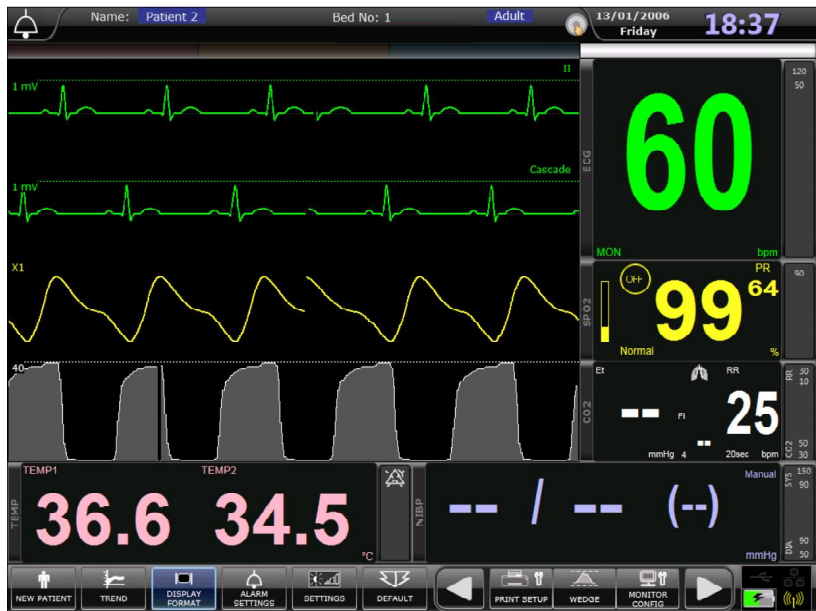


Figure 4.1

Following parameters will be displayed in Standard 1 format :

- Channel 1: ECG waveform with numeric window.
- Channel 2: Cascade (3 lead ECG cable) or Lead V (5 lead ECG cable) waveform.
- Channel 3: SpO₂ waveform with numeric window.
- Channel 4: Resp/ CO₂ waveform with numeric window. (CO₂ gets higher priority over Resp).
- Channel 5: Temperature numeric window (1:2 area) & NIBP Numeric window (1:2 area).

Standard 2

Standard 2 Display Format will be as shown in figure 4.2.

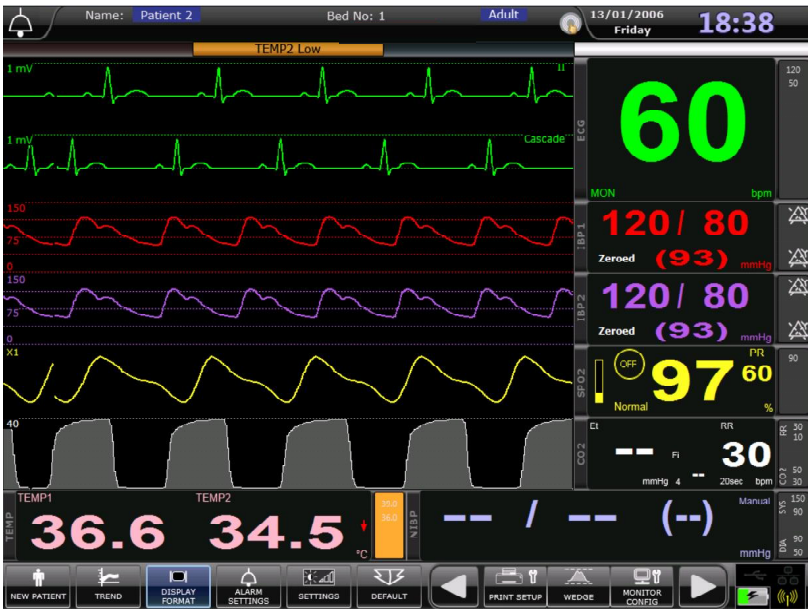


Figure 4.2

Following parameters will be displayed in Standard 2 format:

- Channel 1: ECG waveform with numeric window.
- Channel 2: Cascade (3 lead cable) or Lead V (5 lead cable) waveform.
- Channel 3: IBP1 waveform with numeric window.
- Channel 4: IBP2 waveform with numeric window.
- Channel 5: SpO₂ waveform with numeric window.
- Channel 6: Resp/CO₂ waveform with numeric window.
- Channel 7: Temperature numeric window (1:2 area) & NIBP Numeric window (1:2 area).

Standard 3

Standard 3 Display Format will be as shown in figure 4.3.

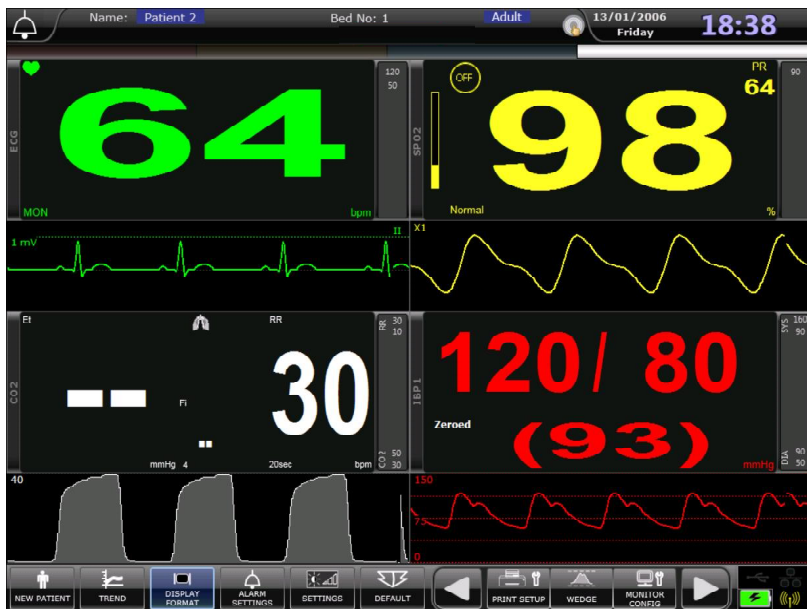


Figure 4.3

Following parameters will be displayed in Standard 3 format :

Channel 1: ECG waveform with numeric window.

Channel 2: SpO₂ waveform with numeric window.

Channel 3: Resp/CO₂ waveform with numeric window.

Channel 4: IBP1/IBP2/IBP3/IBP4 waveform with numeric window or NIBP numeric.

Quick ECG Format

Quick ECG Display Format will 5L ECG cable be as shown in figure 4.4.

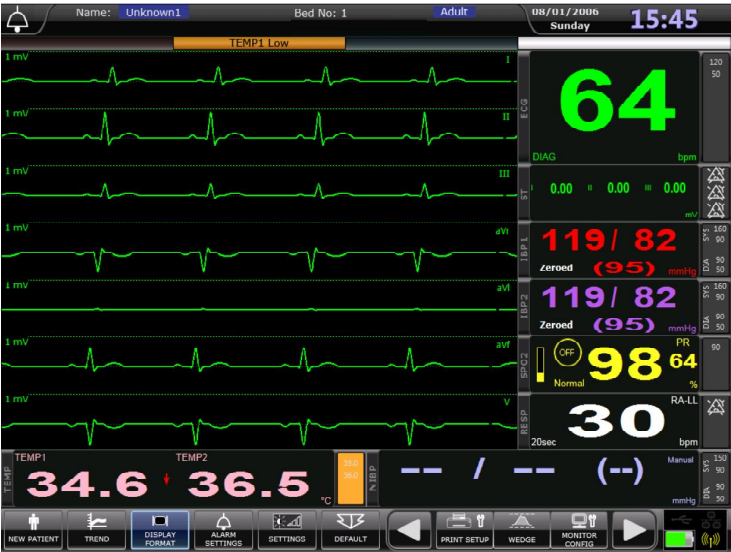


Figure 4.4

Quick ECG Format will work only on selection of Auto 5L.

In this display all the ECG leads will be displayed in the waveform plotting area. The area used for this plotting will be equivalent to area used for a 8 waveform channel display plotting.

Display Format for 5L cable is:

Lead I	HR
Lead II	
Lead III	ST
Lead avr	IBP1
Lead avl	IBP2
Lead avf	SpO ₂
Lead v	CO ₂ /Resp
Temp	NIBP

User will be able to change the Numeric Fields using ECG Setup Menu.

Auto Format

Auto Format will be as shown in figure 4.5.



Figure 4.5

User can select Auto Format from the Display Format tab in the Primary menu.

In Auto Format the display area will fit in a maximum of 8 waveforms and 3 numeric fields. The template for Auto Format screen when all 8 waveform fields and 1 numeric fields are selected will be as shown below.

W/F 1			W/F 1 numeric		
W/F 2			W/F 2 numeric		
W/F 3			W/F 3 numeric		
W/F 4			W/F 4 numeric		
W/F 5			W/F 5 numeric		
W/F 6			W/F 6 numeric		
W/F 7			W/F 7 numeric		
W/F 8			W/F 8 numeric		
Numeric 1		Numeric 2		Numeric 3	

In Auto Format all the parameters will be displayed if the particular cable is detected. In case of IBP channels in addition to the cable detection and parameter selection will be based on the transducer detected.

Display Format will be resize automatically based the detected parameters at any point of time.

Eg: There are only 5 waveform fields and 2 numeric fields available, the screen will resize to adjust to exactly 5 waveform fields and 2 numeric fields. There will not be any blank waveform fields on the screen.

In case any of the parameter is detached from the unit while in working the screen will resize to adjust to fit in all the other selected parameters.

Parameters will be displayed based on the priority in real time screen.

Parameters with Waveforms:

1. Lead II
2. Lead V (Only with 5L Cable)
3. IBP 1
4. IBP 2
5. IBP 3
6. IBP 4
7. SpO₂ (Int)
8. CO₂/Resp
9. AA
10. O₂
11. SpO₂

Parameters with Numerics:

1. NIBP
2. CO
3. N₂O (AGM)
4. Temp
5. ST
6. IPI

Order & Priority of Parameters in Auto Format

1. **ECG**

- a. If ECG module is detected &
- b. If ECG does not have communication error &
- c. If 3 Lead Cable is detected

Then Lead II & Cascade will be displayed in Auto Format.

- d. If ECG is connected &
- e. If ECG does not have communication error &
- f. If 5L cable is detected

Then Lead II & Lead V1 will be displayed in Auto Format.

2. **IBP 1**

- a. If IBP 1 module is detected &
- b. If IBP 1 does not have communication error &
- c. If IBP 1 Cable is detected

Then IBP 1 will be displayed in Auto Format.

Note

These conditions will be same for IBP 2, IBP 3 & IBP 4.

3. **SpO₂**

- a. If SpO₂ module is detected &
- b. If SpO₂ does not have communication error &
- c. If SpO₂ does not have sensor off condition

Then SpO₂ waveform will be displayed in Auto Format.

When AGM, CO₂ & Resp is present, highest priority will be given to AGM followed by CO₂ and Resp.

When CO₂ and SpO₂ are present, IPI will also be present in the display format.

User Format 1 to 4

Four User Configurable Formats are available in Star 65. User can format the User Format 1-4 using Display Format Editor. Channel 1 will always be ECG, and can not be configured by user.

It can be selected using optical encoder or touch. After configuring all the four User formats, selecting the particular user format will display the configured screen in real time. Second time selecting the same User Format will take the user to Display Format Editor window.

User Format

User format can be selected using optical encoder or touch on Display Format.

There are two options in User Format they are

- Display
- Edit

Display

Display can be selected using optical encoder or touch from any of the User Format from 1-4. Selecting on particular User Format from 1-4 and selecting Display will display the previously saved setting for that particular User Format.

Edit

Edit can be selected using optical encoder or touch from any of the User Format from 1-4. Selecting on particular User Format from 1-4 and selecting Edit will take the user to Display Format Editor window, which allows the user to edit the previously saved setting for that particular User Format.

Display Format Editor Window is as shown in figure 4.6.



Figure 4.6

In Display Format, 4 User Configurable Formats they are

- 6-8 Waveforms
- 3-7 Waveforms, 3 Numeric Fields
- 1-4 Waveforms, 6 Numeric Fields
- 1 Waveform, 6 Numeric Fields

6-8 Waveforms

In this format user will be allowed to select a minimum of 6 waveform channels and a maximum of 8 Waveform Channels.

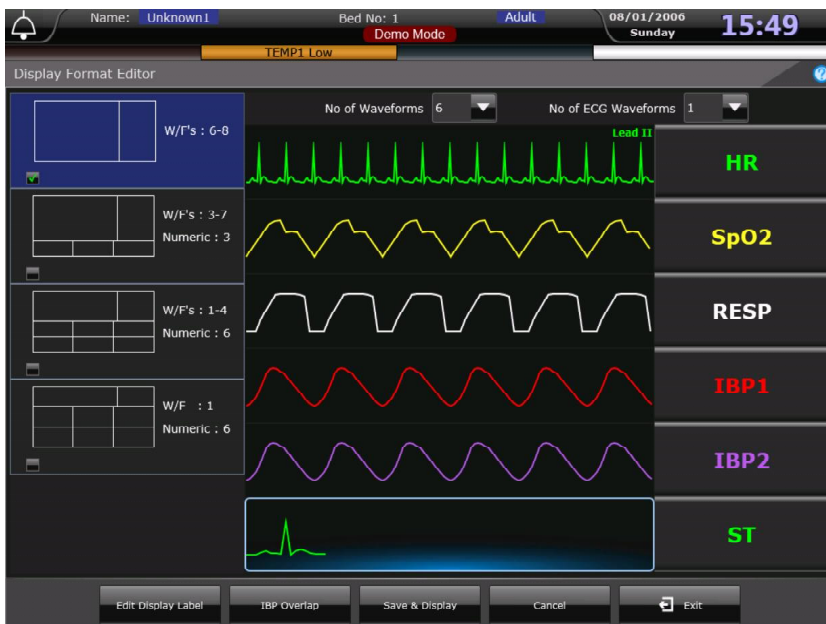


Figure 4.7

3-7 Waveform, 3 Numeric Fields

In this format user will be allowed to select a minimum of 3 waveform channels and a maximum of 7 waveform Channels and 3 Numeric Fields.

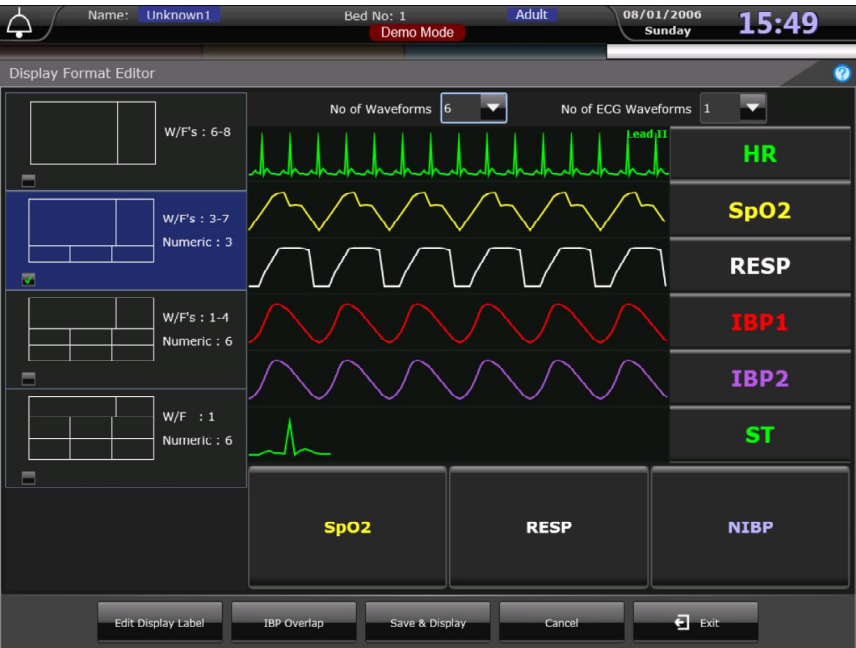


Figure 4.8

1-4 Waveforms, 6 Numeric Fields

In this format user will be allowed to select a minimum of 1 waveform channel and a maximum of 4 waveform Channels and 6 Numeric Fields.

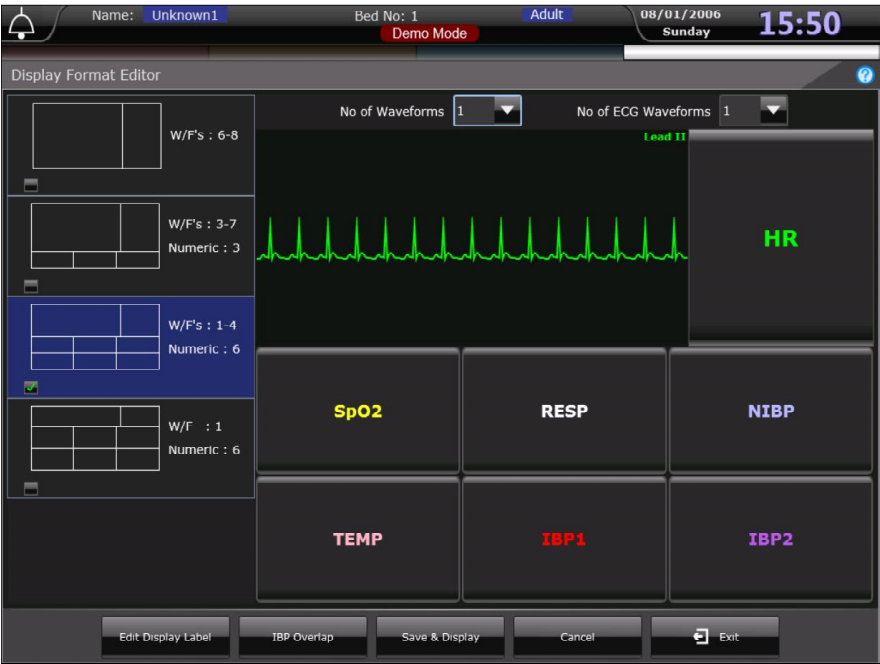


Figure 4.9

1 Waveform, 6 Numeric Fields

In this format user will be allowed to select 1 waveform channel and a 6 Numeric Fields.

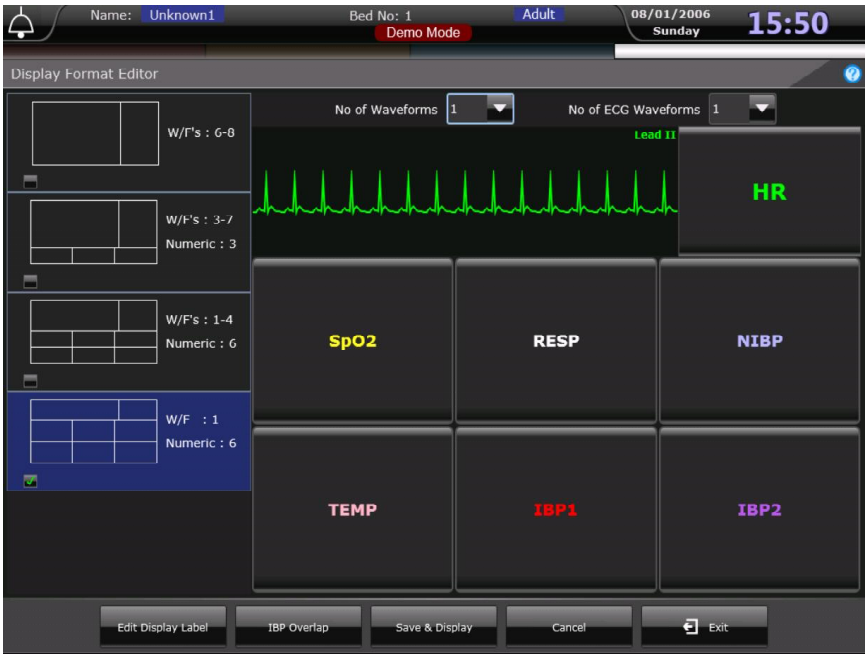


Figure 4.10

After selecting any of the format the cursor will move automatically to “**No of Waveforms**” field, where by default 6 will be selected and user will be allowed to select number of waveforms between 6-10 from the drop down list. According to the No of Waveforms selected, total Waveform area will be divided and equal allotted to each Waveform Channel. All the waveform channel will be reset to “**None**”.

Then the cursor will move automatically to “**No of ECG Waveforms**” field where the user will be allowed to select the number of ECG waveforms to be displayed in real time screen using drop down list. Minimum no of ECG waveforms selectable is 1 and maximum is 8. By default No. of ECG waveforms will be 1.

ECG waveform drop down will vary based on the “**No of Waveforms**” selected.

For Eg: If no of waveforms selected is 6 then ECG waveform drop down list will all the user to select 1-6 ECG waveforms.

After selecting the no of ECG Waveforms the cursor will move to Waveform area. By default first waveform channel will be ECG and it can not be changed by the user. User can change only the ECG Leads.

After selecting ECG Leads user has to select other waveform for other channels. Then the cursor will move to Edit Display Label

Lead options for 3L ECG Cable

Lead I
Lead II
Lead III
Cascade
None

Note

When 3L ECG cable is connected, only one lead can be selected, if the user this to select more than one lead a warning message will pop up.

Lead options for 5L ECG Cable

Lead I
Lead II
Lead III
Lead aVr
Lead aVI
Lead aVf
Lead V
None

Other Waveform Channel

User can select other parameters in the other waveform channel other than that allotted for ECG. After selecting any waveform field, Select Waveform option will appear for selection as below.

ST
SpO ₂
RESP/CO ₂ *
AA*
O ₂ *
IBP 1
IBP 2
IBP 3*
IBP 4*
NONE

* Are the optional parameter. When ever the module is detected, option will appear for selection in Select Waveform list.

Numeric Field

After waveform selection cursor will moved to numeric field where user will be allowed to select any Numerical parameter for Numeric fields other than ECG.

ST
SpO ₂
RESP/CO ₂ *
IPI
AA*
O ₂ *
N ₂ O*
Temp
NIBP
IBP 1
IBP 2
IBP 3*
IBP 4*
CO*
Timer
NONE

- Are the optional parameter. When ever the module is detected, option will appear for selection in Select Waveform list.
- Whenever SpO₂ and CO₂ module both are connected and monitored this parameter will appear.

Edit Display Label

This tab will allow the user to edit label of User Format 1-4. User can enter a name of his choice for the configured format with a maximum limit of 10 character.

IBP Overlap

Selecting IBP Overlap a window will open, which will allow the user to select 2 IBPs Overlap or 3 IBPs Overlap. By default None will be selected.

2 IBPs Overlap : By selecting this user can overlap first two IBP waveforms for display.

3 IBPs Overlap : By selecting this user can overlap first three IBP waveforms for display.

Save & Display

Selecting this user can save the currently configured display format and can display the same in real time screen. Previously selected format details will be lost.

Cancel

Selecting this tab will erase the currently configured settings and will display the previously save settings. User can configure the settings again.

Exit

Selecting this tab user can come out of Display Format Editor window without saving the configured settings.

Patient Management

New Patient

By default on boot up the menu selection will be on “New Patient”. This can be selected using optical encoder or touch.

Selection of New Patient will open a Admit Patient Window as show in figure 5.1.

The screenshot shows a software window titled "Admit Patient" with a help icon in the top right corner. The window contains several input fields and buttons. The "Patient ID" field is highlighted in blue and has an asterisk (*) next to it. The "Bed No" field contains the value "1". The "First Name" field contains "Patient 1" and has an asterisk (*) next to it. The "Last Name" field is empty and has an asterisk (*) next to it. The "Patient Mode" section has three buttons: "ADULT" (highlighted in blue), "PEDIATRIC", and "NEONATAL", with an asterisk (*) next to the group. The "Paced" section has two buttons: "YES" and "NO". The "Age" field is empty, followed by the text "Years". The "Sex" section has two buttons: "MALE" and "FEMALE". The "Height" field is empty, followed by the text "Cm". The "Weight" field is empty, followed by the text "Kgs". There are two large text areas for "Allergy Info" and "Diagnosis". At the bottom right, there are three buttons: "Clear All", "Save", and "Exit".

Figure 5.1

This window allows the user to enter the details of the patient. Patient details can be entered using alpha numeric keypad. In Admit Patient window their are 3 mandatory fields they are

- Patient ID (*)
- First Name (*)
- Patient Mode (*)

* are used to highlight mandatory fields

Patient ID

By default cursor will be on Patient ID field. By selecting Patient ID a alpha numeric keypad will pop up for the user to enter Patient ID. Patient ID can be a alphanumeric with maximum size of 14 characters. After entering Patient ID select Done.

First Name

This field will allow the user to enter patient's First Name using alpha numeric keypad. First Name can be alphanumeric with maximum size of 14 characters. After entering select Done.

Last Name

This field will allow the user to enter patient's Last Name using alpha numeric keypad. Last Name can be alphanumeric with maximum size of 14 characters. After entering select Done.

Patient Mode

This field to select the Patient Mode. There are 3 Patient Modes they are

- Adult
- Pediatric
- Neonatal

Paced

This field is to select if the patient is having a pacer or not. Recommended to select this field for accurate HR calculation with pacemaker patients.

Paced option will be grayed out on selection of Neonatal mode.

Age

Field to enter patient's age. If patient selected is adult then the age will be entered in years, if the patient selected is pediatric then user can enter the age in years or months, similarly if the patient is neonate then the age has to be entered in days.

For Adult maximum size of 3 digits can be entered between 1 year to 140 years.

For Pediatric maximum size of 2 digits can be entered between 1 year to 15 years or 1 month to 11 months.

For Neonatal maximum size of 2 digits can be entered between 1 day to 29 days.

When Age field is selected alphabets in alpha numeric keypad will be grayed out.

Sex

Field to select patients Sex. Male & Female are the two options for selection.

Height

Field to enter the patient's Height. It can be maximum integral of 3 characters. If the unit is in Cms it can be from 20 to 300 & for Inches it can be from 20 to 117.

Height can be entered in Inches or Cms. Unit for Height measurement can be set in Parameter Unit of Monitor Configuration.

Weight

Field to enter the patient's Weight. It can be maximum integral of 3 characters. If the unit is in Kg it can be from 20 to 350 & for lbs it will be from 20 to 770.

Weight can be entered in Kg or lb. Unit for Weight measurement can be set in Parameter Unit of Monitor Configuration.

Allergy Info

Field to enter information of patient's Allergy to drugs if any. It can be maximum of 59 characters.

Diagnosis

Field to enter information of patient's earlier Diagnosis if any. It can be maximum of 59 characters.

Clear All

Selecting Clear All will Clear All the entered patient details.

Save

Selecting Save will save the entered patients details.

Exit

Selecting Exit will return to Main Screen.

Note

A maximum of 10 patients can be entered. Enter eleventh patient a warning message will pop for confirmation for deleting first patient.

Bar Code Scanning (Optional)

Star 65 has a feature of Bar Code Detection. Using Bar Code Scanner user can enter the Patient ID.

How to Connect Bar Code Scanner

Connect the Bar Code Scanner to USB port of Star 65. Once the scanner is detected it will give a beep sound.

How to Use Bar Code Scanner

After connecting Bar Code Scanner to Star 65. Scan the bar coded ribbon tied to patient to admit a new patient. Scanned bar code will be taken as Patient ID.

TREND

Trend is selected to retrieve the data of the patient recorded. Trend can be selected using Optical Encoder or Touch in the primary Menu.

Selecting on Trend will open a Trend Launcher Window as shown in figure 6.1.

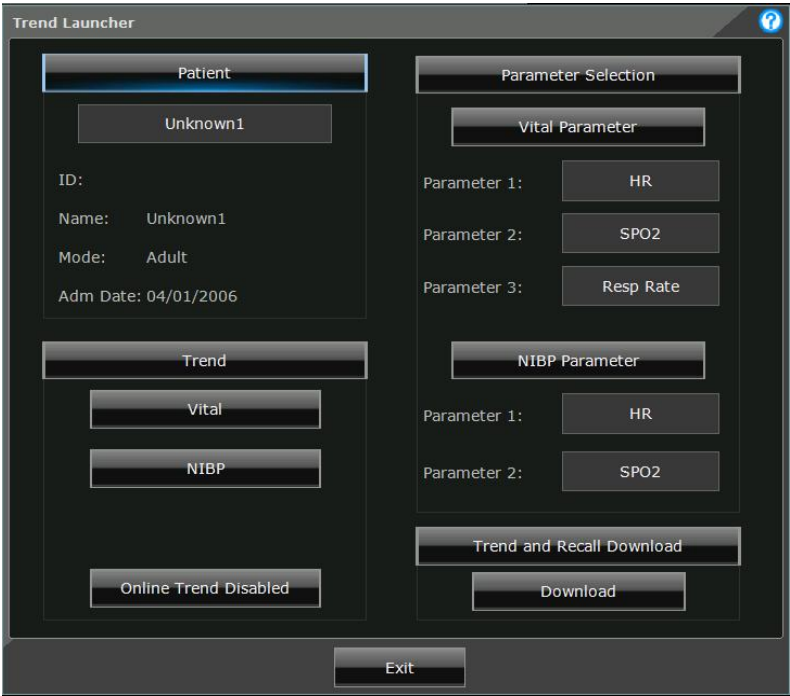


Figure 6.1

Trend data of last 10 patients will be available for viewing.

Movement of Optical Encoder

Initially by default cursor will be on Patient.

Patient-->Trend-->Parameter Selection-->Trend and Recall Download-->Exit

Patient

Selecting this tab will allow the user to select list of all the patients whose trend data is available.

By default current patient will be selected. Using Optical Encoder or Touch user can select the patient from the list.

After selecting the patient details such as ID, Name, Mode & Adm Date of the patient will be displayed.

Trend

- Vital
- NIBP
- CO

Vital Trend

Selecting this tab will open a Vital Trend Window here Tabular Trend and Graphical Trend will be displayed on the same window by dividing the window in to 2 half, first half is Tabular Trend and second half is Graphical Trend.

It will display the Trend data of the parameters selected in Parameter Selection tab.

Vital Trend window will display Name & Pat ID.

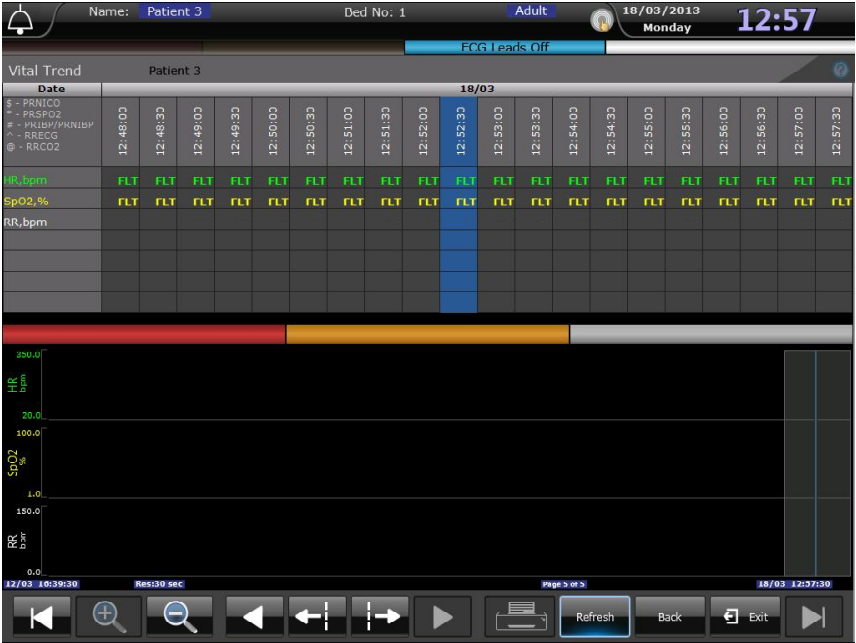


Figure 6.2

- a. Left Page Scroll
- b. Zoom In
- c. Zoom Out
- d. Slider Left
- e. Slider Reading Left
- f. Slider Reading Right
- g. Slider Right
- h. Right Page Scroll

By default resolution will be 30 sec. Resolution can be increased or decreased using Zoom In/Zoom Out. Minimum resolution is 30 sec and maximum resolution is 60 min.

The available resolution options are:

- 30 sec
- 1 min
- 2 min
- 3 min
- 6 min
- 12 min
- 18 min
- 30 min
- 60 min

By default trend scroll tab will be on the latest reading i.e. on the right hand side. The left page scroll and the left reading scroll will be grayed out. It will be active when the trend scroll window is moved towards left. If there is no data or fault alarm condition has occurred, the graphical trend will not show baseline instead it will be blank.

Error messages will be displayed in the corresponding message area.

Left Page Scroll

This can be selected using Optical Encoder or Touch.

Selecting this tab current page data will be replaced with the previous page data with the same resolution as of existing page.

Zoom In

This can be selected using Optical Encoder or Touch.

Selecting this tab will decrease the resolution. Minimum resolution is 30 sec. After reaching minimum value Zoom In will be grayed out and Zoom Out will be highlighted.

Zoom Out

This can be selected using Optical Encoder or Touch.

Selecting this tab will increase the resolution. Maximum resolution is 60 min. After reaching maximum value Zoom Out will be grayed out and Zoom In will be highlighted.

Slider Left

This can be selected using Optical Encoder or Touch.

Selecting this tab the slider will move to left for next set of readings without changing resolution. A set consist of 20 readings.

Slider Reading Left

This can be selected using Optical Encoder or Touch.

Selecting this tab user can move reading by reading inside a selected set. There will be a dotted line on the graphical trend to indicate which reading is selected at present. Corresponding reading will be highlighted in the tabular trend.

Slider Reading Right

This can be selected using Optical Encoder or Touch.

Selecting this tab user can move reading by reading inside a selected set. There will be a dotted line on the graphical trend to indicate which reading is selected at present. Corresponding reading will be highlighted in the tabular trend.

Slider Right

Selecting this tab the slider will move to right for next set of readings without changing resolution. A set consist of 20 readings.

Print

Selecting Print will print the data in selected resolution.

Refresh

Selecting of Refresh tab will refresh and update the trend screen with the latest values.

Back

Selecting Back tab will take the user to Trend Launcher window.

Exit

Selecting Exit will return to Main Screen.

Right Page Scroll

Selecting this tab current page data will be replaced with the next page data with the same resolution as of existing page.

NIBP

Selecting this tab will open a NIBP Trend Window here Tabular Trend and Graphical Trend will be displayed on the same window by dividing the window in to 2 half, first half is Tabular Trend and second half is Graphical Trend.

It will display last 240 NIBP readings.

NIBP Trend window will display Name & Pat ID.

Graphical Trend is event based and will be plotted only when the reading is taken.

Error messages will be displayed in the corresponding message area.

NIBP graphical trend will plot values from 20 mmHg to 260 mmHg.

Left Page Scroll

Selecting this tab current page data will be replaced with the previous page data with the same resolution as of existing page.

Show Connectors/Hide Connectors

Selecting this tab once will Show the connecting lines mean of one reading to the mean of the following reading and the previous reading. Same will be followed for systolic and diastolic reading also. Selecting the same second time will Hide the connecting lines.

Slider Reading Left

Selecting this tab user can move reading by reading inside a selected set. There will be a line on the graphical trend to indicate which reading is selected at present. Corresponding reading will be highlighted in the tabular trend.

Slider Reading Right

Selecting this tab user can move reading by reading inside a selected set. There will be a line on the graphical trend to indicate which reading is selected at present. Corresponding reading will be highlighted in the tabular trend.

Print

Selecting Print will print the data in selected resolution.

Refresh

Selecting of Refresh tab will refresh and update the trend screen with the latest values.

Back

Selecting Back tab will take the user to Trend Launcher window.

Exit

Selecting Exit will return to Main Screen.

Right Page Scroll

Selecting this tab current page data will be replaced with the next page data with the same resolution as of existing page.

Online Trend Enable/Disable

Selecting this tab will Enable/Disable 3hrs online trend on the Real Time Screen.

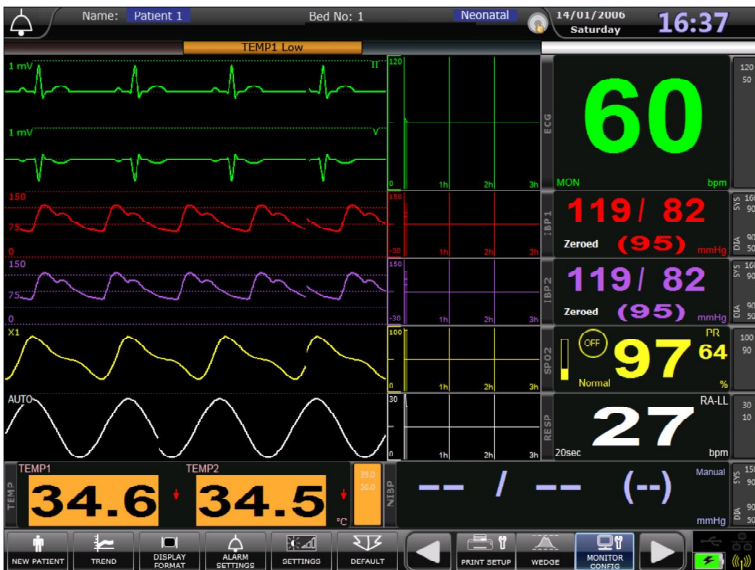


Figure 6.3

Note

Duration of Online Trend fixed.

Parameter Selection

Selecting this tab will enable the user to select the parameter to be displayed in Vital Trend and NIBP Trend.

Vital Parameter

Selecting Vital Parameter user can select 3 Parameters for display in Vital Trend.

Selecting on any of the parameter a list will be displayed for the user to select the parameter. Once a parameter is selected for a particular parameter that same parameter cannot be selected for another parameter.

Note

For 3 Lead ECG cable only ST1 option will come.

The available parameters are

HR
ST1
ST2
ST3
SpO ₂
Temp 1
Temp 2
Resp Rate
IBP1
IBP2
IBP3*
IBP4*
EtCO ₂ *
FiCO ₂ *
EtO ₂ *
FiO ₂ *
EtN ₂ O*
FiN ₂ O*
EtAA*
FiAA*
N ₂ O*
CO*

* Are the optional parameter. When ever the module is detected, option will appear for selection.

User can select IBP parameters only in parameter 2 or parameter 3. Parameter 1 there will be no option of IBP.

NIBP Parameter

Selecting NIBP Parameter user can select 2 Parameters for display in NIBP Trend. Same parameter can not be selected for Parameter 1 & Parameter 2.

The available parameter are

HR
SpO ₂
Temp 1
Temp 2
Resp Rate

Trend and Recall Download

Selecting this tab user can download patient data to USB. Without connecting USB if this option is selected a warning message will appear. Data will be downloaded to thumbdrive with patient name folder. Inside patient name folder there will be two folders namely Graphical & Tabular where user can view ST & Arrhythmia Recalls in PDF Format & all the tabular trend data in Excel Format.

Note

Do not disconnect thumbdrive while downloading data.

Alarm Settings

Alarm Settings

Selecting Settings will popup a Alarm Settings window which allow the user to view the alarm limits & change the set alarm limits for particular parameter.

Alarm Settings window is as shown in figure 7.1.

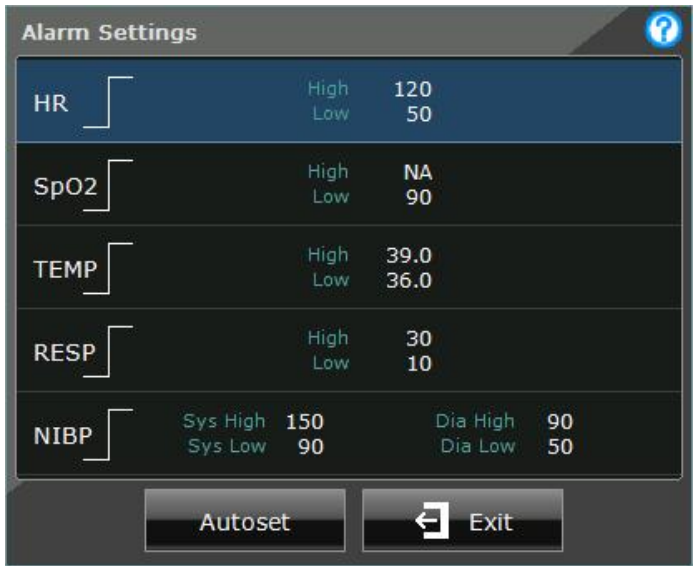


Figure 7.1

Parameter in Alarm Settings window will be displayed based on the display format selected.

