GE HealthCare

Portrait™ VSM Vital Signs Monitor

Technical Manual

Software Version 1.0

5975003-EN
Revision 6
English

Language Policy

Language Policy For Service Documentation

ПРЕДУПРЕЖДЕНИЕ (BG)	Това упътване за работа е налично само на английски език. • Ако доставчикът на услугата на клиента изиска друг език, задължение на клиента е да осигури превод. • Не използвайте оборудването, преди да сте се консултирали и разбрали упътването за работа. • Неспазването на това предупреждение може да доведе до нараняване на доставчика на услугата, оператора или пациента в резултат на токов удар, механична или друга опасност.
警告 (ZH-CN)	本维修手册仅提供英文版本。 • 如果客户的维修服务人员需要非英文版本，则客户需自行提供翻译服务。 • 未详细阅读和完全理解本维修手册之前，不得进行维修。 • 忽略本警告可能对维修服务人员、操作人员或患者造成电击、机械伤害或其他形式的伤 害。
警告 (ZH-HK)	本服務手冊僅提供英文版本。 • 倘若客戶的服務供應商需要英文以外之服務手冊，客戶有責任提供翻譯服務。 • 除非已參閱本服務手冊及明白其內容，否則切勿嘗試維修設備。 • 不遵從本警告或會令服務供應商、網絡供應商或病人受到觸電、機械性或其他的危險。
警告 (ZH-TW)	本維修手冊僅有英文版。 • 若客戶的維修廠商需要英文版以外的語言，應由客戶自行提供翻譯服務。 • 請勿試圖維修本設備，除非 您已查閱並瞭解本維修手冊。 • 若未留意本警告，可能導致維修廠商、操作員或病患因觸電、機械或其他危險而受傷。
UPOZORENJE (HR)	Ovaj servisni priručnik dostupan je na engleskom jeziku. • Ako davatelj usluge klijenta treba neki drugi jezik, klijent je dužan osigurati prijevod. • Ne pokušavajte servisirati opremu ako niste u potpunosti pročitali i razumjeli ovaj servisni priručnik. • Zanemarite li ovo upozorenje, može doći do ozljede davatelja usluge, operatera ili pacijenta uslijed strujnog udara, mehaničkih ili drugih rizika.
VÝSTRAHA (CS)	Tento provozní návod existuje pouze v anglickém jazyce. • V případě, že externí služba zákazníkům potřebuje návod v jiném jazyce, je zajištění překladu do odpovídajícího jazyka úkolem zákazníka. • Nesnažte se o údržbu tohoto zařízení, aniž byste si přečetli tento provozní návod a pochopili jeho obsah. • V případě nedodržování této výstrahy může dojít k poranění pracovníka prodejního servisu, obslužného personálu nebo pacientů vlivem elektrického proudu, respektive vlivem mechanických či jiných rizik.
ADVARSEL (DA)	Denne servicemanual findes kun på engelsk. • Hvis en kundes tekniker har brug for et andet sprog end engelsk, er det kundens ansvar at sørge for oversættelse. • Forsøg ikke at servicere udstyret uden at læse og forstå denne servicemanual. • Manglende overholdelse af denne advarsel kan medføre skade på grund af elektrisk stød, mekanisk eller anden fare for teknikeren, operatøren eller patienten.

WAARSCHUWING (NL)	Deze onderhoudshandleiding is enkel in het Engels verkrijgbaar. • Als het onderhoudspersoneel een andere taal vereist, dan is de klant verantwoordelijk voor de vertaling ervan. • Probeer de apparatuur niet te onderhouden alvorens deze onderhoudshandleiding werd geraadpleegd en begrepen is. • Indien deze waarschuwing niet wordt opgevolgd, zou het onderhoudspersoneel, de operator of een patiënt gewond kunnen raken als gevolg van een elektrische schok, mechanische of andere gevaren.
WARNING (EN)	This service manual is available in English only. • If a customer's service provider requires a language other than English, it is the customer's responsibility to provide translation services. • Do not attempt to service the equipment unless this service manual has been consulted and is understood. • Failure to heed this warning may result in injury to the service provider, operator or patient from electric shock, mechanical or other hazards.
HOIATUS (ET)	See teenindusjuhend on saadaval ainult inglise keeles. • Kui klienditeeninduse osutaja nõuab juhendit inglise keelest erinevas keeles, vastutab klient tõlketeenuse osutamise eest. • Ärge üritage seadmeid teenindada enne eelnevalt käesoleva teenindusjuhendiga tutvumist ja sellest aru saamist. • Käesoleva hoiatuse eiramine võib põhjustada teenuseosutaja, operaatori või patsiendi vigastamist elektrilöögi, mehaanilise või muu ohu tagajärjel.
VAROITUS (FI)	Tämä huolto-ohje on saatavilla vain englanniksi. • Jos asiakkaan huoltohenkilöstö vaatii muuta kuin englanninkielistä materiaalia, tarvittavan käännöksen hankkiminen on asiakkaan vastuulla. • Älä yritä korjata laitteistoa ennen kuin olet varmasti lukenut ja ymmärtänyt tämän huolto-ohjeen. • Mikäli tätä varoitusta ei noudateta, seurauksena voi olla huoltohenkilöstön, laitteiston käyttäjän tai potilaan vahingoittuminen sähköiskun, mekaanisen vian tai muun vaaratilanteen vuoksi.
ATTENTION (FR)	Ce manuel d'installation et de maintenance est disponible uniquement en anglais. • Si le technicien d'un client a besoin de ce manuel dans une langue autre que l'anglais, il incombe au client de le faire traduire. • Ne pas tenter d'intervenir sur les équipements tant que ce manuel d'installation et de maintenance n'a pas été consulté et compris. • Le non-respect de cet avertissement peut entraîner chez le technicien, l'opérateur ou le patient des blessures dues à des dangers électriques, mécaniques ou autres.
WARNUNG (DE)	Diese Serviceanleitung existiert nur in englischer Sprache. • Falls ein fremder Kundendienst eine andere Sprache benötigt, ist es Aufgabe des Kunden für eine entsprechende Übersetzung zu sorgen. • Versuchen Sie nicht diese Anlage zu warten, ohne diese Serviceanleitung gelesen und verstanden zu haben. • Wird diese Warnung nicht beachtet, so kann es zu Verletzungen des Kundendiensttechnikers, des Bedieners oder des Patienten durch Stromschläge, mechanische oder sonstige Gefahren kommen.

