

BeneVision N Series

Patient Monitor

Operator's Manual

Volume I

(BeneVision N22/BeneVision N19/BeneVision N17/
BeneVision N15/BeneVision N12/BeneVision N12C)



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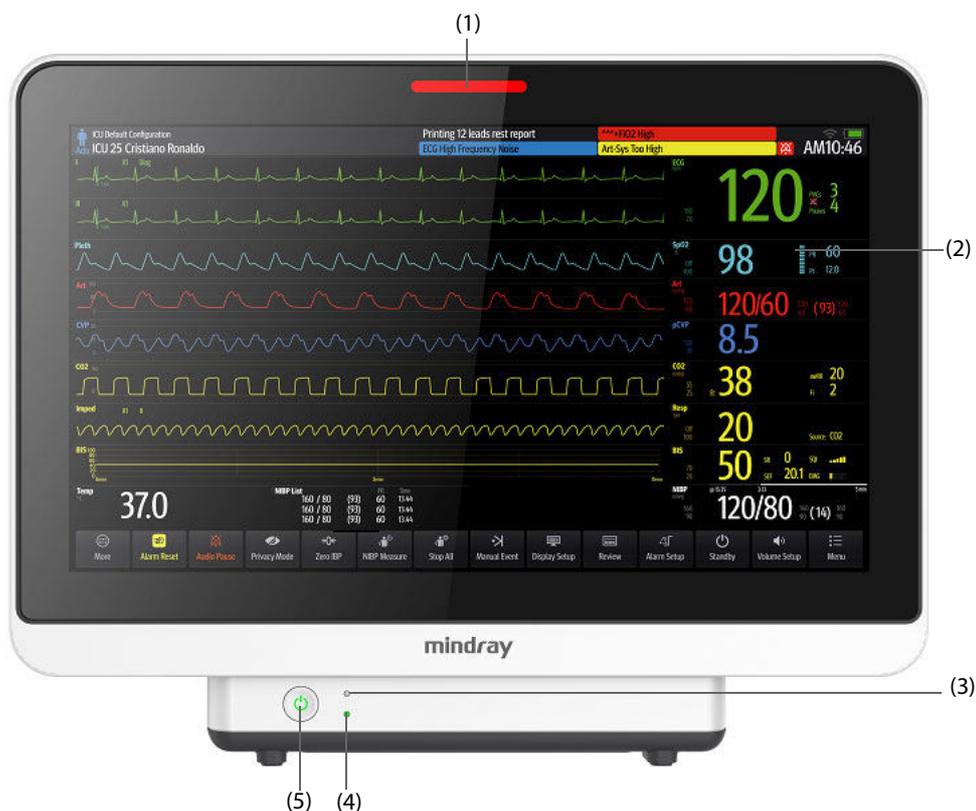
This manual contains two volumes. Volume I contains safety information and introduction to the equipment. It tells you how to perform tasks other than parameter measurements and how to care for and maintain the equipment. Volume II tells you how to perform parameter-related measurements. It also lists parameter measurement specifications, alarms, and default settings.

- (4) DC-in connector: connects the DC adapter to run the secondary display.
- (5) Video connector (VP): connects the VP1 connector at the bottom of the main unit.

2.3.3 N17, N15, N12, N12C Main Unit

The main unit displays and saves data from modules.