AutoSet

Selecting AutoSet, high & low alarm limits will change as per the currently monitored parameter value.

Exit

Selecting Exit will return to Main Screen.

Alarm Checks

Visual Check

Perform a bootup check for verifying visual alarm. During bootup of the monitor all the alarm lamps should glow one after the other.

Audio Check

Perform audio check using alarm volume control by varying alarm volume in steps of 1 and observe for volume change difference between each step.

Note

Auditory alarm signals are distinguishable from those of non auditory alarm signals in the monitor.

Settings

System Settings

Selecting Settings will popup a System Settings window which allow the user set display settings such as Volume, Brightness & Contrast, Waveform Speed, Resp Speed & Parameter Colour.

Initially the cursor position will be placed on Volume.

Volume

Selecting Volume will popup a Volume Setup where the user can set 10 levels of Alarm Volume from 1 to 10, 10 levels of Beep Volume from 0 to 10 & 10 levels of Speech Volume from 0 to 10 using optical encoder or slider. Selecting and rotating clockwise direction to increase the volume and rotating anticlockwise direction to decrease the volume.

Beep Volume and Speech Volume can be muted by clicking on Mute symbol.

Exit to return to System Settings Window.

Brightness & Contrast

Selecting Brightness & Contrast will popup a Brightness & Contrast window where the user can set the Brightness in 4 levels from level 1 to 4 i.e., 40%, 60%, 80% & 100%. Minimum is level 1 (40%) & Maximum is level 4 (100%).

If the unit is working in battery the brightness will automatically change to level 2 (60%) Irrespective of set brightness level. On recovery of AC mains the brightness level will be reset to the set value.

Contrast can be set in 5 levels from 1 to 5 i.e., 20%, 40%, 60%, 80% & 100% using optical encoder or slider.

Select and rotate in clockwise direction to increase Brightness/Contrast and rotate.

anticlockwise direction to decrease Brightness/Contrast.

Exit to return to System Settings Window.

Waveform Speed

Waveform Speed allows the user to change the speed of the waveform.

Selecting Waveform Speed and rotating in clockwise direction will increase the waveform speed and rotating in anticlockwise direction will decrease the Waveform Speed.

The available Waveform Speeds are

- 12.5 mm/sec
- 25 mm/sec
- 50 mm/sec

Resp Speed

Resp Speed allows the user to change the speed of the Respiration waveform.

Selecting Resp Speed and rotating in clockwise direction will increase the waveform speed and rotating in anticlockwise direction will decrease the Resp Speed.

The available Resp Speeds are

- 6.5 mm/sec
- 12.5 mm/sec
- 25 mm/sec

Parameter Colour

Selecting Parameter Colour a Parameter window will popup with the list of parameters. Here the user can select the parameter for which the colour has to be changed.

Selecting the parameter a Colour Change Menu will popup for colour selection. Here the user can select the desired colour for the selected parameter.

Default

Selecting Default will popup a confirmation message. Selecting Confirm will save the settings as default settings & selecting Cancel will return to main screen without saving the settings.

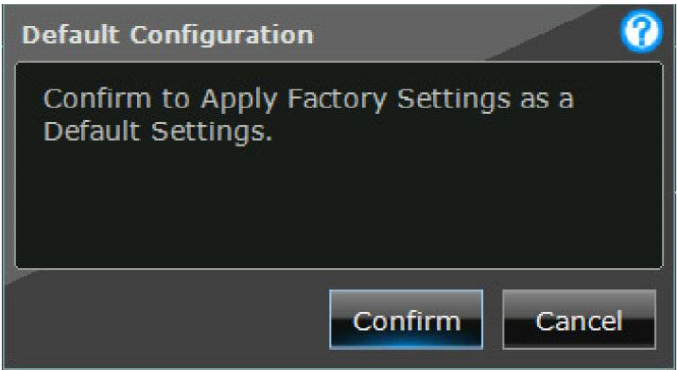
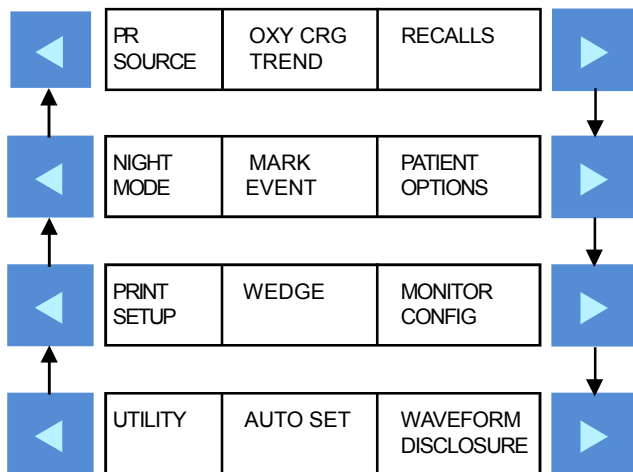


Figure 9.1

Scroll Menu

Scroll Menu

Star 65 has a scroll menu where the user can scroll between 12 menu tabs using Left Scroll & Right Scroll.



PR SOURCE

Selecting PR Source will popup a PR Source window.

Auto
IBP
SpO ₂
NIBP
Exit

Note

Parameters for selection will appear only if the module is detected.

Note

IBP will be available for selection, if IBP label is selected as ART or AO only.

Selected PR Source will be displayed in the ECG numeric area in place of HR. If Auto PR Source is selected then the priority will be

ECG-->IBP-->SpO₂

If the PR Source is selected as IBP then the priority will be

IBP1-->IBP2-->IBP3-->IBP4

Note

When IBP label is selected as AO or ART the PR source is from IBP.

If any of the PR source is selected manually and if the respective module is in error condition then “—” will be displayed in ECG numeric area.

Note

On Power ON by default PR Source will be AUTO.

OXY CRG TREND

This can be selected using Optical Encoder or Touch.

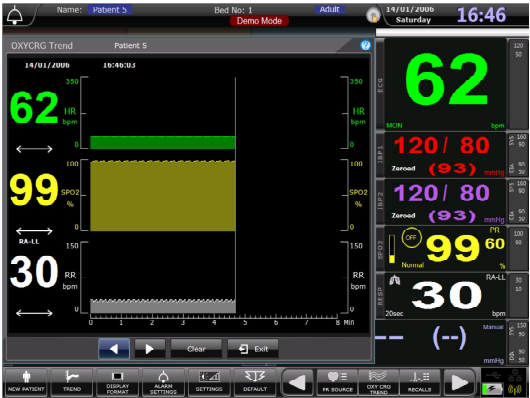


Figure 10.1

Selecting this will open a OXY CRG Trend window. It will display current Patient ID and Patient Name.

Parameters displayed in OXY CRG Trend are HR, SpO₂ & RR. Graphical Trend of the parameters will be displayed.

Parameters of OXY CRG Trend are fixed. OXY CRG display will allow the user to view continuously with 2 sec resolution. OXY CRG storage capacity is 8 min.

Note

OXY-CRG Trend is only for the current patient and not for the previous patient.

Note

OXY-CRG Trend will starts updating once the OXY-CRG Menu invoked.

Marker (Left Marker-Right Marker)

This will allow the user to scroll the marker left & right inside the OXY CRG Trend. Values of HR, SpO₂ & RR will be updated on marker position.

Clear

Selecting Clear will clear the accumulated OXY CRG Trend data.

Exit

Selecting Exit will return to Main Screen.

RECALLS

Selecting this a Recall window will open, where the user can view **Alarm Recall, Arrhythmia Recall, ECG Recall, ST Recall, Apnea Recall & Event.**

By default Alarm Recall will be selected for display.

Alarm Recall

Selecting Alarm, Alarm Recall window will open as shown below

Recalls

Alarm	Arrhythmia	ECG	ST	Apnea	Event
Date	Time	Parameter	Value	Remark(Limit)	
01/01/2010	15:31:17	RR	0	Apnea	
01/01/2010	15:31:07	RR	6	LOW (10)	
01/01/2010	15:28:37	HR	28	LOW (75)	
01/01/2010	15:28:36	HR	62	LOW (75)	
01/01/2010	15:27:58	HR	112	HIGH (95)	
01/01/2010	15:27:29	HR	140	HIGH (95)	
01/01/2010	15:27:13	Arrhythmia	124	Tachycardia	
01/01/2010	15:26:48	Arrhythmia	45	Bradycardia	
01/01/2010	15:26:34	HR	49	LOW (50)	
01/01/2010	15:26:08	Arrhythmia	72	Skip Beat	
01/01/2010	15:26:00	Arrhythmia	75	Skip Beat	
01/01/2010	15:25:50	Arrhythmia	75	Skip Beat	
01/01/2010	15:25:40	Arrhythmia	75	Skip Beat	
01/01/2010	15:25:30	Arrhythmia	75	Skip Beat	
01/01/2010	15:25:20	Arrhythmia	75	Skip Beat	

Page:1 of 3

▲

▼

Refresh

Exit

Figure 10.2

First column indicates Date at which alarm had occurred.

Second column indicates Time at which alarm had occurred.

Third column indicates Parameter for which the alarm had occurred.

Fourth column indicates value at which the alarm occurred.

Fifth column indicates Remark that is value was high or low than the set limit. It will also show the set limit.

Up/Down Arrow

Using Up/Down Arrow user can scroll between the available alarm pages (previous page & next page).

Print

Selecting Print will print the data in selected resolution.

Print option will be enabled only when printer is connected to EUT.

Refresh

Selecting Refresh will refresh the recall screen.

Exit

Selecting Exit will return to Main Screen.

Note

Logs of all the patient alarms are saved irrespective of power interruption.

Note

All the alarm logs are overwritten with the latest data when the storage limit is exceeded.

Arrhythmia

Selecting Arrhythmia a Arrhythmia Recall window will open as shown below



Figure 10.3

Up/Down Arrow

Using Up/Down Arrow user can scroll between the available alarm pages (previous page & next page).

Print

Selecting Print will print the data in selected resolution.

Print option will be enabled only when printer is connected to EUT.

Exit

Selecting Exit will return to Main Screen.

ECG

Selecting ECG a ECG Recall window will open as shown below



Figure 10.4

Select ECG to recall -30sec of freezed ECG waveforms with heart rate Each 30 sec strip stores in the form of 5 individual strips. Each individual strip duration will be 6 sec. There will be maximum of eight pages with five strips in each page.

Up/Down Arrow

Using Up/Down Arrow user can scroll between the available alarm pages (previous page & next page).

Print

Selecting Print will print the data in selected resolution.

Print option will be enabled only when printer is connected to EUT.

Exit

Selecting Exit will return to Main Screen.

ST

Selecting ST a ST Recall window will open as shown below. ST Recall is available for last 240 mins at a resolution of 1 min.

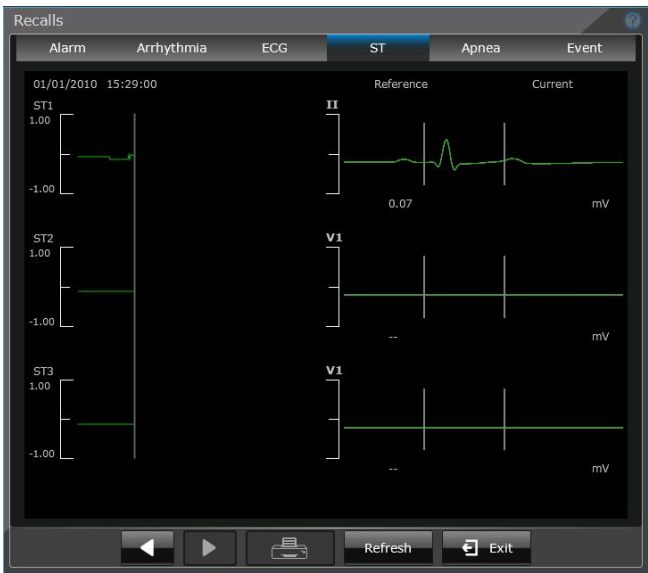


Figure 10.5

Left/Right Arrow

Using Left/Right Arrow user can scroll between the available values.

Print

Selecting Print will print the data in selected resolution.

Refresh

Selecting Refresh will refresh the recall screen.

Exit

Selecting Exit will return to Main Screen.

Up/Down Arrow

Using Up/Down Arrow user can scroll between the available alarm pages (previous page & next page).

Print

Selecting Print will print the data in selected resolution.

Refresh

Selecting Refresh will refresh the recall screen.

Exit

Selecting Exit will return to Main Screen.

Third column will display the name or description of the Event.

Up/Down Arrow

Using Up/Down Arrow user can scroll between the available alarm pages (previous page & next page).

Print

Selecting Print will print the data in selected resolution.

Exit

Selecting Exit will return to Main Screen.

Night Mode

Selecting Night Mode will popup a Night Mode window as shown below

Selecting Night Mode, brightness of the screen, Alarm Volume & Beep Volume will be adjusted automatically.

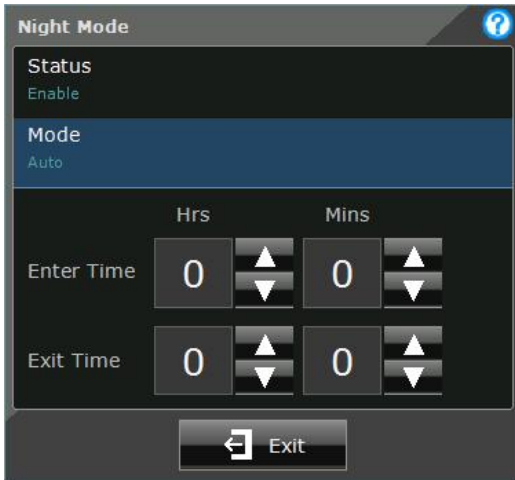


Figure 10.8

- Brightness - Level 2
- Contrast - Level 4
- Alarm Vol – Level 6
- Beep Vol – Level 6
- Speech - Level 3

Selecting Night Mode a Moon symbol will appear in the main screen next to global alarm.

Night Mode have the option of Status, Mode, Enter Time & Exit Time. Night Mode has to be enabled first, otherwise all other options will be grayed out.

There are two modes they are

- Auto
- Manual

Auto Mode

When Auto Mode is selected it will allow the user to enter Enter Time & Exit Time in Hrs & Mins using Up/Down Arrow. Once Enter time & Exit time is entered, monitor will go to Night Mode daily automatically & exits from Night mode automatically as per user defined time.

Manual Mode

When Manual Mode is selected Enter Time & Exit Time will be grayed out.

When user want to exit from night mode, user has to disable the night mode manually.

Exit

Selecting Exit will return to Main Screen.

After enabling Night Mode if the user manually modifies brightness/beep volume/alarm volume settings, a pop up confirmation message will appear for changing the default night mode settings. Selecting Ok will save the changed settings as default night mode settings. Selecting Cancel will exit without saving.

Mark Event

Selecting Mark Event will display a Mark Event window as shown below



Figure 10.9

Events are the records of patients condition. Selecting this will open a Mark Event window, where user can mark instance when the patient experiences a change due to external conditions such as the patient is being shifted to an ICU, patient is just given medication, patient is coughing etc. The doctor/observer might want to record some vital parameters when these conditions occur as it may help him in his observation and his drug administration/treatment.

Events are classified into 3 category they are

- Medication
- Patient
- Intervened

By default the cursor will be on Medication. Events under Medication are:

- Fentanyl
- Versed
- Midazolam
- Morphine
- Demerol
- Propofol
- Sinarest
- Saline

Events under Patient are:

- Eating
- Drinking
- Calm
- Uneasy
- Coughing
- Shifting
- Chest Pt
- Turned
- Snoring

Events under Intervened are:

- Oxygen
- Blood Transfusion
- Suction
- Adj airway
- Narcan
- Romazicon
- Neb Tx
- Stimulated
- Pre Induction
- Intubation
- Sternotomy
- Start of surgery
- End of Surgery

Mark

Selecting on Event, Mark will be highlighted. Clicking on Mark will Mark the selected event and exit Mark Event window. The marked Event will be saved in Event window of Recalls. Marked Event can be viewed in Vital Trend with other Vital parameters.

Note

Time gap of 30 seconds is required for selecting one event to another event.

Edit

Events can be edited by selecting Edit. Event can be of maximum 19 characters. Selecting Edit will open a alphanumeric keypad for entering the event. In each category user can Edit or Add a maximum of 20 events in each category.

Up/Down Arrow

Using Up/Down arrows user can scroll through the available Event list.

Exit

Selecting Exit will return to Main Screen.

Patient Options

Selecting this a popup window will open as shown below

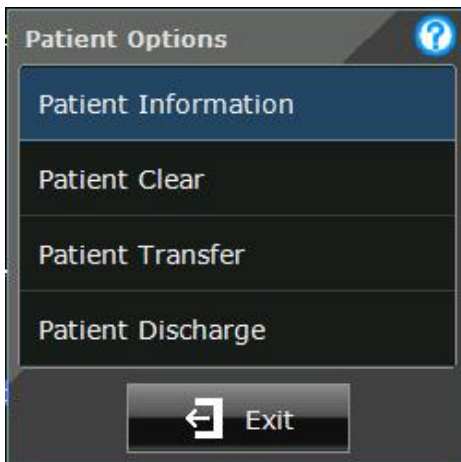


Figure 10.10

The available Patient Options are:

- Patient Information
- Patient Clear
- Patient Transfer
- Patient Discharge

Patient Information

Selecting this, a list of available patients will be displayed. User can select any patient to view the details.



Figure 10.11

Note

User can view details of the patient entered in Admit Window.

Patient Clear

Selecting this a list of available Patient will be displayed for the user. User can clear all the patients data at a time by selecting “All” or user can select a particular patients data and clear. Selecting a patient, a confirmation message will popup, selecting Yes will clear the patient information. Selecting No will go back to Main screen.

Exit

Selecting Exit will return to Patient Options.

Patient Transfer

Selecting Patient Transfer a Patient Transfer window will popup with the options Download & Upload.

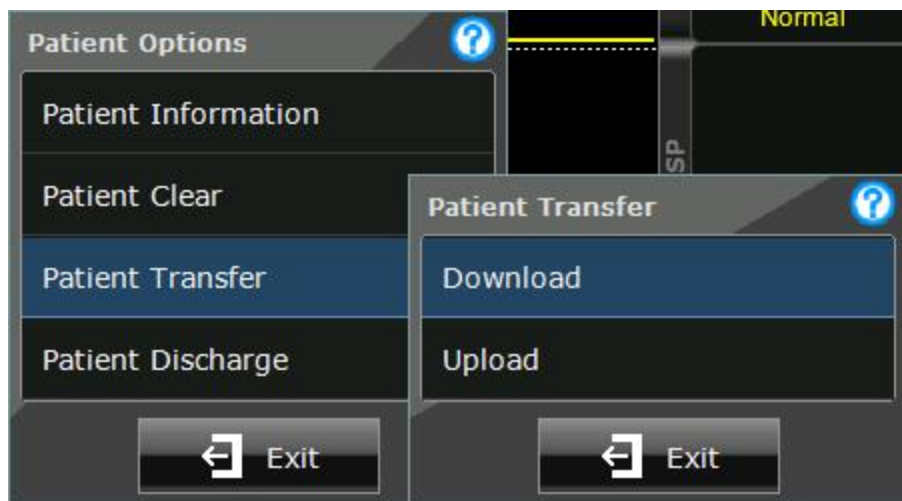


Figure 10.12

Download

Selecting Download, a list of available/admitted patients will be displayed. User can select the patient whose data has to be downloaded. Selecting patient a confirmation message will popup, selecting yes will download the selected patients data to USB in “.dat” format & selecting No will go back to the Main Screen. The downloaded data comprises of Patient info & Trend. This data can be uploaded to another Star 65 using Upload Option. This feature is mainly useful during intra-hospital transport of patient. Note:Downloaded data can't be viewed by the user.

Without connecting USB if a user tries to download, a error message will popup.

Note

Do not disconnect thumbdrive while downloading data.

Upload

Selecting Upload, user can upload the downloaded patient back to Star 65. If the user selects upload without connecting thumb drive, a error message will popup.

Note

Do not disconnect thumbdrive while uploading data.

Note

Before patient upload, ensure to create backup of all the data available in monitor.

Note

All patient data will be erased in the unit when patient upload is done.

Exit

Selecting Exit will return to Patient Options.

Patient Discharge

This can be selected using Optical Encoder or Touch.

Selecting Patient Discharge, a Warning message will popup. User has to download the discharged patients data by downloading all the patient data to Thumb drive with discharge recommendations.

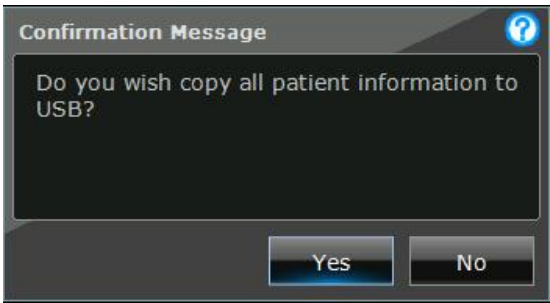


Figure 10.13

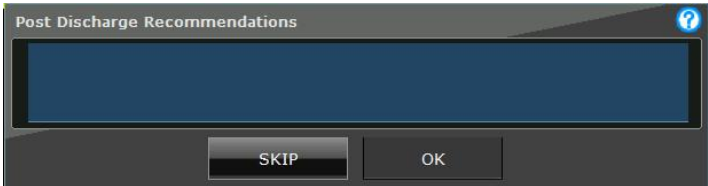


Figure 10.14

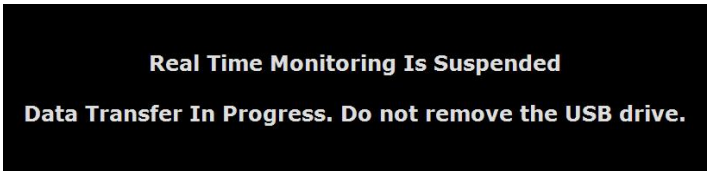


Figure 10.15

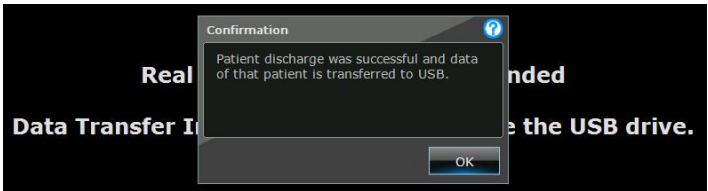


Figure 10.16

Print Setup

Print setup is the interface which allows the user to setup printing preferences.

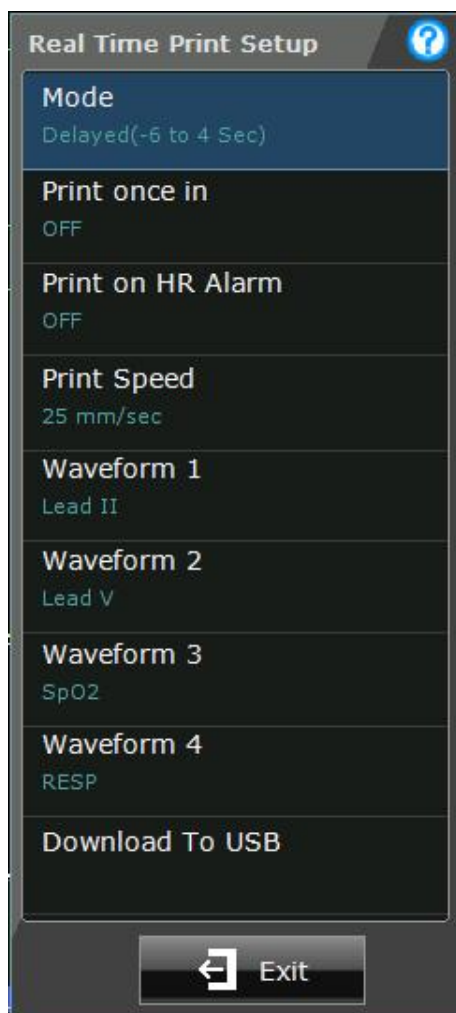


Figure 10.17

Star 65 has the option of printing using network printer, USB printer or to SD Card. Print To option will be available to the user based on the printer type connected to Star 65.

Mode

The available modes are

- Direct (0 to 10 sec)
- Delayed (-6 to 4 sec)
- Continuous (0 to 30 sec)

Selecting Direct, user can print real time data for 10 seconds.

Selecting Delayed, user can print 10 seconds (previous 6 seconds and real time 4 seconds).

Selecting Continuous, user can print real time data for 30 seconds.

Print Once in

The available options are

- 5 min
- 10 min
- 30 min
- 1 Hr
- 8 Hr
- OFF

This will allow the user to select the time interval for printing the data in selected mode.

Print on HR Red Alarm

Select this to ON/OFF printing during patient HR red alarm condition.

Print Speed

The available Print Speed are

- 25 mm/sec
- 50 mm/sec

By default print speed will be 25 mm/sec.

Waveform 1,2,3 & 4

Parameter selected for display on real time screen will be selectable for printing in waveforms fields.

SpO ₂
ECG (any lead)
IBP (any channel)
NIBP
Temp
Resp
CO ₂
CO
Download to USB

Download to USB

User can download softcopy prints (.pdf) to thumb drive.

Note

To get softcopy print, user has to selected Print To as SD Card in printer configuration.

Exit

Selecting Exit will come out of print setup window.

WEDGE

WEDGE can be used by selecting PAP from IBP labels.



Figure 10.18

After selecting PAP select Wedge menu, selecting Wedge menu will display three waveforms

- ECG
- Resp
- PAP

Using left right scroll, user can shift the cursor left & right respectively.

User can freeze the waveform using the Freeze option. A message will be displayed as “Adjust the cursor to get accurate PCWP value and press store to save the value”.

Once the user adjusts the cursor PCWP value is displayed.

Store

Selecting Store will save the PCWP value.

Recall

Selecting Recall will allow the user to view the stored PCWP value. User can view the Wedge recall of last 10 readings.

Exit

Selecting Exit will return to System Configuration Menu.

Monitor Configuration

Selecting this a Monitor Configuration window will popup.

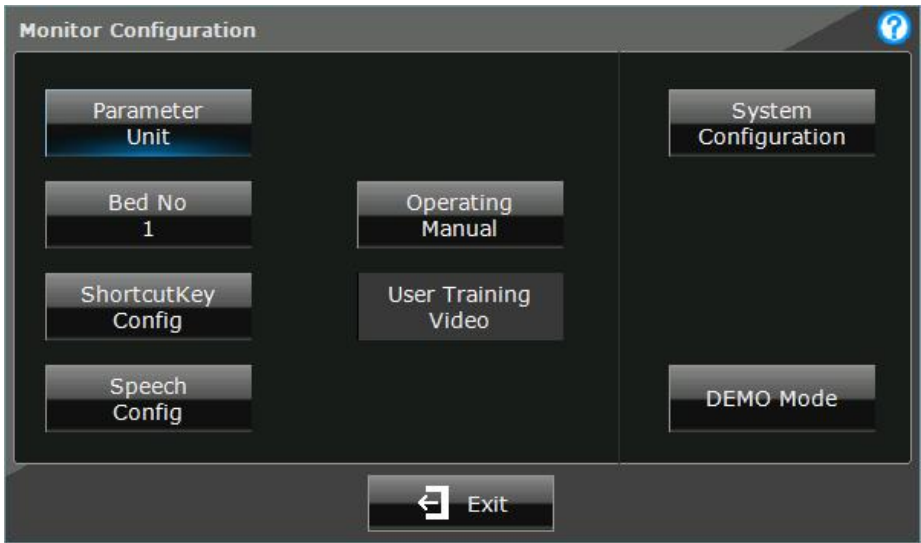


Figure 10.19

Note

Monitor configuration window will not be timed out.

The available options are

- Parameter Unit
- Bed No
- Speech Config
- Operating Manual
- User Training Video
- System Configuration
- Demo Mode

Parameter Unit

Selecting Parameter Unit will popup a Parameter Unit Configuration window, where the user can select the unit for the parameters.

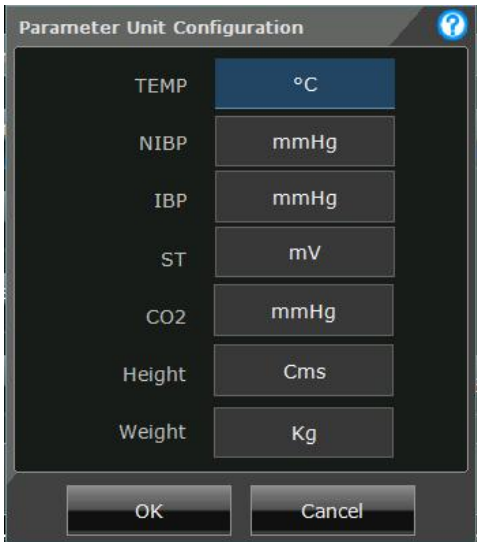


Figure 10.20

The available parameters are

Temp	°C
	°F
NIBP	☐ → mmHg
IBP	
ST	mm
	mV
CO ₂ *	mmHg
	kPa
	Vol%
Height	Inches
	Cms
Weight	Kg
	lb

Bed No

Selecting Bed No a alpha numeric keypad will popup, where the user can enter the bed no.

Bed no can be maximum of 8 characters. If it is alpha numeric, numbers are compulsory at the end of the text, minimum of 1 or maximum of 4.

Selecting Ok will save the entered Bed No. Selecting Clear will clear the Bed No. & selecting Cancel will go back to Monitor Configuration window.

Change in the Bed No. will reflect in Patient Admit Window and Boot Up Screen.

Speech Message

This can be selected using Optical Encoder or Touch.

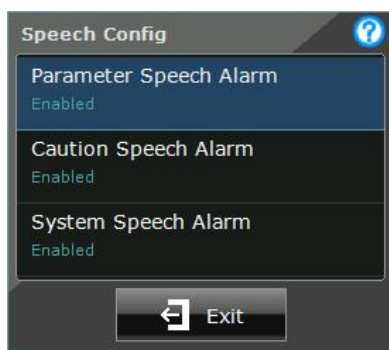


Figure 10.21

Selecting this Speech Config window will popup, where user can Enable /Disable Parameter Speech Alarm, Caution Speech Alarm & System Speech Alarm using optical encoder or touch.

Exit

Selecting Exit will return to Monitor Configuration window.

Parameter Related

Sl.No.	Condition on which the Speech Alarm will be played	Speech Alarm message
1.	With ST ON , user changes ECG filter mode to OT or MON	ST values will be inaccurate if you change the filter mode from diagnostic
2.	PR source is auto, PR source changing from ECG/IBP to SpO ₂	PR source is changing to pulse oximetry
3.	PR source is auto, PR source changing from ECG/SpO ₂ to IBP	PR source is changing to IBP
4.	PR source is auto, PR source changing from SpO ₂ /IBP to ECG	PR source is changing to ECG
5.	When respiration is being monitored and CO ₂ module connected	RR Source changing to CO ₂
6.	When respiration is being monitored and AGM module connected	RR Source changing to AGM
7.	After IBP channel is Zeroed	Channel Zeroed, Ready for measurement

System Related

Sl.No.	Condition on which the Speech Alarm will be played	Speech Alarm message
1.	On IR pairing	Infrared remote successfully paired
2.	After download is completed	Data Download Completed. It is safe to remove the thumb drive
3.	If data upload is successful	Data uploaded successfully
4.	When after scanning and correct entry of PIN, monitor connects to wi-fi network	Connected to wi-fi network successfully
5.	If keyboard locked	Keyboard locked, to unlock please press and hold the home and record key together for 3 sec
6.	On keyboard unlock	Keyboard unlocked
7.	On applying default settings	Applying default settings
8.	During volume level adjustment for speech messages	Check
9.	Hemo calculator is opened and parameters like HR, CVP etc are being monitored and available	Press update to fetch the data of monitored parameters for hemo calculation
10.	If duplicate module are plugged (for e.g. : 2 IBP modules or 2 CO modules)	Duplicate Parameter Module Plugged. Please Remove one of the modules
11.	When NIBP mode is changed to Auto or Stat	Initiate first reading manually to start auto mode Initiate first reading manually to start stat mode
12.	After admitting a new adult patient	Adult patient admitted successfully
13.	After admitting a new pediatric patient	Pediatric patient admitted successfully
14.	After admitting a new neonate patient	Neonate patient admitted successfully
15.	If user tries to zero an IBP channel and IBP channel is not Zeroed	Channel not Zeroed, Please try again

16.	If AGM and CO ₂ are connected together	AGM & CO ₂ connected simultaneously. CO ₂ going into Standby mode
17.	After marking an event from mark event option	The event has been saved

Caution Related

Sl. No.	Condition on which the Speech Alarm will be Played	Speech Alarm Message
1.	When IBP transducer is plugged in and in IBP error code is set for IBP not zeroed	Zero the pressure channel before usage
2.	If IBP channel is in offset error condition	Change IBP transducer
3.	On CO ₂ fault/AGM sample line fault (Except at boot up)	Check sample line connection
4.	When water trap is filled with water droplets or water trap is damaged	Change AGM water trap
5.	When Low battery is detected	System battery is low, Please switch to mains power
6.	On Parameter Audio Off	Caution! Audio for parameter alarms will be disabled
7.	On Parameter alarms disable	Caution! Alarm detection for this parameter will be disabled
8.	If download failed	Download failed, Please ensure that the Thumb drive is inserted properly
9.	If user tries to enter any event within 30 seconds of entering the previous event	Please wait for 30 seconds to enter the next event
10.	If user tries to enter a patient within 30 seconds of entering the previous patient	Please wait for 30 seconds to admit a new patient
11.	When NIBP measurement mode is selecting to AUTO mode	Initiate first reading manually to start auto/stat mode
12.	If battery is critical and unit is going to shut down	Battery empty, monitor will shut down

System Configuration

This is a password protected menu, selecting this a password entry window will popup for the user to enter the password.



Figure 10.22

The default password is “4321”. If the user enters a wrong password “Invalid Password” message will be displayed, user has to Clear and re-enter the correct password.

A Warning message will be displayed, selecting Ok will enter into System Configuration Menu & selecting Cancel will go back to Monitor Configuration window.

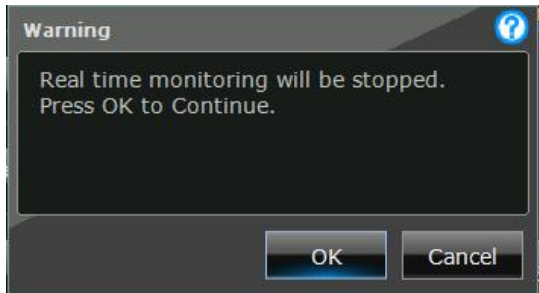


Figure 10.23

System Configuration Window is as shown below

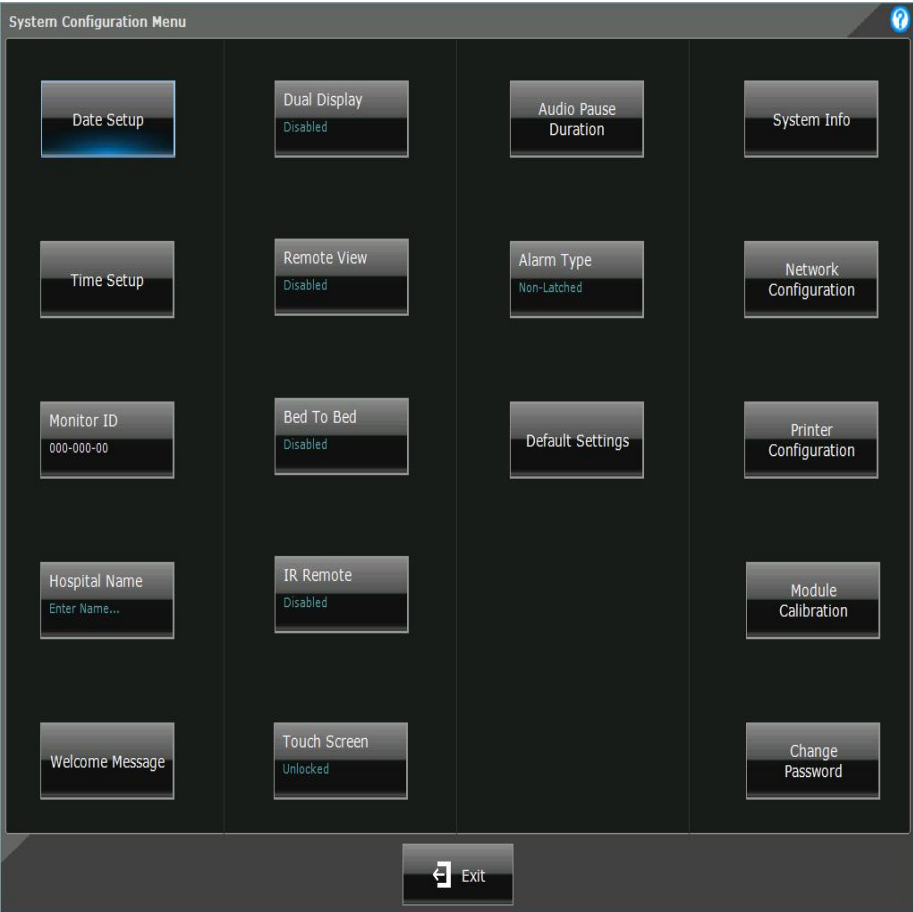


Figure 10.24

Date Setup

Selecting this a Date Setup window will popup.

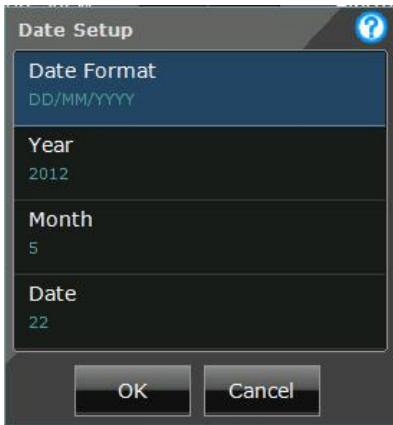


Figure 10.25

Date Format

Selecting Date Format shall display 3 different date format for the user, they are:

- DD/MM/YYYY
- DD/MMM/YYYY
- MM/DD/YYYY

User can select the desired format and enter current Year, Month & Date using numeric keypad.

Selecting on Year, Month & Date a numeric keypad will popup for the user to enter the details.

Selecting Ok will save the settings and selecting Cancel will exit without saving the settings.

Time Setup

Selecting this, a Time Setup window will popup.

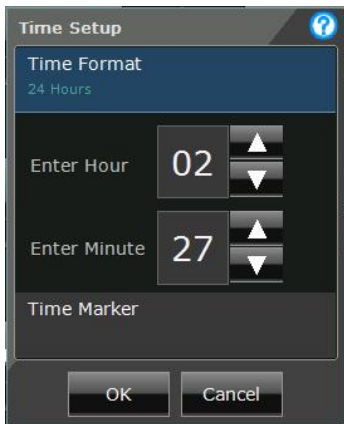


Figure 10.26

In Time Format user can select 24 Hours or 12 Hours format. Based on the format selected user can Enter Hour and Enter Minute respectively.

If 24 Hours format is selected the user can enter hours from 00 to 23 Hours & for 12 Hours format user can enter hours from 01 to 12 hours. For both the format minutes can be entered from 00 to 59.

Enter Hour & Enter Minute can be set using Up/Down arrows.

When 12 Hours format is selected Time Marker will be active. User can select AM or PM by clicking on the Time Marker.

When 24 Hours format is selected Time Marker will be grayedout.

Selecting Ok will save the settings and selecting Cancel will exit without saving the settings.

Monitor ID

Selecting this tab a alphanumeric keypad will popup. User can enter Monitor ID with a maximum of 10 characters.