ΠΡΟΕΙΔΟΠΟΙΗΣΗ (EL)	Τοπαρόν εγχειρίδιο σέρβις διατίθεται στα αγγλικά μόνο. • Εάν το άτομο παροχής σέρβις ενός πελάτη απαιτεί το παρόν εγχειρίδιο σε γλώσσα εκτός των αγγλικών, αποτελεί ευθύνη του πελάτη να παρέχει υπηρεσίες μετάφρασης. • Μηνεπιχειρήσετε την εκτέλεση εργασιών σέρβις στον εξοπλισμό εκτός εάν έχετε συμβουλευτεί και έχετε κατανοήσει το παρόν εγχειρίδιο σέρβις. • Εάν δεν λάβετε υπόψη την προειδοποίηση αυτή, ενδέχεται να προκληθεί τραυματισμός στο άτομο παροχής σέρβις, στο χειριστή ή στον ασθενή από ηλεκτροπληξία, μηχανικούς ή άλλους κινδύνους.
FIGYELMEZ-TETÉS (HU)	Ezen karbantartási kézikönyv kizárólag angol nyelven érhető el. • Ha a vevő szolgáltatója angoltól eltérő nyelvre tart igényt, akkor a vevő felelőssége a fordítás elkészíttetése. • Ne próbálja elkezdeni használni a berendezést, amíg a karbantartási kézikönyvben leírtakat nem értelmezték. • Ezen figyelmeztetés figyelmen kívül hagyása a szolgáltató, működtető vagy a beteg áramütés, mechanikai vagy egyéb veszélyhelyzet miatti sérülését eredményezheti.
AÐVÖRUN (IS)	Þessi þjónustuhandbók er aðeins fáanleg á ensku. • Ef að þjónustuveitandi viðskiptamanns þarfnast annas tungumáls en ensku, er það skylda viðskiptamanns að skaffa tungumálaþjónustu. • Reynið ekki að afgreiða tækið nema að þessi þjónustuhandbók hefur verið skoðuð og skilin. • Brot á sinna þessari aðvörun getur leitt til meiðsla á þjónustuveitanda, stjórnanda eða sjúklings frá raflosti, vélrænu eða öðrum áhættum.
AVVERTENZA (IT)	Il presente manuale di manutenzione è disponibile soltanto in lingua inglese. • Se un addetto alla manutenzione richiede il manuale in una lingua diversa, il cliente è tenuto a provvedere direttamente alla traduzione. • Procedere alla manutenzione dell'apparecchiatura solo dopo aver consultato il presente manuale ed averne compreso il contenuto. • Il mancato rispetto della presente avvertenza potrebbe causare lesioni all'addetto alla manutenzione, all'operatore o ai pazienti provocate da scosse elettriche, urti meccanici o altri rischi.
警告 (JA)	このサービスマニュアルには英語版しかありません。 • サービスを担当される業者が英語以外の言語を要求される場合、翻訳作業はその業者の責任で行うものとさせていただきます。 • このサービスマニュアルを熟読し理解せずに、装置のサービスを行わないでください。 • この警告に従わない場合、サービスを担当される方、操作員あるいは患者 さんが、感電や機械的又はその他の危険により負傷する可能性があります。
경고 (KO)	본 서비스 매뉴얼은 영어로만 이용하실 수 있습니다. • 고객의 서비스 제공자가 영어 이외의 언어를 요구할 경우, 번역 서비스를 제공하는 것은 고객의 책임입니다. • 본 서비스 매뉴얼을 참조하여 숙지하지 않은 이상 해당 장비를 수리하려고 시도하지 마십시오. • 본 경고 사항에 유의하지 않으면 전기 쇼크, 기계적 위험, 또는 기타 위험으로 인해 서비스 제공자, 사용자 또는 환자에게 부상을 입힐 수 있습니다.
BRĪDINĀJUMS (LV)	Šī apkopes rokasgrāmata ir pieejama tikai angļu valodā. • Ja klienta apkopes sniedzējam nepieciešama informācija citā valodā, klienta pienākums ir nodrošināt tulkojumu. • Neveiciet aprīkojuma apkopi bez apkopes rokasgrāmatas izlasīšanas un saprašanas. • Šī brīdinājuma neievērošanas rezultātā var rasties elektriskās strāvas trieciena, mehānisku vai citu faktoru izraisītu traumu risks apkopes sniedzējam, operatoram vai pacientam.

ĮSPĖJIMAS (LT)	Šis eksploatavimo vadovas yra tik anglų kalba. • Jei kliento paslaugų tiekėjas reikalauja vadovo kita kalba – ne anglų, suteikti vertimo paslaugas privalo klientas. • Nemėginkite atlikti įrangos techninės priežiūros, jei neperskaitėte ar nesupratote šio eksploatavimo vadovo. • Jei nepaisysite šio įspėjimo, galimi paslaugų tiekėjo, operatoriaus ar paciento sužalojimai dėl elektros šoko, mechaninių ar kitų pavojų.
ADVARSEL (NO)	Denne servicehåndboken finnes bare på engelsk. • Hvis kundens serviceleverandør har bruk for et annet språk, er det kundens ansvar å sørge for oversettelse. • Ikke forsøk å reparere utstyret uten at denne servicehåndboken er lest og forstått. • Manglende hensyn til denne advarselen kan føre til at serviceleverandøren, operatøren eller pasienten skades på grunn av elektrisk støt, mekaniske eller andre farer.
OSTRZEŻENIE (PL)	Niniejszy podręcznik serwisowy dostępny jest jedynie w języku angielskim. • Jeśli serwisant klienta wymaga języka innego niż angielski, zapewnienie usługi tłumaczenia jest obowiązkiem klienta. • Nie próbować serwisować urządzenia bez zapoznania się z niniejszym podręcznikiem serwisowym i zrozumienia go. • Niezastosowanie się do tego ostrzeżenia może doprowadzić do obrażeń serwisanta, operatora lub pacjenta w wyniku porażenia prądem elektrycznym, zagrożenia mechanicznego bądź innego.
ATENÇÃO (PT-BR)	Este manual de assistência técnica encontra-se disponível unicamente em inglês. • Se outro serviço de assistência técnica solicitar a tradução deste manual, caberá ao cliente fornecer os serviços de tradução. • Não tente reparar o equipamento sem ter consultado e compreendido este manual de assistência técnica. • A não observância deste aviso pode ocasionar ferimentos no técnico, operador ou paciente decorrentes de choques elétricos, mecânicos ou outros.
ATENÇÃO (PT-PT)	Este manual de assistência técnica só se encontra disponível em inglês. • Se qualquer outro serviço de assistência técnica solicitar este manual noutro idioma, é da responsabilidade do cliente fornecer os serviços de tradução. • Não tente reparar o equipamento sem ter consultado e compreendido este manual de assistência técnica. • O não cumprimento deste aviso pode colocar em perigo a segurança do técnico, do operador ou do paciente devido a choques eléctricos, mecânicos ou outros.
ATENŢIE (RO)	Acest manual de service este disponibil doar în limba engleză. • Dacă un furnizor de servicii pentru clienţi necesită o altă limbă decât cea engleză, este de datoria clientului să furnizeze o traducere. • Nu încercaţi să reparaţi echipamentul decât ulterior consultării şi înţelegerii acestui manual de service. • Ignorarea acestui avertisment ar putea duce la rănirea depanatorului, operatorului sau pacientului în urma pericolelor de electrocutare, mecanice sau de altă natură.