2.3.3.1 N17, N15, N12, N12C Front View

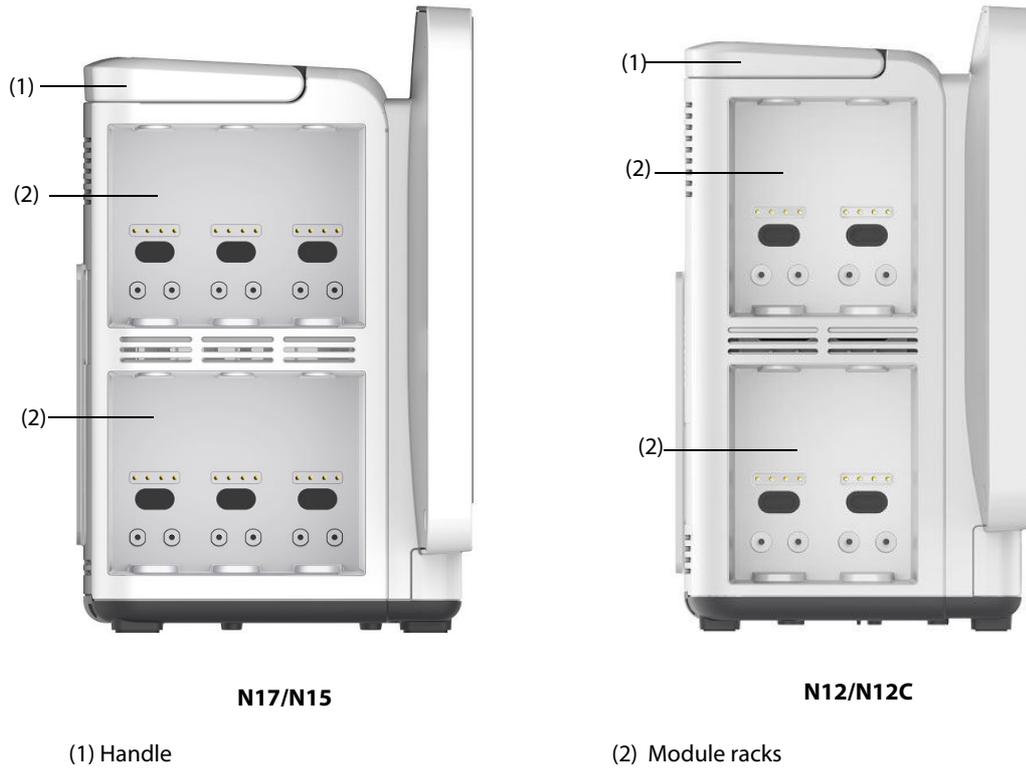


- (1) Alarm lamp:

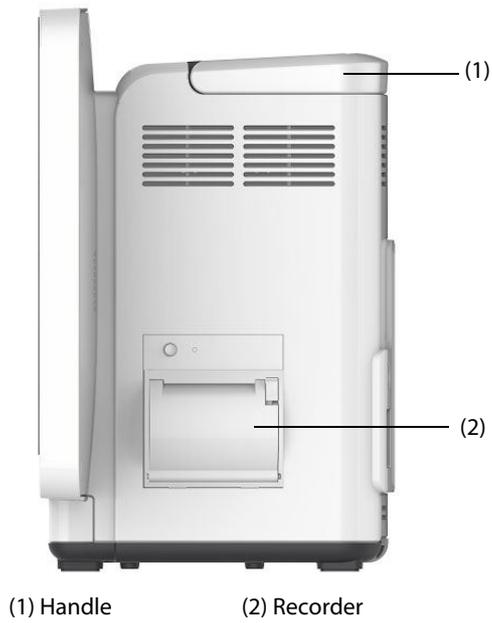
When a physiological alarm or technical alarm occurs, this lamp lights and flashes corresponding with the alarm priority:

 - ◆ High priority alarms: the lamp quickly flashes red.
 - ◆ Medium priority alarms: the lamp slowly flashes yellow.
 - ◆ Low priority alarms: the lamp lights in cyan without flashing.
- (2) Display
- (3) AC power indicator
 - ◆ On: when AC power is connected.
 - ◆ Off: when AC power is not connected.
- (4) Battery indicator:
 - ◆ Yellow: the battery is being charged.
 - ◆ Green: the battery is fully charged.
 - ◆ Flashing green: the monitor operates on battery power.
 - ◆ Off: no battery is installed, or the monitor is powered off and no AC power is connected.
- (5) Power switch
 - ◆ Pressing this switch turns on the monitor.
 - ◆ When the monitor is on, pressing and holding this switch turns off the monitor.

2.3.3.2 N17, N15, N12, N12C Left View



2.3.3.3 N17, N15, N12, N12C Right View



Alarm Indicator		High Priority Alarm	Medium Priority Alarm	Low Priority Alarm	Prompt
Alarm lamp		Red Flashing frequency: 1.4 - 2.8 Hz Duty cycle: 20 - 60% on	Yellow Flashing frequency: 0.4 - 0.8 Hz Duty cycle: 20 - 60% on	Cyan No flashing Duty cycle: 100% on	None
Audible tone pattern	Special alarm sound	Repeat pattern of high-pitched single beep	None	None	None
	ISO	Repeat pattern of triple + double + triple + double beeps	Repeat pattern of triple beeps	Repeat pattern of single beep	None
	ISO2	Repeat pattern of triple + double + triple + double beeps	Repeat pattern of triple beeps	Repeat pattern of single beep	None
	ISO3	Repeat pattern of triple + double + triple + double beeps	Repeat pattern of triple beeps	Repeat pattern of double beeps	None
Alarm message		White text inside a red box	Black text inside a yellow box	Black text inside a cyan box	White text
Alarm priority indicator		!!!	!!	!	None
Parameter value		White text inside a flashing red box	Black text inside a flashing yellow box	Black text inside a flashing cyan box	None