The same will be reflected in Boot Up screen.

Selecting Ok will save the settings, selecting Clear will delete the entry and selecting Cancel will exit without saving the settings.

If the Monitor ID is not entered, by default it will take the unit serial number as the monitor ID.

Note

Monitor ID cannot be blank.

Hospital Name

Selecting this tab an alphanumeric keypad will popup. User can enter Hospital Name with a maximum of 15 characters.

The same will be reflected in Boot Up screen.

Selecting Ok will save the settings, selecting Clear will delete the entry and selecting Cancel will exit without saving the settings.

Welcome Message

Selecting this tab a alphanumeric keypad will popup. User can enter Welcome Message with a maximum of 19 characters.

The same will be reflected in Boot Up screen.

Selecting Ok will save the settings, selecting Clear will delete the entry and selecting Cancel will exit without saving the settings.

IR Remote

User can Enable or Disable IR Remote option using this tab.

Touch Screen

User can Lock or Unlock touch screen option using this tab. Lock will disable touch screen & unlock will enable touch screen.

Audio Pause Duration

Selecting this a Audio Pause Duration window will popup.

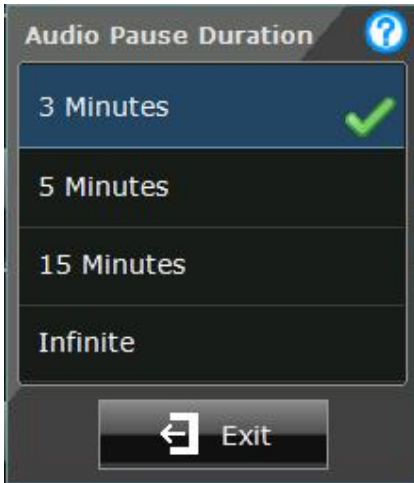


Figure 10.27

The available options are

- 1 Minute
- 3 Minutes
- 5 Minutes
- 15 Minutes
- Infinite

User can select duration to pause the global audio alarm. Selecting Infinite will disable the audio alarm permanently.

Audio pause duration will be activated by selecting Alarm Acknowledge key twice.

Alarm Type

To select Latched or Non-Latched Alarm Type.

Latched

Alarm signal that continues to be generated after its triggering event no longer exists until stopped by deliberate action.

Non-Latched

Alarm signal that automatically stops being generated when its associated triggering event no longer exists.

Default Settings

Selecting this a Default Setup window will popup.

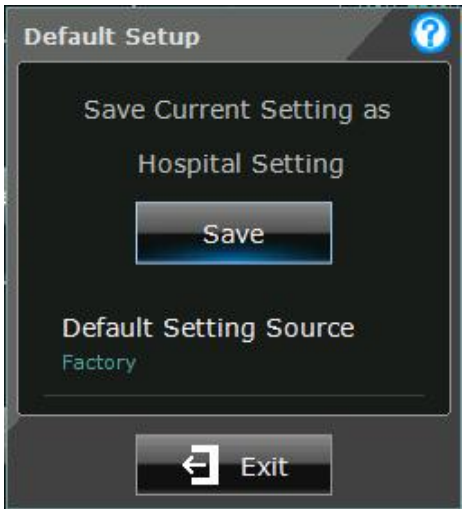


Figure 10.28

Selecting Save will popup a confirmation window, selecting Ok will save the settings as Hospital Setting & selecting Cancel will exit without saving the settings.

Default Setting Source

There are two Default Setting Source they are Hospital & Factory. User can select Hospital or Factory settings for display.

Exit

Selecting Exit will return to System Configuration Menu.

Network Configuration

Selecting this a Network Configuration window will popup.

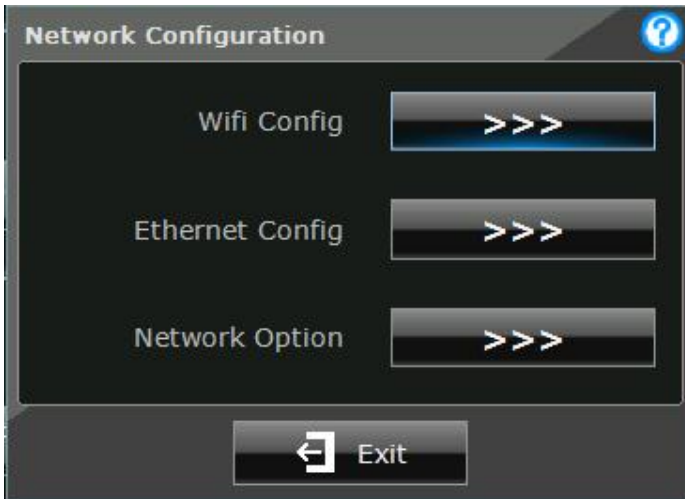


Figure 10.29

The available options in Network Configuration window are

- Wifi Config
- Ethernet Config
- Network Option

Wifi Config

Selecting Wifi Config a WiFi Control Panel window will open.

Scan for Network window will display all the Wifi networks available. User can select and configure the network.

Wifi Setup is as shown below

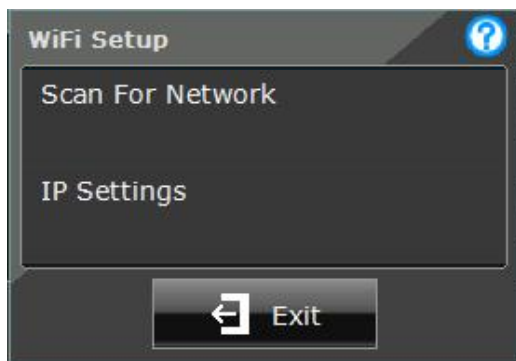


Figure 10.30

Select IP settings, configure IP address, Subnet Mask & Router in the IP properties window for the desired network.

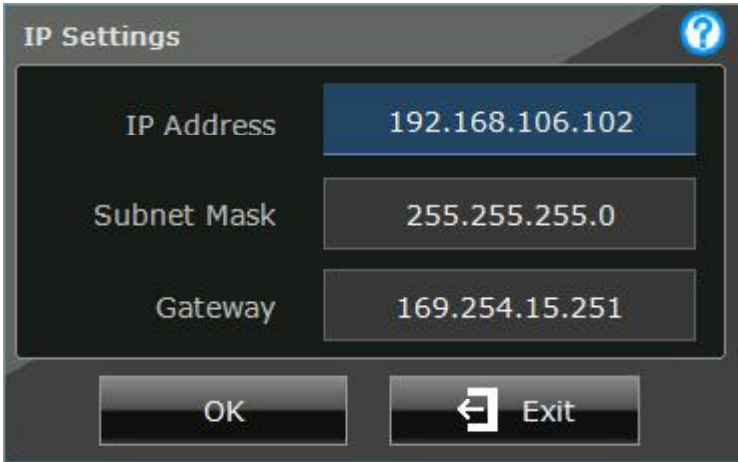


Figure 10.31

Selecting appropriate network, a Pass Key window will appear where the user has to enter the appropriate Security Key. Select Ok to connect and selecting Cancel will go back to Control Panel.

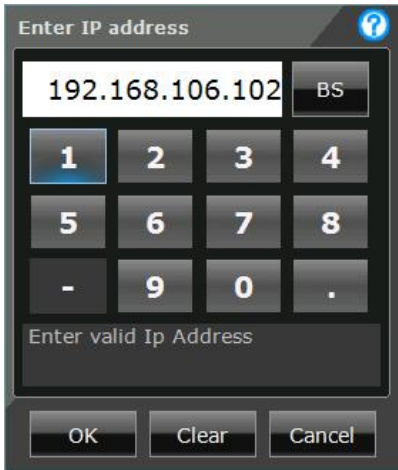


Figure 10.32

Ethernet Config

Ensure that Ethernet Cable is connected to Star 65. Selecting Ethernet Config a Ethernet Configuration window will popup.

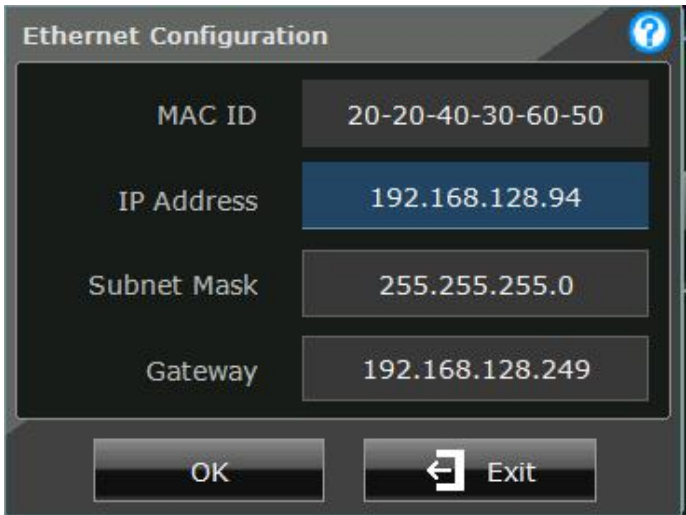


Figure 10.33

User has to configure IP address, Subnet Mask & Gateway. Selecting particular option, a numeric keypad will popup for configuring. Maximum of 15 characters can be entered.

MAC ID cannot be edited by the user.

Select Ok to save the setting and Exit to go back without saving the settings.

Network Option

Selecting Network Option a Network Option window will popup.

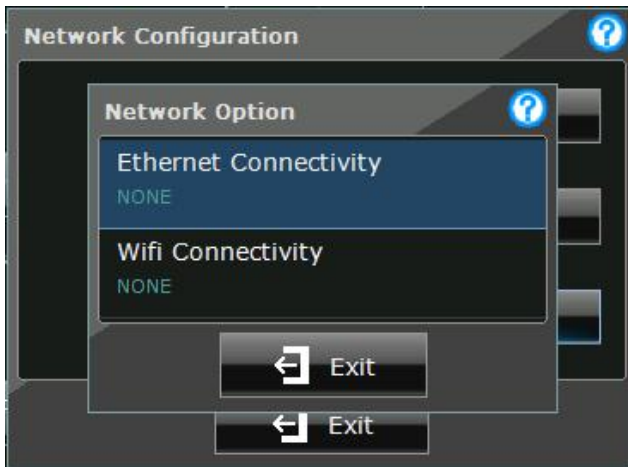


Figure 10.34

Ethernet Connectivity & Wifi Connectivity will have following options for the user to select

- CNS
- Bed to Bed
- Public Network
- None

Either Wifi or ethernet can be selected at a time, both cannot be selected simultaneously.

Wired CNS+Printer+Bed to Bed*

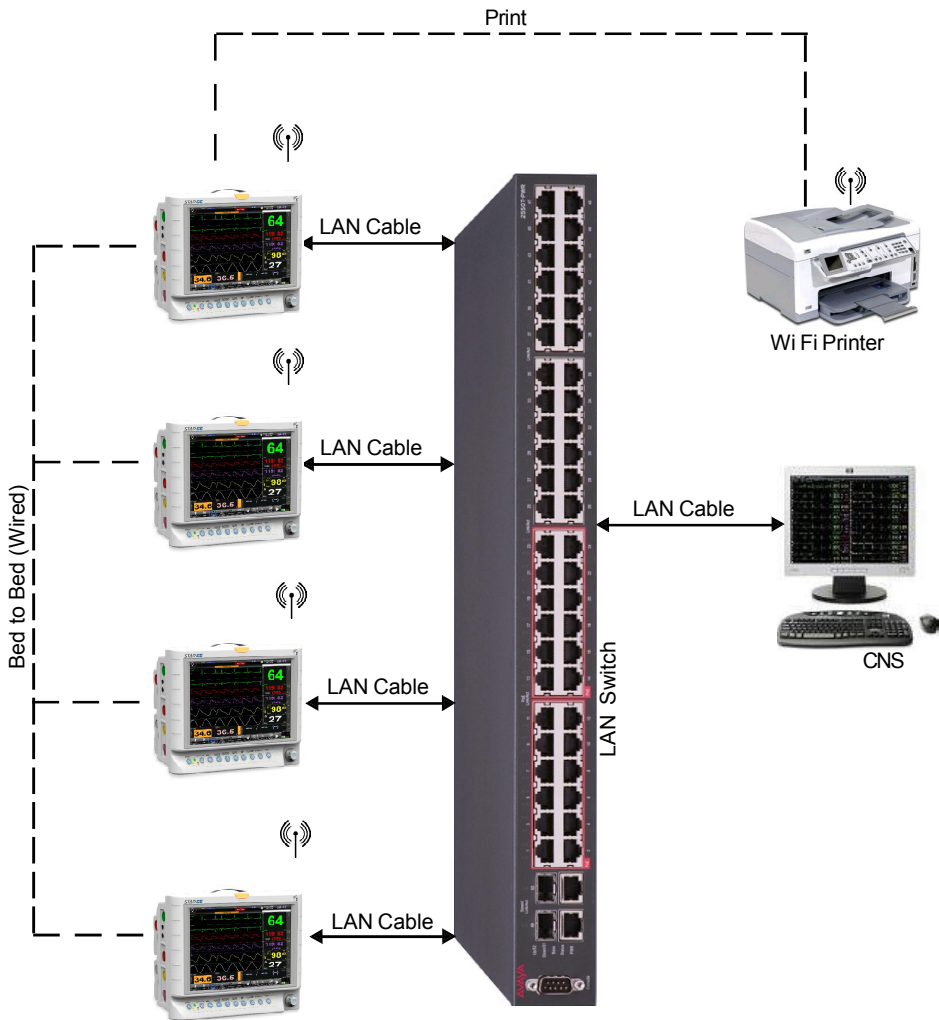


Figure 10.35

Wireless CNS+Printer+Bed to Bed*

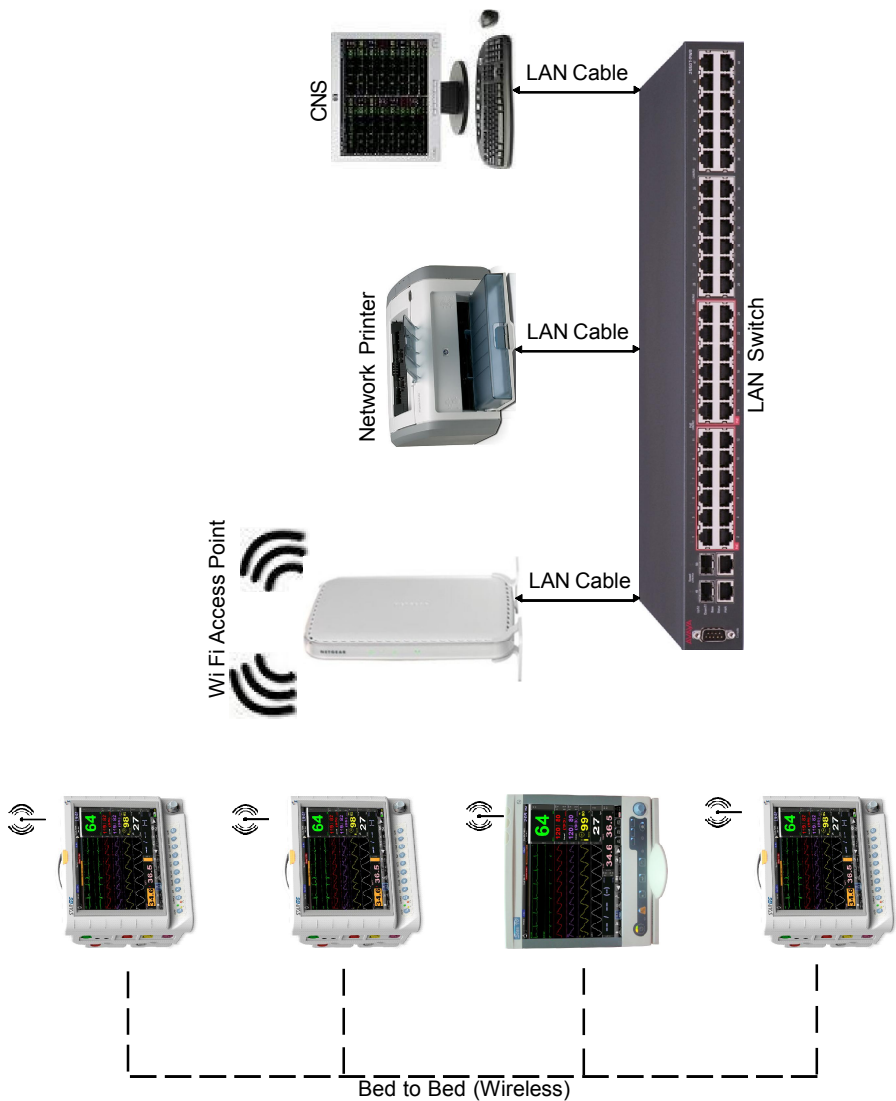


Figure 10.36

Exit

Selecting Exit will return to Network Configuration window.

Printer Configuration

Selecting this will popup a Printer Configuration window.

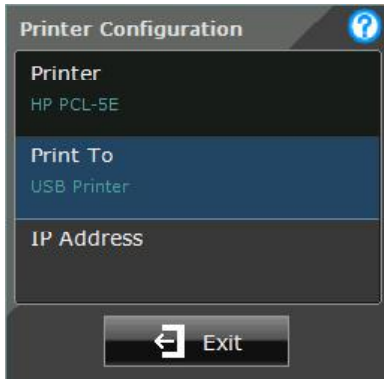


Figure 10.37

Printer

Selecting Printer will display supported printer encryption types. The supported encryption types are

- HP PCL - 3
- HP PCL - 5E

Based on the printer type user can select the printer encryption type.

Print To

Selecting Print To will display the supported printing options. The options are

- Network Printer
- USB Printer
- SD Card

When User selects Network Printer, user has to enter IP address of the printer.

IP address will be active when Network Printer is selected. If USB printer is selected then IP address will be grayedout.

When user selects SD Card the prints will be saved as Softcopy (.Pdf) in the system, which user can download to thumb drive in Real Time Print setup menu.

IP Address

Selecting IP address a numeric keypad will popup, here the user has to enter the IP address of the network printer.

A maximum of 15 characters can be entered.

Exit

Selecting Exit will return to System Configuration Menu.

Printer Configuration Procedure

Star 65 has 3 types of print options, they are:

- USB Printer
- Network Printer
- Print to SD Card (Soft print)

Print outs shall contain information of real time screen, trend, recall etc.

USB Printer:

- Connect the printer to Star 65 using USB cable.
- Select “Monitor Configuration” in Star 65.
- Select “System Configuration”. Password is 4321.
- Select “Printer Configuration” and select the following:
 - Printer HP PCL-5E
 - Print to USB Printer

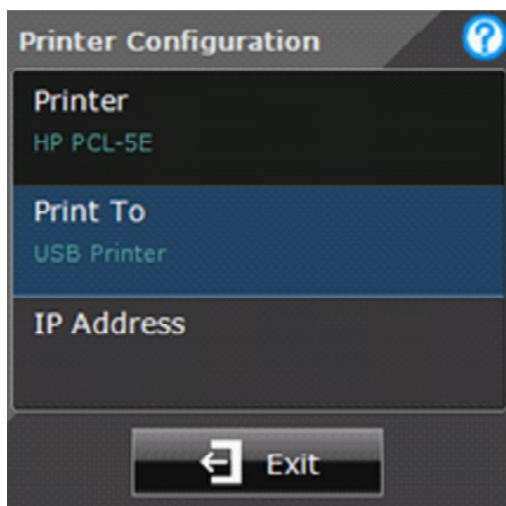


Figure 10.38

- Exit the screens, select “hot key” for printing on touch screen panel to print the real time screen or enter into sub-windows and select “Print” option.
- “Printing” message will be shown in the white message area.
- Connection will establish and hardcopy printout is obtained.

Network Printer:

- Connect the printer to Star 65 using Wi-Fi. The dongle should be present at both the ends.
- Select “Monitor Configuration” in Star 65.
- Select “System Configuration”. Password is 4321.
- Select “Network Configuration”.
- Select “Wifi Config”.

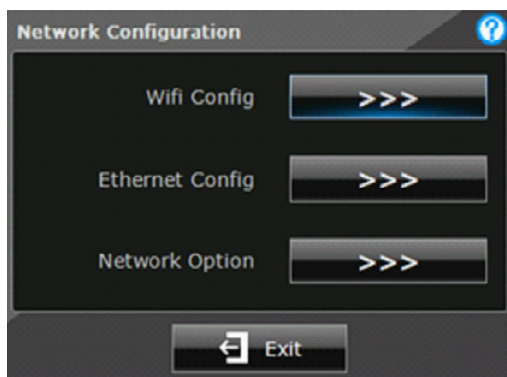


Figure 10.39

- Select “IP Settings”.
- Enter Gateway, which should be access point’s IP address.
- Enter subnet mask as 255.255.255.0.
- Enter IP address, which should be monitor’s IP address and should have the same domain as Gateway and select “Ok”.

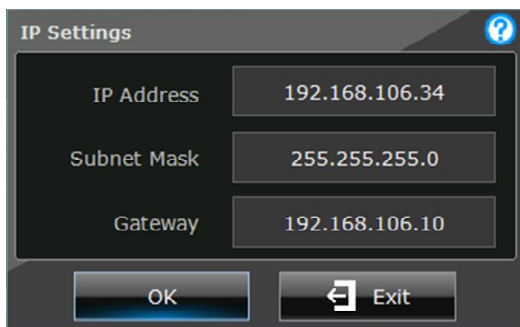


Figure 10.40

- Select "Scan For Network".

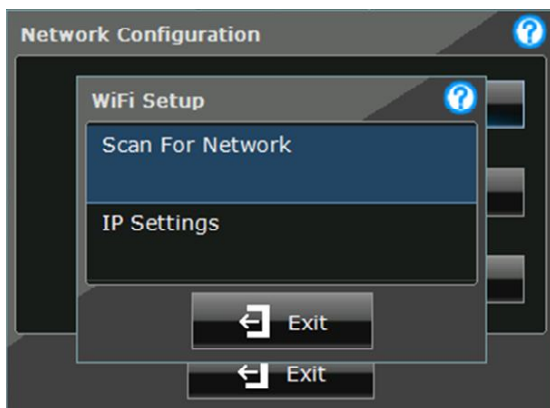


Figure 10.41

- Select the corresponding network.
- Select "Security Properties" and enter the password (password is same as access point).

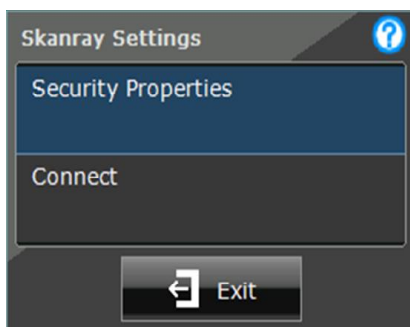


Figure 10.42



Figure 10.43



Figure 10.44

- Exit the screen of security properties and select “Connect”.
- Wait for few seconds.
- A popup message “Connection Established Successfully” will appear.
- Printer should be connected to access point via LAN or Wi-Fi.
- Select “Network Options”.
- Select “Wifi Connectivity”.
- Select “Public Network” and Exit.

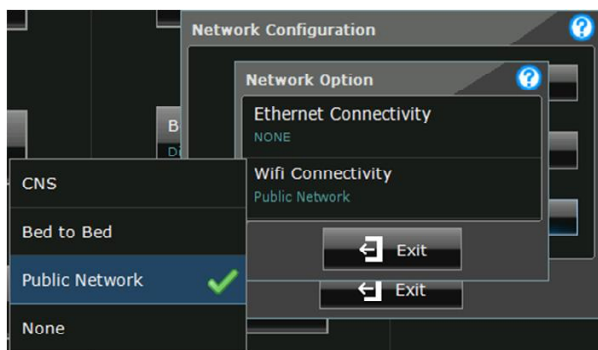


Figure 10.45

- Select “Printer Configuration” and select the followings.
- Printer - HP PCL-5E
- Print To - Network printer.
- Select “IP Address” and enter the IP Address of printer.

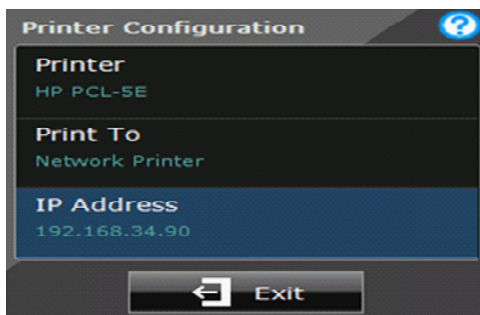


Figure 10.46

- Exit the screen, press “hot key” for printing on touch screen panel to print the real time screen or enter into sub-windows and select “Print” option.
- “Printing” message will be displayed in white message area.
- Connection will be establish and hardcopy printout is obtained.

Print To SD Card (Soft Print):

- SD card has to be there in the monitor.
- Select “Monitor Configuration” in Star 65.
- Select “System Configuration”. Password is 4321.
- Select “Printer Configuration” and select the followings.
 - Printer HP PCL - 5E
 - Print To - SD Card

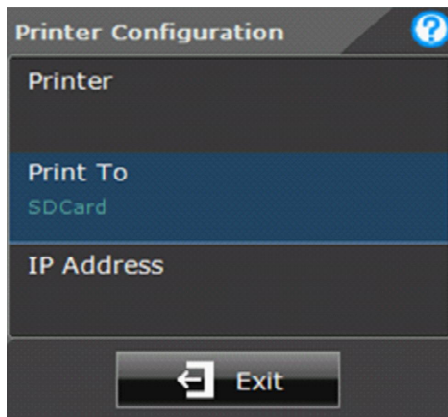


Figure 10.47

- Exit the screen, press “hot key” for printing on touch screen panel to print the real time screen or enter into sub-windows and select “Print” option.
- “Printing” message will be displayed in white message area.
- Data will be stored in PDF format in SD card, which can be downloaded into the Thumb drive and softcopy of the same is available.
- Connect the Thumbdrive.
- Transfer the data from SD card to Thumbdrive, go to “Print Setup” in real time screen and select “Download to USB”.

Procedure to Connect CNS (Central Nursing Station)

Star 65 has 2 types of CNS connectivity options:

- Wired
- Wireless

Wired CNS Connection Procedure

For Wired CNS, connection should be there from Star 65 to CNS through LAN.
Connect LAN cable from Star 65 to LAN Switch.

a. Goto Monitor Configuration --> System Configuration --> Enter Password (4321) -->
Network Configuration --> Ethernet Configuration.

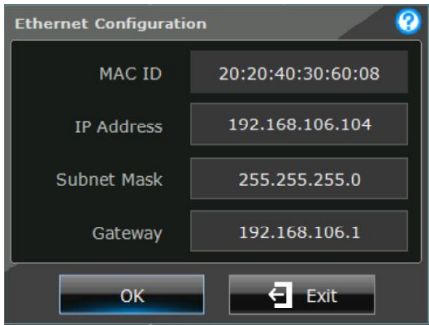


Figure 10.48

b. Enter IP address of bed present in CNS and subnet mask as 255.255.255.0 and gateway IP address should be same as CNS PC IP address.

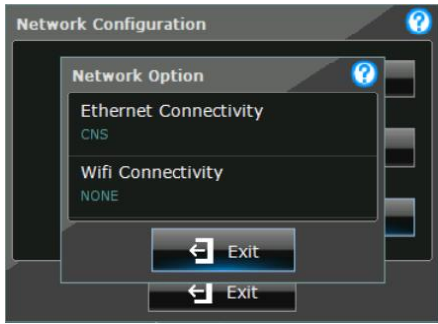


Figure 10.49

- c. Select Ok and go back to network option, which is present in network option.
- d. Goto Ethernet connectivity and select CNS and Exit all windows.

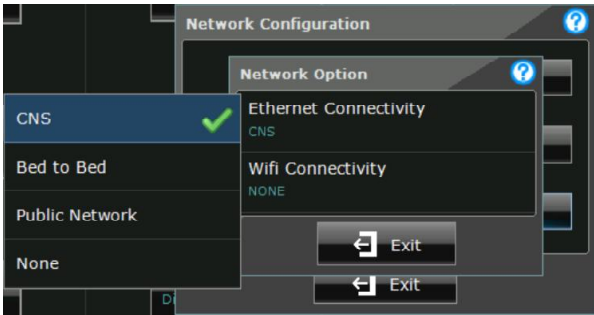
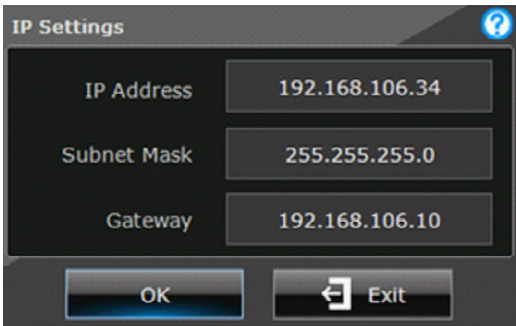


Figure 10.50

Wireless CNS Connection Procedure

- a. Select “Monitor Configuration” in Star 65.
- b. Select “System Configuration”. Password is 4321.
- c. Select “Network Configuration”.
- d. Select “Wifi Config”.
- e. Select IP settings and enter IP address same as CNS bed, enter subnet mask as 255.255.255.0 and enter gateway IP same as access point IP address (which is connected to CNS PC).



xFigure 10.51

- f. Select Ok and select Scan for network.
- g. Select network as Skyline55.

h. Goto Security Properties

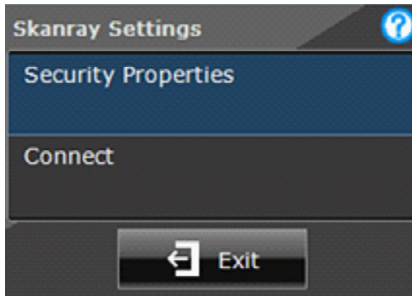


Figure 10.52

- i. Goto Security Key and enter password as 12345678912345678912345678 select Ok and Exit, select connect and wait for confirm message (Connected to network successfully).
- j. Select Ok and go back to network option, which is present in network option.
- k. Goto Wi-Fi connectivity and select CNS and Exit all windows.

Wired Bed to Bed Connection Procedure

Bed to Bed is a feature where user can view the data of multiple monitors parameter in one monitor.

For Wired Bed to Bed, connection should be there from Star 65 to Star 65 / Star 90 through LAN.

Connect LAN cable from Star 65 to LAN Switch if more than 2 monitors are present.

- a. Goto Monitor Configuration --> System Configuration --> Enter Password (4321) --> Goto Bed to Bed --> Enable --> Network Configuration --> Ethernet Configuration.
- b. Enter IP address of monitor and subnet mask as 255.255.255.0 and gateway IP address should be same for all monitors with same domain of monitor IP address.

Note

Monitors IP address should not be same, but domain address should be same for all monitors.

- c. Select Ok and go back to network option, which is present in network option.
- d. Goto Ethernet connectivity and select Bed to Bed and Exit all windows.
- e. Goto display format present in sub menu and select Bed to Bed format, a popup window will appear with names of beds connected to the network.
- f. Select the bed to be monitored from the list.

Wireless Bed to Bed Connection Procedure

- a. Select "Monitor Configuration" in Star 65.
- b. Select "System Configuration". Password is 4321.
- c. Enable Bed to Bed option.
- c. Select "Network Configuration".
- d. Select "Wifi Config".
- e. Select IP settings and enter IP address the monitor, enter subnet mask as 255.255.255.0 and enter gateway IP same as access point IP address.

Note

All monitors should be connected to same access point, with different monitor IP address.

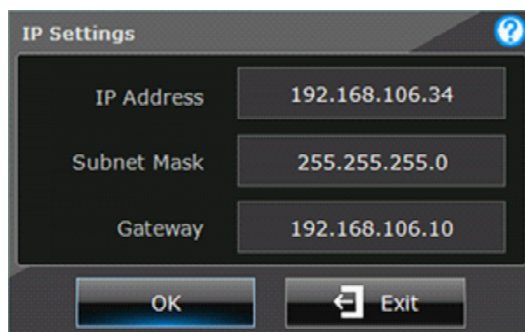


Figure 10.53

- f. Select Ok and select Scan for network.
- g. Select network of required access point.

h. Goto Security Properties

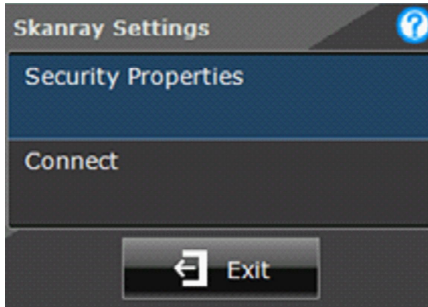


Figure 10.54

- i. Goto Security Key and enter access point password and select Ok and Exit, select connect and wait for conform message (connected to network successfully).
- j. Select Ok and go back to network option, which is present in network option.
- k. Goto Wi-Fi connectivity and select as Bed to Bed and Exit all windows.
- l. Goto display format present in sub menu and select Bed to Bed format, a popup window will appear with names of beds connected to the network.
- m. Select the bed to be monitored from the list.

Module Calibration

Module Calibration will allow the user to see the calibration and perform calibration of specific module. Module Calibration window is as shown below



Figure 10.55

The available Calibration options are

- ECG/TEMP Cal
- NIBP Cal
- CO2 Cal
- AA Cal
- Touch Panel Cal

ECG/Temp Cal

Select this option and observe the display, a square pulse of 1mv/1cm amplitude will be produced.



Figure 10.56

ECG CAL is associated for II, III, V leads for 5 lead and lead II, III for 3 lead ECG cable.

Temperature will read 98.6° F or 37° C.

Exit

Selecting Exit will return to Module Calibration window.

NIBP Cal

Selecting this a NIBP Test window will popup as shown below

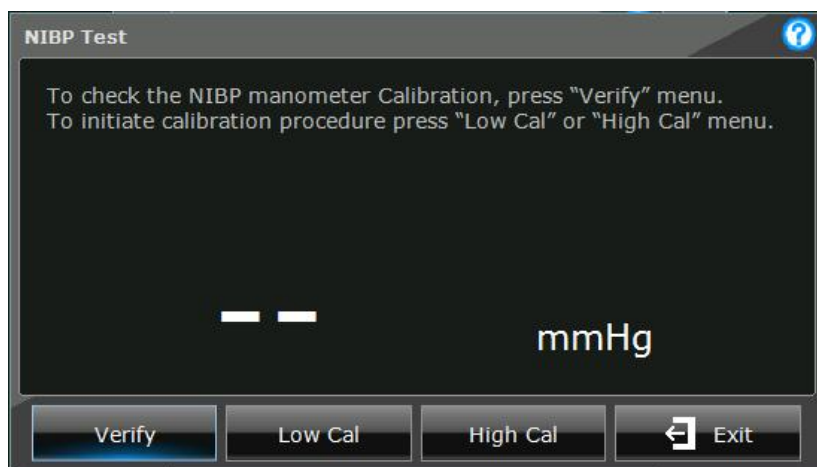


Figure 10.57

Verify

Selecting Verify will display applied pressure at the NIBP Inlet in the “—” display area.

Low Cal

Selecting Low Cal the NIBP module starts performing low cal. If low cal is passed successfully *“0 mmHg test passed”* will be displayed, otherwise measured value with test failed will be displayed.

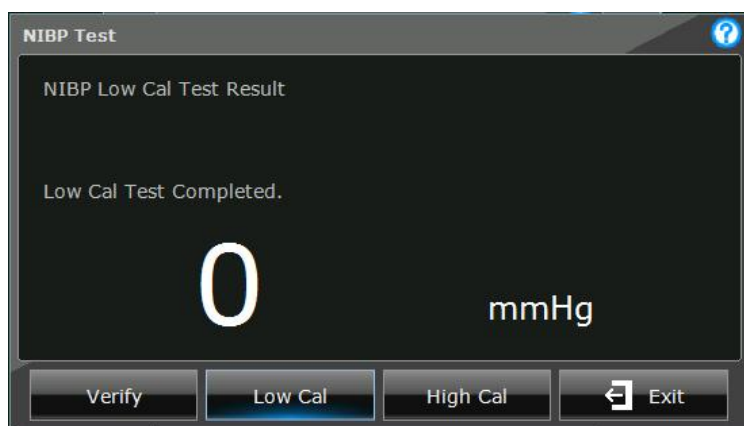


Figure 10.58

CO₂ Cal

Selecting this a CO₂ Cal window will popup as shown below

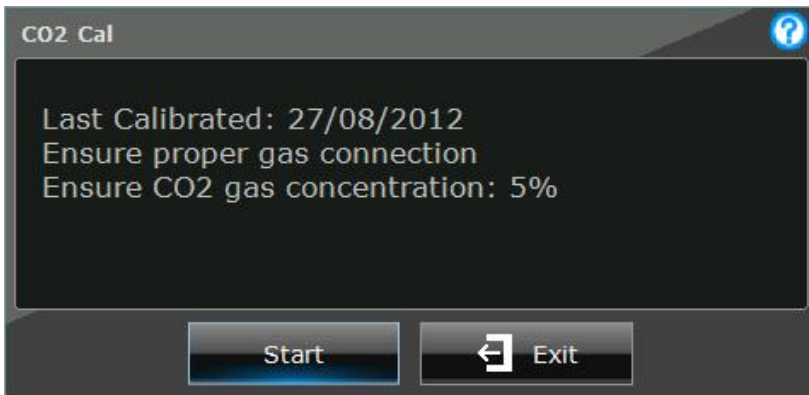


Figure 10.59

Steps for Calibration

- Connect filter line from calibration kit to the monitor.
- Press Start and Confirm for further proceedings.
- Message “ Keep pressing cylinder knob to deliver the gas” will display. Press the knob of the cylinder kit and select Ok.
- Message “Calibrating... Please Wait” will display.
- Message “Calibrating ... Please Remove Gas” will display.
- After calibration, message “Calibration Succeeded” will display
- Remove filter line from the monitor.
- Check the last calibrated date in CO₂ Cal Window.

AA Cal

Selecting this a AA Cal window will popup as shown below

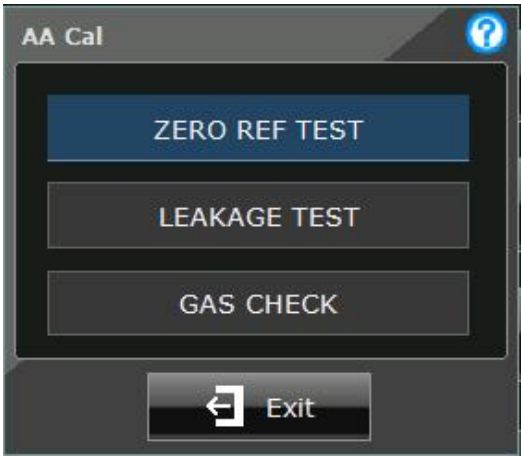


Figure 10.60

For more information on AA cal contact SKANRAY service engineer.

Change Password

Selecting this, Change Password window will popup where user can change the password for accessing System Configuration.

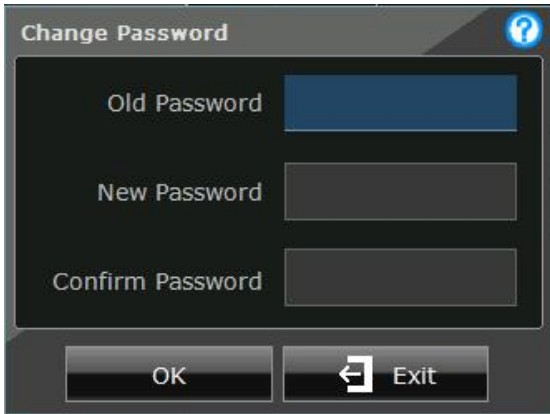


Figure 10.61

Where the user has to enter Old Password, New Password & Confirm Password. Selecting on each option a numeric keypad will popup.

Password can be maximum of 4 character.

Select Ok to save the new password and select Exit to go back to System Configuration Menu without changing the password.

Exit

Selecting Exit will return to Monitor Configuration Window.

Demo Mode

This is a password protected menu, selecting this a password entry window will popup for the user to enter the password.



Figure 10.62

The Password for Demo Mode is “456123”, entering the password user can enter into Demo Mode.