ОСТОРОЖНО! (RU)	Данное руководство по техническому обслуживанию представлено только на английском языке. • Если сервисному персоналу клиента необходимо руководство не на английском, а на каком-то другом языке, клиенту следует самостоятельно обеспечить перевод. • Перед техническим обслуживанием оборудования обязательно обратитесь к данному руководству и поймите изложенные в нем сведения. • Несоблюдение требований данного предупреждения может привести к тому, что специалист по техобслуживанию, оператор или пациент получит удар электрическим током, механическую травму или другое повреждение.
UPOZORENJE (SR)	Ovo servisno uputstvo je dostupno samo na engleskom jeziku. • Ako klijentov serviser zahteva neki drugi jezik, klijent je dužan da obezbedi prevodilačke usluge. • Ne pokušavajte da opravite uređaj ako niste pročitali i razumeli ovo servisno uputstvo. • Zanemarivanje ovog upozorenja može dovesti do povređivanja servisera, rukovaoca ili pacijenta usled strujnog udara ili mehaničkih i drugih opasnosti.
UPOZORNE-NIE (SK)	Tento návod na obsluhu je k dispozícii len v angličtine. • Ak zákazníkov poskytovateľ služieb vyžaduje iný jazyk ako angličtinu, poskytnutie prekladateľských služieb je zodpovednosťou zákazníka. • Nepokúšajte sa o obsluhu zariadenia, kým si neprečítate návod na obluhu a neporozumiete mu. • Zanedbanie tohto upozornenia môže spôsobiť zranenie poskytovateľa služieb, obsluhujúcej osoby alebo pacienta elektrickým prúdom, mechanické alebo iné ohrozenie.
ATENCION (ES)	Este manual de servicio sólo existe en inglés. • Si el encargado de mantenimiento de un cliente necesita un idioma que no sea el inglés, el cliente deberá encargarse de la traducción del manual. • No se deberá dar servicio técnico al equipo, sin haber consultado y comprendido este manual de servicio. • La no observancia del presente aviso puede dar lugar a que el proveedor de servicios, el operador o el paciente sufran lesiones provocadas por causas eléctricas, mecánicas o de otra naturaleza.
VARNING (SV)	Den här servicehandboken finns bara tillgänglig på engelska. • Om en kunds servicetekniker har behov av ett annat språk än engelska, ansvarar kunden för att tillhandahålla översättningstjänster. • Försök inte utföra service på utrustningen om du inte har läst och förstår den här servicehandboken. • Om du inte tar hänsyn till den här varningen kan det resultera i skador på serviceteknikern, operatören eller patienten till följd av elektriska stötar, mekaniska faror eller andra faror.
OPOZORILO (SL)	Ta servisni priročnik je na voljo samo v angleškem jeziku. • Če ponudnik storitve stranke potrebuje priročnik v drugem jeziku, mora stranka zagotoviti prevod. • Ne poskušajte servisirati opreme, če tega priročnika niste v celoti prebrali in razumeli. • Če tega opozorila ne upoštevate, se lahko zaradi električnega udara, mehanskih ali drugih nevarnosti poškoduje ponudnik storitev, operater ali bolnik.
DİKKAT (TR)	Bu servis kılavuzunun sadece ingilizcesi mevcuttur. • Eğer müşteri teknisyeni bu kılavuzu ingilizce dışında bir başka lisandan talep ederse, bunu tercüme ettirmek müşteriye düşer. • Servis kılavuzunu okuyup anlamadan ekipmanlara müdahale etmeyiniz. • Bu uyarıya uyulmaması, elektrik, mekanik veya diğer tehlikelerden dolayı teknisyen, operatör veya hastanın yaralanmasına yol açabilir.

ЗАСТЕРЕЖЕННЯ (UK)	Даний посібник з експлуатації доступний тільки англійською мовою. • Якщо постачальник послуг клієнта спілкується іноземною мовою, тоді клієнт зобов'язаний забезпечити переклад. • Заборонено проводити огляд обладнання без попереднього звертання до даного посібника з експлуатації і розуміння інформації, поданої у ньому. • Недотримання цього застереження може завдати шкоди здоров’ю постачальника послуг, оператора або пацієнта через ураження електричним струмом, механічну травму або інше ушкодження.

Revision history

Revision	Date	Reason for change
1	2023-5-6	Initial release.
2	2023-6-7	Manufacturer release.
3	2023-7-6	Software updates.
4	2023-11-13	Design transfer.
5	2023-12-18	Update configuration.
6	2024-8-6	Software updates.

Contents

1 About this manual

1.1 Intended use of this manual

This manual contains instructions necessary to install, maintain and service the device to the assembly level. It gives an overview of the patient monitoring system and contains information needed for system installation. Information for the planned and corrective maintenance of the device is also provided.

Use the manual as a guide for installation, maintenance and repairs considered field repairable. Where necessary the manual identifies additional sources of relevant information and technical assistance.

See the user's manual for the technical specifications, default settings and compatibility information, including electromagnetic compatibility.