NOTE

- **When multiple alarms of different priority levels occur simultaneously, the monitor selects the alarm of the highest priority to light the alarm lamp and issue the alarm tone.**
- **When multiple alarms of different priority levels occur simultaneously and should be displayed in the same area, the monitor only displays the messages of the highest priority alarm.**
- **When multiple alarms of the same priority levels occur simultaneously, alarm messages are displayed circularly.**
- **The frequency of the alarm tone is different with those of the heart beat tone, pulse tone, and keystroke tone so that the alarm tone can be distinguished with other tones.**

6.3.5 Alarm Status Symbols

Apart from the alarm indicators as described in **6.3.3 Alarm Priority Escalation**, the monitor uses the following symbols to indicate the alarm status:



Alarm pause: indicates that all the alarms are paused.



Alarm off: indicates that individual measurement alarms are turned off or the system is in the alarm off status.



Audio pause: indicates that audible alarm tones are paused.



Audio off: indicates that audible alarm tones are turned off.



Alarm reset: indicates that the alarm system is reset.

6.3.6 Highlighted Display of Alarm Messages

When some alarms are triggered, alarm messages are highlighted to indicate that the patient may be in a critical condition. When an alarm is highlighted, the alarm message covers both the physiological alarm area and the technical alarm area with enlarged word size. Messages of technical alarms and other physiological alarms are displayed at the left of the highlighted alarm.

Alarm messages of the following alarms can be highlighted:

- Alarms are not paused or reset.

WARNING

- **Do not rely exclusively on the nurse call system for alarm notification. Remember that the most reliable alarm notification combines audible and visual alarm indications with the patient's clinical condition.**
-

6.13 Calling for Help

In case of needing a help, you can call monitors in the same department and the central station, from your monitor so that nearby doctors and nurses can come for help.

To call help, select the **Call Help** quick key and select **OK** from the popup dialog box. If you did not select **OK**, the monitor will automatically send out the call help signal in five seconds.

After the call help signal is sent out, the **Call Help** quick key flashes in red. If you need to stop calling for help, select the **Call Help** quick key again.

Monitors receiving the call help signal issue a sound and a dialog box pops up indicating which monitor is calling. Select **OK** to acknowledge the call and stop the sound at this monitor.

NOTE

- **The call help function works only when the monitor is connected to the network.**
 - **The call help sound may disturb patients in the same department.**
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6.14 CPB Mode

The CPB (Cardiopulmonary Bypass) mode is activated only if you set the department to **OR**.

In the CPB mode, except for BIS, EEG, NMT, tcGas, and rSO₂ related alarms, all the physiological alarms and technical alarms are switched off. So when performing CPB, you can put the monitor in the CPB mode in order to inactivate unnecessary alarms.

6.14.1 Entering the CPB Mode

To enter the CPB mode, choose either of the following ways:

- Select the **CPB Mode** quick key.
- Select the **Main Menu** quick key → from the **Alarm** column select **CPB Mode**.

In the CPB mode, **CPB Mode** is displayed in the physiological alarm area with a red background color.

NOTE

- **When the CPB mode is entered, the monitor stops all NIBP measurements. You can restart NIBP measurements after entering the CPB mode.**
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6.14.2 Exiting the CPB Mode

To exit the CPB mode, choose either of the following ways:

- Select the **CPB Mode** quick key.
- Select the **Main Menu** quick key → from the **Alarm** column select **Exit CPB Mode**.

6.15 Intubation Mode

Intubation mode is available for Resp, CO₂, AG and RM monitoring. When performing intubation during general anesthesia, you can put the monitor in the intubation mode in order to inactivate unnecessary alarms.

In the intubation mode, Resp, CO₂, AG and RM related physiological alarms are switched off.

14 Networked Monitoring

14.1 Network Introduction

The monitor can be connected with Mindray central monitoring system (CMS), eGateway, other monitors, infusion supervision systems, and ventilators through wired LAN or wireless LAN. You can view waveforms and data from other monitors, pumps, and ventilators on the monitor.