Demo Mode will be displayed in the display format selected.

Restart the system to Exit Demo Mode.

Utility

Selecting Utility a popup window will open as shown below

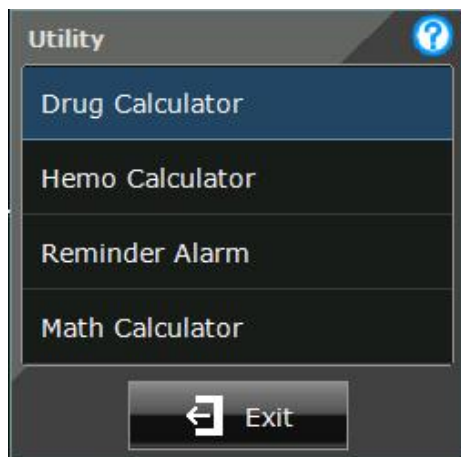


Figure10.63

The available options under Utility are

- Drug Calculator
- Hemo Calculator
- Reminder Alarm
- Math Calculator

Drug Calculator

Selecting Drug Calculator a Drug Calculator window will open as shown below

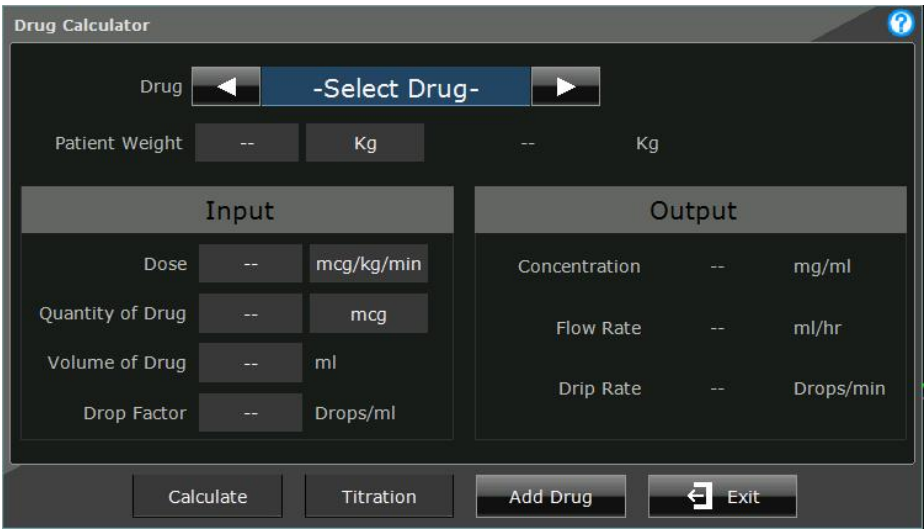


Figure 10.64

Warning

Before you administer any drug, always check that the correct calculation units are selected.

Decisions on dosage of drugs administered to the patients must always be made by the physician in charge. The Drug Calculator performs calculations based on the input values during use, it does not check the plausibility of the calculations performed.

Drug

Drug will allow the user to select the Drug form the available list. The corresponding message weight dependent / independent is displayed depends on the drug selected.

There are 25 drugs available in Star 65 they are

Drug Name	Drug Dependencies	Dosage Unit
Aminophylline	Weight dependent	mcg/kg/min
Diltiazem	Weight dependent	mcg/kg/min
Dobutamine	Weight dependent	mcg/kg/min
Dopamine	Weight dependent	mcg/kg/min
Epinephrine	Weight independent	mcg/min
Esmolol HCL	Weight dependent	mcg/kg/min
Fentanyl Citrate	Weight dependent	mcg/kg/min
Heparin Sodium	Weight independent	mcg/min
Inamrinone Lactate	Weight dependent	mcg/kg/min
Insulin Regular	Weight dependent	mcg/kg/min
Isoproterenol HCL	Weight independent	mcg/min
Labetalol HCL	Weight dependent	mcg/kg/min
Lorazepam	Weight dependent	mcg/kg/min
Midazolam	Weight dependent	mcg/kg/min
Milrinone	Weight dependent	mcg/kg/min
Nicardipine	Weight dependent	mcg/kg/min
Nitroglycerin	Weight independent	mcg/min
Nitroprusside	Weight dependent	mcg/kg/min
Norepinephrine	Weight independent	mcg/min
Phenylephrine	Weight independent	mcg/min
Procainamide HCL	Weight independent	mcg/kg/min
Propofol	Weight dependent	mcg/kg/min
Vasopressin	Weight independent	mcg/min
Lidocaine HCL	Weight independent	mcg/min
Pitocin	Weight independent	mcg/min

Patient Weight

Selecting this a numeric keypad will popup to enter the patients weight. Patient Weight can be 0.5 Kgs to 250 Kgs.

Weight can be entered in Kg or Lb. If the user enters patients weight in Lb the system will convert the drug in to Kg and will be displayed.

Patient Weight will be active if weight dependent drug is selected, otherwise it will be grayedout.

Input

The available options in input are

- Dose
- Quantity of Drug
- Volume of Drug
- Drop Factor

Dose

Selecting Dose a numeric keypad will popup to enter drug dos. Drug dose can be entered from 0.01 to 10000.

Selecting on the unit, a list of units will be displayed for the use to select the unit of the drug.

The available units are

- gm/kg/min
- mg/kg/min
- mcg/kg/min
- KIU/kg/min
- IU/kg/min
- mEq/kg/min
- gm/kg/hr
- mg/kg/hr
- mcg/kg/hr
- KIU/kg/hr
- IU/kg/hr
- mRq/kg/hr

Quantity of Drug

Selecting Quantity Drug will popup a numeric keypad, using which user can enter the quantity of drug. It can be entered from 0.01 to 10000.

Quantity of Drug unit will be displayed based on the unit selected in dose.

Volume of Drug

Selecting this a numeric keypad will popup to enter the drug volume. It can be entered from 1 to 10000.

Unit for Volume of Drug is ml.

Drop Factor

Selecting Drop Factor will popup a numeric keypad for the user to enter drop factor. Drop Factor can be entered from 0.1 to 10000.

Unit for Drop Factor is Drops/ml.

Note

Drop factor should be given as input only when drop infusion pump is used for infusing the drug.

Calculate

Selecting Calculate will calculate Concentration, Flow Rate & Drip Rate based on the input.

Unit of Concentration is mg/ml, unit of Flow Rate is ml/hr & unit of Drip Rate is Drops/min.

Note

Reverse calculation from Flow Rate, Drip Rate and Concentration to get quantity of Drug, Volume and Dose is not possible.

Formula

Weight dependent drugs

Concentration : (mg/mL or mcg/mL)

Concentration = Quantity of Drug / Volume

Flow Rate : (mL/hr)

Flow Rate =
$$\frac{(\text{Dose}) \times (\text{Weight}) \times 60 \text{ min}}{(\text{Concentration})}$$

If dose is given in mg/kg/hr or mcg/kg/hr then

$$\text{Flow Rate} = \frac{(\text{Dose}) \times (\text{Weight})}{(\text{Concentration})}$$

$$\text{Drip Rate} : (\text{drops/min})$$

$$\text{Drip Rate} = \frac{(\text{Dose}) \times (\text{Weight}) \times (\text{Drop Factor})}{(\text{Concentration})}$$

If dose is given in mg/kg/hr or mcg/kg/hr then

$$\text{Drip Rate} = \frac{(\text{Dose}) \times (\text{Weight}) \times (\text{Drop Factor})}{(\text{Concentration}) \times 60 \text{ min}}$$

Weight independent drugs

$$\text{Concentration} : (\text{mg/mL or mcg/mL})$$

$$\text{Concentration} = \text{Quantity of Drug / Volume}$$

$$\text{Flow Rate} : (\text{mL/hr})$$

$$\text{Flow Rate} = \frac{(\text{Dose}) \times 60 \text{ min}}{(\text{Concentration})}$$

If dose is given in mg/hr or mcg/hr then

$$\text{Flow Rate} = \frac{(\text{Dose})}{(\text{Concentration})}$$

$$\text{Drip Rate} : (\text{drops/min})$$

$$\text{Drip Rate} = \frac{(\text{Dose}) \times (\text{Drop Factor})}{(\text{Concentration})}$$

If dose is given in mg/hr or mcg/hr then

$$\text{Drip Rate} = \frac{(\text{Dose}) \times (\text{Drop Factor})}{(\text{Concentration}) \times 60 \text{ min}}$$

Titration

Selecting Titration will open a Titration Table.

Titration table is as shown below

Titration Table-Fentanyl Citrate(Weight Dependent)

Weight67.0 KgConcentration9.50 mcg/ml

Dose48.00 mcg/kg/minFlow Rate-?- ml/hr

Drip Rate-?- Drops/min

Dose	Flow Rate	Drip Rate	Dose	Flow Rate	Drip Rate
1.00	423.16	-?-	11.00	4654.74	-?-
2.00	846.32	-?-	12.00	5077.89	-?-
3.00	1269.47	-?-	13.00	5501.05	-?-
4.00	1692.63	-?-	14.00	5924.21	-?-
5.00	2115.79	-?-	15.00	6347.37	-?-
6.00	2538.95	-?-	16.00	6770.53	-?-
7.00	2962.11	-?-	17.00	7193.68	-?-
8.00	3385.26	-?-	18.00	7616.84	-?-
9.00	3808.42	-?-	19.00	8040.00	-?-
10.00	4231.58	-?-	20.00	8463.16	-?-

Dose Step

Flow Rate Step

Drip Rate Step

1

1

1

▲

▼

Exit

Figure 10.65

Titration table will display Weight, Dose, Concentration, Flow Rate & Drip Rate entered in Drug Calculator window.

Here user can change the Dose Step, Flow Rate Step & Drip Rate Step from 1 to 20 using numeric keypad. The same will be updated in titration table.

Up/Down Arrow

Using Up/Down arrow user can scroll the pages next and previous.

Print

Select Print to print the current page of the Titration Table.

Exit

Selecting Exit will return to Drug Calculator window.

Add Drug

Selecting this user can add the drug other than default drugs. Selecting Add Drug will popup a Add New Drug window.

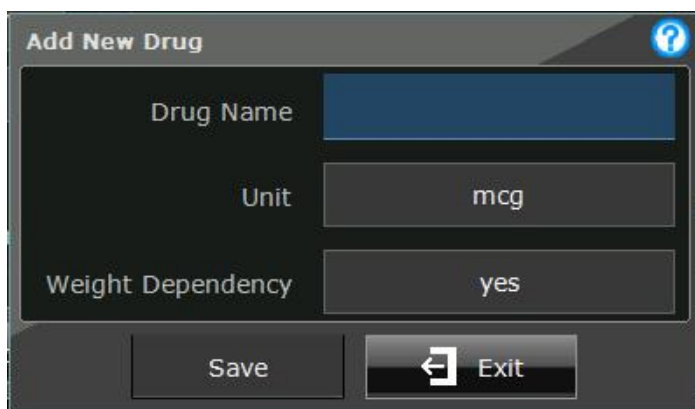
A screenshot of a software dialog box titled "Add New Drug". The dialog has a dark gray background and a light gray border. In the top right corner, there is a blue circular icon with a white question mark. The main area of the dialog contains three input fields: "Drug Name" with a blue text box, "Unit" with a dropdown menu showing "mcg", and "Weight Dependency" with a dropdown menu showing "yes". At the bottom of the dialog, there are two buttons: a "Save" button and an "Exit" button. The "Exit" button features a white icon of a door with an arrow pointing out, followed by the text "Exit".

Figure 10.66

Selecting Drug Name a alpha numeric keypad will popup for the user to enter the name of the drug. Name of the drug can be maximum of 10 characters.

Selecting Unit will display a list of units available. The available units are

- mcg
- mg
- gm
- mEq
- IU
- KIU

Selecting Weight Dependency will allow the user to select 'Yes' or 'No' based on the drug added.

User can add a maximum of 10 drugs. Adding more then 10 drugs a confirmation message will popup to delete one custom added drug.

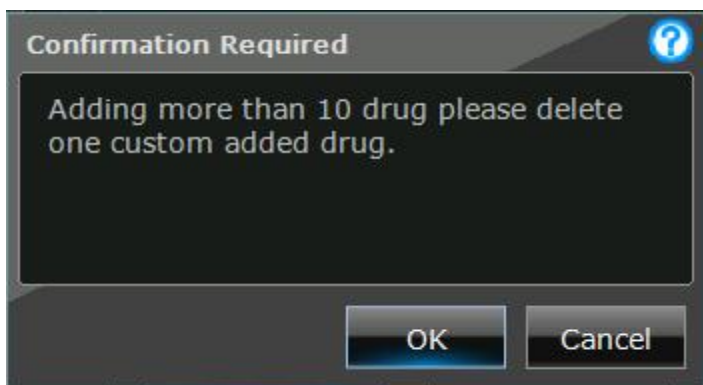


Figure 10.67

Selecting Ok will popup a Drug Deletion window. Selecting Drug Name will display list of drugs added. User can select the drug and select Delete will delete the selected drug. Selecting Exit will exit without deleting the drug.

Exit

Selecting Exit will return to Main Screen.

Hemo Calculator

Selecting Hemo Calculator will open a Hemodynamic Calculator window. It will display Patient ID, Name, Date & Time.

Patient ID & Name are editable fields. Selecting Patient ID/Name will popup a alpha numeric window, using which user can enter the Patient ID/Name.

Hemo Calculator window is as shown below

Hemo Calculator

Patient ID

Date10/10/2012

NamePatient 4

Time5:50 PM

Input

Weightkg

Heightcm

ABP(MEAN)mmHg

PAP(MEAN)mmHg

PCWPMmHg

CVP(MEAN)mmHg

HRbpm

COL/min

LVETmsec

Output

BSA--m2

LCWI--kg. m/m2

CI--L/min/m2

LVSW--gm. m

SV--ml

LVSW1--gm. m/m2

S1--ml/m2

RCW--kg. m

SVR--dynes. sec/cm5

RCWI--kg. m/m2

SVRI--(dynes. sec/cm5). m2

RVSW--gm. m

PVR--dynes. sec/cm5

RVSW1--gm. m/m2

PVRI--(dynes. sec/cm5). m2

TFC--ohm-1

LCW--kg. m

Update

Calculate

Exit

Figure 10.68

In Hemo Calculator window user has to enter the following input within the given range

Name	Unit	Range
Weight	kg	30.0 to 153.0 (67 to 341 lbs)
Height	cm	122 to 229 (4 ft to 7 ft 5 in)
BSA	m ²	0.00 to 5.00
ABP(MEAN)	mmHg	1 - 300
PAP(MEAN)	mmHg	1 - 100
PCWP	mmHg	1 - 100
CVP(MEAN)	mmHg	-30 - 100
PR	bpm	30 to 350
CO	L/min	0.5 to 20.0
CI	L/min/m ²	0.0 to 20.0
SV	ml	0 to 150
SI	ml/m ²	0 to 200
SVR	dynes.sec/cm ⁵	0 to 8000
SVRI	(dynes.sec/cm ⁵)*m ²	0 to 10000
PVR	dynes.sec/cm ⁵	0 to 1000
PVRI	(dynes.sec/cm ⁵)*m ²	0 to 1000
LCW	kg.m	0.0 to 80.0
LCWI	kg.m/m ²	0.0 to 80.0
LVSW	gm.m	0 to 500
LVSWI	gm.m/m ²	0 to 500
RCW	kg.m	0.00 to 90.00
RCWI	kg.m/m ²	0.00 to 90.00
RVSW	gm.m	0 to 50
RVSWI	gm.m/m ²	0 to 50
Zo	ohm	0 to 75
TFC	ohm ⁻¹	0 to 200
LVET	msec	0 to 1500

Update

Selecting Update will update all the input fields with the values of real time.

Calculate

Selecting Calculate will calculate the output parameters based on the input available.

Print

Select to print the Hemo table.

Exit

Selecting Exit will return to Main Screen.

Reminder Alarm

Selecting this will popup a Reminder Alarm Setup. User can set the reminder alarm time & message.

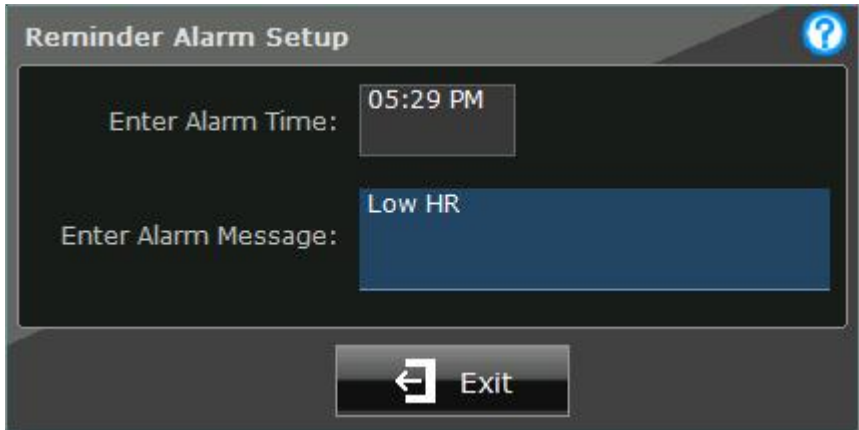
The image shows a 'Reminder Alarm Setup' dialog box with a dark background. At the top left, the title 'Reminder Alarm Setup' is displayed in a light font. At the top right, there is a blue circular icon with a white question mark. The main area contains two input fields: 'Enter Alarm Time:' with a text box showing '05:29 PM', and 'Enter Alarm Message:' with a larger text box containing 'Low HR'. At the bottom center, there is a button with a white left-pointing arrow icon and the text 'Exit'.

Figure 10.69

Enter Alarm Time

Selecting Enter Alarm Time will display a Time Setup, where user can enter Hours and Minutes using numeric keypad. Select Ok to save the settings & Clear to delete the settings.

Enter Alarm Message

Select Enter Alarm Message will display a Alpha Numeric Keypad using this user can enter the Alarm message. Alarm message can be maximum of 50 characters.

When time Base alarm is activated, the corresponding alarm time will be highlighted in real time screen till it gets acknowledged, Audio Alarm will be activated for 60 sec since alarm activation and if alarm message is entered even that will be displayed on real time screen.

Exit

Selecting Exit will return to Main Screen.

Math Calculator

Selecting this will popup a calculator, using which user can do mathematical calculations.

Exit

Selecting Exit will return to Main Screen.

Default

Selecting Default will popup a confirmation message. Selecting Confirm will save the settings as default settings & selecting Cancel will return to main screen without saving the settings.

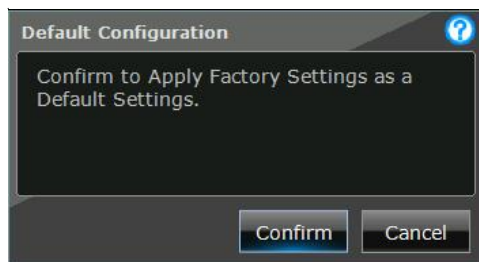


Figure 10.70

Waveform Disclosure

Waveform Disclosure is as shown in figure 9.73.



Figure 10.71

This allow the user to save parameter waveforms into micro SD Card (which is inside the system). User can store max 24 Hrs waveform data. There is an Option to Enable & Disable the Waveform Disclosure as shown in figure 9.73.

In Waveform disclosure maximum of four waveforms are available for download. ECG and IBP are the parameters available for downloading to a thumbdrive. The files that are downloaded to the thumbdrive can be viewed in PC using a software 'Waveform Viewer' (PC Application).

Waveform Viewer window is as shown in figure 9.74.

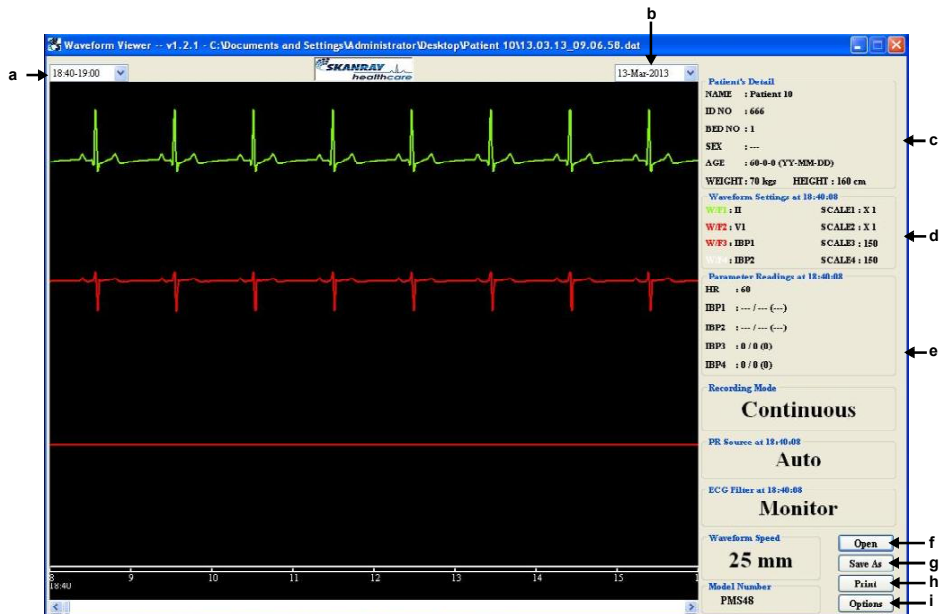


Figure 10.72

- a. Time Duration
- b. Date Selection
- c. Patient Details
- d. Waveform Settings
- e. Parameter Readings
- f. Open
- g. Save As
- h. Print
- i. Options

Open

It will allow the user to browse and open the waveform disclosure data.

Save As

It will allow the user to Save the current page in .JPG format.

Print

It will Print the selected patient data using network printer.

Options

Selecting Options will popup a Colour selection window, where user can select background colour as white or black, Waveform 1 to 4 Colours and Enable or Disable Display Grid.

Selecting Ok will save the settings and selecting Cancel will exit without saving the settings.

Parameter Setup

Factory Default Settings

ECG

Alarm Audio Disable	Enabled
HR Alarm Status	Enabled
HR Upper Limit	As per Alarm Limit Setting
HR Lower Limit	As per Alarm Limit Setting
Cable Mode	Auto/5 Lead (5 Lead ECG Module) Auto
Filter Mode	Mon (Diag - If ST is Selected)
Pacer	Off
Arrhythmias	Off
Lead	II & CAS (FOR 3 LEAD)II & V (FOR 5 LEAD)II Scale 1 mV
ECG Grid	OFF
Online Trend	Off
Colour	Green

SpO₂

Alarm Audio Disable	Enabled
SpO2 Alarm Status	Enabled
HR Upper Limit * Note 2	As per Alarm Limit Setting
HR Lower Limit	As per Alarm Limit Setting
Response	Normal
SetSec	Off
Pleth Bar	On
Scale	X1
Online Trend	Off
Colour	Yellow

RESP

Alarm Audio Disable	Enabled
RR Alarm Status	Enabled
RR Upper Limit	As per Alarm Limit Setting
RR Lower Limit	As per Alarm Limit Setting
RR Source	RA-LA
No Breath	20 sec
Scale	Auto
Online Trend	Off
Colour	White

CO₂

Alarm Audio Disable	Enabled
CO2 Alarm Status	Enabled
RR Alarm Status	Enabled
EtCO2 Upper Limit	As per Alarm Limit Setting
EtCO2 LowerLimit	As per Alarm Limit Setting
FiCO2 Upper Limit	As per Alarm Limit Setting
RR Upper Limit	As per Alarm Limit Setting
RR Lower Limit	As per Alarm Limit Setting
CO2 Pump	On
No Breath	20 sec
Scale	40
Online Trend	Off
Colour	White
Unit	mmHg

NIBP

Alarm Audio Disable	Enabled
NIBP Alarm Status	Enabled
SYS Upper Limit	As per Alarm Limit Setting
SYS Lower Limit	As per Alarm Limit Setting
DIA Upper Limit	As per Alarm Limit Setting
DIA Lower Limit	As per Alarm Limit Setting
Mode	Manual
Auto Timer	15 Min
Online Trend	Off
Colour	Lavender
Unit	mmHg

TEMP

Alarm Audio Disable	Enabled
Temp Alarm Status	Enabled
Upper Limit	As per Alarm Limit Setting
Lower Limit	As per Alarm Limit Setting
Delta T	Off
Online Trend	Off
Colour	Light Pink
Unit	deg C

ST

Alarm Audio Disable	Enabled
Alarm	Enabled
ST1/ST2/ST3 Upper Limit	As per Alarm Limit Setting
ST1/ST2/ST3 Lower Limit	As per Alarm Limit Setting
ST1/ST2/ST3 ISO Point	80 ms (16 bytes)
ST1/ST2/ST3 ST Point	100 ms (20 bytes)
ST1/ST2/ST3 J - ST Point	J+60
ST Status	On
Lead	II (For 3 Lead) II, III & V (For 5 Lead)
ST speed	25mm/sec (Fixed)
Colour	Green
Unit	mV

IPI

Alarm Audio Disable	Enabled
IPI Alarm Status	Enabled
Upper Limit	As per Alarm Limit Setting
Lower Limit	As per Alarm Limit Setting
Online Trend	Off
Colour	White

CO

Alarm Audio Disable	Enabled
BT Alarm Status	Enabled
Upper Limit	As per Alarm Limit Setting
Lower Limit	As per Alarm Limit Setting
Scale	2
Colour	White
Unit	0C

IBP

Label	IBP
Alarm Audio Disable	Enabled
Alarm Status	Enabled
Alarm Limits	As per alarm Limit Sheet & IBP label
IBP average	Normal
Scale	IBP, ART, LVP ,AO & User defined Label → 150(A), 120(P), 100(N) CVP, RAP, LAP, PCW, ICP Label → 30PAP Label → 80
Online Trend	Off
Colour	Red
Unit	mmHg

GM

For CO2 refer CO2 default setting

AA, O2 N2O

Alarm Audio Disable	Enabled
AA Alarm Status	Enabled
O2 Alarm Status	Enabled
N2O Alarm Status	Enabled
Alarm Limts	As per Alarm Limit Setting
AA Flow Rate Mode	Auto
AA Flow Rate Value	200 (A) & 70(N)
AA Scale	0.6
O ₂ Scale	40
AA Online trend	Off
O ₂ Online trend	Off
AA Color	White
O ₂ Color	White
N ₂ O Color	White

General Default Settings

W/F Speed	25mm/sec
Resp/CO2 Speed	12.5 mm/sec
Vital Trend Parameters	HR, SpO2 and RESP
NIBP Trend Parameters	HR and SpO2
Vital Trend Resolution	6 min
Printer Mode	Delayed
Printer Waveform	ECG & SpO2
Alarm Volume	5th Step
Beep Volume	5th Step
Print On Alarm	Off
PR Source	Auto
Display Format	Standard 1
Global Alarm Suspension	Enabled
Weight	Kg
Height	cm
Date Format	dd/mm/yyyy
Alarm Type	Non Latched
Audio Pause duration	3 min
Non Display ParaAlarm	Off
HR Alarm Continuous ON	Enabled
Stop SpO2 at NIBP	Enabled
Default Setup	Factory
Monitor ID	Unit Serial Number
Monitor Setting Password	1904
Dual Display	Disabled
CNS Conectivity	Ethernet
IR remote Connectivity	Disabled
Speech volume	5 Step
Brightness	3 Step
Contrast	4 Step

Parameter Setup:

Parameter setup will be available on clicking respective parameter area, where user can change the settings.

- ECG Setup
- SpO₂ Setup
- NIBP Setup
- Resp Setup
- IBP Setup
- Temp Setup
- ST Setup
- CO₂ Setup
- CO Setup
- IPI Setup
- AA Setup
- O₂ Setup
- N₂O Setup

ECG Setup

ECG Setup allows the user change the ECG related settings.

Setup menu can be selected by clicking on Waveform Field or Numeric Field of ECG.

ECG Setup menu is as shown below

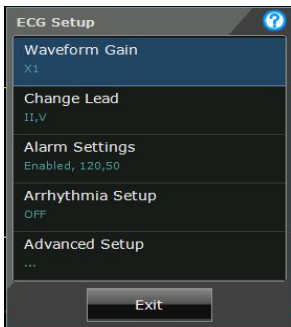


Figure 11.1

The available options in ECG Setup are

- Waveform Gain
- Change Lead
- Alarm Settings
- Arrhythmia Setup
- Advanced Setup

Waveform Gain

Selecting Waveform Gain in ECG Setup menu user can change the gain of the ECG waveform. Initially previously selected gain will be displayed.

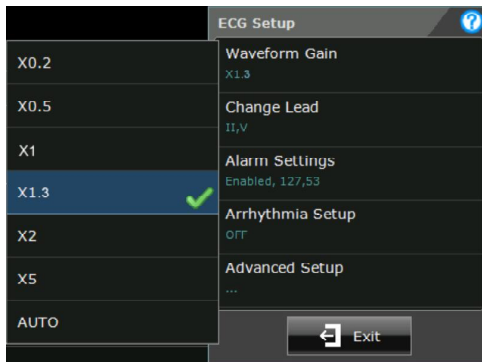


Figure 11.2

The available options are

- X0.2
- X0.5
- X1
- X1.3
- X2
- X5
- AUTO

Selected gain will be immediately reflected on real time display.

Change Lead

Selecting Change Lead will popup a Change Lead window. The available options in change lead are Trace 1 (Primary) & Trace 2.

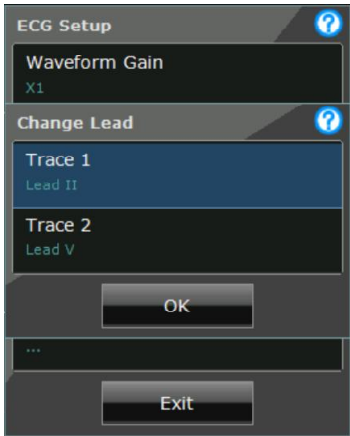


Figure 11.3

Trace 1 (Primary)

The available options in Trace 1 (Primary) are

3L Cable	5L Cable
Lead I	Lead I
Lead II	Lead II
Lead III	Lead III
	Lead aVr
	Lead aVI
	Lead aVf
	Lead V

Trace 2

The available options in Trace 2 are

3L Cable	5L Cable
Lead I	Lead I
Cascade	Cascade
Lead II	Lead II
Lead III	Lead III
None	Lead aVr
	Lead aVl
	Lead aVf
	Lead V
	None

After selecting lead, Select Ok will update the real time display with the selected lead.

Alarm Settings

Selecting alarm settings will popup a ECG Alarm Setup window as shown below

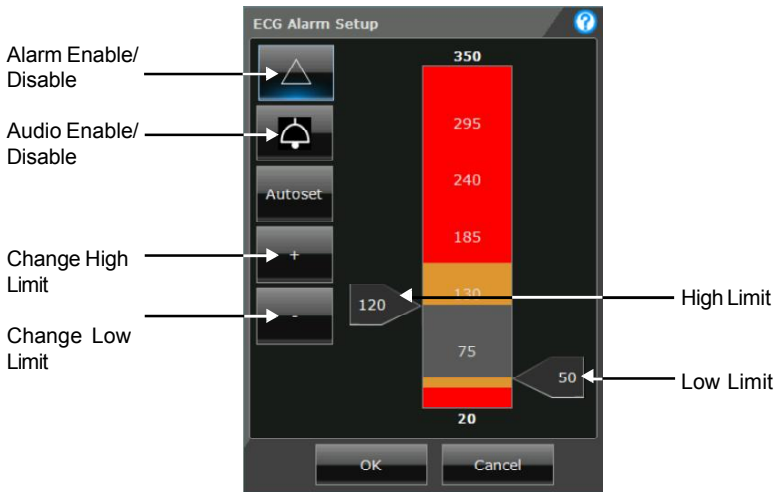


Figure 11.4

Alarm Enable/Disable

By default, cursor will be on Alarm Enable/Disable. Alarm Enable /Disable is password protected, selecting this will popup a Enter Password window where user has to enter the password same as Monitor Setting (4321) using numeric keypad, selecting “Ok” will disable the ECG Alarm with a speech message.

Alarm Disabled will indicate a alarm disabled symbol in the alarm limit area (right side of the numeric window) & it will not consider the alarm condition violation due to parameter. No audio and visual indication will be shown in the monitor. Current condition will be displayed on tab.

When alarm is disabled, then the cursor will not move to any other options except Ok & Cancel.

Selecting Ok will save the settings and selecting Cancel will discard the settings.

Audio Enable/Disable

Selecting this user can enable/ disable the audio during alarm condition.

Audio alarm will be disabled with a caution speech message. Current condition will be displayed on tab

AutoSet

Selecting AutoSet, high & low alarm will change as per the currently monitored parameter value.

Formula for AutoSet is

HR/PR	High Limit	$(\text{Present HR/PR}) \times 8/10 + 76$
	Low Limit	$(\text{Present HR/PR}) \times 8/10 + 2$

High Limit

High Limit can be selected if Alarm is enabled. Otherwise option will be grayedout.

Scrolling optical encoder clockwise will increase the alarm limits & scrolling optical encoder anticlockwise direction will decrease the alarm limits.

User can vary the limits using touch, selecting and moving the pointer through alarm limit bar will increase/decrease the alarm limits.

For fine tuning of limits user can use “+” & “-”.

Low Limit

Low Limit can be selected if Alarm is enabled. Otherwise option will be grayedout.

Scrolling optical encoder clockwise will increase the alarm limits & scrolling optical encoder anticlockwise direction will decrease the alarm limits.

User can vary the limits using touch, selecting and moving the pointer through alarm limit bar will increase/decrease the alarm limits.

For fine tuning of limits user can use “+” & “-”.

Selecting Ok will save the settings and selecting Cancel will exit without changing the settings.

Arrhythmia Setup

Selecting Arrhythmia Setup will popup will Arrhythmia Settings window.

The available options are

- Arrhythmia Detection
- Arrhythmia Selection

Note

Arrhythmia Setup will appear in ECG Setup menu only if arrhythmia is ON in Production Menu.

Arrhythmia Detection

Selecting Arrhythmia Detection user can ON/OFF arrhythmia detection.

Selecting Arrhythmia Detection ON will activate Arrhythmia Selection, otherwise it will be grayedout.

Arrhythmia Selection

Selecting this will popup a Arrhythmia Setup with available arrhythmia options (as per basic arrhythmia option enabled in Production Menu).

Basic Arrhythmias are:

- Asystole
- Bradycardia
- Tachycardia
- Irregular
- Skip Beat

User will be allowed to select or deselect any number of arrhythmias for the drop down list.

Selection of the Arrhythmia is identified by a tick mark in front of that Arrhythmia.

Definition of Arrhythmia's
Asystole Cardiac arrest, no QRS complexes for five minutes.
Bradycardia HR below the lower HR limit.
Tachycardia HR above the higher HR limit.
Irregular Irregular ECG waveform.
Missing BEAT/Skip Beat Actual RR interval is more then 1.8 times the average RR interval

Advanced Setup

Selecting this will popup a ECG Advanced Setup as shown below

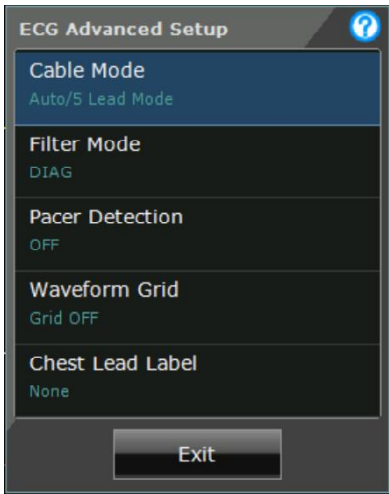


Figure 11.5

Cable Mode

Options will be available based on the module installed in the system.

5L ECG Module
3 Lead
Auto/5 Lead

The selected lead will be displayed on the real time screen.

Filter Mode

Selecting Filter Mode will display the following options

MON
DIAG
OT

MON is recommended for monitoring purpose.

DIAG is recommended for diagnostic purpose.

OT is recommended for Surgery/OT application.

Selected option will be enabled on the monitor and will be displayed on the real time display.

Pacer Detection

Selecting Pacer “ON” monitor will start detecting pacer pulses from patient & will display with the red marker.

Selecting Pacer “OFF” monitor will disable the Pacer detection.

If Patient is paced user can set Pacer ON in Patient Admit Window, and by default this setting will be OFF.

Note

In Demo mode, Pacer selection will be inactive & option will be grayedout.

Note

Pacer pulse width on the screen will be 15 msec.

Note

NEONATE mode pacer will be permanently OFF. Selection of PACER will not be available.

Waveform Grid

Selecting this will popup the following options for the user to select.

ON
OFF
ON Freeze

Selecting ON will enable the Grid in real time ECG waveform. Selecting OFF will not display ECG grid. Selecting ON Freeze will enable grid for ECG when Freeze is active.

Chest Lead Label

Selecting this a list will popup, with the following options

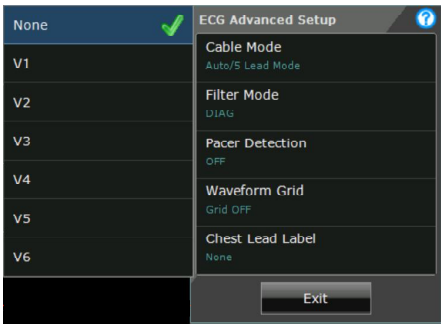


Figure 11.6

Selecting of any new option, changes will apply immediately on the real time display.

Selection of “None” will display “Lead V” at chest lead Waveform.

This option will appear for selection in case of 5Lead cable mode and Auto/5Lead cable mode. If the 3-lead cable detected, this option will not appear for selection.

Exit

Selecting Exit will return to ECG Setup Menu.

Acquisition Mode

This can be selected using Optical Encoder or Touch.

Selecting this will popup the following options for the user to select.

Continuous
Single Sweep

By default the acquisition type selected will be Continuous Mode.

Single Acquisition

Single Acquisition window is as shown below

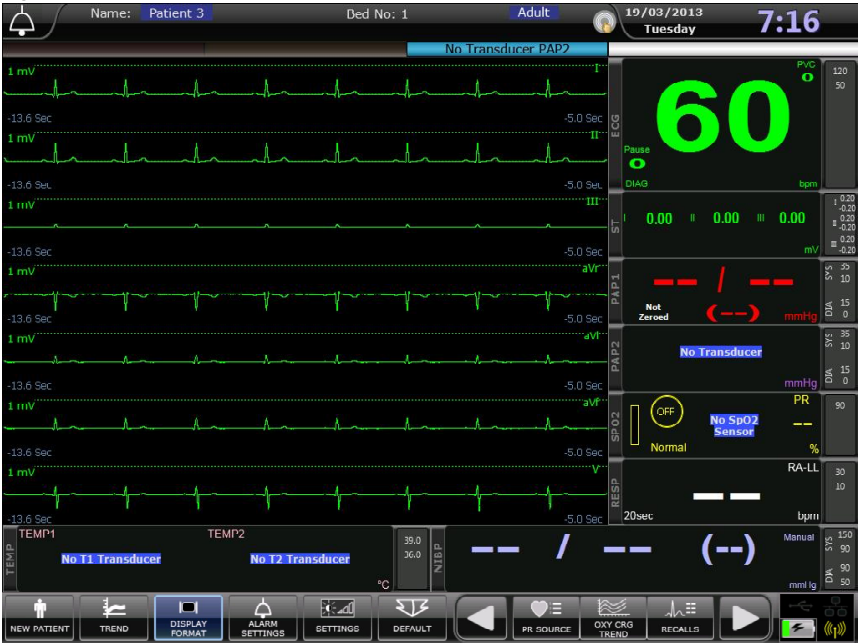


Figure 11.7

When this mode is selected, the tabs part of scrollable menus in the Real time screen will be replaced with tabs Acquire, Left Shift & Right Shift.

Upon press of acquire, 30 Sec ECG trace will be captured, which can be reviewed by the user by pressing Left Shift and Right Shift tabs.

Continuous Acquisition

This is a normal mode where continuous acquisition of ECG waveform will be feasible.

Note

This Option will be available only in Quick ECG display format in place of the Change Lead options.