See the user’s manual for the instructions necessary to operate the device safely in accordance with its function and intended use.

As the monitor configuration may vary, some menus, displays and functions described may not be available in the monitor you are using.

1.2 Intended audience of this manual

This manual is intended for service representatives and technical personnel who install, maintain, troubleshoot, or repair this device.

1.3 Manual conventions

This manual uses the following styles to emphasize text or indicate action.

Item	Description
`Courier`	Indicates hardware terms.
bold	Indicates software terms.
italic	Indicates terms for emphasis.
select	The word select means choosing and confirming.
supplemental information	Indicates information that appears in the supplements provided.
NOTE	Note statements provide application tips or other useful information.

1.4 Naming conventions

In this manual, the following naming conventions are used:

- Portrait^{TM} HUBXB, Mobile Patient Monitor Hardware: Hub
- Portrait^{TM} HSWXB, Mobile Patient Monitor Software: Hub

1.5 Illustrations and names

This manual uses illustrations as examples only. Illustrations in this manual may not necessarily reflect all system settings, features, configurations, or displayed data.

Names of persons, institutions, and places and related information are fictitious; any similarity to actual persons, entities, or places is purely coincidental.

1.6 Related documents

- Portrait™ VSM Vital Signs Monitor User's Manual
- Supplies and Accessories
- Portrait Network Infrastructure - Enterprise Configuration Guide
- HL7 Reference Manual
- Privacy and Security Manual
- B1X5-REC Recorder Instruction for Use
- B1X5-REC Recorder Service Manual
- Portrait™ Mobile Monitoring Solution User Manual
- Wireless LAN Network Configuration Guide

1.7 Ordering manuals

Paper copies of the medical device IFU will be provided within 7 days of receiving the request, at no additional cost. Contact your local GE HealthCare representative and request the part number on the first page of the eIFU.

1.8 Accessing manuals online

To obtain the latest version of the manual:

1. Go to https://www.gehealthcare.com/documentationlibrary.
2. Enter the Customer Documentation Portal.
3. Select **Modality** > **Monitoring Solutions (MS)**.
4. Select **Products** > the products you want to search.

   You may also select the **Document Type** and **Language** to narrow down the search.
5. Launch the search.
6. Identify and download the manual.

The manuals are in PDF format. Make sure that your viewing device (for instance, computer) has software to open the PDF files (for instance, Adobe® Acrobat® Reader).

Security related documents can be downloaded from https://securityupdate.gehealthcare.com.

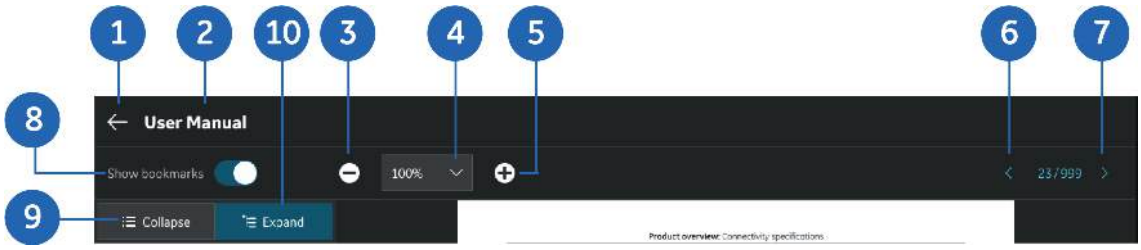
1.9 Accessing manuals on monitor

To access manuals on monitor:

1. Press the `On/Off` button (more than 3 seconds) to turn on the monitor.
2. Select the **Configurations** > **E-Manual** tab.
3. Select **View** for the relevant manual.

1.9.1 Using E-manuals on monitor

The E-manual can be navigated from the top of the menu.



1.	←	Return to the **E-Manual** menu.
2.	User Manual (**User manual**)	Title of the selected manual
3.	⊖	Zoom out
4.	∨	Select the key to open the list of all display scales.
5.	⊕	Zoom in
6.	<	Turn to previous page
7.	>	Turn to next page
8.	Show bookmarks (**Show bookmarks**)	Select or to display or hide bookmarks.
9.	Collapse (**Collapse**)	Collapse bookmark
10.	Expand (**Expand**)	Expand bookmark

1. Swipe down and up to scroll the page.
2. Select ⊖ or ⊕ or ∨ to set the scale.
3. Select < or > to turn pages.
4. Select **Show bookmarks** or to display or hide the bookmark on the left.
5. Select to collapse bookmark.
6. Select to expand bookmark.

1.10 Trademarks

Portrait and Round Advisor are trademarks of GE HealthCare.

GE and GE Monogram are trademarks of General Electric Company used under trademark license.

DINAMAP is trademark of General Electric Company or one of its subsidiaries used under trademark license.

1.10.1 Third party trademarks

Masimo and SET are trademarks of Masimo Corporation.

Covidien, Nellcor and OxiMax are trademarks of Medtronic.

HL7 is a registered trademark of Health Level Seven (HL7), Inc.

Welch Allyn and SureTemp Plus are trademarks of Welch Allyn, Inc.

Exergen and TAT-5000S-USB are trademarks of Exergen Corporation.

HeTaida is the trademark of HeTaida Technology Company.

All other third-party trademarks are the property of their respective owners.

1.11 Manufacturer responsibility

GE HealthCare is responsible for the effects on safety, reliability, and performance of the equipment only if:

- Assembly operations, extensions, readjustments, modifications, servicing, or repairs are carried out by authorized service personnel.
- The electrical installation of the relevant room complies with the requirements of the appropriate regulations.
- The equipment is used in accordance with the instructions for use.

1.12 Product availability

NOTE
Due to continual product innovation and design, specifications for these products are subject to change without notice.

Some of the products mentioned in this manual may not be available in all countries. Please consult your local representative about availability.

2 Safety

2.1 Safety message signal words

Safety message signal words designate the severity of a potential hazard.

DANGER

Indicates a hazardous situation that, if not avoided, will result in death or serious injury.

WARNING

Indicates a hazardous situation that, if not avoided, could result in death or serious injury.

CAUTION

Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

NOTICE

Indicates a hazardous situation not related to personal injury that, if not avoided, could result in property damage.

2.2 System safety

WARNING

Do not perform any service activities on the device in the patient vicinity while a patient is being connected to the device.