14.2 Network Safety Information

CAUTION

- **Wireless network design, deployment, debugging, and maintenance should be executed by Mindray service personnel or authorized technicians.**
 - **Always deploy the wireless network according to local wireless regulations.**
 - **Using 5 GHz frequency band is recommended whenever possible. There are more interference sources in 2.4 GHz frequency band.**
 - **Private APs and wireless routers are not allowed. These devices may cause radio interference and result in monitor and CMS data loss.**
 - **To ensure network security and stability, data communication must be performed within a closed network or within a virtually isolated hospital network. The hospital is responsible for ensuring the security of the virtually isolated network.**
 - **WPA2-PSK and WPA2-Enterprise verification and encryption should be used if possible. Otherwise, the equipment may not be able to work or patient information may be leaked. WPA2-Enterprise and a long password are recommended.**
 - **Keep network authentication information, for example password, from being accessed by unauthorized users.**
 - **Do not connect non-medical devices to the monitor network.**
 - **If wireless network signal is poor, there may be a risk of CMS data loss.**
 - **Maximum number of monitors connected to a single AP is 16 for N17/N15/N12/N12C or 12 for N22/N19. Too many monitors connected to the same AP may result in network disconnection.**
 - **RF interference may result in wireless network disconnection.**
 - **Disconnecting from the network may result in CMS data loss and function failure. Check the patient in case of network disconnection and reconnect the network as soon as possible.**
 - **Ensure that the monitor IP address setting is correct. Changing the network settings may result in network disconnection. Contact your service personnel if you have any problems on setting the IP address.**
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14.3 Connecting the Monitor to the CMS

You can connect the monitor to the BeneVision CMS through wired LAN or wireless LAN. When connected to the CMS, the system provides the following function.

- The monitor can transmit parameter values, waveforms, alarm settings, and events to the CMS. From the CMS, you can check the patient's monitoring data and alarms.
- The monitor can transmit parameter values and alarm settings getting from the connected external devices to the CMS. From the CMS you can check the patient's monitoring data and alarms obtaining from the connected external devices.
- Patient information, alarm settings, and alarm status can be synchronized between the monitor and the CMS.
- You can start or stop NIBP measurements from the CMS.

- In case of network disconnection, the monitor can transmit the offline data to the CMS when network is reconnected.

For more information on the CMS, see the operator's manual of corresponding central monitoring system.

Connect the monitor to the CMS through either of the following methods:

- Admit the monitor on the CMS.
- Select the system status information area at the top right corner of the main screen. Select the desired CMS from the popup CMS list. For more information, see *13.17.4 The Central Station Setup Tab*.

NOTE

- **You can select CMS only when the Select CMS switch is on. For more information, refer to *13.17.4 The Central Station Setup Tab*.**
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14.4 Connecting the eGateway

You can connect the monitor to the eGateway to implement interaction between the monitor and external devices. When connected to the eGateway, the system provides the following functions:

- The monitor can transmit parameter values, waveforms, alarm settings, and events to the eGateway.
- The monitor can transmit parameter values and alarm settings getting from the connected external devices to the eGateway.
- Clock can be synchronized between the monitor and the eGateway.

14.5 MLDAP

MLDAP refers to Mindray LDAP (Lightweight Directory Access Protocol). It is an independent process which can be installed on eGateway or other application server (Windows). MLDAP provides user identity and authentication.

The MLDAP server is connected with the hospital LDAP server. All monitoring devices are connected to the MLDAP server to implement identity and authentication for the following operations:

- Changing alarm settings
- Changing arrhythmia settings
- Accessing the **Maintenance** menu

For more information on setting the MLDAP server, see *13.17.10 The MLDAP Tab*. For more information on selecting or changing the passwords, see *13.13 The Authorization Setup Settings*

14.6 Connecting the Wireless Network

You can add up to five wireless networks for the monitor. If connecting the current wireless network fails, the monitor automatically connects other wireless networks in the order when they were added.

To manually switch the wireless network, from the system status information area on the top right corner of the screen select , and select the desired wireless network.

14.7 Disconnecting the Wireless Network

To disconnect the wireless network manually, follow this procedure:

1. Swipe the screen from top down with a single finger.
2. Select .

To reconnect the wireless network after it is disconnected manually, follow this procedure:

1. Swipe the screen from top down with a single finger.
2. Select .

A.10.5 Interface Specifications of the N17/N15/N12/N12C

AC power input	1
Network connector	N17: 2, standard RJ45 connectors (one on the iView module) N15/N12/N12C: 1, standard RJ45 connector
USB connector	N15/N12/N12C: 4, USB 2.0 N17: 8, USB 2.0, 4 on the iView module
Satellite module rack (SMR)Dock connector	1 (For N17/N15, it connects the SMR, N1 Dock, or T1 Dock. For N12/N12C, it connects the N1 Dock or T1 Dock)
Video output connector	N17: 2 (one for the iView system) N15/N12/N12C: 1
Nurse call connector	1, standard BNC
Equipotential grounding terminal	1