Exit

Selecting Exit will return to Main Screen.

Note

When HR alarm occurs CASCADE ECG waveform will freeze. User will be allowed to defreeze by pressing FREEZE hot key.

Resp Setup

Setup menu can be selected by clicking on Waveform Field or Numeric Field of Resp.

Resp Setup menu is as shown below

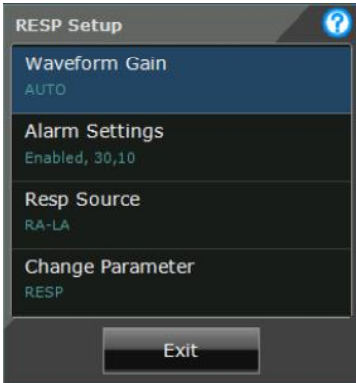


Figure 11.8

The available options are

- Waveform Gain
- Alarm Settings
- Resp Source
- Change Parameter

Waveform Gain

Selecting Waveform Gain in Resp Setup menu user can change the gain of the Resp waveform. Initially previously selected gain will be displayed.

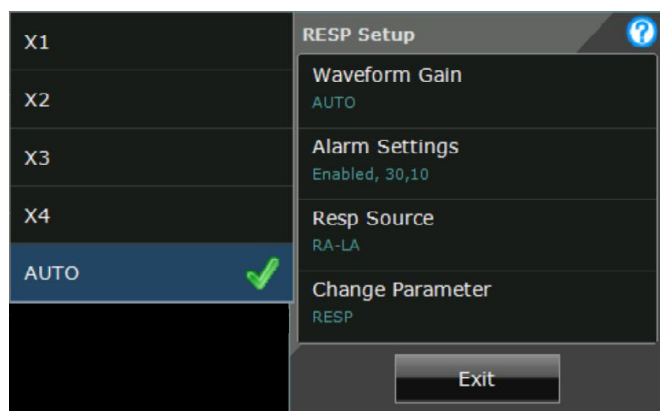


Figure 11.9

Selected gain will be immediately reflected on real time display.

Note

Resp Setup option will be available for selection only if Resp is selected in the waveform filed.

Alarm Settings

Selecting alarm settings will popup a Resp Alarm Setup window as shown below

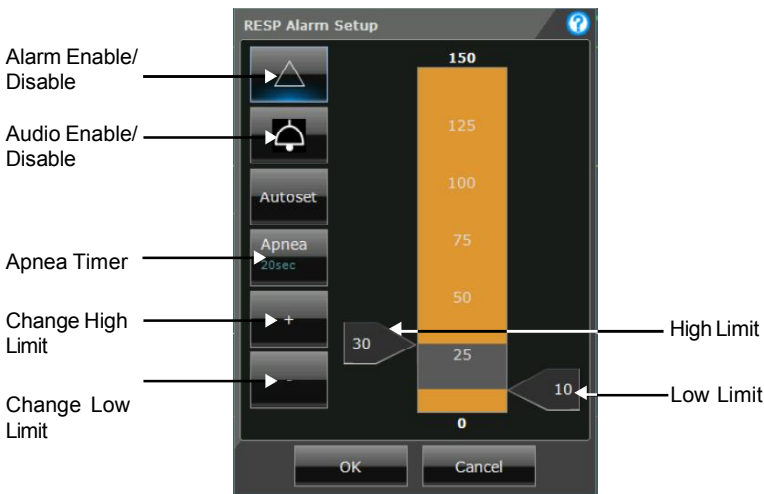


Figure 11.10

Alarm Enable/Disable

By default, cursor will be on Alarm Enable/Disable. Alarm Enable /Disable is password protected, selecting this will popup a Enter Password window where user has to enter the password same as Monitor Setting (4321) using numeric keypad, selecting “Ok” will disable the Resp Alarm, with a speech message.

Alarm Disabled will indicate a alarm disabled symbol in the alarm limit area (right side of the numeric window) & it will not consider the alarm condition violation due to parameter. No audio and visual indication will be shown in the monitor. Current condition will be displayed on tab.

When alarm is disabled then the cursor will not move to any other options except Ok & Cancel.

Selecting Ok will save the settings and selecting Cancel will discard the settings.

Audio Enable/Disable

Selecting this user can enable/ disable the audio during alarm condition.

Audio alarm will be disabled with a caution speech message. Current condition will be displayed on tab

AutoSet

Selecting AutoSet, high & low alarm will change as per the currently monitored parameter value.

Formula for AutoSet is

Resp	High Limit	Present Respiration rate +5
	Low Limit	Present Respiration rate -5

Apnea

Apnea is the condition where respiration is not detected for a certain amount of time. This time limit will generally vary from 5sec to 60sec.

If respiration is not detected continuously for the set time limit, then there will be a red alarm indication.

Selecting this will display list of available Apnea options for the user to select.

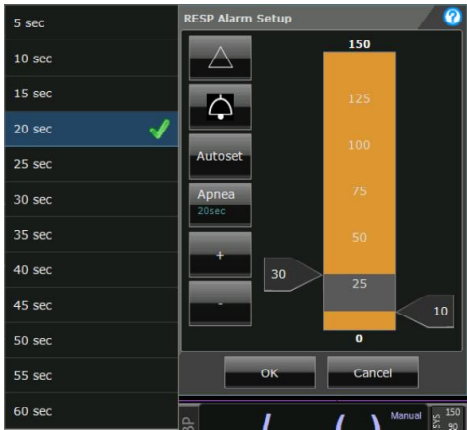


Figure 11.11

Note

Apnea option should be enabled in Production Menu, else option will not be available for selection.

High Limit

High Limit can be selected if Alarm is enabled. Otherwise option will be grayedout.

Scrolling optical encoder clockwise will increase the alarm limits & scrolling optical encoder anticlockwise direction will decrease the alarm limits.

User can vary the limits using touch, selecting and moving the pointer through alarm limit bar will increase/decrease the alarm limits.

For fine tuning of limits user can use “+” & “-”.

Low Limit

Low Limit can be selected if Alarm is enabled. Otherwise option will be grayedout.

Scrolling optical encoder clockwise will increase the alarm limits & scrolling optical encoder anticlockwise direction will decrease the alarm limits.

User can vary the limits using touch, selecting and moving the pointer through alarm limit bar will increase/decrease the alarm limits.

For fine tuning of limits user can use “+” & “-”.

Selecting Ok will save the settings and selecting Cancel will exit without changing the settings.

Resp Source

Selecting this will display the available options for selecting Resp Source.

The available options are

- RA-LA
- RA-LL

By default previously selected option will be ticked. Resp will be derived from the source selected.

Change Parameter

Selecting this will display list of parameters available for selection.

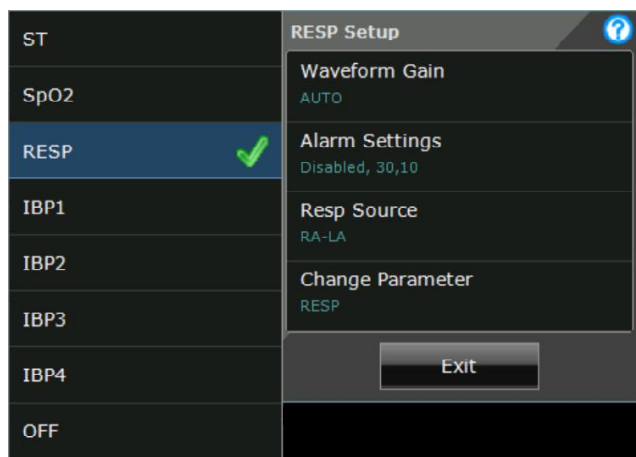


Figure 11.12

Note

Change Parameter option will be available only for User Formats.

Selecting any new parameter, changes will apply immediately and display will be configured.

Waveform Field Parameter
ST
SpO ₂
RESP
CO ₂ *
AA*
O ₂ *
IBP 1
IBP 2
IBP 3 *
IBP 4 *
None

Numeric Field Parameter
ST
SpO ₂
RESP
CO ₂ *
AA*
O ₂ *
N ₂ O*
Temp
IPI*
NIBP
IBP 1
IBP 2
IBP 3*
IBP 4 *
CO*

* are the optional parameters, it will be available for selection when module is detected.

Exit

Selecting Exit will return to Main Screen.

Temp Setup

Setup menu can be selected by clicking on Numeric Field of Temp.

Temp Setup Menu is as shown below

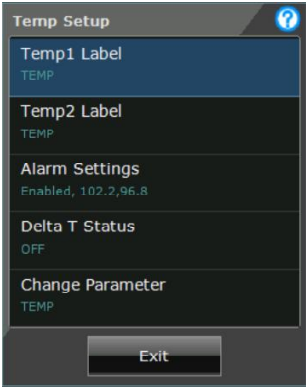


Figure 11.13

Temp1 Label

Selecting this will display list of labels available, user can select a label from the list.

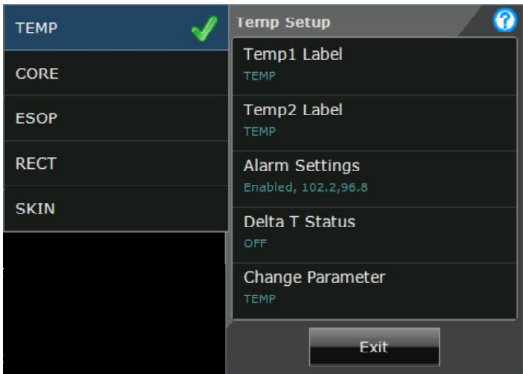


Figure 11.14

Default Label will be Temp. After selection of any label, suffix 1 will be added to it.

Temp2 Label

Selecting this will display list of labels available, user can select the label from the list.

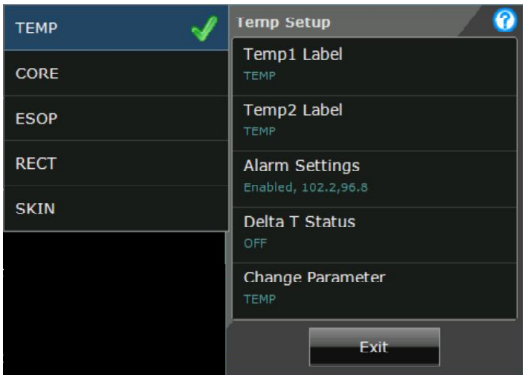


Figure 11.15

Default Label will be Temp. After selection of any label, suffix 2 will be added to it.

Alarm Settings

Selecting alarm settings will popup a Temp Alarm Setup window as shown below

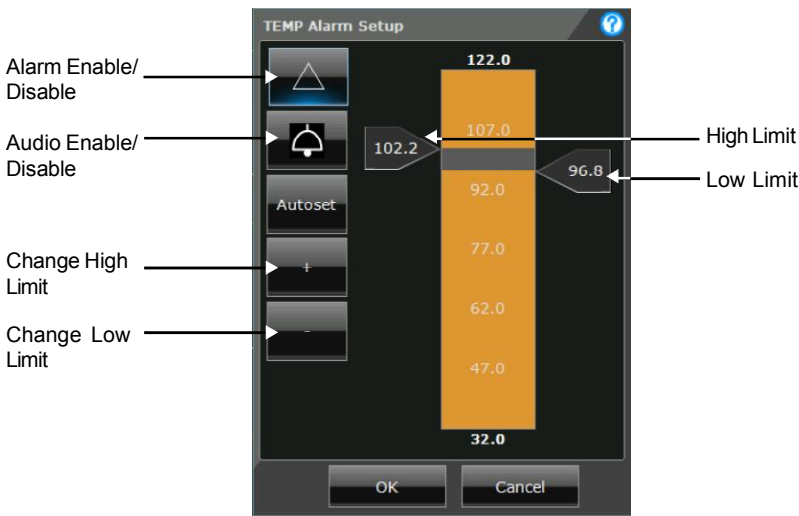


Figure 11.16

Alarm Enable/Disable

By default, cursor will be on Alarm Enable/Disable. Alarm Enable /Disable is pass-word protected, selecting this will popup a Enter Password window where user has to enter the password same as Monitor Setting (4321) using numeric keypad, selecting “Ok” will disable the Temp Alarm with a speech message.

Alarm Disabled will indicate a alarm disabled symbol in the alarm limit area (right side of the numeric window) & it will not consider the alarm condition violation due to parameter. No audio and visual indication will be shown in the monitor. Current condition will be displayed on tab.

When alarm is disabled then the cursor will not move to any other options except Ok & Cancel.

Selecting Ok will save the settings and selecting Cancel will discard the settings.

Audio Enable/Disable

Selecting this user can enable/ disable the audio during alarm condition.

Audio alarm will be disabled with a caution speech message. Current condition will be displayed on tab.

AutoSet

Selecting AutoSet, high & low alarm will change as per the currently monitored parameter value.

Formula for AutoSet is

Temp	High Limit	Present Temp Value +2
	Low Limit	Present Temp Value -2

High Limit

High Limit can be selected if Alarm is enabled. Otherwise option will be grayedout.

Scrolling optical encoder clockwise will increase the alarm limits & scrolling optical encoder anticlockwise direction will decrease the alarm limits.

User can vary the limits using touch, selecting and moving the pointer through alarm limit bar will increase/decrease the alarm limits.

For fine tuning of limits user can use “+” & “-”.

Low Limit

Low Limit can be selected if Alarm is enabled. Otherwise option will be grayedout.

Scrolling optical encoder clockwise will increase the alarm limits & scrolling optical encoder anticlockwise direction will decrease the alarm limits.

User can vary the limits using touch, selecting and moving the pointer through alarm limit bar will increase/decrease the alarm limits.

For fine tuning of limits user can use “+” & “-”.

Selecting Ok will save the settings and selecting Cancel will exit without changing the settings.

Delta T Status

Delta T is the difference between two temperature channels. Selecting on Delta T option user can ON/OFF the delta status.

When Delta T is ON it will be displayed in place of the T2 on the Temperature numeric window. When Delta T is OFF it will display T2 in the numeric field.

Delta T can be either negative or positive.

Message “Delta T Fault” will be displayed incase of fault condition on any temp channel.

Note

When alarm occurs for T2, same alarm will be posted to Delta T also.

Change Parameter

Selecting this will display list of parameters available for selection.

Note

Change Parameter option will be available only for User Formats.

Selecting any new parameter, changes will apply immediately and display will be configured.

Waveform Field Parameter
ST
SpO ₂
RESP
CO ₂ *
AA*
O ₂ *
IBP 1
IBP 2
IBP 3 *
IBP 4*
None

Numeric Field Parameter
ST
SpO ₂
RESP
CO ₂ *
AA*
O ₂ *
N ₂ O*
Temp
IPI*
NIBP
IBP 1
IBP 2
IBP 3*
IBP 4*
CO*

* are the optional parameters, it will be available for selection when module is detected.

Exit

Selecting Exit will return to Main Screen.

Note

When Temp value is 0, then -? - Will be displayed in Temp numeric field.

NIBP Setup

Setup menu can be selected by clicking on Numeric Field of NIBP.

NIBP Setup Menu is as shown below

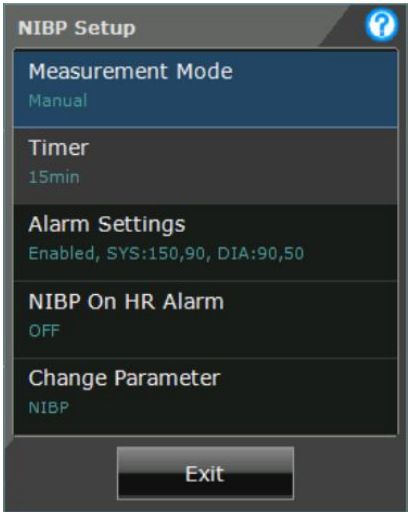


Figure 11.17

Measurement Mode

Selecting this will display list of available option for the user to select.

The available options are

Auto
Manual
Stat

Auto Mode

Selecting Auto mode will enable Timer with a Speech message. First measurement has to be manually started.

In AUTO Mode measurements are taken at time intervals selected.

Manual Mode

In Manual Mode, measurements have to be taken manually by pressing NIBP START/STOP key.

Stat Mode

When Stat Mode is selected, continuous measurements will be taken for 5 minutes.

When Stat Mode is selected a Speech message will be given for the user to start first measurement manually.

Note

In Stat Mode, if any error message occurs then user has to select manual mode manually.

Timer

Timer will be enable only if the Measurement Mode is selected as Auto, else it will be grayedout. Selecting this will display a list of options available for the user to select.

The available options are

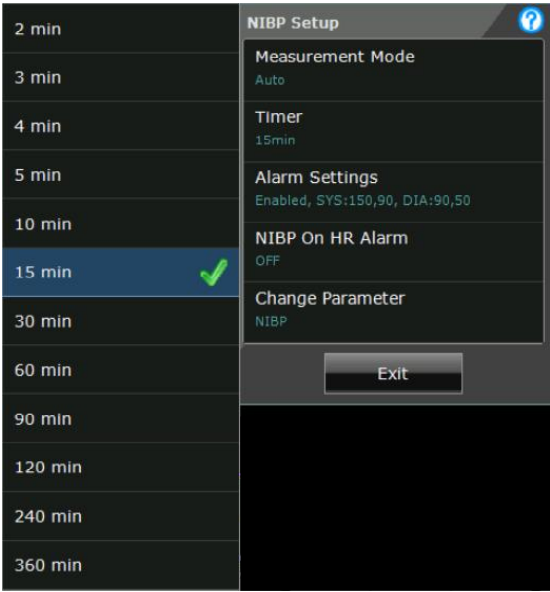


Figure 11.18

NIBP cuff will be inflated at selected time automatically in Auto Mode.

Alarm Settings

This can be selected using Optical Encoder or Touch.

Selecting alarm settings will popup a Resp Alarm Setup window as shown below

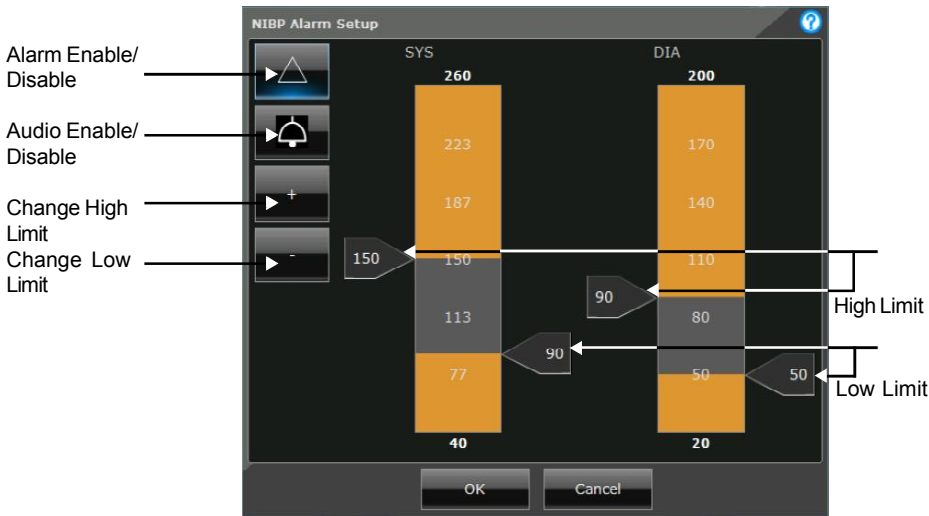


Figure 11.19

Alarm Enable/Disable

By default, cursor will be on Alarm Enable/Disable. Alarm Enable /Disable is password protected, selecting this will popup a Enter Password window where user has to enter the password same as Monitor Setting (4321) using numeric keypad, selecting “Ok” will disable the Resp Alarm with a speech message.

Alarm Disabled will indicate a alarm disabled symbol in the alarm limit area (right side of the numeric window) & it will not consider the alarm condition violation due to parameter. No audio and visual indication will be shown in the monitor. Current condition will be displayed on tab.

When alarm is disabled then the cursor will not move to any other options except Ok & Cancel.

Selecting Ok will save the settings and selecting Cancel will discard the settings.

Audio Enable/Disable

Selecting this user can enable/ disable the audio during alarm condition.

Audio alarm will be disabled with a caution speech message. Current condition will be displayed on tab.

High Limit

High Limit can be selected if Alarm is enabled. Otherwise option will be grayedout.

Scrolling optical encoder clockwise will increase the alarm limits & scrolling optical encoder anticlockwise direction will decrease the alarm limits.

User can vary the limits using touch, selecting and moving the pointer through alarm limit bar will increase/decrease the alarm limits.

For fine tuning of limits user can use “+” & “-”.

Low Limit

Low Limit can be selected if Alarm is enabled. Otherwise option will be grayedout.

Scrolling optical encoder clockwise will increase the alarm limits & scrolling optical encoder anticlockwise direction will decrease the alarm limits.

User can vary the limits using touch, selecting and moving the pointer through alarm limit bar will increase/decrease the alarm limits.

For fine tuning of limits user can use “+” & “-”.

Selecting Ok will save the settings and selecting Cancel will exit without changing the settings.

NIBP ON HR Alarm

This can be selected using Optical Encoder or Touch.

Selecting this will allow the user to ON/OFF NIBP On HR Alarm. Selecting ON will initiate NIBP measurement automatically on detection of HR alarm condition.

By default it will be in OFF condition.

Change Parameter

This can be selected using Optical Encoder or Touch.

Selecting this will display list of parameters available for selection.

Note

Change Parameter option will be available only for User Formats.

Selecting any new parameter, changes will apply immediately and the display will be configured.

Waveform Field Parameter
ST
SpO ₂
RESP
CO ₂ *
AA*
O ₂ *
IBP 1
IBP 2
IBP 3 *
IBP 4*
None

Numeric Field Parameter
ST
SpO ₂
RESP
CO ₂ *
AA*
O ₂ *
N ₂ O*
Temp
IPI*
NIBP
IBP 1
IBP 2
IBP 3*
IBP 4*
CO*

* are the optional parameters, it will be available for selection when module is detected.

Exit

Selecting Exit will return to Main Screen.

SpO₂ Setup

Setup menu can be selected by clicking on Waveform Field or Numeric Field of SpO₂.

SpO₂ Setup Menu is as shown below



Figure 11.20

Waveform Gain

Selecting this will display available options for the user to select.

The available options are

X0.5
X1

Selecting any option, changes will apply immediately and be reflected on the display.

Alarm Settings

Selecting alarm settings will popup a SpO₂ Alarm Setup window as shown below

For Adult / Pediatric

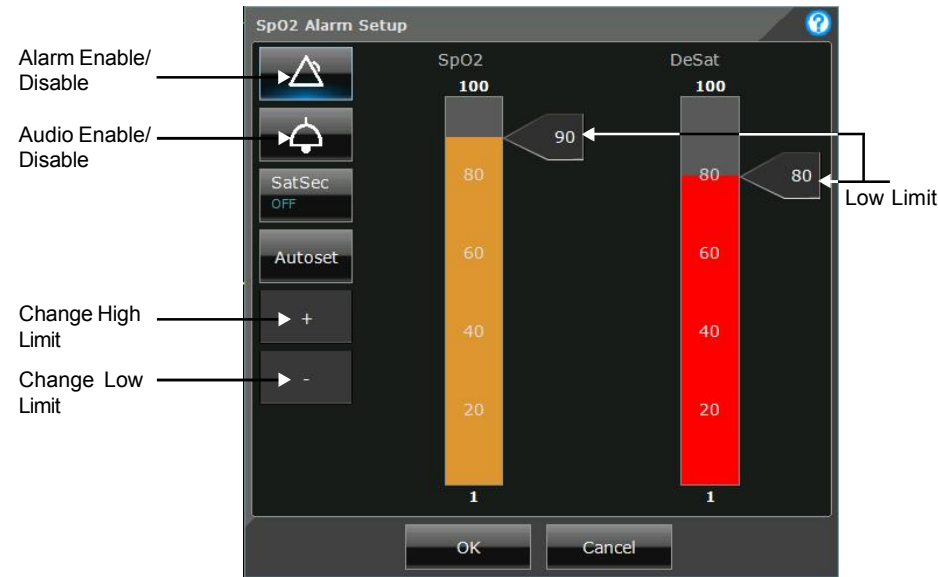


Figure 11.21

For Neonatal

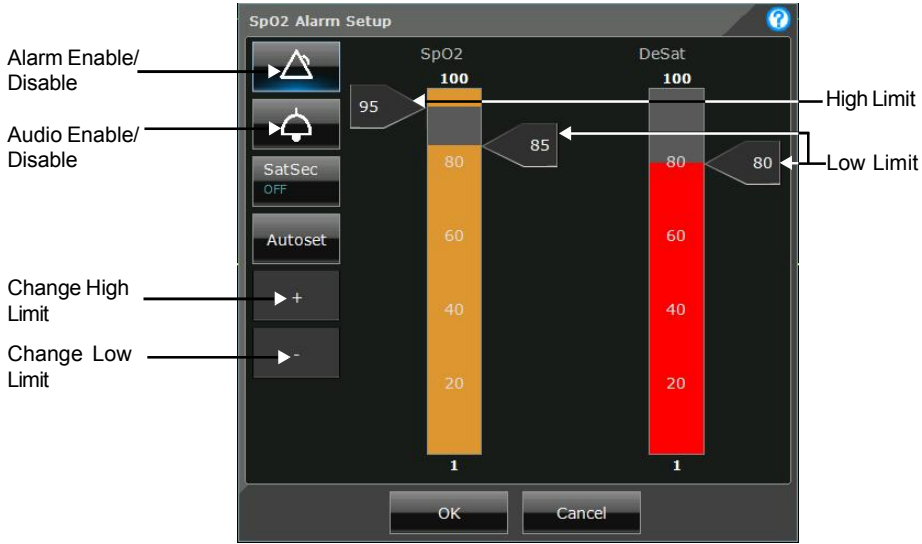


Figure 11.22

Alarm Enable/Disable

By default, cursor will be on Alarm Enable/Disable. Alarm Enable /Disable is password protected, selecting this will popup a Enter Password window where user has to enter the password same as Monitor Setting (4321) using numeric keypad, selecting “Ok” will disable the SpO₂ Alarm with a speech message.

Alarm Disabled will indicate a alarm disabled symbol in the alarm limit area (right side of the numeric window) & it will not consider the alarm condition violation due to parameter. No audio and visual indication will be shown in the monitor. Current condition will be displayed on tab.

When alarm is disabled then the cursor will not move to any other options except Ok & Cancel.

Selecting Ok will save the settings and selecting Cancel will discard the settings.

Audio Enable/Disable

Selecting this user can enable/ disable the audio during alarm condition.

Audio alarm will be disabled with a caution speech message. Current condition will be displayed on tab.

SatSec

Selecting SatSec will display available options for the user for selection.



Figure 11.23

After selection of any option, changes will apply immediately. Selecting OFF will deactivate the SatSec alarm.

When SpO₂ value goes above higher limit or below lower limit SatSec detection starts. If SatSec remains within the ranges 10/25/50/100 (whichever user has selected), then no alarm will be triggered even if SpO₂ value is above/below the High limit/Low limit. If the SatSec goes above set limit then it will give a red alarm.

AutoSet

Selecting AutoSet, high & low alarm will change as per the currently monitored parameter value.

Formula for AutoSet is

SpO ₂	High Limit	100
	Low Limit	(Present SpO ₂ Value -8) or 80 Which ever is greater?

Low Limit

High Limit can be selected if Alarm is enabled. Otherwise option will be grayedout.

Scrolling optical encoder clockwise will increase the alarm limits & scrolling optical encoder anticlockwise direction will decrease the alarm limits.

User can vary the limits using touch, selecting and moving the pointer through alarm limit bar will increase/decrease the alarm limits.

For fine tuning of limits user can use “+” & “-”.

Response

Selecting this will display available option for selection. The available options are

Normal
Fast

Selected response time will applied immediately on the real time screen.

Normal mode is preferred for Adults & Fast mode is preferred for Sleep Studies.

PlethBar Display

PlethBar indicates the signal strength. User can ON/OFF the PlethBar display in the SpO₂ numeric field. Selecting ON will display the PlethBar.

Change Parameter

Selecting this will display list of parameters available for selection.

Note

Change Parameter option will be available only for User Formats.

Selecting any new parameter, changes will apply immediately and display will be configured.

Waveform Field Parameter
ST
SpO ₂
RESP
CO ₂ *
AA*
O ₂ *
IBP 1
IBP 2
IBP 3 *
IBP 4*
None

Numeric Field Parameter
ST
SpO ₂
RESP
CO ₂ *
AA*
O ₂ *
N ₂ O*
Temp
IPI*
NIBP
IBP 1
IBP 2
IBP 3*
IBP 4*
CO*

* are the optional parameters, it will be available for selection when module is detected.

Exit

Selecting Exit will return to Main Screen.

IBP Setup

Setup menu can be selected by clicking on Waveform Field or Numeric Field of IBP.

IBP Setup Menu is as shown below

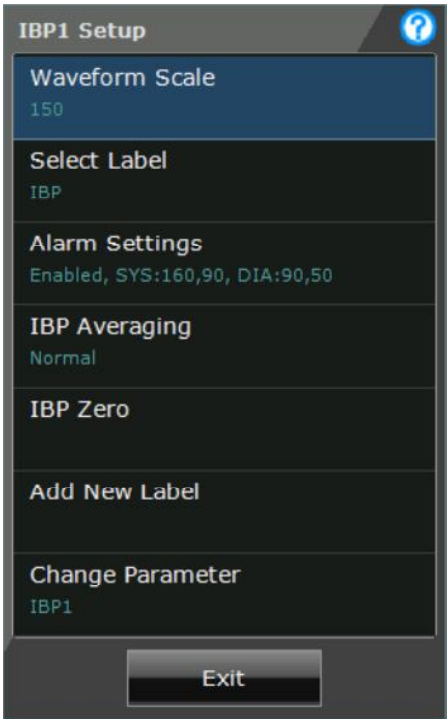


Figure 11.24

Waveform Scale

Selecting Waveform Scale will display list of available scale as shown below

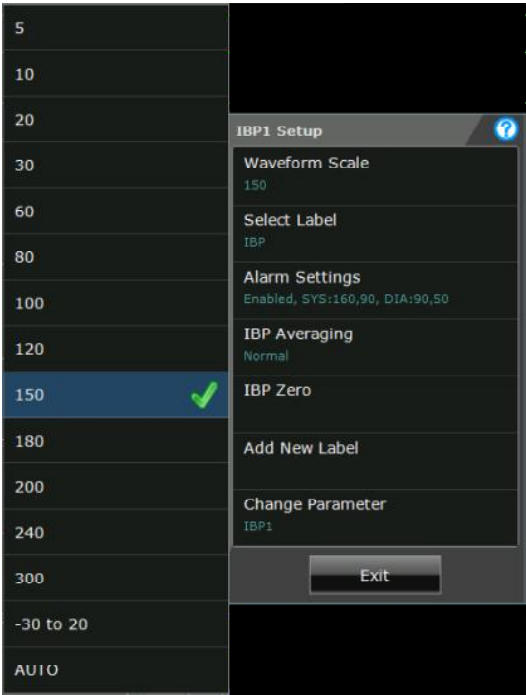


Figure 11.25

Waveform scale will immediately change to the selected scale.

Select Label

Select Label allows the user to choose label for IBP channel. The available labels are

- IBP (Invasive Blood Pressure channel)
- ICP (Intracranial Pressure)
- CVP (Central Venous Pressure)
- PAP (Pulmonary Artery Pressure)
- LAP (Left Atrial Pressure)
- RAP (Right Atrial Pressure)
- PCW (Pulmonary Capillary Wedge Pressure)
- LVP (Left Ventricular Pressure)
- ART (Arterial Blood Pressure)
- AO (Aorta Blood Pressure)

The selected label will be displayed both in waveform & numeric fields. The changed label will appear in Graphical TREND, RECORDING.

Note

It is recommended to set label properly according to the area of catheterization for accurate IBP measurements.

Alarm Settings

Selecting alarm settings will popup a IBP

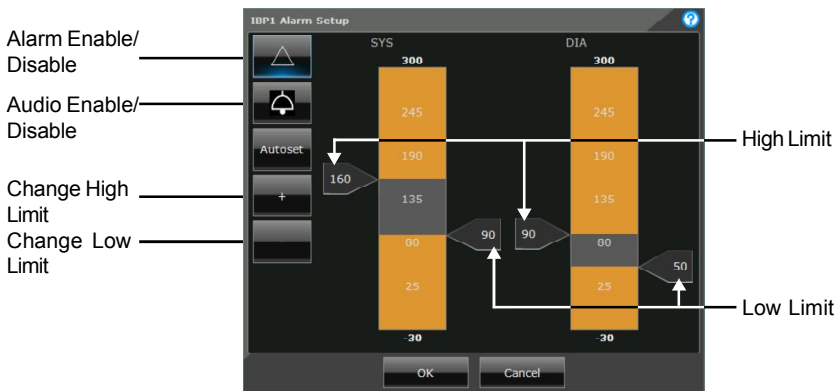


Figure 11.26

Alarm Enable/Disable

By default, cursor will be on Alarm Enable/Disable. Alarm Enable /Disable is password protected, selecting this will popup a Enter Password window where user has to enter the password same as Monitor Setting (4321) using numeric keypad, selecting "Ok" will disable the Resp Alarm with a speech message.

Alarm Disabled will indicate a alarm disabled symbol in the alarm limit area (right side of the numeric window) & it will not consider the alarm condition violation due to parameter. No audio and visual indication will be shown in the monitor. Current condition will be displayed on tab.

When alarm is disabled then the cursor will not move to any other options except Ok & Cancel.

Selecting Ok will save the settings and selecting Cancel will discard the settings.

Audio Enable/Disable

Selecting this user can enable/ disable the audio during alarm condition.

Audio alarm will be disabled with a caution speech message. Current condition will be displayed on tab.

AutoSet

Selecting AutoSet, high & low alarm will change as per the currently monitored parameter value.

Formula for AutoSet is

IBP SYS	High Limit	Present Systolic value +8
	Low Limit	Present Systolic value -8
IBP DIA	High Limit	Present Systolic value +8
	Low Limit	Present Systolic value -8

High Limit

High Limit can be selected if Alarm is enabled. Otherwise option will be grayedout.

Scrolling optical encoder clockwise will increase the alarm limits & scrolling optical encoder anticlockwise direction will decrease the alarm limits.

User can vary the limits using touch, selecting and moving the pointer through alarm limit bar will increase/decrease the alarm limits.

For fine tuning of limits user can use “+” & “-”.

Low Limit

Low Limit can be selected if Alarm is enabled. Otherwise option will be grayedout.

Scrolling optical encoder clockwise will increase the alarm limits & scrolling optical encoder anticlockwise direction will decrease the alarm limits.

User can vary the limits using touch, selecting and moving the pointer through alarm limit bar will increase/decrease the alarm limits.

For fine tuning of limits user can use “+” & “-”.

Selecting Ok will save the settings and selecting Cancel will exit without changing the settings.

IBP Averaging

Selecting this will display list of available options. The available options are

- Normal
- Slow
- Fast

After selecting any option, changes will be applied immediately.

When “Normal” is selected averaging of IBP readings will be done at the rate of 6 Beats.

When “Slow” is selected averaging of IBP readings will be done at the rate of 8 Beats.

When “Fast” is selected averaging of IBP readings will be done at the rate of 4 Beats.

IBP Zero

Selecting this will popup a IBP Zero window, here the user can select IBP channel and select Zero.

Add New Label

Selecting this will popup a alpha numeric keypad, where the user can enter a new label for selected IBP channel.

Label can be of maximum 3 characters. Selecting Ok will save the label in Select Label list with a confirmation message, selecting Clear will clear the entered label & selecting Cancel will return to previous menu.

If user tries to add 2nd label it will popup a Warning message for replacing the previous one. Selecting Ok will replace the label and selecting Cancel will exit without replacing the label.

Change Parameter

Selecting this will display list of parameters available for selection.

Note

Change Parameter option will be available only for User Formats.

Exit

Selecting Exit will return to Main Screen.

ST Setup

Setup menu can be selected by clicking on Waveform Field or Numeric Field of ST.

ST Setup Menu is as shown below

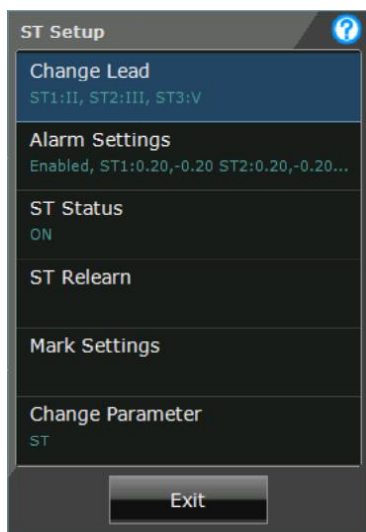


Figure 11.27

When ST is selected for measurement on real-time display then ECG Filter mode will automatically changed to “DIAG”. User will be allowed to change the mode from ECG setup menu. Changing the mode will popup a confirmation message for the user.

Note

Setting ST analysis ON, the monitor will select ‘Diagnostic’ mode. User can set it to ‘Monitor’ or ‘OT’ mode as required. It is recommended to view the ST analysis in ‘Diagnostic’ mode for accurate ST measurement.

Change Lead

Selecting this will popup a Change ST Lead window, where user can select the lead for ST1, ST2 & ST3. The selected lead will be displayed in real time mode.

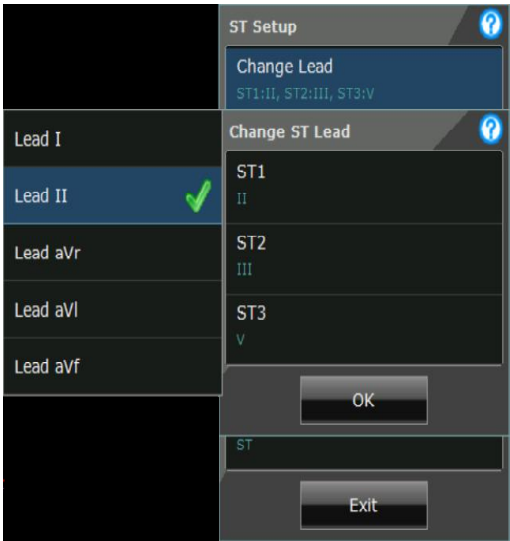


Figure 11.28

Change Lead option will be available only when Auto 5L ECG cable gets detected otherwise this menu will not be available for selection.

In case of 3 lead ECG cable, ST Lead will also get changed as per the change in the “Change lead” tab in the ECG setup menu.

5L Cable
Lead I
Lead II
Lead III
Lead aVr
Lead aVl
Lead aVf
Lead V
None

Alarm Settings

Selecting alarm settings will popup a ST Alarm Setup window as shown below

ST 3L Alarm Setup

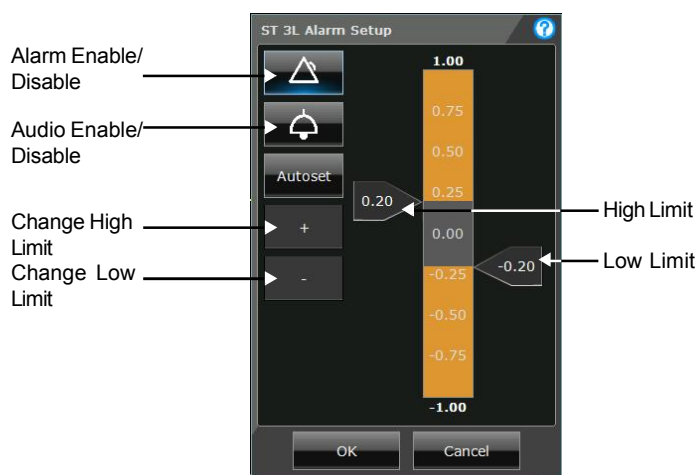


Figure 11.29

ST 5L Alarm Setup



Figure 11.30

Alarm Enable/Disable

By default, cursor will be on Alarm Enable/Disable. Alarm Enable /Disable is password protected, selecting this will popup a Enter Password window where user has to enter the password same as Monitor Setting (4321) using numeric keypad, selecting “Ok” will disable the Resp Alarm with a speech message.