WARNING

EXPLOSION HAZARD.

Do not incinerate a battery or store at high temperatures. Serious injury or death could result.

CAUTION

DISPOSAL.

At the end of its service life, the product described in this manual, as well as its accessories, must be disposed of in compliance with the guidelines regulating the disposal of each product. If you have any questions concerning disposal of a product, please contact GE HealthCare or its representatives.

For a complete list of system safety messages that apply to the entire system, refer to the user manual. For safety messages specific to parts of the system or to a certain installation or service task, refer to the relevant sections.

2.3 ESD precautionary procedure training

It is recommended that all potential users receive an explanation of the ESD warning symbol and training in ESD precautionary procedures.

The minimum contents of an ESD precautionary procedure training should include an introduction to the physics of electrostatic charge, the voltage levels that can occur in normal practice and the damage that can be done to electronic components if they are touched by an operator who is electrostatically charged. Further, an explanation should be given of methods to prevent build-up of electrostatic charge and how and why to discharge one’s body to earth or to the frame of the equipment or bond oneself by means of a wrist strap to the equipment or the earth prior to making a connection.

2.4 Service requirements

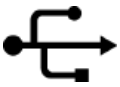
Follow the service requirements listed below.

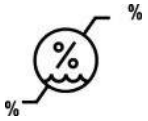
- Refer servicing of the equipment to qualified service personnel only. Service personnel servicing this product must have an appropriate technical qualification, or equivalent work experience, and be familiar with the service requirements described in this manual and in any related service documentation. Service training for the product is recommended.
- Any unauthorized attempt to repair equipment under warranty voids that warranty.
- It is the user's responsibility to report the need for service to GE HealthCare or to one of their authorized agents.
- Failure on the part of the responsible individual, hospital, or institution using this equipment to implement a satisfactory maintenance schedule may cause undue equipment failure and possible health hazards.
- Regular maintenance, irrespective of usage, is essential to ensure that the equipment will always be functional when required.

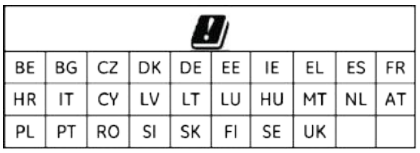
2.5 Equipment symbols

For user interface keys and symbols, please refer to "Monitoring basics" chapter.

	General warning sign.

	Caution. Highlights the fact that there are specific warnings or precautions associated with the device.
	Follow instructions for use.
 eIFU indicator	Consult electronic instructions for use.
	Electrostatic sensitive device. Connections should not be made to this device unless ESD precautionary procedures are followed.
	Non-ionizing electromagnetic radiation. Interference may occur in the vicinity of this device.
	Type BF (IEC 60601-1) defibrillator-proof protection against electric shock. Isolated (floating) applied part suitable for intentional external and internal application to the patient, excluding direct cardiac application.
	Type CF (IEC 60601-1) defibrillator-proof protection against electric shock. Isolated (floating) applied part suitable for intentional external and internal application to the patient including direct cardiac application.
	Power On/ Off key.
	On the front cover: power indicator. On the back cover: alternating current.
	On the front cover: battery indicator.
	Equipotentiality. Connect device to a potential equalization conductor.
X1	Recorder connector.
X4	Nurse call connector.
	USB connector.
	Ethernet connector.

HDMI	HDMI connector.
IP22	Degree of ingress protection (on monitor).
	Date of manufacture, and Country of manufacture. The first four digits identify the year, the following two digits identify the month, and the last two digits identify the day. The alpha-3 characters in the center identify the country code.
	Manufacturer name and address.
REF	Catalog or orderable part number.
SN	Device serial number.
#	Device model number or type number.
UDI	Every device has a unique marking for identification. The UDI marking appears on the device label.
	Atmospheric pressure limitations.
	Temperature limitations.
	Humidity limitations.
	Keep dry. Protect from rain.
	Fragile. Handle with care.
	This way up.

	This symbol indicates that the waste of electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of your equipment. The separate collection symbol is affixed to a battery, or its packaging, to advise you that the battery must be recycled or disposed of in accordance with local or country laws. To minimize potential effects on the environment and human health, it is important that all marked batteries that you remove from the product are properly recycled or disposed of. For information on how the battery may be safely removed from the device, please consult the service manual or equipment instructions.
	Recycled materials or may be recycled.
	Recyclable lithium-ion.
Rx Only U.S.	Prescriptive Device. USA only. For sale by or on the order of a Physician.
ANATEL	Brazil only. Approved under ANATEL (Agência Nacional de Telecomunicações) requirements.
CMIIT ID	China only. China Ministry of Industry and Information Technology identification number for Radio Transmission Equipment Type Approval.
	Australia and New Zealand only. Regulatory Compliance Mark (RCM). Indicates compliance with electrical safety, EMC, electromagnetic energy, and telecommunications requirements applicable to each product.
	This product is restricted to indoor use. Restricted Member States as below: Belgium (BE), Bulgaria (BG), Czech Republic (CZ), Denmark (DK), Germany (DE), Estonia (EE), Ireland (IE), Greece (EL), Spain (ES), France (FR), Croatia (HR), Italy (IT), Cyprus (CY), Latvia (LV), Lithuania (LT), Luxembourg (LU), Hungary (HU), Malta (MT), Netherlands (NL), Austria (AT), Poland (PL), Portugal (PT), Romania (RO), Slovenia (SI), Slovakia (SK), Finland (FI), Sweden (SE) and United Kingdom (UK).
	Korea only. Approved under KCC (Korea Communications Commission) requirements. This device has been evaluated to use in a business environment, and there is a risk of radio interference if used in a home environment.
	Philippines only. The product complies with the NTC (National Telecommunications Commission) requirements.
	Malaysia only. Malaysian Communication and Multimedia Commission (MCMC) certification mark.

ICASA	South Africa only. Approved under ICASA (Independent Communications Authority of South Africa) requirements.
Segurança Compulsório INMETRO	Brazil only. INMETRO certificate.
MR	MR Unsafe. Indicates that the device is not intended for use in an MR environment.
MD	This product is a medical device.
	Indicates medical USB.
NIBP	Indicates NIBP connector.
SpO_2	Indicates SpO_2 connector.
Temp	Indicates temperature connector.