A.11 Signal Outputs Specifications

Auxiliary Output	
Standard	Meets the requirements of IEC 60601-1: 2005 for short-circuit protection and leakage current
ECG Analog Output	
Bandwidth (-3dB; reference frequency: 10 Hz)	Diagnostic mode: 0.05 to 150 Hz Monitor mode: 0.5 to 40 Hz Surgical mode: 1 to 20 Hz ST mode: 0.05 to 40 Hz
Maximum QRS delay	25 ms (in diagnostic mode, and non-paced)
Gain (reference frequency 10 Hz)	1V/mV ($\pm 5\%$)
Pace enhancement	Signal amplitude: $V_{oh} \geq 2.5V$ Pulse width: $10ms \pm 5\%$ Signal rising and falling time: $\leq 100 \mu s$
IBP Analog Output	
Bandwidth (-3dB; reference frequency: 1Hz)	0 to 40 Hz
Maximum transmission delay	30 ms
Gain (reference frequency 1 Hz)	1 V/100 mmHg, $\pm 5\%$
Nurse Call Signal	
Amplitude	High level: 3.5 to 5 V, $\pm 5\%$, providing a minimum of 10 mA output current; Low level: $< 0.5 V$, receiving a minimum of 5 mA input current.
Rising and falling time	$\leq 1 ms$
Video Output	
Video signals	VGA signal
Defib Sync Pulse	
Output impedance	$\leq 100 ohm$
Maximum time delay	35 ms (R-wave peak to leading edge of pulse)
Amplitude	High level: 3.5 to 5 V, $\pm 5\%$, providing a maximum of 10 mA output current; Low level: $< 0.5 V$, receiving a maximum of 5 mA input current.
Pulse width	100 ms $\pm 10\%$

maximum rising and falling time	1 ms
Alarm output	
Alarm delay time from the monitor to remote equipment	The alarm delay time measured at the monitor signal output connector: From the monitor to the CMS and remote monitors: ≤2 seconds From the monitor to the TM80 telemetry monitor: ≤3 seconds
Alarm signal sound pressure level range	45 db(A) to 85 db(A) within a range of one meter

A.12 Data Storage

Trends	A minimum of 120 hours' trend data with the resolution no less than 1 minute.
Events	1000 events, including parameter alarms, arrhythmia events, technical alarms, and so on
NIBP measurements	1000 sets
Interpretation of resting 12-lead ECG results	20 sets
Full-disclosure waveforms	48 hours at maximum. The specific storage time depends on the waveforms stored and the number of stored waveforms. 48 hours (8 G storage card, for N22/N19)
ST view	A maximum of 120 hours' ST segment waveforms. One group of ST segment waveforms is stored every one minutes.
OxyCRG view	A maximum of 48 hours of oxyCRG events

A.13 Wi-Fi Specifications

A.13.1 Wi-Fi Technical Specifications (MSD45N)

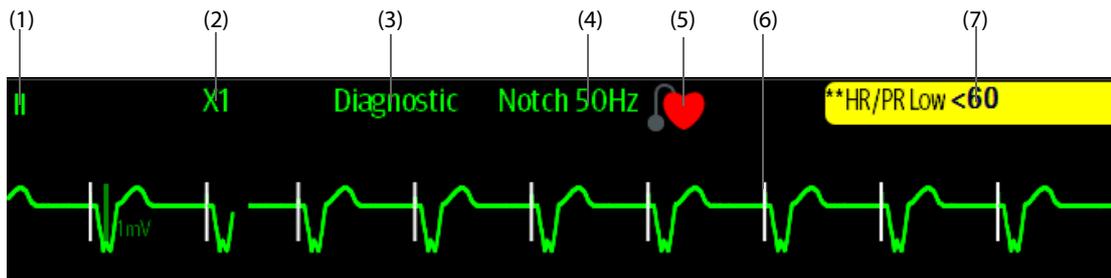
Protocol	IEEE 802.11a/b/g/n
Modulation mode	BPSK, QPSK, 16QAM, 64QAM
Operating frequency	2.4 GHz to 2.495 GHz. 5.15 GHz to 5.25 GHz, 5.725 GHz to 5.85 GHz
Channel spacing	IEEE 802.11b/g: 5 MHz IEEE 802.11n (at 2.4 GHz): 5 MHz IEEE802.11a: 20 MHz IEEE802.11n (at 5 GHz): 20 MHz
Wireless baud rate	IEEE 802.11b: 1 Mbps to 11 Mbps IEEE 802.11g: 6 Mbps to 54 Mbps IEEE 802.11n: 6.5 Mbps to 72.2 Mbps (MCS0-MCS7) IEEE 802.11a: 6 Mbps to 54 Mbps
Output power	<20dBm (CE requirement, detection mode: RMS) <30dBm (FCC requirement: detection mode: peak power)
Operating mode	As station, access AP for data transmission
Data security	Standards: WPA-PSK, WPA2-PSK, WPA-Enterprise, WPA2-Enterprise EAP method: EAP-FAST, EAP-TLS, EAP-TTLS, PEAP-GTC, PEAP- MSCHAPv2, PEAP-TLS, LEAP Encryption: TKIP, AES