Alarm Disabled will indicate a alarm disabled symbol in the alarm limit area (right side of the numeric window) & it will not consider the alarm condition violation due to parameter. No audio and visual indication will be shown in the monitor. Current condition will be displayed on tab.

When alarm is disabled then the cursor will not move to any other options except Ok & Cancel.

Selecting Ok will save the settings and selecting Cancel will discard the settings.

Audio Enable/Disable

Selecting this user can enable/ disable the audio during alarm condition.

Audio alarm will be disabled with a caution speech message. Current condition will be displayed on tab

AutoSet

Selecting AutoSet, high & low alarm will change as per the currently monitored parameter value.

Formula for AutoSet is

ST	High Limit	Present value +0.2
	Low Limit	Present value -0.2

High Limit

High Limit can be selected if Alarm is enabled. Otherwise option will be grayedout.

Scrolling optical encoder clockwise will increase the alarm limits & scrolling optical encoder anticlockwise direction will decrease the alarm limits.

User can vary the limits using touch, selecting and moving the pointer through alarm limit bar will increase/decrease the alarm limits.

For fine tuning of limits user can use “+” & “-”.

Low Limit

Low Limit can be selected if Alarm is enabled. Otherwise option will be grayedout.

Scrolling optical encoder clockwise will increase the alarm limits & scrolling optical encoder anticlockwise direction will decrease the alarm limits.

User can vary the limits using touch, selecting and moving the pointer through alarm limit bar will increase/decrease the alarm limits.

For fine tuning of limits user can use “+” & “-”.

ST Status

Selecting this user can ON/OFF ST analysis. Selecting ON will enable ST analysis & selecting OFF will disable ST analysis.

ST Relearn

Selecting this will Relearn the ST segment again.

Caution

For accurate ST measurement during varying heart rate or ECG morphology changes press ST relearn.

Mark Settings

Selecting this will popup a ST 3/5 Lead Mark Setup, here the user can mark ISO, ST & J points.

ST 3Lead Mark Setup Standard

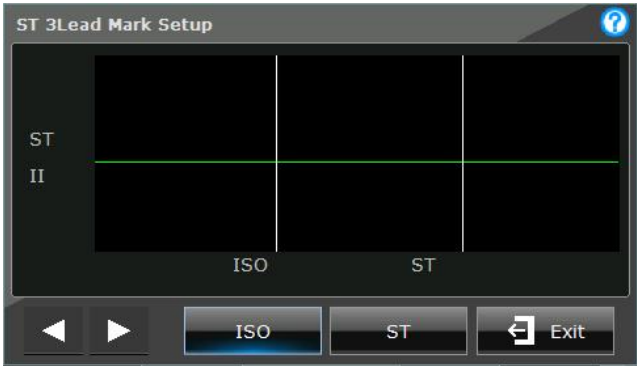


Figure 11.31

ST 5 Lead Mark Setup Standard



Figure 11.32

ISO Point

Selecting this user can mark ISO Point. The set ISO Point will be displayed in ST numeric field. The default value is 80 msec.

Maximum ISO Point is 360 msec & minimum ISO Point is 0 msec.

Selection of ISO will give the control of optical encoder to ISO Point. One single cursor is maintained for all the three waveforms in case of 5 Lead.

ST Point

Selecting this user can mark ST Point. The set ST Point will be displayed in ST numeric field. The default value is 100 msec.

Maximum ST Point is 640 msec & minimum ST Point is 0 msec.

Selection of ST will give the control of optical encoder to ST Point. One single cursor is maintained for all the three waveforms in case of 5 Lead.

Note

400samples will be displayed in this window with R-Peak at 144th location and user will be able to scroll in step of 2.5msec. Averaging of ST template is over 8 QRS peaks.

Change Parameter

Selecting this will display list of parameters available for selection.

Note

Change Parameter option will be available only for User Formats.

Exit

Selecting Exit will return to Main Screen.

Co2 Setup (Optional)

Co2 is a optional & hot pluggable module. When the module is plugged, Star 65 will display a module detection message “CO2 Module Detected”.

Setup menu can be selected by clicking on Waveform Field or Numeric Field of Co2.

Co2 Setup Menu is as shown below

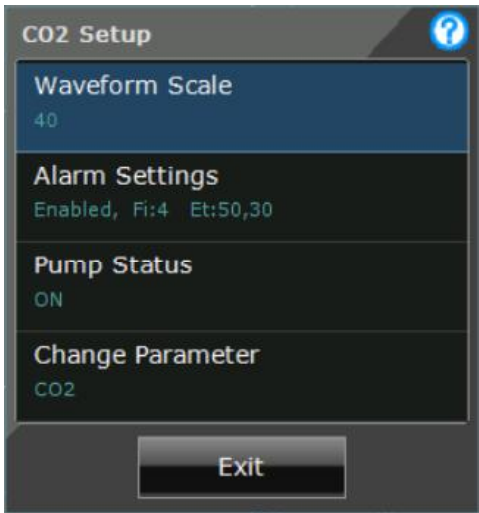


Figure 11.33

Waveform Scale

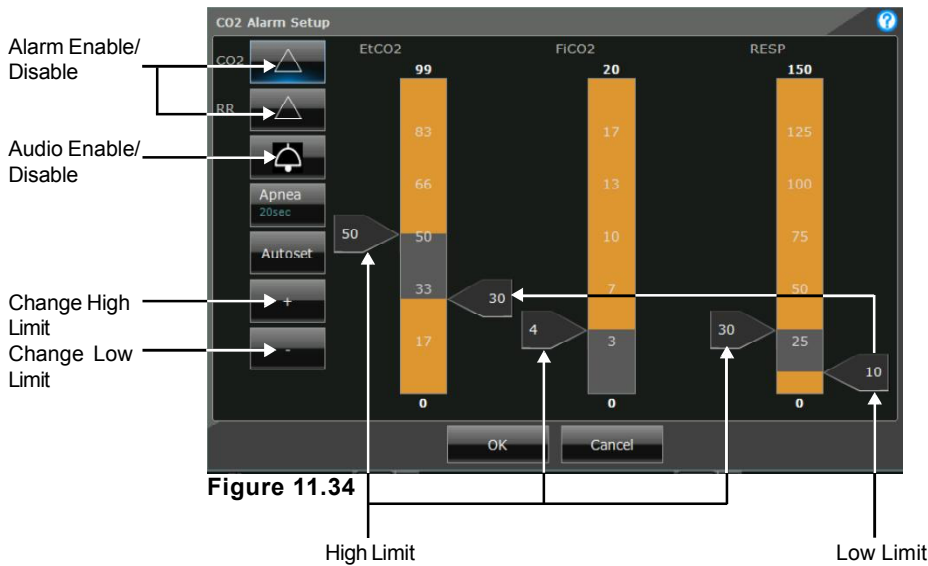
Selecting this will display available option for the user to select. The available options are

- 20
- 40
- 60
- 80
- 100

Selected scale will be displayed in the waveform field.

Alarm Settings

Selecting alarm settings will popup a Resp Alarm Setup window as shown below



Alarm Enable/Disable

By default, cursor will be on Alarm Enable/Disable. Alarm Enable /Disable is password protected, selecting this will popup a Enter Password window where user has to enter the password same as Monitor Setting (1904) using numeric keypad, selecting "Ok" will disable the Resp Alarm with a speech message.

Alarm Disabled will indicate a alarm disabled symbol in the alarm limit area (right side of the numeric window) & it will not consider the alarm condition violation due to parameter. No audio and visual indication will be shown in the monitor. Current condition will be displayed on tab.

When alarm is disabled then the cursor will not move to any other options except Ok & Cancel.

Selecting Ok will save the settings and selecting Cancel will discard the settings.

Audio Enable/Disable

Selecting this user can enable/ disable the audio during alarm condition.

Audio alarm will be disabled with a caution speech message. Current condition will be displayed on tab

AutoSet

Selecting AutoSet, high & low alarm will change as per the currently monitored parameter value.

Formula for AutoSet is

Resp	High Limit	Present Respiration rate +5
	Low Limit	Present Respiration rate -5
EtCo2	High Limit	Present Respiration rate +5
	Low Limit	Present Respiration rate -5
FiCo2	High Limit	Present Respiration rate +2
	Low Limit	NA

Apnea

Apnea is the condition where respiration is not detected for a certain amount of time. This time limit will generally vary from 5sec to 60sec.

If respiration is not detected continuously for the set time limit, then there will be a red alarm indication.

Selecting this will display list of available Apnea options for the user to select.

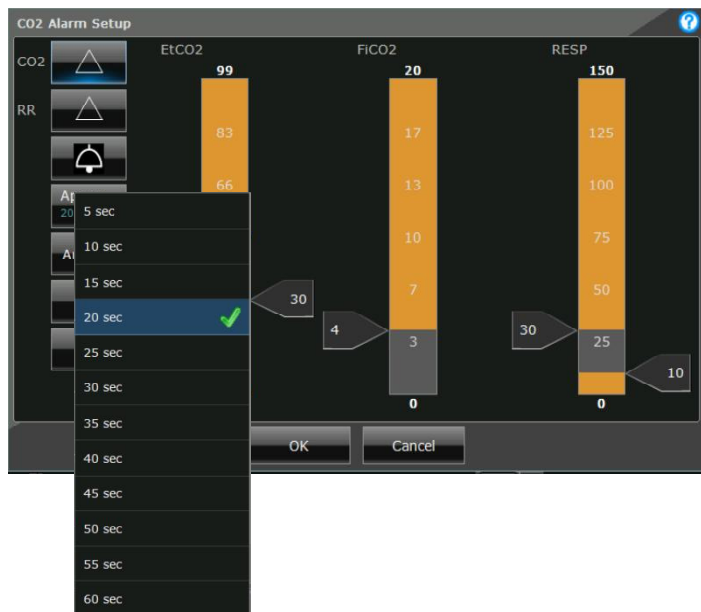


Figure 11.35

Note

Apnea option should be enabled in Production Menu, else option will not be available for selection.

High Limit

High Limit can be selected if Alarm is enabled. Otherwise option will be grayedout.

Scrolling optical encoder clockwise will increase the alarm limits & scrolling optical encoder anticlockwise direction will decrease the alarm limits.

User can vary the limits using touch, selecting and moving the pointer through alarm limit bar will increase/decrease the alarm limits.

For fine tuning of limits user can use “+” & “-”.

Low Limit

Low Limit can be selected if Alarm is enabled. Otherwise option will be grayedout.

Scrolling optical encoder clockwise will increase the alarm limits & scrolling optical encoder anticlockwise direction will decrease the alarm limits.

User can vary the limits using touch, selecting and moving the pointer through alarm limit bar will increase/decrease the alarm limits.

For fine tuning of limits user can use “+” & “-”.

Selecting Ok will save the settings and selecting Cancel will exit without changing the settings.

Pump Status

User can ON/OFF the Co2 pump. Selecting ON will start the measurement as soon as sample line is connected.

Selecting OFF will not start measurement, even when sample line is connected.

Change Parameter

Selecting this will display list of parameters available for selection.

Note

Change Parameter option will be available only for User Formats.

Exit

Selecting Exit will return to Main Screen.

Note

During boot up if AGM & CO2 both are connected. AGM option will appear for wave-form & digital area selection. Power will not be supplied to CO2 module and error message will be displayed in the real time display "CO2 Module Plugging Error".

CO Setup

CO is a optional & hot pluggable module. When the module is plugged, Star 65 will display a module detection message “CO Module Detected”.

Setup menu can be selected by clicking on Waveform Field or Numeric Field of CO.

CO Setup Menu is as shown below

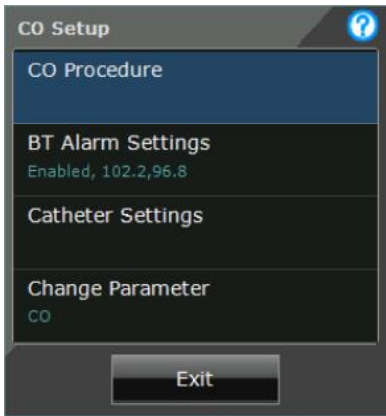


Figure 11.36

CO Procedure

Selecting this will popup a CO Procedure window as shown below



Figure 11.37

In CO Procedure screen user can get parameters like

- Body Temperature (BT)
- Injectate Temperature (IT)
- Cardiac Output (CO)
- Cardiac Index (CI)
- Average CO
- Average CI

Note

Before starting CO procedure make sure that catheter settings & corresponding computation constant is proper, for accurate measurements.

BT Scale

Selecting this will display available options for changing the amplitude of CO waveform. The available options are

- 0.5
- 1
- 2

The selected option will be displayed in the CO waveform.

Trend

Selecting Trend will popup a CO Trend window as shown below

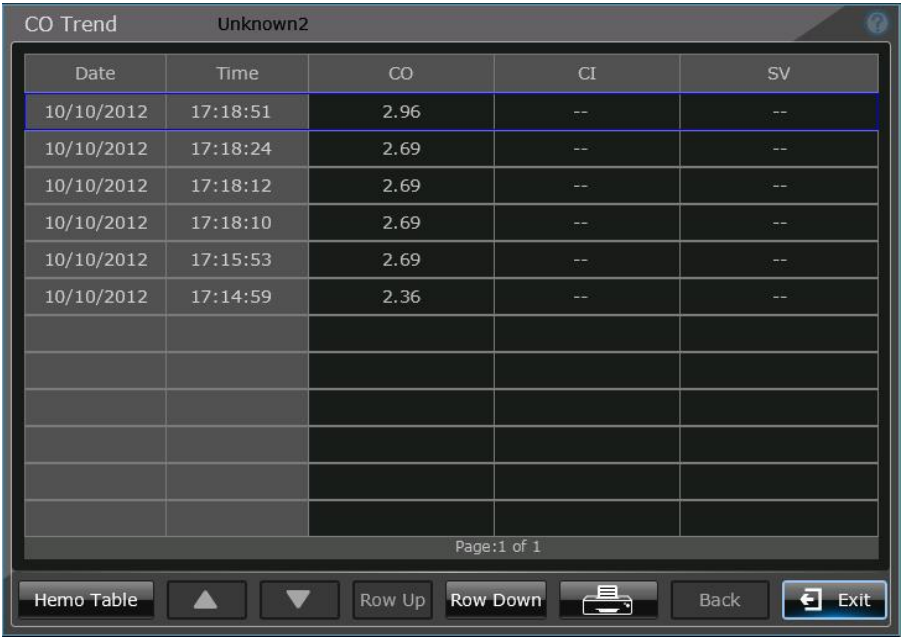


Figure 11.38

CO Trend is only a Tabular Trend window. CO Trend window is divided into 5 columns, it will display last 40 readings of CO, CI & SV with date & time.

CO Trend will be displayed for current patient only.

Hemo Table

Selecting Hemo Table will popup a Hemo Calculator window as shown below

Hemo Calculator

Patient ID

Date

10/10/2012

Name

TEST

Time

5:33 PM

Input

Weight

65

kg

Height

178

cm

ABP(MEAN)

mmHg

PAP(MEAN)

mmHg

PCWP

mmHg

CVP(MEAN)

mmHg

HR

bpm

CO

2.32

L/min

Output

BSA

--

m2

LCWI

--

kg. m/m2

CI

--

L/min/m2

LVSW

--

gm. m

SV

--

ml

LVSWI

--

gm. m/m2

SI

--

ml/m2

RCW

--

kg. m

SVR

--

dynes. sec/cm5

RCWI

--

kg. m/m2

SVRI

--

(dynes. sec/cm5). m2

RVSW

--

gm. m

PVR

--

dynes. sec/cm5

RVSWI

--

gm. m/m2

PVRI

--

(dynes. sec/cm5). m2

LCW

--

kg. m

Calculate

Exit

Figure 11.39

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Inputs for Hemo Calculator will be taken from Admit Patient window. If values are not entered or if user wants to change the values, it has to be done manually by selecting particular input parameter.

Name	Unit	Range
Weight	kg	30-153
Height	cm	20-299
ABP(MEAN)	mmHg	0-300
PAP(MEAN)	mmHg	0-300
PCWP	mmHg	0-300
CVP(MEAN)	mmHg	0-300
HR	bpm	20-350
CO	L/min	0.5 to 20.0

Calculate

Selecting Calculate will calculate the output parameters based on the input available.

Print

Select to print the Hemo table.

Exit

Selecting Exit will return to CO Trend Screen.

Up/Down Arrow

Using Up/Down Arrow user can scroll between the available alarm pages (previous page & next page).

Row Up/Row Down

Using Row Up/Row Down user can scroll through the values.

Print

Selecting Print will print the data in selected resolution.

Exit

Selecting Exit will return to CO Procedure Screen.

Clear

Selecting Clear will popup a Warning message “ Current CO Procedure will be Cleared! Press Ok to Continue”. Selecting Ok will clear the CO Procedure & selecting Cancel will go back to the CO Procedure window.

Select

This option will be available if the CO measurement is taken atleast one time or CO data is available otherwise it will be grayed out. “Select” will be used to select the curves for which the average of CO and CI values to be calculated. After selection of the “Select” user will be allowed to select or deselect the stored BT Waveform.

Initially all the CO readings will be selected. And will be indicated by a tick mark. User can select/deselect any of the waveform field for CO & CI average.

Average

This option will be available if the CO measurement is taken atleast one time or CO data is available otherwise it will be grayed out.

Selecting Average will calculate the average of selected CO and CI values.

If any CO waveform out of 5 is not able to calculate the value it will be shown as “—” . CO value will be ‘- ?-’ if out of range.

Exit

Selecting Exit will return to Main Screen.

BT Alarm Settings

Selecting this will popup a BT Alarm Setup as shown below

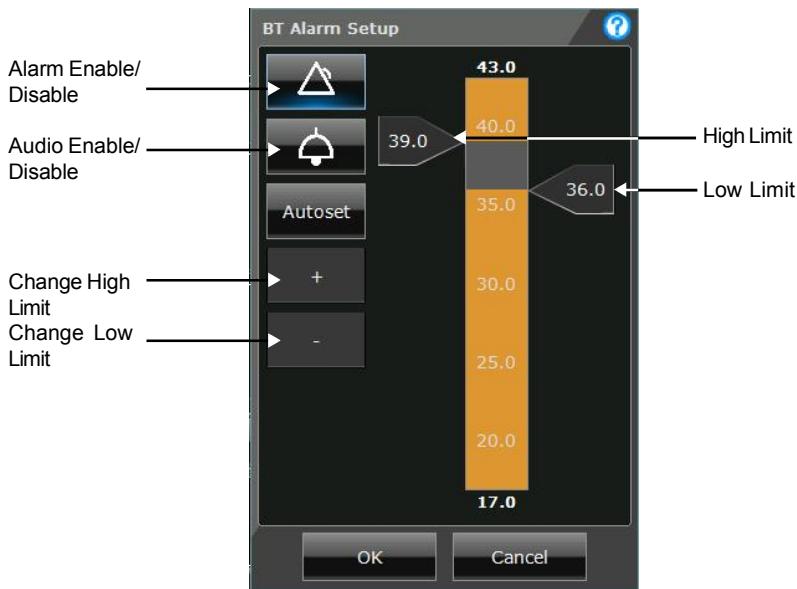


Figure 11.40

Alarm Enable/Disable

By default, cursor will be on Alarm Enable/Disable. Alarm Enable /Disable is password protected, selecting this will popup a Enter Password window where user has to enter the password same as Monitor Setting (4321) using numeric keypad, selecting “Ok” will disable the BT Alarm with a speech message.

Alarm Disabled will indicate a alarm disabled symbol in the alarm limit area (right side of the numeric window) & it will not consider the alarm condition violation due to parameter. No audio and visual indication will be shown in the monitor. Current condition will be displayed on tab.

When alarm is disabled then the cursor will not move to any other options except Ok

Selecting Ok will save the settings and selecting Cancel will discard the settings.

Audio Enable/Disable

Selecting this user can enable/ disable the audio during alarm condition.

Audio alarm will be disabled with a caution speech message. Current condition will be displayed on tab

AutoSet

Selecting AutoSet, high & low alarm will change as per the currently monitored parameter value.

Formula for AutoSet is

CO/SV	High Limit	Present value + 40 % of Present value
	Low Limit	Present value - 40 % of Present value

High Limit

High Limit can be selected if Alarm is enabled. Otherwise option will be grayedout.

Scrolling optical encoder clockwise will increase the alarm limits & scrolling optical encoder anticlockwise direction will decrease the alarm limits.

User can vary the limits using touch, selecting and moving the pointer through alarm limit bar will increase/decrease the alarm limits.

For fine tuning of limits user can use “+” & “-”.

Low Limit

Low Limit can be selected if Alarm is enabled. Otherwise option will be grayedout.

Scrolling optical encoder clockwise will increase the alarm limits & scrolling optical encoder anticlockwise direction will decrease the alarm limits.

User can vary the limits using touch, selecting and moving the pointer through alarm limit bar will increase/decrease the alarm limits.

For fine tuning of limits user can use “+” & “-”.

Selecting Ok will save the settings and selecting Cancel will exit without changing the settings.

Catheter Settings

Selecting this will popup a CO Catheter Settings window.

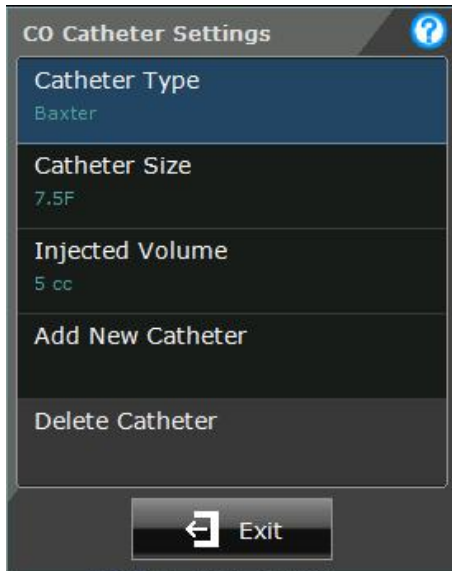


Figure 11.41

Note

Ensure Proper Catheter settings for accurate CO measurements.

Catheter Type

Selecting this will allow the user to select the Catheter from the drop down list. The recommended Catheters are

- Baxter
- Ohmeda
- BL Life Science

New catheters entered by the user will be displayed in the drop down list.

Catheter Size(F)

Selecting this will allow the user to select the Catheter Size. The available options are

- 8F
- 7.5F
- 7F
- 6F
- 5F

Injected Volume

Selecting this will allow the user to select injected volume of saline. The available options are

- 10 cc
- 5 cc
- 3 cc

3cc option will not be available for Baxter.

Add New Catheter

Selecting this will popup a Add Catheter window, where user can enter

Catheter Name

Catheter Size(F)

Injectate Volume

Computation Constant At 0°C - 4.9°C

Computation Constant At 5°C - 15.9°C

Computation Constant At 16°C - 27°C

User has to enter all the details to add the Catheter in Catheter Type. If any data is not entered, then the Catheter will not be saved.

Catheter Name

Selecting this will popup a alpha numeric keypad, using which the user can enter the Catheter Name. It can be maximum of 10 characters.

Catheter Size(F)

Selecting this will popup a numeric keypad, using which the user can enter the Catheter Size(F). It can be maximum of 2 integral characters.

By default Catheter Size will be 7.5.

Injectate Volume

Selecting this will popup a numeric keypad, using which the user can enter the Injectate Volume. It can be maximum of 2 integral characters.

By default Injectate Volume will be 5.0.

Computation Constant At 0°C - 4.9°C

Selecting this will popup a numeric keypad, using which the user can enter the Computation Constant. It will range from 0°C - 4.9°C.

Computation Constant At 5°C - 15.9°C

Selecting this will popup a numeric keypad, using which the user can enter the Computation Constant. It will range from 5°C - 15.9°C.

Computation Constant At 16°C - 27°C

Selecting this will popup a numeric keypad, using which the user can enter the Computation Constant. It will range from 16°C - 27°C.

Selecting Ok will save the settings and selecting Exit will come back to CO Setup menu.

Change Parameter

Selecting this will display list of parameters available for selection.

Note

Change Parameter option will be available only for User Formats.

Exit

Selecting Exit will return to Main Screen.

IPI Setup

Setup menu can be selected by clicking on Waveform Field or Numeric Field of IPI.

IPI Setup Menu is as shown below

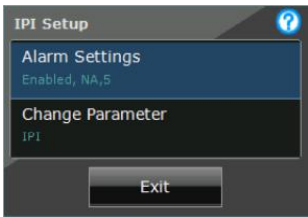


Figure 11.42

Note

IPI option will appear for selection only when CO2 & SpO2 are monitored.

Alarm Settings

Selecting alarm settings will popup a IPI Alarm Setup window as shown below

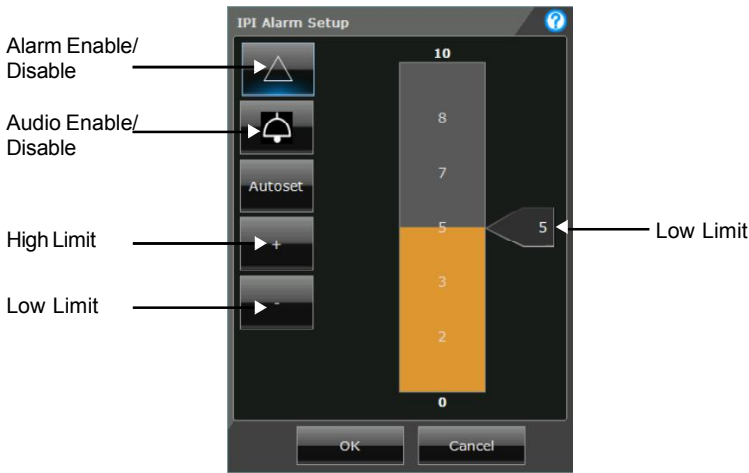


Figure 11.43

Alarm Enable/Disable

By default, cursor will be on Alarm Enable/Disable. Alarm Enable /Disable is password protected, selecting this will popup a Enter Password window where user has to enter the password same as Monitor Setting (4321) using numeric keypad, selecting "Ok" will disable IPI Alarm with a speech message.

Alarm Disabled will indicate a alarm disabled symbol in the alarm limit area (right side of the numeric window) & it will not consider the alarm condition violation due to parameter. No audio and visual indication will be shown in the monitor. Current condition will be displayed on tab.

When alarm is disabled then the cursor will not move to any other options except Ok & Cancel.

Selecting Ok will save the settings and selecting Cancel will discard the settings.

Audio Enable/Disable

Selecting this user can enable/ disable the audio during alarm condition.

Audio alarm will be disabled with a caution speech message. Current condition will be displayed on tab

AutoSet

Selecting AutoSet, high & low alarm will change as per the currently monitored parameter value.

Formula for AutoSet is

IPI	Low Limit	Present value -2
-----	-----------	------------------

High Limit

High Limit can be selected if Alarm is enabled. Otherwise option will be grayedout.

Scrolling optical encoder clockwise will increase the alarm limits & scrolling optical encoder anticlockwise direction will decrease the alarm limits.

User can vary the limits using touch, selecting and moving the pointer through alarm limit bar will increase/decrease the alarm limits.

For fine tuning of limits user can use “+” & “-”.

Low Limit

Low Limit can be selected if Alarm is enabled. Otherwise option will be grayedout.

Scrolling optical encoder clockwise will increase the alarm limits & scrolling optical encoder anticlockwise direction will decrease the alarm limits.

User can vary the limits using touch, selecting and moving the pointer through alarm limit bar will increase/decrease the alarm limits.

For fine tuning of limits user can use “+” & “-”.

Selecting Ok will save the settings and selecting Cancel will exit without changing the settings.

Change Parameter

Selecting this will display list of parameters available for selection.

Note

Change Parameter option will be available only for User Formats.

Exit

Selecting Exit will return to Main Screen.

O2 Setup

Setup menu can be selected by clicking on Waveform Field or Numeric Field of O2.

O2 Setup Menu is as shown below

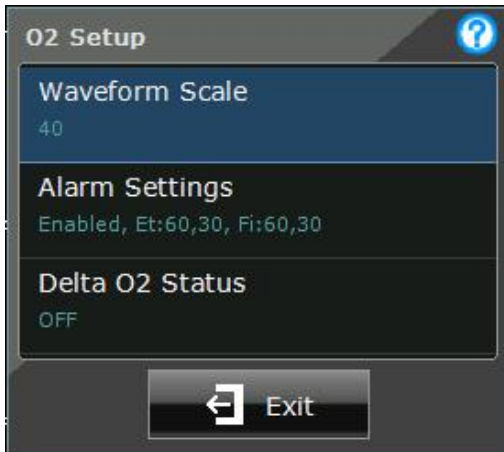


Figure 11.44

Waveform Scale

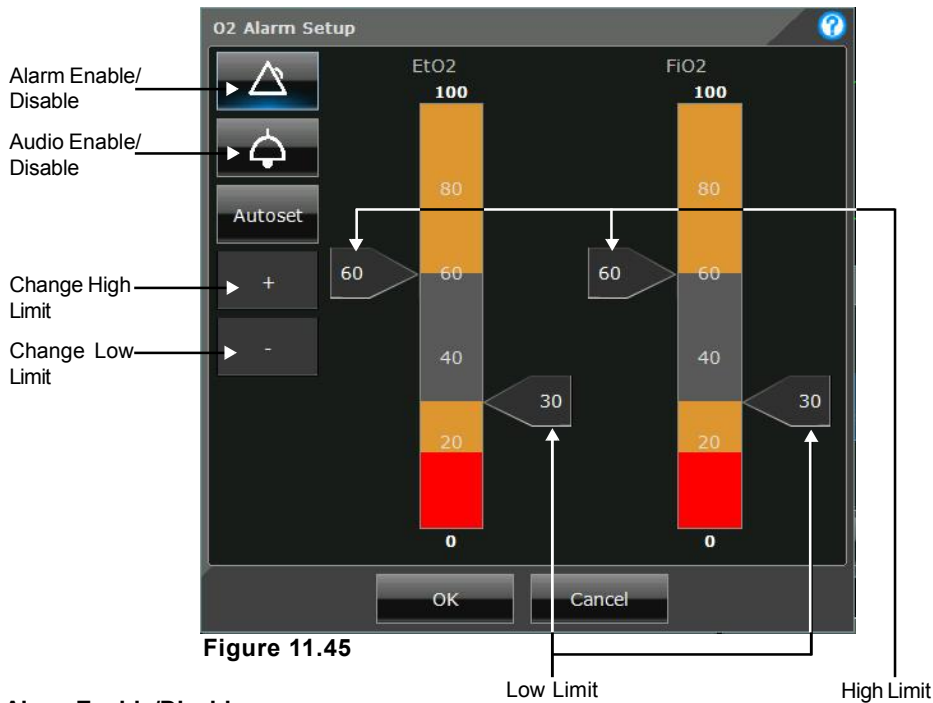
Selecting this will display available option for the user to select. The available options are

- 20
- 40
- 60
- 80
- 100

Selected scale will be displayed in the waveform field.

Alarm Settings

Selecting alarm settings will popup a O2 Alarm Setup window as shown below



Alarm Enable/Disable

By default, cursor will be on Alarm Enable/Disable. Alarm Enable /Disable is pass-
word protected, selecting this will popup a Enter Password window where user has to
enter the password same as Monitor Setting (4321) using numeric keypad, selecting
“Ok” will disable the O2 Alarm with a speech message.

Alarm Disabled will indicate a alarm disabled symbol in the alarm limit area (right
side of the numeric window) & it will not consider the alarm condition violation due to
parameter. No audio and visual indication will be shown in the monitor. Current
condition will be displayed on tab.

When alarm is disabled then the cursor will not move to any other options except Ok
& Cancel.

Selecting Ok will save the settings and selecting Cancel will discard the settings.

Audio Enable/Disable

Selecting this user can enable/ disable the audio during alarm condition.

Audio alarm will be disabled with a caution speech message. Current condition will be displayed on tab.

AutoSet

Selecting AutoSet, high & low alarm will change as per the currently monitored parameter value.

Formula for AutoSet is

O2	High Limit	Present value + 5
	Low Limit	Present value - 5

High Limit

High Limit can be selected if Alarm is enabled. Otherwise option will be grayedout.

Scrolling optical encoder clockwise will increase the alarm limits & scrolling optical encoder anticlockwise direction will decrease the alarm limits.

User can vary the limits using touch, selecting and moving the pointer through alarm limit bar will increase/decrease the alarm limits.

For fine tuning of limits user can use “+” & “-”.

Low Limit

Low Limit can be selected if Alarm is enabled. Otherwise option will be grayedout.

Scrolling optical encoder clockwise will increase the alarm limits & scrolling optical encoder anticlockwise direction will decrease the alarm limits.

User can vary the limits using touch, selecting and moving the pointer through alarm limit bar will increase/decrease the alarm limits.

For fine tuning of limits user can use “+” & “-”.

Selecting Ok will save the settings and selecting Cancel will exit without changing the settings.

Delta O2 Status

Selecting this user can ON/OFF Delta O2. If Delta O2 is ON, then delta will be displayed in O2 numeric field.

Formula:

$\Delta O_2 = FiO_2 - EtO_2$

Change Parameter

Selecting this will display list of parameters available for selection.

Note

Change Parameter option will be available only for User Formats.

Exit

Selecting Exit will return to Main Screen.

AA Setup

Setup menu can be selected by clicking on Waveform Field or Numeric Field of AA.

AA Setup Menu is as shown below

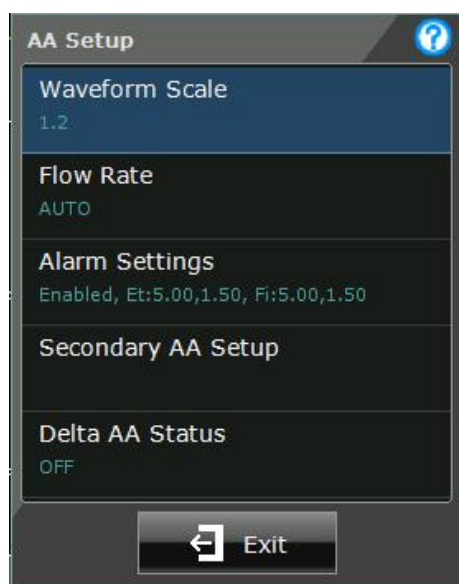


Figure 11.46

Waveform Scale

Selecting this will display available option for the user to select. The available options are

- 1.2
- 2.5
- 5
- 10
- 20

Selected scale will be displayed in the waveform field.

Flow Rate

Selecting this will display available option for the user to select. The available options are

- 70
- 80
- 100
- 120
- 140
- 160
- 180
- 200
- Auto

Alarm Settings

Selecting alarm settings will popup a AA Alarm Setup window as shown below

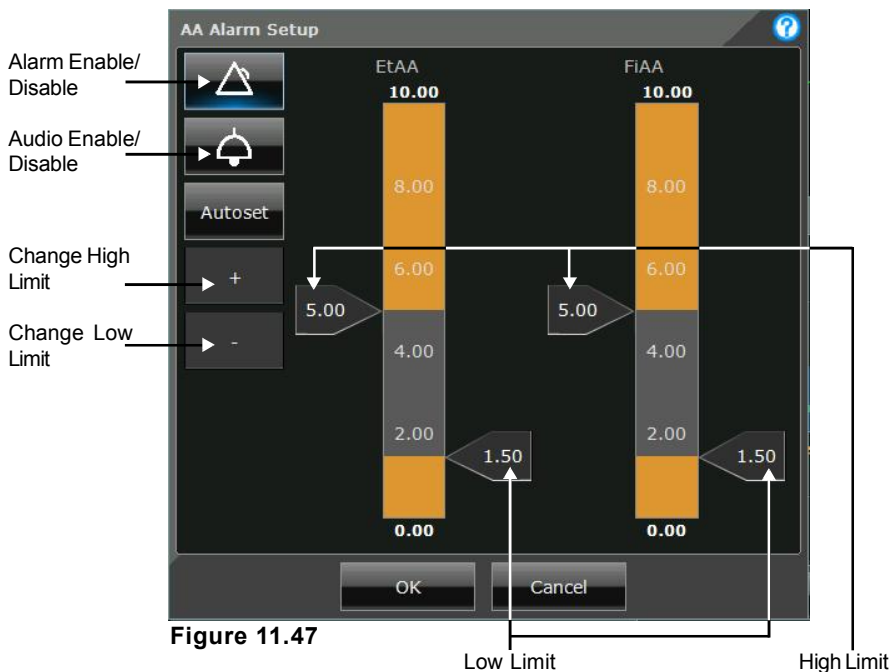


Figure 11.47

Alarm Enable/Disable

By default, cursor will be on Alarm Enable/Disable. Alarm Enable /Disable is password protected, selecting this will popup a Enter Password window where user has to enter the password same as Monitor Setting (4321) using numeric keypad, selecting "Ok" will disable the AA Alarm with a speech message.

Alarm Disabled will indicate a alarm disabled symbol in the alarm limit area (right side of the numeric window) & it will not consider the alarm condition violation due to parameter. No audio and visual indication will be shown in the monitor. Current condition will be displayed on tab.

When alarm is disabled then the cursor will not move to any other options except Ok & Cancel.

Selecting Ok will save the settings and selecting Cancel will discard the settings.

Audio Enable/Disable

Selecting this user can enable/ disable the audio during alarm condition.

Audio alarm will be disabled with a caution speech message. Current condition will be displayed on tab

AutoSet

Selecting AutoSet, high & low alarm will change as per the currently monitored parameter value.

Formula for AutoSet is

AA	High Limit	Present value + 1
	Low Limit	Present value - 1

High Limit

High Limit can be selected if Alarm is enabled. Otherwise option will be grayedout.

Scrolling optical encoder clockwise will increase the alarm limits & scrolling optical encoder anticlockwise direction will decrease the alarm limits.

User can vary the limits using touch, selecting and moving the pointer through alarm limit bar will increase/decrease the alarm limits.

For fine tuning of limits user can use “+” & “-”.

Low Limit

Low Limit can be selected if Alarm is enabled. Otherwise option will be grayedout.

Scrolling optical encoder clockwise will increase the alarm limits & scrolling optical encoder anticlockwise direction will decrease the alarm limits.

User can vary the limits using touch, selecting and moving the pointer through alarm limit bar will increase/decrease the alarm limits.

For fine tuning of limits user can use “+” & “-”.

Selecting Ok will save the settings and selecting Cancel will exit without changing the settings.

Secondary AA Setup

Selecting this will popup a Secondary AA Setup window as show below

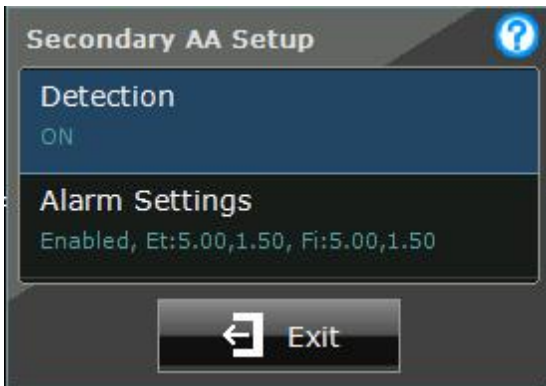


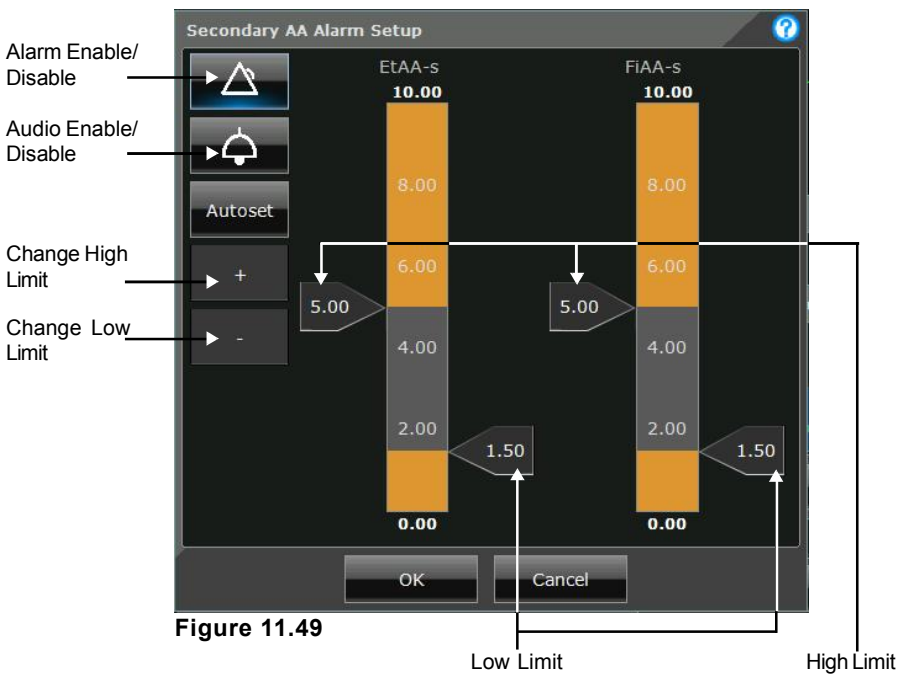
Figure 11.48

Detection

Selecting this will allow the user to ON/OFF Secondary Detection. If detection is ON, then values of secondary AA will be displayed in AA numeric field.