2.6 Unique Device Identifier (UDI)

	Unique Device Identifier. (UDI) Every medical device has a unique marking for identification. The UDI marking appears on the device labeling. Note that this is only an example of a UDI marking. The device may have a DataMatrix code as in this example, or a linear bar-code, or only alphanumeric identifiers with no barcode. Identifiers also vary per product.

The characters used in the UDI marking represent specific identifiers. In the example above:

Device identifier:

- (01) = GS1 global trade item number (GTIN) of the device.
- 01234567123456 = Global trade item number.

Production identifiers:

- (21) = GS1 application identifier for the serial number of the device.
- XYZ12345678XY = Serial number.
- (11) = GS1 application identifier for the manufacturing date of the device.
- 180718 = Manufacturing date: year-month-day (YYMMDD).

Note that for some product types, the production identifier can have other elements instead of the ones listed above:

- (10) = GS1 application identifier for the batch or lot number, followed by the batch or lot number.
- (17) = GS1 application identifier for the expiration date of the device, followed by the expiration date.

3 Using advanced interface

3.1 Using advanced interface

This chapter introduces the following advanced interface:

- Advanced menu on monitor

3.1.1 Advanced menu on monitor

The advanced menu on monitor covers two levels of configurations: **Clinical** and **Service**.

Figure 3-1 Advanced settings - Clinical

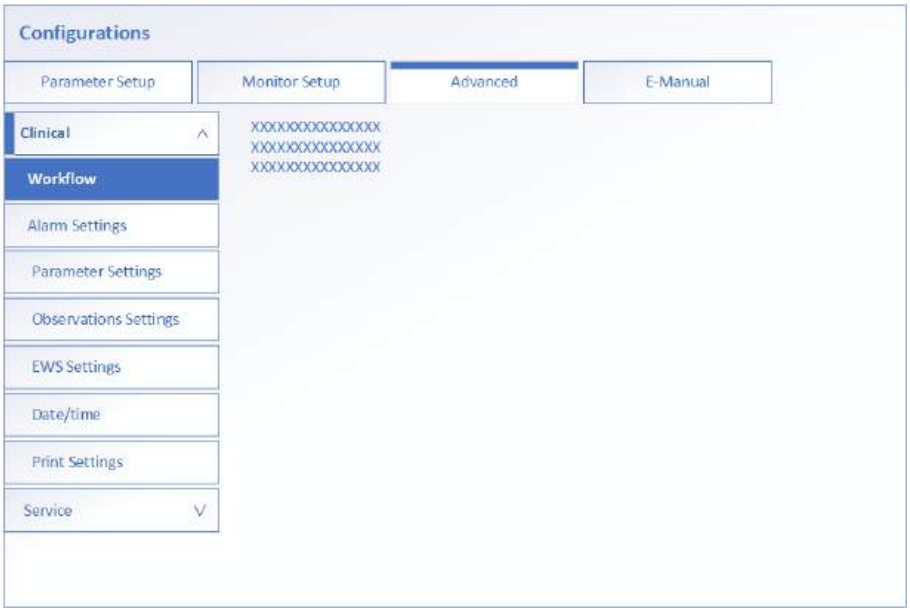
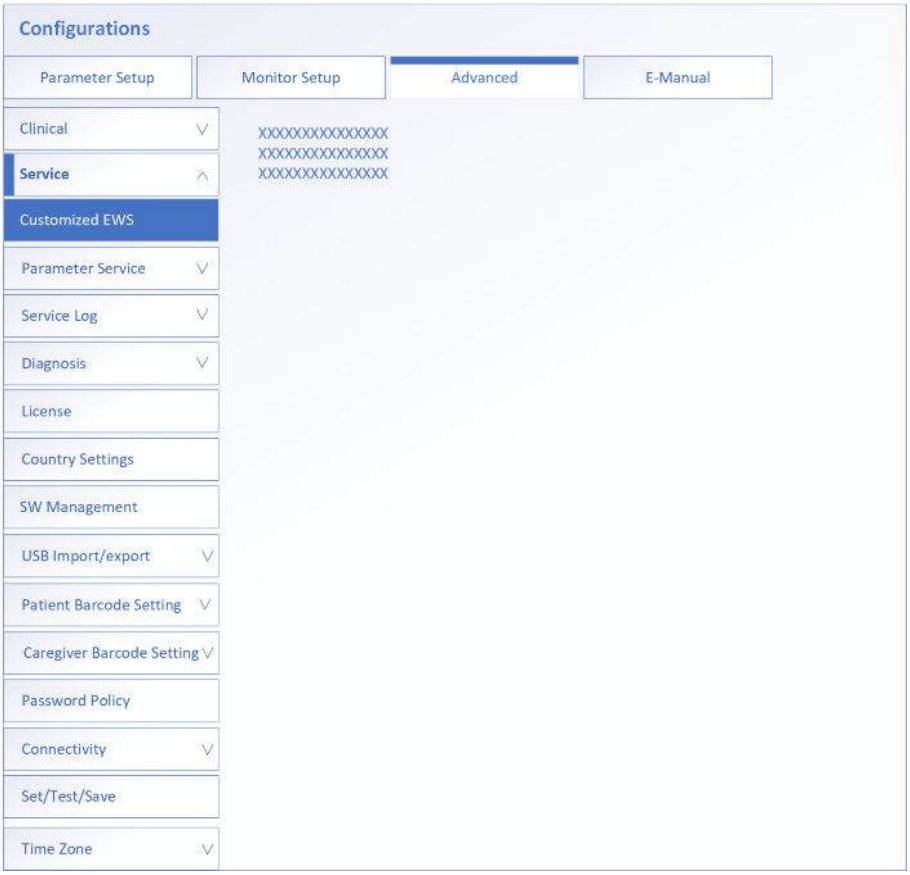


Figure 3-2 Advanced settings - Service



NOTE
The pictures in this chapter are for reference only. Details on the menu page can vary depending on the software version and the configuration of your device.

To access the advanced menu, select the **Configurations**> **Advanced** > select **Username**: **clinical** or **service** and enter **Password** > select **Login**.

NOTE
The advanced clinical settings are available to the username identity of both clinical and service. But the service settings can only be accessed by the service identity.

For more information on passwords, please refer to "Password management" in "Configuration" chapter.