A.13.2 Wi-Fi Technical Specifications (SX-SDMAC-2832S+)

Protocol	IEEE 802.11a/b/g/n
Modulation mode	BPSK, QPSK, 16QAM, 64QAM

20.3 ECG Display

The following figures show the ECG waveform and numeric areas:



(1) ECG lead label of the displayed waveform, When 6-lead placement is used to derive 12-lead ECG (D12L), all derived leads are marked with a "d" in front of the lead label, for example "dV1".

(2) ECG waveform gain

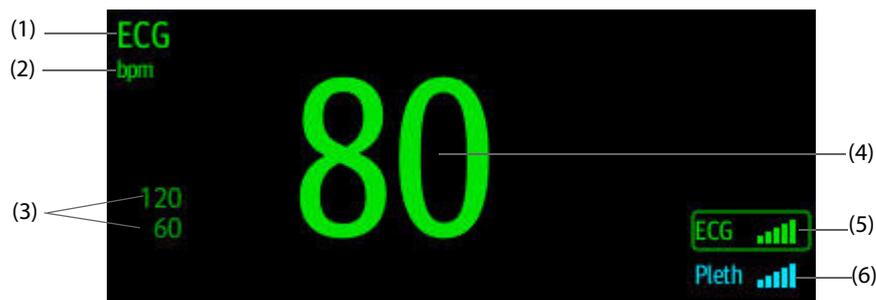
(3) ECG filter mode

(4) Notch filter status

(5) Paced status: If **Paced** is set to **Yes**, is displayed. If **Paced** is set to **No**, is displayed.

(6) Pace pulse mark: If **Paced** is set to **Yes**, the pace pulse markers "|" are displayed corresponding to detected pace pulse on each ECG waveform.

(7) HR/PR alarm message



(1) Parameter label

(2) HR unit

(3) HR alarm limits

(4) HR value

(5) ECG signal quality index (ECG SQI)

(6) Pleth signal quality index (Pleth SQI)

SQI with five highlighted bars indicates the best signal. SQI with one highlighted bar indicates the poorest signal. If the SQI is poor, check ECG electrodes or SpO₂ sensor application. Reposition the electrodes or sensor if necessary.

The CrozFusion™ function analyzes the ECG signal and the Pleth wave signal together to achieve more accurate arrhythmia analysis result and HR/PR measurements. To view the on-screen help for the CrozFusion™ function, select the **CrozFusion** tab from the **ECG** menu.

The ECG SQI, Pleth SQI, and signal fusion status are displayed when the CrozFusion™ function is enabled. The following table lists SQI indications of different signal fusion status:



The quality of both ECG and Pleth signal is good. ECG signal and Pleth signal are independently analyzed.



The quality of Pleth signal is poor. The PR value may be erroneous. The ECG signal is being used to correct the PR value.



The quality of ECG signal is poor. The HR value and arrhythmia analysis may be erroneous. The Pleth signal is being used to correct the HR value and for arrhythmia analysis.

Alarm message	Default priority
Missed Beat	Prompt
A-Fib	Prompt
SVT	Med
SVCs/min High	Med

Note: When arrhythmia alarms occur, check the patient's condition and the ECG connections.

I.1.3 ST Physiological Alarm Messages

ST alarm mode	Alarm messages	Default priority	Cause and solution
Absolute	ST-XX High	Med	The ST value of respective ECG lead has risen above the high alarm limit or fallen below the low alarm limit. Check the patient's condition and check if the patient category and alarm limit settings are correct.
	ST-XX Low	Med	
Relative	ST Single	Med	ST value of any ECG leads has risen above the high alarm limit or fallen below the low alarm limit. Check the patient's condition and check if the patient category and alarm limit settings are correct.
	ST Dual	Med	ST values of two or more ECG leads have risen above the high alarm limit or fallen below the low alarm limit. Check the patient's condition and check if the patient category and alarm limit settings are correct.