Alarm Settings

Selecting alarm settings will popup a Resp Alarm Setup window as shown below



Note

Alarm Settings will be active if detection is ON, else it will be grayed out.

Note

Alarm limits will vary based on the agent selected.

Alarm Enable/Disable

By default, cursor will be on Alarm Enable/Disable. Alarm Enable /Disable is password protected, selecting this will popup a Enter Password window where user has to enter the password same as Monitor Setting (4321) using numeric keypad, selecting "Ok" will disable the AA Alarm with a speech message.

Alarm Disabled will indicate a alarm disabled symbol in the alarm limit area (right side of the numeric window) & it will not consider the alarm condition violation due to parameter. No audio and visual indication will be shown in the monitor. Current condition will be displayed on tab.

When alarm is disabled then the cursor will not move to any other options except Ok & Cancel.

Selecting Ok will save the settings and selecting Cancel will discard the settings.

Audio Enable/Disable

Selecting this user can enable/ disable the audio during alarm condition.

Audio alarm will be disabled with a caution speech message. Current condition will be displayed on tab.

AutoSet

Selecting AutoSet, high & low alarm will change as per the currently monitored parameter value.

Formula for AutoSet:

AA	High Limit	Present value + 1
	Low Limit	Present value - 1

High Limit

High Limit can be selected if Alarm is enabled. Otherwise option will be grayedout.

Scrolling optical encoder clockwise will increase the alarm limits & scrolling optical encoder anticlockwise direction will decrease the alarm limits.

User can vary the limits using touch, selecting and moving the pointer through alarm limit bar will increase/decrease the alarm limits.

For fine tuning of limits user can use “+” & “-”.

Low Limit

Low Limit can be selected if Alarm is enabled. Otherwise option will be grayedout.

Scrolling optical encoder clockwise will increase the alarm limits & scrolling optical encoder anticlockwise direction will decrease the alarm limits.

User can vary the limits using touch, selecting and moving the pointer through alarm limit bar will increase/decrease the alarm limits.

For fine tuning of limits user can use “+” & “-”.

Selecting Ok will save the settings and selecting Cancel will exit without changing the settings.

Exit

Selecting Exit will return to AA Setup window.

Delta AA Status

Selecting this user can ON/OFF Delta AA. If Delta AA is ON, then delta will be displayed in AA numeric field.

Formula:

$\text{Delta AA} = \text{FiAA} - \text{EtAA}$

Change Parameter

Selecting this will display list of parameters available for selection.

Note

Change Parameter option will be available only for User Formats.

Exit

Selecting Exit will return to Main screen.

N₂O Setup

Setup menu can be selected by clicking on Numeric Field of N₂O.

N₂O Setup Menu is as shown below

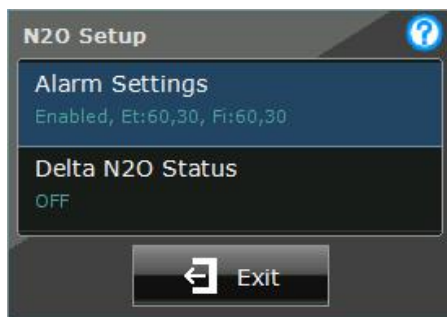
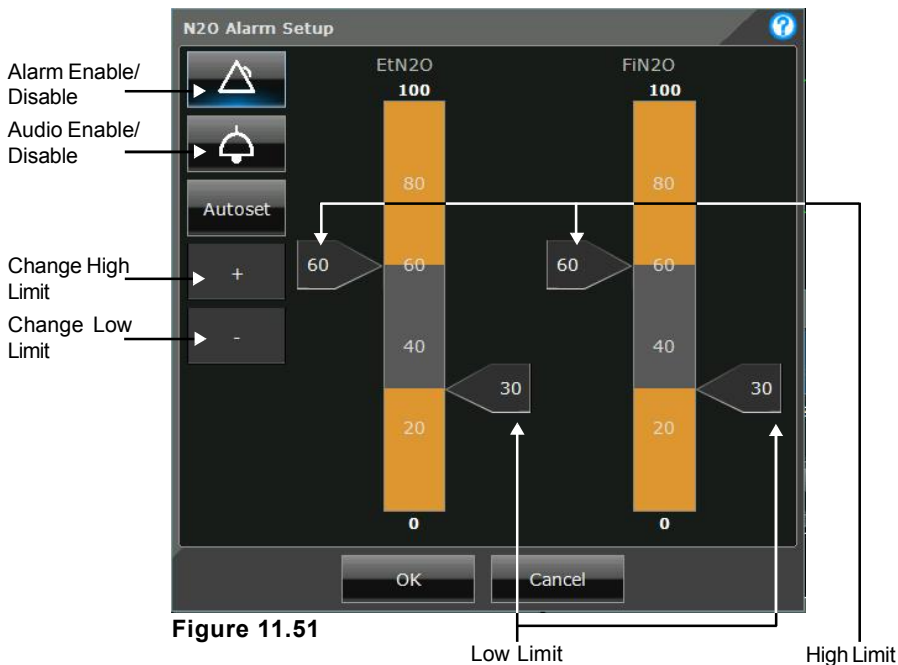


Figure 11.50

Alarm Settings

Selecting alarm settings will popup a N₂O Alarm Setup window as shown below



Alarm Enable/Disable

By default, cursor will be on Alarm Enable/Disable. Alarm Enable / Disable is password protected, selecting this will popup a Enter Password window where user has to enter the password same as Monitor Setting (4321) using numeric keypad, selecting “Ok” will disable the N₂O Alarm with a speech message.

Alarm Disabled will indicate a alarm disabled symbol in the alarm limit area (right side of the numeric window) & it will not consider the alarm condition violation due to parameter. No audio and visual indication will be shown in the monitor. Current condition will be displayed on tab.

When alarm is disabled then the cursor will not move to any other options except Ok & Cancel.

Selecting Ok will save the settings and selecting Cancel will discard the settings.

Audio Enable/Disable

Selecting this user can enable/ disable the audio during alarm condition.

Audio alarm will be disabled with a caution speech message. Current condition will be displayed on tab

AutoSet

Selecting AutoSet, high & low alarm will change as per the currently monitored parameter value.

Formula for AutoSet is

N ₂ O	High Limit	Present value + 5
	Low Limit	Present value - 5

High Limit

High Limit can be selected if Alarm is enabled. Otherwise option will be grayedout.

Scrolling optical encoder clockwise will increase the alarm limits & scrolling optical encoder anticlockwise direction will decrease the alarm limits.

User can vary the limits using touch, selecting and moving the pointer through alarm limit bar will increase/decrease the alarm limits.

For fine tuning of limits user can use “+” & “-”.

Low Limit

Low Limit can be selected if Alarm is enabled. Otherwise option will be grayedout.

Scrolling optical encoder clockwise will increase the alarm limits & scrolling optical encoder anticlockwise direction will decrease the alarm limits.

User can vary the limits using touch, selecting and moving the pointer through alarm limit bar will increase/decrease the alarm limits.

For fine tuning of limits user can use “+” & “-”.

Selecting Ok will save the settings and selecting Cancel will exit without changing the settings.

Delta N₂O Status

Selecting this user can ON/OFF Delta N₂O. If Delta N₂O is ON, then delta will be displayed in N₂O numeric field.

Formula:

$$\text{Delta N}_2\text{O} = \text{FiN}_2\text{O} - \text{EtN}_2\text{O}$$

Change Parameter

Selecting this will display list of parameters available for selection.

Note

Change Parameter option will be available only for User Formats.

Exit

Selecting Exit will return to Main Screen.

Technical Specification

Equipment Classification

Mode of Operation	: Continuous
Type of Protection	
against electrical shock	: Class 1
Degree of Protection	
against electrical shock	: Type CF for ECG, IBP1, IBP2, IBP3, IBP4, Temp1, Temp2, RESP (ECG), CO Type BF for CO ₂ , AGM, NIBP, SpO ₂ (All with Defib Protection)
Degree of Protection	
against Hazards of explosion	: Not protected
Degree of Protection	
against Ingress of liquids	: Drip Proof (IPX1)

Note

Equipment is suitable for connecting to public mains.

Power Supply

Voltage	: 110 - 230V AC (+/- 10% Tolerance), 50Hz / 60Hz (+/- 5% tolerance)
Fuse	: 3.15A, 250V Fuse in Line & Neutral
Indicator	: Amber LED ON indicates mains ON Green LED ON indicates monitor ON Amber LED OFF & Green LED ON indicate unit is ON in battery mode.
Current	: 0.9 A max @ 230V & 1.5 A max @ 110V
Wattage	: 100W Typical (Full Configuration)

Battery Specifications

Type	: Single Battery Pack, 14.8V (Nom), Lithium Ion
Capacity	: 4.0Ah
Charging time (min)	: 10 Hrs
Discharge time	: 2 Hrs (Typ)
Low Battery indication	: Visual & Audio
Battery Status Indication	: Main Unit Internal battery charge level will be displayed

For 2 hrs backup:

One high power pack fully charged new batteries at 25° C.

Discharge condition:

ECG, RESP, SpO2, Temp1 &Temp 2, NIBP running at 15 min interval.

Low battery indication voltage : 14.5 V

Battery cut-off voltage : 14.0V

Controls

Front Panel Keys

Keys	Function
Unit ON / OFF	Fixed Function
Alarm Acknowledgement	Fixed Function
NIBP Start / Stop	Fixed Function
Freeze	Fixed Function
Print	Fixed Function
Goto	Fixed Function
IBP Zeroing	Fixed Function
CO2 Pump ON/OFF	Fixed Function
Stand by	Fixed Function
Home	Fixed Function

Optical Encoder with Enter

Touch Screen (Optional)

Display

Display	: 12.1" TFT display (1024X768)
Trace Speed	: 12.5, 25, 50 mm/sec for ECG, SpO ₂ , IBP1, IBP2, IBP3 & IBP4 6.25, 12.5, 25 mm/sec Respiration, AGM & Capnography
Waveform Channels	: Maximum 8 Waveform Channels
Display Formats	: 3 Standard Formats, 1 Auto Format, 1 Quick ECG & 4 User Configurable Formats
Parameter Colour	: Colour of the parameter display (waveform & digital fields together) is user selectable
SpO ₂ Plethbar	: Bar graph showing SpO ₂ signal strength
Sat Sec	: Indication provided in SpO ₂ Numeric Field
Waveform Sampling Rate	: 500 samples/sec for ECG (max) 100 samples/sec for SpO ₂ (fixed) 100 samples/sec. for Respiration (fixed) 10 samples/sec. for Capnography 100 samples/sec for IBP
Patient Modes	: Adult/Pediatric/Neonate
No Of Patients	: 10

Trend

Vital Trend Duration	: 240 Hrs
Vital Trend Resolution	: 30 sec (min)
Vital Trend Parameter	: HR/PR, SpO ₂ , IBP1-IBP4, T1, T2, RR, EtCO ₂ , FiCO ₂ , EtO ₂ , FiO ₂ , EtAA, FiAA, EtAA-s, FiAA-s, EtN ₂ O, FiN ₂ O, ST
Online Trend	: 3 Hrs Online Trend Display with 1 min resolution on real time screen for all parameters
NIBP	: Last 240 readings will be displayed in graphical & tabular format
ST	: 4 Hrs data with 1 min resolution (ST storage) No option to record strips
OXYCRG display	: For 8 minute online monitoring with the resolution of 2 sec. This data will be stored until manual clear is done online. In Power 'off' this trend data will not be stored. This monitoring is only for current patient with the parameters ECG, HR/PR, SpO ₂ , RESP
Trend time scales	: Selectable using Zoom & Unzoom Feature
Alarm trend (Recall)	: Tabular trend for display of last 24 patient alarms, violation of all Parameters and arrhythmia condition with Recording Option
View Resolution	: 30sec, 1min, 2min, 5min, 10min, 30min & 60min waveform
Event Trend (Recall)	: Tabular Trend for display of last 48 patient alarms
CO Trend *	: Last 40 readings will be displayed in tabular format

Recall (Strip) : Arrhythmia Recall, ECG Recall (30 strips of 30 sec each)

Alarms

Patient Alarms

High Priority : Audio & Visual (flashing RED LED alarm) and message indication. Respective parameter values will be highlighted

Medium Priority : Visual (flashing YELLOW LED alarm) and message indication. Respective parameter values will be highlighted

Equipment Alarms

Low Priority : Audio & Visual (flashing BLUE LED alarm) and message indication

Alarms Suspend : Continuous RED & YELLOW LED ON to indicate alarms suspend condition with crossed bell icon on Real Time Screen

Alarm Volume Control : 10 steps (Low to High & Vice versa)

Re-Alarm : 3 minute re-alarm provided in case condition persists after alarm Acknowledgment

Auto Setting of Alarms : Provided for HR, SpO₂, IBP, RR & EtCO₂, FiCO₂, ST, N₂O, AA & Sec AA, O₂, IPI, BT, CO, SV and TEMP

Formula Used

ECG

High Limit = Present HR value X 8/10 +76

Low Limit = Present HR value X 8/10 +2

RESP

High Limit = Present Respiration rate +5

Low Limit = Present Respiration rate -5

SpO₂

High Limit = 100

Low Limit = (Present SpO₂ value - 8) or 80 (whichever is lower)

TEMP

High Limit = Present T1 value+2

Low Limit = Present T1 value-2

IBP SYS

High Limit = Present Systolic value+8

Low Limit = Present Systolic value-8

IBP DIA

High Limit = Present Diastolic value+8

Low Limit = Present Diastolic value-8

ST

High Limit = Present value+0.2

Low Limit = Present value-0.2

EtCO₂

High Limit = Present value+5

Low Limit = Present value -5

FiCO₂

High Limit = Present value+2

Low Limit = NA

CO/SV

High Limit = Present value+40 % of Present value

Low Limit = Present value-40 % of Present value

BT

High Limit = Present value+2

Low Limit = Present value-2

EtAA/FiAA

High Limit = Present value+1%

Low Limit = Present value-1%

EtO₂/FiO₂

High Limit = Present value+5

Low Limit = Present value-5

EtN₂O/FiN₂O

High Limit = Present value+5

Low Limit = Present value-5

IPI

High Limit = NA

Low Limit = Present value-2

Input

ECG/RESP	: Green colour NICOLAY round connector
SpO ₂	: Yellow colour NICOLAY round connector
IBP1-IBP4	: Red colour round connector
NIBP	: Female Coupling
Cardiac Output	: Violet color NICOLAY round connector
N ₂ O, O ₂ and AA	: Water trap for Capnography
CO ₂	: Filter Line Connector
Temperature	: YSI Connector
Rear panel	: Standard 3-pin IEC power connector. Line and neutral lines protected by fuse

ECG

Leads	: 3L/5L (Standard)
Input	: Isolated and floating 10 lead. Protected against surges produced by ESU and defibrillator potentials
Input Impedance	: >2.5 M ohms at 10Hz, &100 M ohm at DC
CMRR	: <15mm (max.) (Allowable noise for 3 V P-P 20Hz sine wave)
Patient Applied Risk	
Current	: < 10 μ A (Isolated Normal Condition) <50 μ A (Isolated Single Fault Condition)
Overload Recovery	: < 8 Sec
Fault Indication	: Individual lead fault indication on screen
Calibration	: On screen cal. indicator for all the gain setting
Patient Isolation	: 4KV (isolated Normal Condition)
Bandwidth	: 3 - 40 Hz for Monitoring mode 0.05 - 120 Hz for Diagnostic mode 3 - 20HZ for OT mode (Resp parameter not available in OT mode)
Gain	: 5mV, 2mV, 1.3mV, 1mV, 0.5mV, 0.2mV & Auto (User selectable)
Tall T Wave Rejection	: Up to 1.2mV, 40-120 ms width
Pacemaker Pulse	
Rejection Capability	: When pacer is ON the monitor will display the HR for all single and double pacemaker pulses either 150 or 250 msec apart of amplitudes +/-2mv to +/-700mv from 0.5 msec to 2.0 msec. Pacer pulse with overshoot is not rejected.
Filter	: Auto Interference Detection with Diathermy / Electro surgical filter in OT mode. 50 HZ, 60HZ line frequency filter
Leads	: I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6
Acquisition Sampling	
Rate	: 500
Heart Rate Range	: 20-350 BPM
Accuracy	: 2 bpm or 2% which ever is greater
Fault Messages	: Leads Off, Individual Lead fault messages

Heart Rate with PR source ECG & SpO₂

Range	: 20-350 BPM
Accuracy	: 2 bpm or 2% which ever is greater
HR Alarms	: Adjustable alarm limits Min – 20 to 320 BPM. Max - 50 to 350 BPM 4 seconds delay for HR alarms 3 seconds R-R interval triggers a systole alarms if selected in Arrhythmia menu Time to alarm for Tachy 5 sec
HR/PR Source	: ECG, SpO ₂ , IBP Auto & Manual selection options
Heart Rate Meter	
Response Time	: Change from 80 to 120 BPM (6 to 7 sec) Change from 80 to 40 BPM (6 to 8 sec)

Heart Rate with PR source IBP

Range	: 30 - 350 BPM
Accuracy	: +/- 3 BPM

Arrhythmias

Arrhythmia (Standard)	: Asystole, Bradycardia, Tachycardia, Irregular, Skip Beat
Leads	: 3L/5L

Note

Arrhythmia is not supported for Neonates.

ST Analysis

Standard Package	: SKANRAY ST Package
Input	: From ECG cable
Measurement Range	: -10 mm to +10 mm
Resolution	: +/- 0.2 mm
Leads	: ST analysis can be performed on any one of I, II, III incase of 3 lead configuration and any three of I, II, III, avR, avL, avF, chest in case of 5 lead configurations
ST Value Updating	: After every 8 valid QRS samples
ISO Point	: -80 ms from QRS Peak (Default) Any point in the range of -150 ms to 0 from QRS peak (user selectable)
Marker Resolution	: 2.5ms
Alarms	: Alarm limits adjustable in the range
Method Of Measurement	: Cyclic

Note

ST analysis is not supported for Neonates.

Respiration

Input	: RA – LL
Leakage Current	: <10 μ A at 240V AC, 50Hz
Excitation Current	: < 300 μ A at 50 kHz
Sensitivity (Max)	: 0.2 ohm/cm
Sensitivity (Min)	: 4 ohm/cm
Range	: 0 -150 breaths\min
Accuracy	: Up to 30, +/- 1bpm, from 30 to 60 +/- 2bpm, >60 +/- 4bpm
Fault Indication	: Cable/Electrode fault indication
RR Source	: Respiration, CO ₂ and AGM
Gain	: Options x1, x2, x3, x4, AUTO (user selectable) x4 is default gain level

No Breath Alarm Delay: 10 - 90 sec (selectable) in steps of 5 Sec
Fault Messages : 'Fault' Message during lead fault condition

SpO₂

Module Type : Nell 1 (Standard)
Tone Variation with
Change in SpO₂ : Provided
Measurement Range : 1-100%
Accuracy : Adults (+/- 1 Std. Dev)
70-100% +/-3 digits
0- 69% : unspecified
Neonates
70-100% +/-4 digits
0-69% Unspecified
Alarms : Adjustable alarm limits
Minimum: 50 to 95% Maximum: 55 to 100%
Pulse Rate Range : 20 to 300 bpm
Accuracy
(+/- 1 Std. Dev) : +/- 3 bpm
Signal Strength Bar : Provided
Sat Sec : Provided with Nellcor SpO₂
Fault Messages : Sensor Disconnected, Check Probe Site

NIBP

Module Type : Skanray Pluse Skan 2 NIBP
Method : Oscillometric
Display : Systolic, Diastolic and Mean
Modes : Manual, Auto, STAT
Duration of Auto Mode : Intervals are 2,3,4,5,10,15,30,60,90,120,240 and 360
minutes. Auto mode interval is user selectable
Duration of STAT Mode: In STAT mode unit will take as many readings as possible
in 5 minutes

Range	: 20-250 mmHg
Accuracy	: +/-5mmHg with a standard deviation not greater than 8 mmHg
Auto Zero	: Zero pressure reference is automatically established after Every reading
Cuff Inflation	: Initial inflation: Adult: 160 mmHg Neonates: 80 mmHg Pediatric: 120 mmHg Subsequent inflation approximately 30 mmHg greater than previous systolic pressure
Cuff Deflation	: Automatic
Alarm	: Adjustable alarm limits (for both SYS & DIA) Upper: 30 to 250 mmHg Lower: 20 to 240 mmHg
Safety Features	: Automatic deflation if : Cuff pressure exceeds 300 mmHg in Adult & Pediatric and 150 mmHg in Neonate Mode Measurement time exceeds 50 sec

Temperature

Inputs	: Isolated and floating
Leakage Current	: <10 μ A at 240V AC, 50Hz
Measurement Range	: 0°C – 50°C
Scale Value	: Displays direct readings of temperature input. 'ΔT' value displayed in place of T2
Warm Up	: <10min (excluding PROBE)
Accuracy	: $\pm 0.2^{\circ}$ C or $\pm 0.4^{\circ}$ F
Alarms	: Temperature limits adjustable Min: 12°C to 47°C Max: 15.0°C to 50°C
Unit	: °C or °F user selectable
User Selectable	
Labels	: TEMP, CORE, ESOP, RECT & SKIN

Fault Messages	: Display shows 'OFF' if the probe not connected Display shows out of range condition (-? -) in the event of short circuit or open circuit probes Out of range condition also indicated if the temperature raises above 50° C or falls below 1°C If a fault is present in the temperature measuring circuit, the message 'FAULT' will be displayed
Calibration	: Injects signal of (37.0 +/-0.1) °C into both inputs

Pressure IBP1 - IBP4

Module Type	: SKANRAY IBP Module
Standard Configuration	: IBP1 & IBP2 (Integrated)
Optional Upgrades	: IBP3 & IBP4 (Externally Pluggable)
Input	: Isolated and floating. Protected against surges produced by Electro-surgical and defibrillator potentials, provided SKANRAY approved cables are used
IBP1-IBP4 W/F	
Sampling Rate	: 100 (Fixed)
Input Impedance	: >1 Mohm
Leakage Current	: <10µA at 240V AC, 50Hz
Processed Pressure	
Signals	: Systolic, Diastolic and Mean
Accuracy	: 2 mmHg or 2% whichever is greater
Bandwidth	: D.C to 20Hz
Sensitivity	: 5 µV / V /mmHg of transducers
Transducer Excitation	: 3 V DC short circuit protected and isolated
Manual ZERO	: Zero message appears in the pressure field when zeroing is required
Pressure Range	: -30 to 20, 5, 10, 20, 30, 60, 80, 100, 120, 150, 180, 200, 240, 300 & AUTO
Measurement Range	: -30 to 300 mmHg
Calibration	: 100 mmHg signal injected into the screen
Alarms	: Adjustable alarm limits over the range

PRESSURE TABLE : ALARMS - ADULT/PEDIATRIC/NEONATE

LABEL		Low Limit Range			High Limit Range		
		Adult	Pediatric	Neonate	Adult	Pediatric	Neonate
IBP	Sys	90	70	55	160	120	90
	Dia	50	40	20	90	70	60
CVP	Mean	0	0	0	10	5	5
PAP	Sys	10	25	25	35	60	60
	Dia	0	-5	-5	15	5	5
LAP	Mean	0	0	0	10	5	5
RAP	Mean	0	0	0	10	5	5
LVP	Sys	90	70	55	160	120	90
	Dia	5	5	5	15	15	15
ART	Sys	90	70	55	160	120	90
	Dia	50	40	20	90	70	60
AO	Sys	90	70	55	160	120	90
	Dia	50	40	20	90	70	60
PCW	Mean	0	0	0	10	5	5
ICP	Mean	0	0	0	10	5	5
User	Sys	90	70	55	160	120	90
Defined	Dia	50	40	20	90	70	60

CO₂ (Optional Pluggable)

Module Type : Micro Medico
 ETCO₂ : 0-100 mmHg
 FiCO₂ : 0-20 mmHg
 RR : 0-150 bpm

Measurement Accuracy

Time	CO ₂ Partial Pressure	Customer Accuracy
0-20 min	0-38 mmHg	±4 mmHg
	39-99 mmHg	±12% of Reading
20 min and up	0-38 mmHg	±4 mmHg
	39-99 mmHg	±5% of reading +0.08% for every 1 mmHg (above 38 mmHg)

Units : mmHg or kPa or Vol %
 Scale : 20,40,60, 80,100 mmHg or 2.6,5.3,8,11 kPa / Vol%
 Warm Up Time : 40 Sec (Typical)
 Zeroing : Automatically performed by the module. Indicated to user with a message on the screen
 Calibration Interval : Initially calibrate after 1200 operating hours, then once a year or after 4000 operating hours, whichever comes first
 Alarms : Low and high limits adjustable over the complete measurement range for EtCO₂ and FiCO₂
 Alarm Ranges : EtCO₂
 Upper : 5-80 mmHg
 Lower : 0 - 75 mmHg
 FiCO₂
 Upper : 2 - 20 mmHg
 RR
 Upper : 10 - 150 BPM
 Lower : 5 - 145 BPM

RR Accuracy : 0-70 bpm (± 1 bpm)
 71-120 bpm (± 2 bpm)
 121-150 bpm (± 3 bpm)

IPI (Option available with CO₂)*

IPI : 1-10
 Alarms : Low alarm limit adjustable over complete measurement range
 Availability : When PR, SpO₂, RR and EtCO₂ valid values are available
 Patient Modes : Available in Adult & Pediatric

AGM (Optional External)

Identification of
 Anesthetic Agent : Auto
 Oxygen Sensor Type : Galvanic
 Measurement Range : EtCO₂ 0-80 mmHg or 0.0-10.0 kPa / Vol%
 FiCO₂ 0-20 mmHg or 0.0 - 2.6 kPa / Vol%
 RR 2-100 bpm

Measurement Accuracy

Gas	Concentration	Tolerance
RR	Up to 60 - +/- 1bpm	>60 unspecified
N ₂ O	0 – 20 20 – 100	± 2 ± 3
Halothene	0 – 1 1 – 5 > 5	± 0.15 ± 0.2 Unspecified
Isoflurane	0 – 1 1 – 5 > 5	± 0.15 ± 0.2 Unspecified
Enflurane	0 – 1 1 – 5 > 5	± 0.15 ± 0.2 Unspecified

Sevofurane	0 – 1	±0.15
	1 – 5	±0.2
	5 – 8	±0.4
	> 8	Unspecified
Desflurane	0 – 1	±0.15
	1 – 5	±0.2
	5 – 10	±0.4
	10 – 15	±0.6
	15 – 18	±1
	> 18	Unspecified
CO ₂	0 – 1	±0.1
	1 – 5	±0.2
	5 – 7	±0.3
	7 – 10	±0.5
	> 10	Unspecified
O ₂	0 – 40	±1
	40 – 60	±2
	40 – 80	±3
	80 – 100	±4

Resolution : CO₂ : +/-1 mmHg or 0.1 kPa or 0.1 Vol %

AA : 0.1%

N₂O : 1%

O₂ : 1%

Units : CO₂ : mmHg or kPa or Vol %

AA/O₂/N₂O : Vol%

Warm-up Phase : ISO accuracy within 45 sec, full accuracy within 10 min

Pump : Flow controlled dual membrane 70-200+/- 10ml/min
or +/- 10% which ever is greatest

Primary Agent ID

Threshold : 0.15% (0.4% during ISO accuracy mode)

Secondary Agent ID

Threshold : 0.3% (0.5% during ISO accuracy mode) or 5%REL
(10% for Isoflurane) of primary agent if primary agent
>10%

Zeroing	: Automatically performed by the module. Indicated to the user through a message on the screen Automatically every 4 hours (in Full accuracy mode) in steady state with room air. Additional zeroing performed during startup
Calibration	: Initiated through Power 'on' service menu
Alarms	: Low and high limits adjustable over the complete measurement range
Delay Time	: < 4Sec
Span Calibration	: Once in a Year
Waveform Sampling Rate	: 50
APNEA alarm	: Within 10-90 seconds when respiration not detected

Note

Identification of Anesthetic agent is auto.

Cardiac Output (Optional Pluggable)

Module Type	: SKANRAY CO (Thermodilution)
Probe Type	: In-line
Catheter Size	: 5F, 6F, 7F, 7.5F and 8F
Cardiac Output	: 0.1 liter /min to 20 liter /min
Accuracy	: $\pm 5\%$
Blood Temp	: 17°C - 45°C
Injectate Temp	: 0°C - 30°C
(Bt) and (It) Accuracy	: $\pm 0.1^\circ\text{C}$
(Bt) and (It) Resolution	: 0.1°C
BT Waveform Scale	: 0.5, 1 & 2
Alarms	: High & low limits adjustable over the entire measurement range
Recording	: Hemo table with individual records

Printing

Printer Type	: PCL 3 / 5e Laser or Inkjet Printer
Connectivity	: USB, Wireless (WiFi) or Network (Connected to Wireless Access Point)
Print Channels	: 4 (max)
Printing Modes	: Paper Mode (A4), Paperless Mode (PDF)
Print Output	: Waveform Printing with Numeric, Trend Printing, Alarm Recall, Apnea Recall Printing

Patient Reports, Data Transfer and Disclosures

Patient Reports

Report Type	: Patient Discharge
Report Format	: PDF, Can be downloaded to USB
Contents	: Patient Information, Tabular Trends, Recall's
Report Type	: Trend
Report Format	: CSV format
Download Media	: USB Thumb Drive
Waveform Disclosure	: No. of waveforms : 4 Traces of ECG & IBP (User Selectable)
Duration	: 24 hrs
Patient Transfer	: Transfer of patient information, stored trend, settings from one monitor to another through USB

Output Ports

USB (1 no in standard model)	: For uploading software to Monitor, Patient Transfer, Trend data download and Bar Code Scanner
Ethernet (1 no)	: Communicating with Central Nursing Station (SKANRAY's CNS) and Bed To Bed
Wi-Fi	: Communicating with Central Nursing station (SKANRAY's CNS) and Bed To Bed
DVI	: External Slave Display
Serial Port (1 no)	: AGM55 Connectivity

Specifications

Dimensions

(H X W X D) in mm	: 292 X 320 X 161
Weight	: 4.3 kg (approx with battery)
Mounting Option	: GCX Option & Bed Rail Option
Patients	: 10 (Max)

Other Features

Drug Dose Calculator

Haemodynamic Calculator

General Calculator

User Reminder Alarm and Three User Configurable Timers

IR Remote with Pairing Option

Patient entry using Barcode Scanner

Environmental Specifications

Temperature Range	: Operating 0 to 40°C Storage -10 to 50°C
Humidity Range	: Operating 10 to 90% RH (Non condensing) Storage 0 to 90% RH (Non condensing)
Pressure Range	: Operating 0 ft to 10,000 ft Storage -1,250 ft to 15,000 ft
Ingress Protection	: IPX 1
Storage/Transport	
Stack up	: Upto 1.5mt
Storage/Transport	
Orientation	: Upright
Storage/Transport	
Rain Exposure	: Equipment should not be exposed to rain
Transport Handling	: Fragile equipment

Standard Accessory List

Description	Qty
SpO ₂ Probe Durasensor	1
ECG Cable 3 Lead	1
ECG Cable 5 Lead	1
SpO ₂ Extension Cable	1
NIBP Tubing-12FT	1
NIBP Adult Cuff	1
ECG Electrode Disposable (Adult)	3
Operating Manual CD	1
Quick Reference Guide	1
ASSY C/F Chassis Earthing	1
CORD MAINS/3*0.75/90 DEG/EU	1
PAS/Conducting Jelly Bottle	1
IBP Interface Cable (DUAL)	1

Communication Option

Option Description	Connectivity Port	Remarks
CNS Connectivity	Ethernet / Wi-Fi	Option for connectivity to Skyline 55
Bed To Bed	Ethernet / Wi-Fi	Option for viewing other bed connected in the network. Bed to Bed will be a selectable fixed display format
Slave Display	DVI	Option for connecting a additional slave display
Thumb Drive	USB	Option for downloading waveforms, trend & soft ware upgrade
Printer	USB/ Wi-Fi	Option for connecting laser printers

Electro Magnetic Compatibility Information And Manufacturer's Declaration:
Electromagnetic Compatibility :

Emission Test	Compliance level
Radiated Emission CISPR 11	Class A, Group1
Conducted Emission CISPR 11	Class A, Group1
Harmonic Distortion IEC 61000-3-2	Class B
Voltage fluctuations / flicker emissions IEC 61000-3-3	Complies

Electromagnetic Immunity:

Immunity test	IEC 60601 test level	Compliance level
Electro Static Discharge (ESD) IEC 61000-4-2	± 6 KV Contact ± 8 KV Air	Level 3 ± 6 KV Contact ± 8 KV Air
Radiated Susceptibility IEC 61000-4-3	3 V/m Field Strength 80 MHz-2.5 GHz Frequency	3 V/m Field Strength 80 MHz-2.5 GHz Frequency
Electrical Fast Transient IEC 61000-4-4	± 2 KV for power supply lines ± 1 KV for input/output lines	Level 3 ± 2 KV Voltage
Surge IEC 61000-4-5	± 1 KV line(s) to line(s) ± 2 KV line(s) to earth	± 1 KV line(s) to line(s) ± 2 KV line(s) to earth
Voltage dips, short interruptions and Voltage variations on power supply Input lines IEC 61000-4-11	<5% UT (>95% dip in UT) for 0.5 cycle 40% UT (60% dip in UT) for 5 cycles 70% UT (30% dip in UT) for 25 cycles <5% UT (>95% dip in UT) for 5 cycles	<5% UT (>95% dip in UT) for 0.5 cycle 40% UT (60% dip in UT) for 5 cycles 70% UT (30% dip in UT) for 25 cycles <5% UT (>95% dip in UT) for 5 cycles
Power Frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m magnetic field strength
Conducted RF Immunity IEC 61000-4-6	3 Vrms 150 KHz to 80 MHz	3 Vrms Voltage 150 KHz to 80 MHz Frequency

Accessories

ECG

Star 65 offers 3 lead and 5 lead ECG monitoring facility.

- 3 lead ECG cable (I, II, III)
- 5 lead ECG cable (I, II, III, aVR, aVL, aVF, V)



Figure 13.1 :
3 Lead ECG Cable



Figure 13.2 :
5 Lead ECG Cable*

Respiration

Respiration can be monitored through same ECG cables 3/5 lead or through Capnography. Priority for respiration is given to Capnography, if the option is installed.



Figure 13.3 : 3 Lead ECG Cable



Figure 13.4 : 5 Lead ECG Cable*



Figure 13.5 : Adult / Paediatric Filter Line*

* Optional

Temperature

SKANRAY Star 65 is compatible with YSI 400 series of temperature probes.

YSI 401 : Rectal/Esophageal temperature probe (Adult)

YSI 402 : Rectal/Esophageal temperature probe (Neonatal)

YSI 409A : Tape-on skin probe



Figure 13.6 : Rectal/Esophageal Temperature Probe (Adult)*



Figure 13.7 : Rectal/Esophageal Temperature Probe (Neonatal)*



Figure 13.8 : Tape-on Skin Probe*

* Optional

Pulse Oximeter (SpO₂) (Nellcor Accessories)

- DS (Dura Sensor) 100A (Adult - Finger Sensor)
- Dura Y (Universal) (Ear Clip - Optional)
- Extension cable (Adult / Neonate)
- Neonate Max NI (Disposable - Optional)
- Adult Max AI (Disposable - Optional)



Figure 13.9 : Dura Sensor*

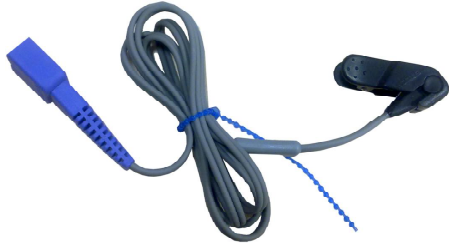


Figure 13.10 : Dura Y Sensor*



Figure 13.11 : Extension Cable

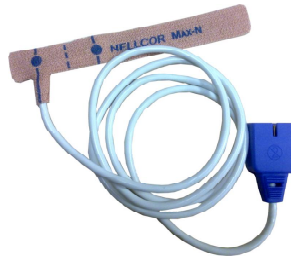


Figure 13.12 : Neonate Max NI*



Figure 13.13 : Adult Max AI*

Note

Do not reuse disposable accessories.

Note

Refer accessory manufacturers manual for more details on use & disposal action.

* Optional

Non Invasive Blood Pressure

NIBP basic configuration comprises of following accessories:

- Adult cuff (27 cm - 35 cm) (reusable)
- Child cuff (13 cm - 21 cm) (reusable)
- Neonate cuff (5.8 cm -10.8 cm) (disposable)
- Hose tube (3 meters) (reusable)



Figure 13.14 : Adult Cuff



Figure 13.15 : Child Cuff*



Figure 13.16 : Neonate Cuff*



Figure 13.17 : Hose Tube

* Optional

Capnography (Optional)

Following accessories are provided for Capnography (Microstream) along with Star 65 monitor.