3.2 Advanced settings - Clinical

3.2.1 Workflow settings

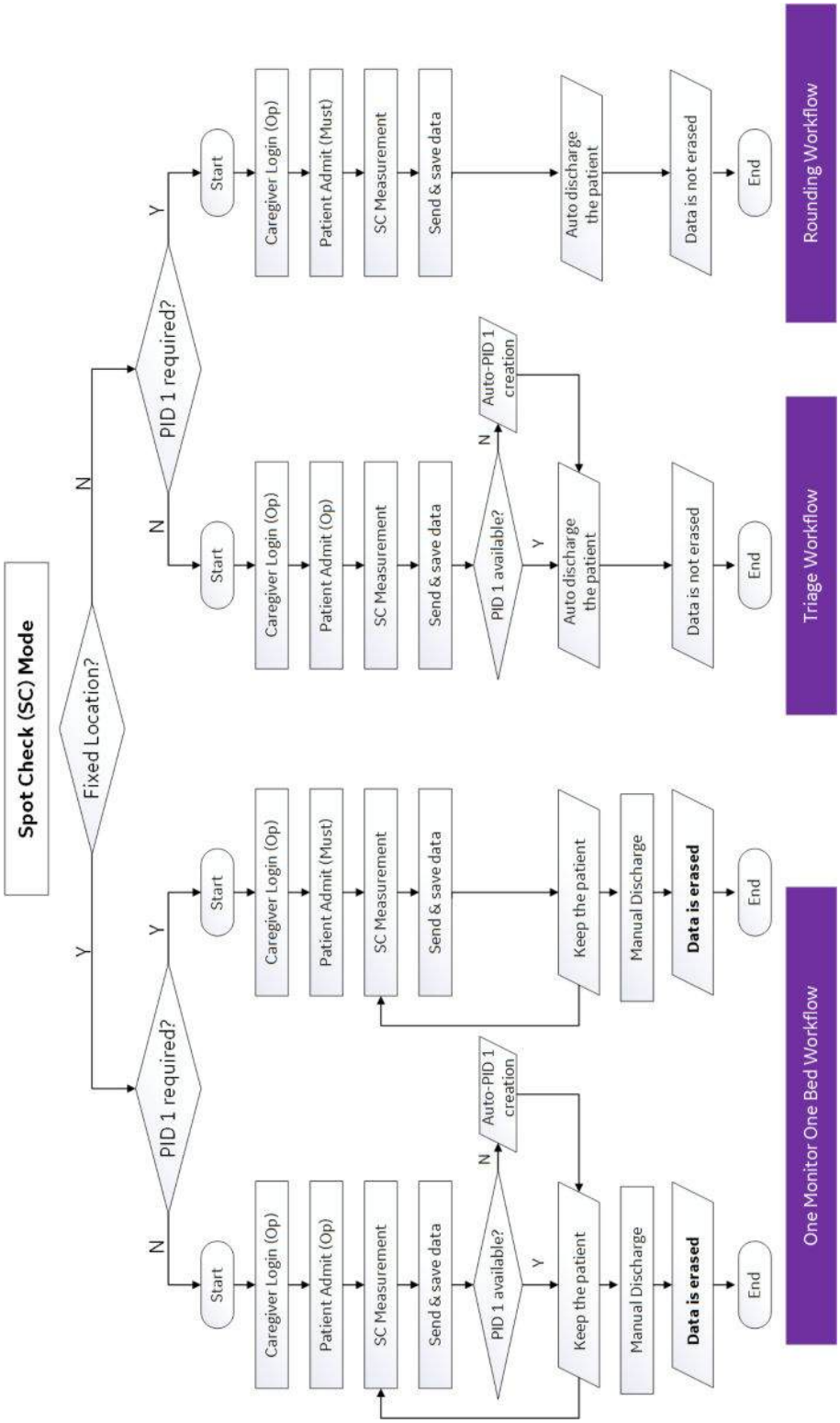
Select the **Configurations** > **Advanced** > **Clinical** > **Workflow**.

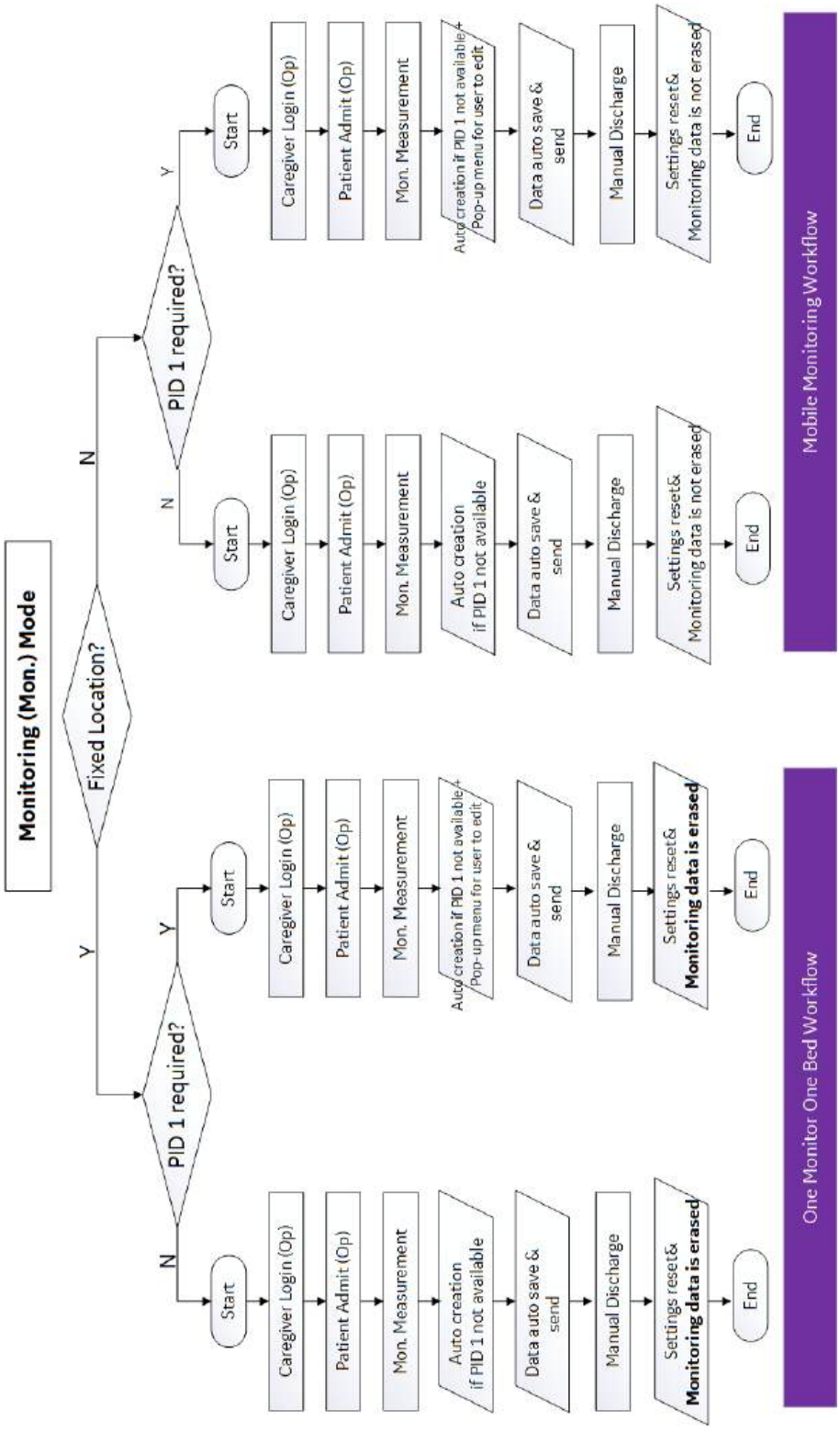
Setting	Description	Default value
Default patient type	Select the default type for a new patient.	**Adult / Pediatric**