Note: XX represents the ECG lead label.

I.1.4 Resp Physiological Alarm Messages

Alarm message	Default priority	Cause and solution
Resp Artifact	High	The patient's heartbeat has interfered with his respiration. Check the patient's condition and the Resp connections.
Apnea	Adult: Med Pediatric: Med Neonate: High	The respiration signal was so weak that the monitor cannot perform respiration analysis. Check the patient's condition, module and patient connections.

I.1.5 SpO₂ Physiological Alarm Messages

Alarm message	Default priority	Cause and solution
SpO ₂ Low/SpO ₂ b Low (YY hrs YY min YYsec)	High	The SpO ₂ or SpO ₂ b value falls below the alarm limit. Check the patient's condition and check if the alarm limit settings are correct.
SpO ₂ Desat/SpO ₂ b Desat (YY hrs YY min YYsec)	High	The SpO ₂ or SpO ₂ b value falls below the desaturation alarm limit. Check the patient's condition and check if the alarm limit settings are correct.
ΔSpO ₂ High	Med	The ΔSpO ₂ value exceeds the alarm limit. Check the patient's condition.

Note: YY hrs YY min YYsec represents the period of time that the SpO₂ alarm lasts.

I.1.6 PR Physiological Alarm Messages

Alarm message	Default priority	Cause and solution
No Pulse	High	The pulse signal was so weak that the monitor cannot perform pulse analysis. Check the patient's condition, SpO ₂ sensor and measurement site.

I.2.4 SpO₂ Technical Alarm Messages

Alarm message	Default priority	Indication on alarm reset	Cause and solution
SpO ₂ b Sensor Off	Low	B	The SpO ₂ sensor has become detached from the patient or the module. Check the sensor connection. If the alarm persists, replace the sensor.
SpO ₂ No Sensor	Low	A	The SpO ₂ extension cable is detached from the SpO ₂ module, or the SpO ₂ sensor is detached from the SpO ₂ extension cable. Check the SpO ₂ cable and the sensor connection. If the alarm persists, replace the sensor.
SpO ₂ Excess Light	Low	C	Ambient light is too strong. Move the sensor to a place with lower level of ambient light or cover the sensor to minimize the ambient light.
SpO ₂ No Pulse	Low	C	The SpO ₂ sensor failed to obtain pulse signal. Check the patient's condition and replace the sensor application site. If the alarm persists, replace the sensor.
SpO ₂ Sensor Incompatible	Low	C	Incompatible or an unspecified SpO ₂ sensor is used. Use specified sensors.
SpO ₂ Low Signal Quality	Low	C	<ol style="list-style-type: none"> 1. Check the sensor and sensor position. 2. Make sure the patient is not shivering or moving. 3. The patient's pulse may be too low to be measured.
SpO ₂ Interference	Low	C	The SpO ₂ signal has been interfered. Check for any possible sources of signal noise and check the patient for excessive motion.
SpO ₂ Sensor Error	Low	C	Replace the sensor and measure again.
SpO ₂ Searching Pulse	Prompt	/	SpO ₂ is searching for pulse.
SpO ₂ Low Perfusion	Prompt	/	<p>The SpO₂ sensor is not properly placed or the patient's perfusion index is too low.</p> <ol style="list-style-type: none"> 1. Check the sensor and sensor position. 2. Reposition the sensor if necessary.

I.2.5 Temp Technical Alarm Messages

Alarm message	Default priority	Indication on alarm reset	Cause and solution
T1/T2 Sensor Off	Low	A	Check the sensor connection and reconnect the sensor.
TempIF Ambient Temp High (for tympanic thermometer)	Low	A	The ambient temperature is too high. Move the patient to a cooler place and take temperature measurement again if necessary.
TempIF Ambient Temp Low (for tympanic thermometer)	Low	A	The ambient temperature is too low. Move the patient to a warmer place and take temperature measurement again if necessary.
TempIF Overrange (for tympanic thermometer)	Low	C	The temperature measurement exceeds the measurement range. Check the patient's condition.
TempIF Thermometer Error (for tympanic thermometer)	High	C	The tympanic thermometer may fail. Take temperature measurement again. If the alarm persists, replace the tympanic thermometer.