- Capno Line
 - Adult
 - Paediatric
 - Infant - Neonate



Figure 13.18 : Capno Adult*



Figure 13.19 : Capno Paediatric*



Figure 13.20 : Capno Infant - Neonatal*

* Optional

- Filter Line
 - Adult / Paediatric
 - H set Adult / Paediatric
 - H set Infant / Neonatal



Figure 13.21 : Adult / Paediatric Filter Line*



Figure 13.22 : Adult / Paediatric H Set Filter Line*

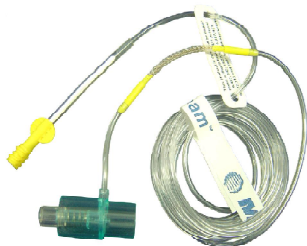


Figure 13.23 : Infant / Neonatal H Set Filter Line*

* Optional

Cardiac Output (Optional)

- CO Cable
- Injectate Temperature (IT) Probe
- CO Room Temperature Set
- CO IceTemperature Set
- Baxter Thermodilution PAC
- CO Primary Artery Catheter(PAC)
- Syringe (closed (safe) position)



Figure 13.24 : CO Cable*



Figure 13.25 : Injectate Temperature (IT) Probe*

* Optional



Figure 13.26 : CO Room Temperature Set*



Figure 13.27 : CO Ice Temperature Set*

* Optional

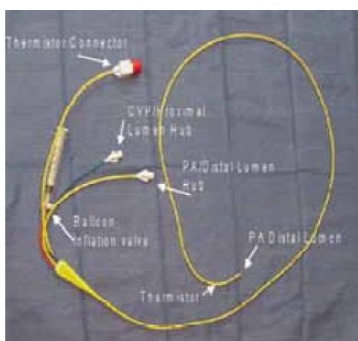


Figure 13.28 : Baxter Thermodilution PAC*

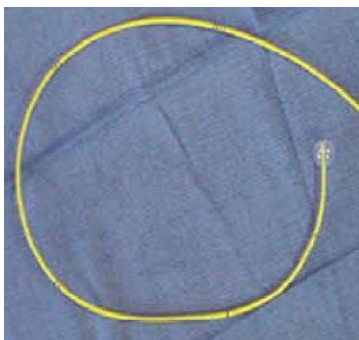


Figure 13.29 : CO Primary Artery Catheter (PAC)*

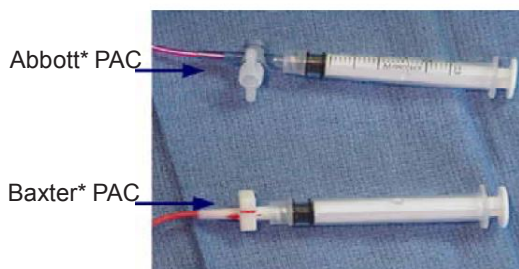


Figure 13.30 : Syringe (closed (safe) position)*

* Optional

Invasive Blood Pressure (Optional)

Following accessories can be used for measuring IBP:

- Disposable Blood Pressure Transducer (Edward)
- Reusable Interface Cable

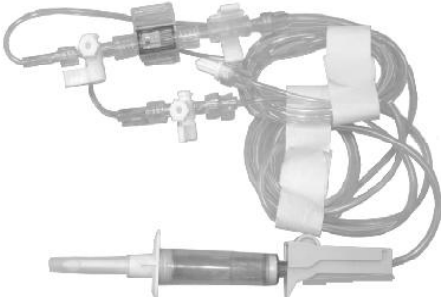


Figure 13.31 : Disposable Blood Pressure Transducers



Figure 13.32 : Reusable Interface Cable

Note

IBP transducer in Star 65 is single use only.

TroubleShooting Chart

Troubleshooting Chart

Problems	Cause	Corrective Action
Unit Not Switching ON/ No Display	Mains supply not OK.	Change the plug point. If problem persists, call SKANRAY authorized service personnel.
	Fuse blown.	Call SKANRAY authorized service personnel.
No audio alarm	Audio Pause duration Set to Infinite.	Change the audio pause duration.
Poor ECG waveform	Electrode sites are incorrect.	Clean the area and resite the electrodes.
	Poor electrode contact.	Resite electrodes.
	Dried electrodes.	Remove electrodes. Apply gel and reattach properly.
Noise in ECG trace area	Faulty ECG cable.	Replace patient cable.
	Noise pickup due to improper grounding.	Check the mains plug for proper ground connections. Check that grounding cable is connected properly.
Poor respiration waveform	Electrode sites RA-LA/ RA-LL are incorrect.	Clean the area and resite electrodes.
	Poor electrode contact.	Resite electrodes.
	Dried electrodes.	Remove electrodes. Apply gel and reattach properly.
After NIBP measurement is taken, unit displays (-) in NIBP window.	Cuff not connected properly.	Check cuff for proper connection and position. The cuff must be properly wrapped around the limb and must not be loosely attached.
Waveforms on the Screen	Freeze Key activated.	Defreeze using Freeze/defreeze
Freezed		Key on the Keyboard.
ECG Cascade Waveform	Freeze On Alarm Option	Disable Freeze On Alarm
Freezed	Enabled.	option in ECG advance setup.

Problems	Cause	Corrective Action
Keyboard Not Working	Keyboard to Main board Communication problem	Call authorized SKANRAY service personnel.
Touch Screen Not Working	Touch Screen Locked.	Unlock Touch Screen in System Configuration.
Remote Not Working	IR Remote Disabled.	Enable IR Remote in System Configuration.
Bed to Bed Not Working	Bed to Bed option Disabled.	Enable Bed to Bed in System Configuration.
Remote View Not Working	Remote View option Disabled.	Enable Remote View in System Configuration.
Printer Not Working	Printer configurations not proper.	Configure Printer settings properly in System Configuration.
Unintended menu Pops up with use of Touch Screen	Touch Screen Calibration expired.	Calibrate Touch Screen in System Configuration.
Wi-Fi Symbol Not detected in screen	Wi-Fi Power Off.	Power on Wi-Fi in System Configuration.
Dull Display	Low Brightness & Contrast Set.	Set Brightness & Contrast to required level in Settings Menu.
Low alarm Volume & Dull Display	Night Mode Enabled.	Check Moon Symbol on display, If seen disable the Night Mode or change the Night Mode settings as required.
No Beep/QRS tone	Beep Volume Set to Min or Muted.	Set Beep Volume to the required level in Settings Menu.

Problems	Cause	Corrective Action
No Speech Messages	Speech Volume Set to Min or Muted.	Set Speech Volume to the required level in Settings Menu.
External Pluggable module Not detecting	Module not connection properly.	Make sure the Module Plugged to the Slot properly, If problem persists Call authorized SKANRAY Service Personnel.
Boot Up Test failed message appearing during System Boot up	Self Test failure.	Call SKANRAY authorized Service Personnel.
Communication Error message on Display	Respective module communication.	Call SKANRAY authorized Service Personnel.

PROBLEMS OBSERVED DURING ECG MONITORING

PATIENT RELATED

A. INVOLUNTARY MOVEMENT

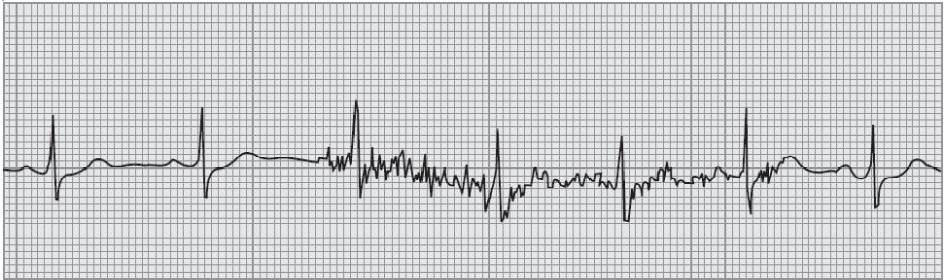


Figure 14.1

IDENTIFICATION :

Muscle movement near the electrodes generates myoelectricity or additional background electrical patterns. Notice the irregular height and width of the spikes.

CORRECTIVE ACTION :

Involuntary movement is usually a result of patient discomfort and is caused by chill or muscle tremors, coughing or other nervous reactions. Assuring the patient that the procedure will not hurt and setting his mind at ease will help relieve natural anxieties. Ensure the room temperature is warm enough for the patient.

B. VOLUNTARY MOVEMENT



Figure 14.2

IDENTIFICATION :

Gross body movement will cause base line deviation. The signal will be present but, there will be baseline wanders. Myoelectricity may be present as well.

CORRECTIVE ACTION :

The patient should be comfortable and relaxed. Again, reassuring the patient that the monitoring will not hurt him, will restore confidence. Usually voluntary movement is of short duration. Normal ECG waveform will return when movement stops. If severe artifact results from slightest body movements, check the electrode application.

C. POOR SKIN PREPARING :

Figure 14.3

IDENTIFICATION :

Failure to prep a patient with oily skin will cause low amplitude, wandering base line and 60/50 Hz frequency interference. Poor skin preparation may not show problems immediately, but effects the signal in long term monitoring (Figure 12.3)

CORRECTIVE ACTION :

Cleaning the body oils and dead tissues are essential for proper adhesion and contact of electrodes. The prep area should includes the electrodes site under the adhesive as well as the contact area. Preferred scrub solutions for skin preparation are : abrasion, special detergent solutions and saline wash. While using solutions, ensure that the area is dried before the application of electrodes.

ELECTRODES RELATED

A. LOOSE ELECTRODE

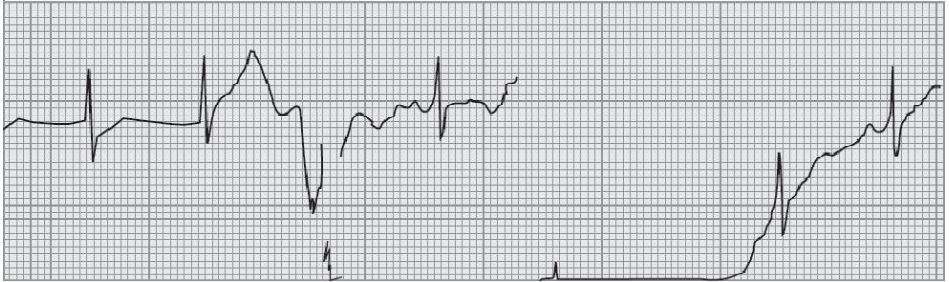


Figure 14.4

PLACEMENT ON BONY AREA :

Electrode placed on a bony area will show abrupt base line deviation or complete loss of signal. A loose electrode usually have a full amplitude signal with several artifacts. It also happens if electrodes are not placed properly.

Line Transients : When electrodes or lead wires are loose or detached, the transients may be transmitted to the monitor through patient cable and can resemble ECG waveform. This may also inhibit heart rate alarms and may indicate false information.

CORRECTIVE ACTION :

Electrodes should be placed on fleshy areas which will help to place electrodes properly. Check that the patient cables are not pulling the electrodes and the electrode is attached properly to the body of the patient.

B. DRIED OUT ELECTRODE

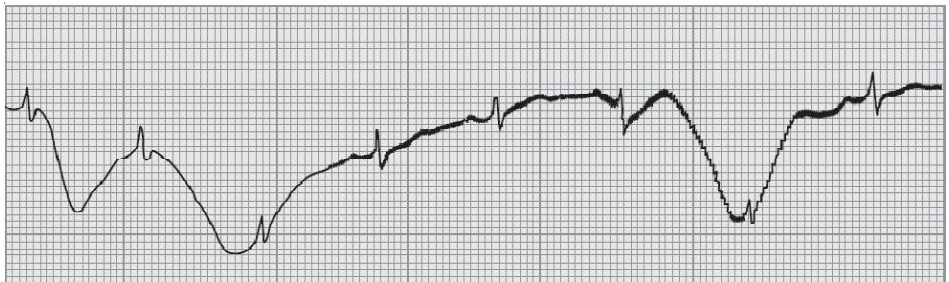


Figure 14.5

IDENTIFICATION :

This signal usually degenerates with time. Characteristics such as low amplitude, diphasic QRS complexes, 60/50 Hz frequency interference and base line wander will usually be present.

CORRECTIVE ACTION :

Check the electrode to make sure that the electrolyte is moist and is in sufficient quantity and is in proper contact with the electrode and skin.

EQUIPMENT RELATED

A. POOR CONNECTION

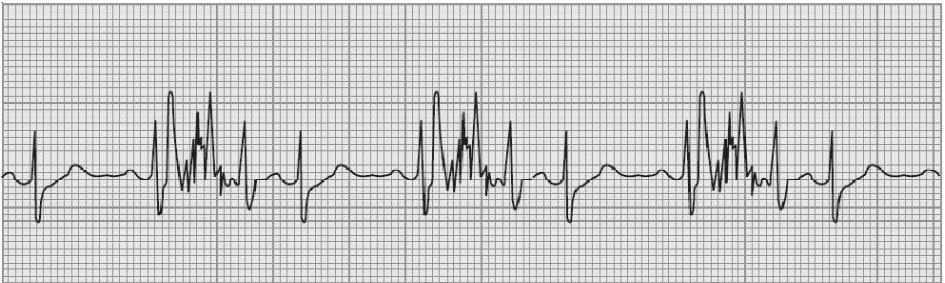


Figure 14.6

IDENTIFICATION :

Poor connection will indicate muscle artifact on entire trace.

CORRECTIVE ACTION :

Check lead wires, junction of cable and electrode to ensure proper connection.

B. BROKEN LEAD WIRE

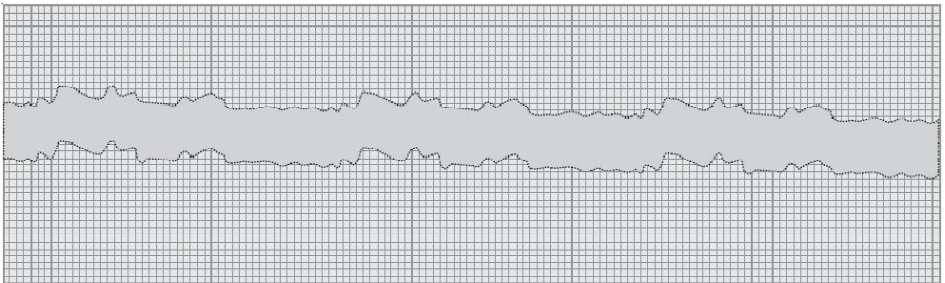


Figure 14.7

IDENTIFICATION :

Broken lead wire or completely detached electrode will cause pure 60/50 Hz frequency interference. The QRS complex is almost masked by the extremely wide base line.

CORRECTIVE ACTION :

Check the lead wires, cables and connections. Replace with new cable if required. The use of shielded cables is recommended, to protect lead wires from interfering current.

C. BAD GROUNDING

Figure 14.8

IDENTIFICATION :

Bad grounding may cause 60/50 Hz frequency interference which is distinguishable because of wide base line.

CORRECTIVE ACTION :

Bad grounding may also create a shock hazard. If grounding is doubtful, request for an electrical maintenance check. TV sets, electrical cords and fluorescent bed lamps near the bed may also cause 60/50 Hz frequency interference.

D. STATIC ELECTRICITY

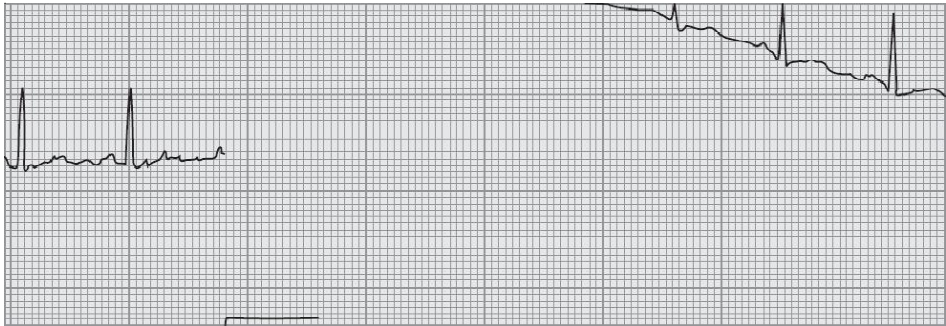


Figure 14.9

IDENTIFICATION :

Static electricity may throw the trace off the screen abruptly. The trace will gradually recenter itself within few seconds.

CORRECTIVE ACTION :

Synthetic fabrics in bed sheets and clothing may generate static electricity. This can disturb the trace abruptly without patient movement, especially when cables without proper shieldings are used.

PROBLEMS OBSERVED DURING CO₂ MONITORING

Cardiogenic Oscillations:

Cardiogenic oscillations appears during the final phase of the alveolar plateau and during the descending limb. They are caused by the heart beating against the lungs.

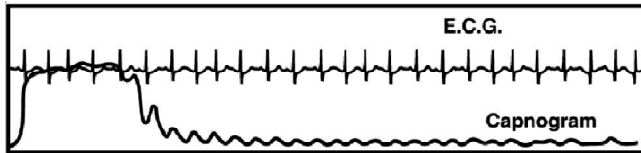


Figure 14.10

Characteristics:

- Rhythmic and equal to heart rate.
- May be observed in paediatric patients, mechanically ventilated at low respiratory rates with prolonged expiratory times.

Hyperventilation:

A decrease in the level of the End Tidal CO₂ from previous levels.

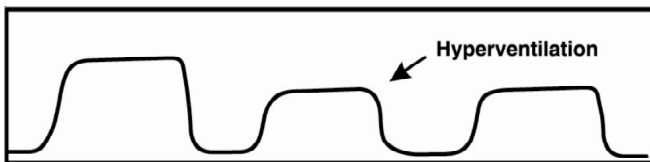


Figure 14.11

Possible Causes:

- Increase in respiratory rate
- Increase in Tidal Volume
- Decrease in metabolic rate.
- Fall in body temperature

NOTE:

Exponentially decrease in CO₂ can also be because of cardiac arrest or severe hypotension (massive bleeding).

Hypoventilation:

An increase in the level of the End Tidal CO_2 from previous levels.

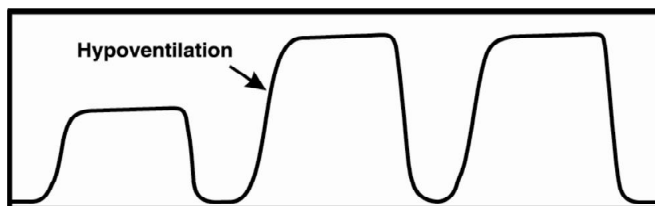


Figure 14.12

Possible Causes:

- a. Decrease in respiratory rate
- b. Decrease in tidal Volume
- c. Increase in metabolic rate
- d. Rapid rise in body temperature (malignant hyperthermia)

Muscle Relaxants:

Clefts are seen in the final third portion of the alveolar plateau. They appear when the action of the muscle relaxants are affected by spontaneous ventilation.

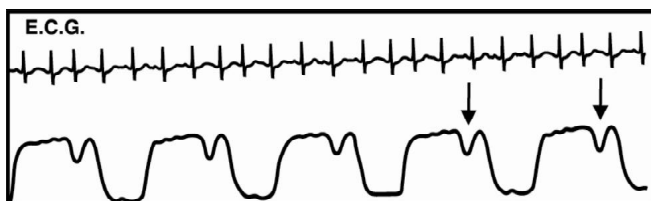


Figure 14.13

Characteristics:

- a. Depth of the cleft is inversely proportional to the degree of drug activity.
- b. Position fairly constant on same patient but may not be present in every capnogram.

Rebreathing:

Rebreathing is characterized by an elevation in the baseline with a corresponding increase in End Tidal CO_2 . It indicates the rebreathing of the previously exhaled CO_2



Figure 14.14

Possible Causes:

- a. Insufficient expiratory time
- b. Faulty expiratory valve
- c. Inadequate inspiratory flow
- d. Malfunction of a CO_2 absorber system
- e. Partial rebreathing circuits.

Obstruction in Breathing Circuit or Airway:

An obstruction to the expiratory gas flow noted as a change in the slope of the ascending limb of the capnogram. The expiratory portion may diminish without a plateau

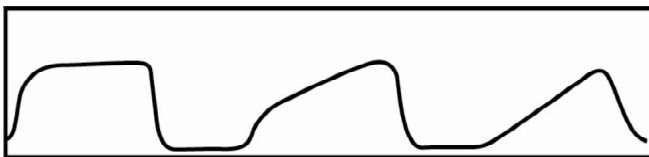


Figure 14.15

Possible Causes:

- a. Partial obstruction in the expiratory limb of the breathing circuit
- b. Presence of a foreign body in the upper airway
- c. Partially kinked or occluded artificial airway
- d. Herniated endotracheal / tracheostomy tube cuff
- e. Bronchospasm

Endotracheal Tube Kinked:

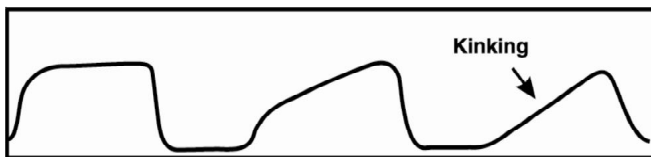


Figure 14.16

Waveform Evaluation:

- a. Any obstruction will cause an abrupt change in the ascending limb resulting in either a diminished plateau or no plateau. EtCO₂ and slope will depend on the degree of obstruction.

Inadequate Seal Around Endotracheal Tube:

A Capnogram in which the downward slope of the plateau blends in with the descending limb (Figure 12.17).

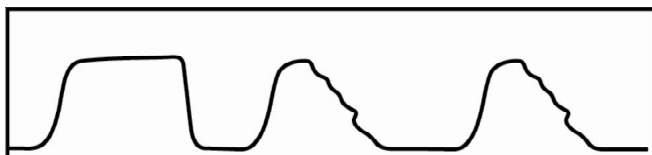


Figure 14.17

Possible Causes:

- a. A leaky or deflated endotracheal or tracheostomy cuff.
- b. An artificial airway that is too small for the patient.

Endotracheal Tube in Esophagus:



Figure 14.18

Waveform Evaluation:

- a. A normal capnogram is the best available evidence that the Et tube is correctly positioned and that ventilation is occurring. When the Et tube is placed in the Esophagus, either no CO₂ is sensed or any small transient capnograms are present.

Faulty Ventilator Circuit Valve:



Figure 14.19

Waveform Evaluation:

- a. Baseline elevated
- b. Sloping descending limb of capnogram
- c. Allows patient to rebirth exhaled gas.

Paediatric Capnogram

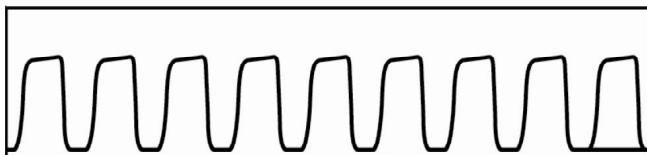


Figure 14.20

Typical Capnogram for a Paediatric Patient.

Error Messages

Alarm Category	Indicator Color
High Priority	Red
Medium Priority	Yellow
Low Priority	Blue

Parameter	Message	Condition	Alarm Priority
ECG	HR High	Adult HR = 180 + 20 Pedia HR = 200 + 20 Neo HR = 220 + 20	Medium
	HR High	Adult HR >=200 Pedia HR >=220 Neo HR >=240	High
	HR Low	Adult HR = 60-20 Peida HR = 60-20 Neo HR = 70-20	Medium
	HR Low	Adult HR < 40 Pedia HR < 40 Neo HR < 50	High
	Bradycardia	HR Low	High
	Tachycardia	HR Low	High
	Irregular		Medium
	Skip Beat		Medium
	Asystole		High
	Vent Rhythm		Medium

Parameter	Message	Condition	Alarm Priority
	Vent Tachycardia		High
	Vent Trigeminy		Medium
	Vent Bigeminy		Medium
	Vent Fibrillation		High
	Vent Run		Medium
	Multifocal PVC		Medium
	R On T PVC		Medium
	Vent Couplet		Medium
	ECG Communication Error	Module not responding	Low
	No ECG Cable	ECG Cable not connected properly to the unit	Low
	RA Lead Off	RA disconnect from Patient	Low
	LA Lead Off	LA disconnect from Patient	Low
	LL Lead Off	LL disconnect from Patient	Low
	C1 Lead Off	C1 disconnect from Patient	Low
	C2 Lead Off	C2 disconnect from Patient	Low
	C3 Lead Off	C3 disconnect from Patient	Low

Parameter	Message	Condition	Alarm Priority
	C4 Lead Off	C4 disconnect from Patient	Low
	C5 Lead Off	C5 disconnect from Patient	Low
	C6 Lead Off	C6 disconnect from Patient	Low
	RL Lead Off	RL disconnect from Patient	Low
ST	ST High		Medium
	ST Low		Medium
SpO ₂	SpO ₂ Low	SpO ₂ < 80	High
	SpO ₂ Low	Till 80	Medium
	SpO ₂ High	Only for Neo	Medium
	Desaturation	Saturation < set limit	High
	SpO ₂ Communication Error	Module not responding	Low
	No SpO ₂ Sensor	Sensor not connected to the unit	Low
	Check Probe Site	Sensor not connected properly to patient Or gets disconnected	Low

Parameter	Message	Condition	Alarm Priority
NIBP	NIBP Sys High		Medium
	NIBP Sys Low		Medium
	NIBP Dia High		Medium
	NIBP Dia Low		Medium
	NIBP Communication Error	Module not responding	Low
	Cuff Position Error	Cuff placement is not proper	Low
	Loose Cuff	Cuff loosely wrapped	Low
	Over Pressure	Not using appropriate cuff	Low
	Pneumatic Blockage	Bent or block in NIBP tube	Low
	Air leak	• Removal of NIBP tube from the unit • Leakage in tube or cuff	Low
	Time Exceeded	Measurement time exceeded	Low

Parameter	Message	Condition	Alarm Priority
IBP	IBP Sys High		Medium
	IBP Sys High		Medium
	IBP Sys Low		Medium
	IBP Dia High		Medium
	IBP Dia Low		Medium
	IBP Communication Error	Module not responding	Low
	No IBP Cable	IBP cable not connected to unit properly	Low
	No Transducer	IBP transducer not connected to respective IBP channel	Low
Temperature	Temp High		Medium
	Temp Low		Medium
	No T1 Transducer No T2 Transducer	Patient Cable not connected properly to the unit	Low
AA	AA Et High		Medium
	AA Et Low		Medium
	AA Fi High		Medium
	AGM communication Error	Module not responding	Low

Parameter	Message	Condition	Alarm Priority
O ₂	O ₂ Et High		Medium
	O ₂ Et Low		Medium
	O ₂ Fi High		Medium
	AGM communication Error	Module not responding	Low
	O ₂ Fi Low		Medium
	Low Oxygen	O ₂ < 18 Vol %	High
NO ₂	N ₂ O Et High		Medium
	N ₂ O Et Low		Medium
	N ₂ O Fi High		Medium
	N ₂ O Fi Low		Medium
	AGM communication Error	Module not responding	Low
Secondary AA	Sec Et High		Medium
	Sec Fi High		Medium
	AGM communication Error	Module not responding	Low
CO	BT High		Medium
	BT Low		Medium

Parameter	Message	Condition	Alarm Priority
CO ₂ (AGM/CO ₂)	EtCO ₂ High		Medium
	EtCO ₂ Low		Medium
	FiCO ₂ High		Medium
	CO ₂ Communication Error	Module not responding	Low
	No CO ₂ Tubing	Sample line not connected to unit	Low
	Change sample line	Purging continues for more than 30 Sec	Low
	CO ₂ Purging	Sample line blocked	Low
	AGM Zero Failure	Zero Failure AGM Status	Low

Parameter	Message	Condition	Alarm Priority
Respiration	RR High		Medium
	RR Low		Medium
	No Breath		High
	Resp Lead Off	RA-LA or RA-LL leads not connected properly to patient	Low

Messages Displayed in White Message Area

Parameter	Message	Condition
ECG	HR-RR Coincidence	Difference between HR and RR is less than 30 BPM
	Check HR	Difference between PR from SpO ₂ and HR from ECG is more than 30 BPM
	ECG Overload	ECG signal crosses the DC threshold
	Noisy ECG	External Interference or noise in ECG
ST	Learning ST	During learning of ST
	Cannot find ST	When its unable to calculate ST
Arrhythmia	During Arrhy Learning	Learning Rhythm
SpO ₂	Pulse Search	Module trying to find a pulse
CO ₂	CO ₂ Pump Off	CO ₂ Pump is turned Off manually by the user
	CO ₂ Warm Up	CO ₂ in Warm Up phase after power ON

Parameter	Message	Condition
	CO ₂ Ready	CO ₂ Ready for Measurement will be displayed after boot up once CO ₂ warm phase gets completed
AGM	AGM Warm Up	Warm Up AGM Status
	AGM Auto Zeroing AGM	Auto Zeroing AGM Status
	AGM Zero Ref Abort	Zero Ref Measure Aborted AGM Status
	AGM Limit Error	Readings are out of range
	AGM Zero Ref Error	Zero reference measurement not performed due to occlusion/ bad flow
	AGM readings inaccurate	Unspecified accuracy
	AGM calibration required	Out of calibration
O₂	O ₂ Sensor not connected	O ₂ sensor not connected

Parameter	Message	Condition
Event & Alarm Status	Occlusion	Sample line is blocked Status Code
System Related	Printing	When data is printing to the printer from monitor
	Downloading	When data is downloading to the USB from monitor
	Uploading	When Patient data is uploading to the monitor from USB
	Upload Completed	Upon completion of patient data upload
	Download Completed	Upon completion of patient data download
	Low Battery	When Battery charge level is $\leq 20\%$
	Patient Upload Failed	When file that is being uploaded to system does not have the compatible format as that of the system

Maintenance Schedule

Routine Maintenance

SKANRAY products have been designed to operate continuously with minimum maintenance.

However, in order to ensure better performance and safety, the routine maintenance should be performed. A summarized schedule and full details of maintenance is covered in this section.

Caution

Maintenance involving removal of the outer case must not be attempted by the operator, but referred to a qualified SKANRAY's representative.

Following action should be carried out in routine maintenance. Asterix (*) indicate that the following action is required.

Action	General	ECG, RESP, SpO ₂ TEMP, NIBP, IBP, CO ₂
	A	B
1.Check patient connections and accessories		*
2.Cleaning and disinfecting of accessories		*
3.Clean monitor exterior	*	
4.Check power cord	*	
5.Check battery	*	
6.Check monitor operation	*	*
7.Check monitor calibration		*

To clean/disinfect/sterilize reusable transducers, sensors, cables, leads etc., refer instructions provided by the accessory manufacturer.

Action Details

- 1B) Leads, sensor and probes should be carefully checked for any signs of damage. Damaged leads should be replaced. Do not attempt to repair.
- 2B) All accessories must be cleaned before use. Following precautions must be observed while cleaning and sterilizing of accessories.

Cleaning

WARNING

Do not use sharp instrument for cleaning cables.

ECG:

- a. ECG leads should be cleaned with a cloth slightly moistened with soap water. Always allow the cable to dry thoroughly before use.
- b. Clean blood from all external surfaces.

SpO₂, CO₂, IBP and Temp:

Refer relevant accessory instruction leaflet provided along with the accessories for any specific cleaning procedures.

NIBP :

- a. Cuffs - reusable may be cleaned in any of the two ways.
 - 1) Sponge the outer surface of the cuff with a moist cloth.
 - 2) Remove the cuff's bladder. Wash the cuff in water with soap or detergent / disinfectant. Rinse the cuff and allow it to air dry.
- b. Hoses - clean the hose by wiping it with a cloth moistened with soap water.

WARNING

Do not immerse the hose of NIBP in any liquid.

Do not use phenol - based cleaner for cleaning NIBP cuffs and hose.

Note

On accidental wetting of the monitor,

1. Wipe the surface of the monitor with a clean and dry cloth.
2. If the monitor malfunctions, refer the monitor to SKANRAY authorized service personnel.

WARNING

Do not use alcohol based cleaning agents for cables/ lead wires.
Do not boil accessories.

WARNING

To clean touch enabled display, disable the touch operation by selecting touch screen disable in monitor settings under system configuration.

Sterilization

ECG:

- a Clean as detailed above.
- b Wrap the connector lead in a polythene bag to prevent moisture penetration.
- c Loosely coil the cable to avoid any kinks.
- d. Wrap cable in the recommended way for ethylene oxide sterilization.

SpO₂, CO₂, IBP, Temp, CO and AGM:

Refer relevant accessory instruction leaflet provided along with the accessories for any specific sterilizing procedures.

NIBP :

WARNING

Do not steam autoclave reusable accessories and their associated cable like ECG & NIBP.
Use ethylene oxide gas only for sterilization.

- 3A) Isolate equipment from mains supply before cleaning. Clean the case and front panel with a soft cloth lightly moistened with warm soap water. Use only mild soaps or detergents. Allow the machine to dry thoroughly before use. Do not use chemicals or abrasive cleaning agents.
- 4A) Inspect the power cord for any signs of damage to cable or connectors. If damaged, replace with a SKANRAY replacement part. Do not attempt to repair.

- 5A) Isolate monitor from the mains supply. Switch ON the monitor and observe the battery status area in the display. If that area blinks with red colour, connect monitor to mains supply. Leave the unit for charging. If low battery indication still remains on the screen, refer the monitor to service personnel for battery replacement.

Caution

Batteries will be permanently damaged if left discharged.

- 6AB) Connect the power cable to the mains supply, switch ON the monitor and check the following:

- ◆ Adjustment of alarm volume.
- ◆ Adjustment of Beep volume.
- ◆ Adjustment of alarm limits. Enabling and disabling of individual alarms.
- ◆ Operation of alarm functions.
- ◆ Operation of recorder functions (optional).
- ◆ Operation of fault function (patient cable disconnected).
- ◆ Selection of trace speed for ECG, IBP, RESP, SpO₂ and CO₂.
- ◆ Selection of waveform parameters.
- ◆ Selection of graphical/tabular trend view.
- ◆ Selection of ECG, Resp, SpO₂, IBP and CO₂ gains.
- ◆ Selection of ECG arrhythmias.
- ◆ Selection of SpO₂ response.
- ◆ Selection of IBP label.
- ◆ Selection of no breath detect duration.
- ◆ Selection of TEMP unit (either °C or °F).
- ◆ Selection of NIBP mode.
- ◆ Return all adjustments to the desired settings after the checks.

- 7B) Perform the following checks to ensure that the monitor is calibrated correctly.

i. **ECG**

- Select CAL option from the menu list of ECG and observe the display.
- Square pulses will be produced of 1mV / 1 cm amplitude.

Note

ECG CAL is associated for II, III, V leads for 5 lead and lead II, III for 3 lead.

ii. TEMPERATURE

- Select CAL option from the menu list of TEMP and observe the display.
- The monitor displays 98.6⁰ F or 37⁰ C.

Capnography Maintenance Schedule

- Use specified accessories only.
- Check the accessories before use.
- Sample line is disposable and for single use only.
- In case of any water condensation in sample line, replace the sample line with a new one.
- CO₂ module should be calibrated once in a year or 4000 hours of usage, whichever is earlier. This calibration should be done by authorized SKANRAY personnel.

The calibration must be performed with a manufacturer approved calibration kit. The manufacturer approved calibration kit must be purchased from Scott Medical. Calibration gas contains 5% CO₂, 21% O₂ and balance N₂O. Switch ON the Monitor.

Procedure for calibrating Capnography Module

- Switch ON the monitor.
- Go to set up screen by pressing optical encoder during self test.
- Press **CO₂ CAL** from the **Setting** menu.
- Connect filter line from calibration kit to the monitor.
- Press start **CAL** and **Confirm** for further proceedings.
- Message " Keep pressing cylinder knob to deliver the gas" will display. Press the knob of the cylinder kit and select **OK**.
- Message "Calibrating... Please wait" will display.
- Message "Calibrating ... Please remove gas" will display.
- After calibration , message "Calibration succeeded" will display
- Remove filter line from the monitor.

Check the last calibrated date in Menu → System → All Info

NIBP Calibration

The pressure transducers used in the NIBP module are designed for medical applications, specifically non-invasive blood pressure. The accuracy with in 1% at full scale and they are temperature compensated to maintain this accuracy in different environments. These transducers do not need calibration for many years. However Pressure transducer calibration verification is recommended to be done on an annual basis.

Battery Maintenance Schedule

The batteries used in this Monitor are Li Ion Batteries.

- Whenever the monitor is not in use or stored for an extended period, it is recommended to remove the batteries from the monitor or battery shall be charged every three months to avoid permanent battery damage, fire hazard or complete discharge.
- Due to self discharge characteristics, the recommended shelf life for the Li Ion batteries (without charging) is six months, above which the battery characteristics may change leading to reduction or even complete loss in battery backup.
- Dont use or store batteries in high temperature environment (more than 60°C) or near fire as it may explode.
- To ensure maximum battery life, it is recommended to run the unit in battery once in a month until it turns off it self and then recharge the battery.
- Call SKANRAY authorized service personnel for battery replacement.

Clinical Studies

This appendix contains data from clinical study(s) conducted in healthy subjects using Nellcor sensors and the oximetry module (i.e. Nell-3) which is used in Star 65. The demographic information of the subjects enrolled into the study can be found in Table 1. Subject weight ranges were 58.4 kg – 114.4 kg and height ranges were 159 – 187 cm. The following describes the demographic information of the study subjects. A total of 11 subjects were analyzed. There were 4 (36.4%) males and 7 (63.6%) female subjects enrolled into the study. The mean age of study participants was 30.36 ± 7.85 years, with a range of 22 to 46 years of age. Three subjects had dark pigmentation (dark olive to extremely dark). Weight ranged from 58.4 kg to 114.4 kg, and height ranged from 159 cm to 187 cm.

Gender	Skin Pigmentation	Age	Race
Female	1 (Very Light)	37	Caucasian
Female	1 (Very Light)	27	Caucasian
Male	1 (Very Light)	27	Caucasian
Female	1 (Very Light)	24	Caucasian
Male	3 (Dark Olive)	31	Asian
Male	1 (Very Light)	22	Caucasian
Female	4 (ExtremelyDark)	46	African-American
Female	1 (Very Light)	42	Caucasian
Male	2 (Olive hue)	27	Caucasian
Female	1 (Very Light)	26	Caucasian
Female	1 (Very Light)	25	Caucasian

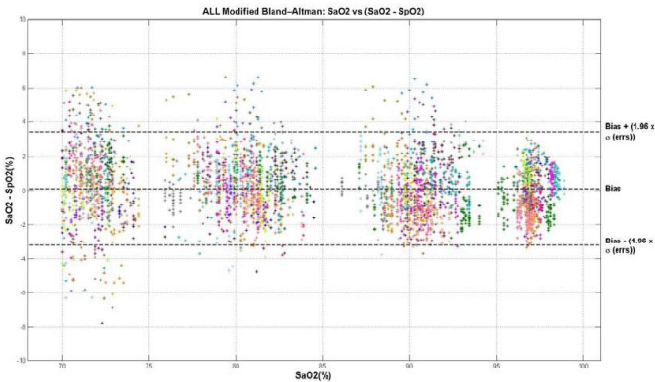
Demographics

Note: Skanray recommends to use DS-100A and D-YSE sensors with Star 65.

The accuracy results of SpO2 can be found in Table 2.

Sensor	# of Data Points	Bias (%)	Sigma (Errors)	Slope	Sigma (Residuals)	R^2	95% Upper C.I.(%)	A _{RMS} (%)	SpO2 Acceptance Criteria 70-100(%)	Pass/Fail
DS-100A	411	0.37	2.13	1.02	2.13	0.95	2.75	2.16	≤ 3.0	Pass
D-YSE	458	0.07	1.96	0.95	1.91	0.96	2.46	1.96	< 3.5	Pass

SpO2 Accuracy Results



Modified Bland-Altman for SpO2 - All Data

SpO2 Range	100%-90%	89%-80%	79%-70%
N	1693	1037	1212
RMSD (%)	1.46	1.66	2.01

RMSD of SpO2 per Decade

The plateau that were used during the study were 70 - 76, 76.01 - 85, 85.01 - 94 and >94% as shown in Table 4.

SpO2 Range	100%-94.01%	94%-85.01%	85%-76.01%	76%-70%
N	978	1102	1064	828
RMSD (%)	1.27	1.65	1.69	2.15

RMSD of SpO2 per Plateau

Warranty and Warranty Service

WARRANTY AND WARRANTY SERVICE

SKANRAY warrants its Medical equipment against only manufacturing defects for a period of 12 (Twelve) months from the date of installation or 13 (Thirteen) months from the date of despatch from SKANRAY whichever is earlier, unless specified otherwise by separate document from SKANRAY.

During the warranty, SKANRAY will, at its option, either repair or replace the defective components / assemblies free of charge. The defective part shall be sent duly packed to SKANRAY's concerned office / service station at purchaser's cost including freight, insurance and forwarding charges. Other claims, particularly for compensation, are excluded.

The warranty shall be valid only if installation and repairs are carried out by SKANRAY's Engineer or Authorized Service Franchisee.

The warranty shall not apply to defects resulting from:

1. Unauthorized modification / misuse / mishandling of the equipment.
2. Operation of the equipment outside the environmental specifications of the product (e.g. Temperature, Electrical requirement, etc.) as specified in the operating manual.
3. Improper site preparation and maintenance.
4. Any other reason external to the equipment (e.g. accidents, vibrations, etc.)
5. Any mechanical damage to the unit and / or accessories.

Following items are specifically excluded from the warranty:

1. Battery of any type.
2. Mains Cord / Power supply cable.
3. Consumables of any type.

SKANRAY shall not be liable for any special or consequential damages of any kind or nature. SKANRAY will not be liable in any manner for use of or failure in the performance of other equipment to which the product is attached / connected.

Annex: Contact details

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SKANRAY

NOTHING IS OPAQUE

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