I.2.6 NIBP Technical Alarm Messages

Alarm message	Default priority	Indication on alarm reset	Cause and solution
NIBP Cuff Loose	Low	A	There is a leak in the cuff or air tubing. Use a cuff of correct type based on the patient size. Apply the cuff and connect the air tubing as instructed in the manual.
NIBP Cuff or Airway Leak	Low	A	Check the NIBP cuff and pump for leakages.
NIBP Airway Error	Low	A	The air tubing may be occluded. Check the air tubing for an occlusion or kinking. If the alarm persists, contact your service personnel.
NIBP Weak Signal	Low	A	The patient's pulse is weak or the cuff is loose. Check the patient's condition and replace the cuff application site.
NIBP Overrange	Low	A	The measured NIBP value exceeds the module measurement range. Check the patient's condition.
NIBP Excessive Motion	Low	A	Check the patient's condition and reduce patient motion.
NIBP Cuff Overpressure	Low	A	The NIBP airway may be occluded. Check the airway and measure again. If the alarm persists, contact your service personnel.
NIBP Timeout	Low	A	The measurement time exceeds 120 seconds in the adult or pediatric mode, or exceeds 90 seconds in the neonatal mode, and the BP value cannot be obtained. Check the patient's condition and NIBP connections, or replace the cuff and measure again.
NIBP Cuff and Patient Mismatch	Low	A	The cuff type mismatches the patient category. Verify the patient category or replace the cuff if necessary. If patient category is correct, check that the tubing is not bent and the airway is not occluded.
NIBP Airway Leak	Low	A	Airway leakage is found during the NIBP leakage test. Check the NIBP cuff and pump for leakages.

I.2.7 IBP Technical Alarm Messages

Alarm message	Default priority	Indication on alarm reset	Cause and solution
XX Sensor Error	Med	C	The IBP sensor fails. Replace the sensor.
XX No Sensor	MedLow	A	The IBP patient cable and/or corresponding IBP sensor is not connected or detached. Check the cable and sensor connection.
XX No Pulse	Low	A	The catheter may be occluded. Please flush the catheter.
XX Disconnected	High	C	The liquid way is disconnected from the patient, or the three-way valve is open to the air. Check the connection of the liquid way. Make sure that the valve is open to the patient. If the alarm persists, contact your service personnel.

Alarm message	Default priority	Indication on alarm reset	Cause and solution
ANI Low Input Signal Quality	Low	C	Interference is detected. 1. Check that sensors are properly placed along an imaginary line through the heart (acquisition of an electrical QRS axis). 2. Check that any other device can interfere.
Check ANI potential disturbances	Low	C	Interference is detected. 1. Check that sensors are properly placed along an imaginary line through the heart (acquisition of an electrical QRS axis). 2. Check that any other device can interfere.
ANI Input Signal Rate Out of Range.	Low	C	The patient heart rate is under 30 bpm or over 150 bpm. Wait for the patient's heart rate to come back into the valid range of 30 bpm to 150 bpm for the ANI computation.
ANI Energy Out of Range	Low	C	Wait for the energy value to come back into the valid range of 0.05 to 2.5 for the ANI computation

I.2.21 EWS Technical Alarms

Alarm message	Default priority	Indication on alarm reset	Cause and solution
EWS param XX is timeout	Low	A	The manually input parameter is timeout. Input a parameter numeric again.
EWS score needs to be confirmed	Low	A	Confirm to save or give up current score.

XX represents RR, SpO2, Supp. O2, Temp, BP, HR, Consciousness, Blood Sugar, Urine Output, Catheter, Pain Score, Pain, EtCO2, FiO2, Airway, or Customer defined parameter.

I.2.22 Power Supply Technical Alarm Messages

Alarm message	Default priority	Indication on alarm reset	Cause and solution
Low Battery	Med	C	Connect the monitor to an AC power source and allow the batteries to charge.
Critically Low Battery	High	C	Connect the monitor to an AC power source and allow the batteries to charge.
Battery Service Required (N22/N19)	Low	B	The battery reaches its lifetime. Replace the battery.
Battery Overload (N22/N19)	High	C	Too many parameter modules are connected, causing system overload and high power consumption. Use AC power supply.
Power Board Comm Error	High	C	Restart the monitor. If the alarm persists, contact your service personnel.
Battery Error	High	C	The battery may fail. Contact your service personnel.
Battery Charging Error (N22/N19)	High	C	The charging circuit fails or the battery fails. Contact your service personnel.