Setting	Description	Default value
PID 1	Select the type for primary PID.	**Patient ID**
PID 1 required	Set if the primary PID is mandatory to enter.	Enabled
PID 2	Select the type for secondary PID.	None
Mandatory fields for caregiver login	Select mandatory fields that caregiver should fill in before login.	**ID**
Caregiver info display	Select what caregiver information to display.	**Name**
Caregiver auto logout after	Select the time period for caregiver to logout automatically.	**OFF**
Patient name display	Display or hide the patient name.	**Name**
Measurement expiration time	Select the expiration display time for NIBP, Temp, RR values measured values, and the imported paramerer data from the Hub through QR code scanning.	**15 min**
Standby after	Select the time period for the device to enter standby automatically.	**15 min**
Confirm report before send / save (Spot Check)	Display or hide **Report** menu when click on the **Send** / **Save** key in Spot Check mode.	Disabled
Print when send / save (Spot Check)	Enable or disable auto printing when click on the **Send** / **Save** key in Spot Check mode.	Disabled
Location		
Patient status	Display current patient status: Discharged or Admitted.	N/A
Fixed	Set if the device is placed on a fixed location. The toggle is enabled only when no patient is admitted. When the toggle is enabled, the **Round Advisor** feature will not work. For more information about **Round Advisor**, see the User's manual.	Disabled
Location	Enter the location (for example, bed name) of the device. The field is enabled only when **Fixed** is enabled.	N/A
Patient data auto saving in Monitoring mode		
Interval	Select the time interval for patient data auto saving in Monitoring mode.	**5 min**
On NIBP completion	Enable or disable patient data auto saving when complete an NIBP measurement in Monitoring mode.	Enabled
On Temp completion	Enable or disable patient data auto saving when complete a temperature measurement in Monitoring mode.	Enabled
Auto send saved monitoring data to EMR	Enable or disable saved monitoring data auto sending to EMR in Monitoring mode. Display only when **Protocol** in **EMR Outbound** is not set to **None**. For more information, see 6.4.6 Configuring EMR outbound on page 62.	Disabled

These settings will affect the workflow on this device for patient monitoring. Check with clincial users first before setup.

The following graphics explain the different workflows caused by settings of **PID 1 required** and location **Fixed**.





3.2.2 Alarm settings

Select the **Configurations** > **Advanced** > **Clinical** > **Alarm Settings**.

Setting	Description	Default value
Minimum alarm volume settings		
Alarm volume control	Select the policy for alarm volume control. • Common for all: the same volume for high, medium and low priorities alarms • Separate for low: a separate volume for low priority alarms	**Common for all**
High, medium & low priority alarm volume	Display when you select "Common for all". Select the minimum audible alarm volume for high, medium and low priorities alarms.	**5**
High & medium priority alarm volume	Display when you select "Separate for low". Select the minimum audible alarm volume for high & medium priorities alarms.	**5**
Low priority alarm volume	Display when you select "Separate for low". Select the minimum audible alarm volume for low priority alarms.	**5**
Other alarm audio settings		
Audio off allowed	Select whether to allow silence all alarms function.	Disabled
Reminder volume	Select the reminder audible volume.	**5**
Alarm tones	Select the alarm tone patterns. The choices are IEC, ISO, General and ISO2.	**ISO2**
Low priority alarm tone	Select the audible alarm tone sound (Single / Repeat) for low priority alarms.	**Single**
Allowed alarm priorities settings		
NIBP high/low	Select the allowed priorities settings for this alarm.	**High, medium**
SpO2 low		**Escalating, high, medium**
SpO2 probe off		**Escalating, high**
PR high		**Escalating, high, medium**
PR low		**Escalating, high, medium**
Other settings		
Latching alarms	Enable or disable to keep the below alarm indicators even if initial alarm condition goes away. • alarm messages on MF (message field) of the screen • alarm light • A alarm reminder beep shall be sounded every 10 seconds.	Disabled
Nurse call	Select the nurse call system electrical level in the hospital. The choices are: • Normal open: high electrical level export from the nurse call connector when there is medium or high priority alarm. • Normal close: low electrical level export from the nurse call connector when there is medium or high priority alarm.	**Normal open**

3.2.3 Parameter settings

Select the **Configurations** > **Advanced** > **Clinical** > **Parameter Settings**.

NOTE
The **Height**, **Weight** or **Beside glucose** unit displays on the screen only when they are enabled in the **Advanced** > **Clinical** > **Observations** menu first.

Setting	Default value
Units	
Height	**cm**
Weight	**kg**
Blood pressure	**mmHg**
Temp	**°C**
Beside glucose	**mmol/L**
Colors	
NIBP	Red
SpO2	Light cyan
Temp	White
RR	Yellow

3.2.4 Observations settings

Select the **Configurations** > **Advanced** > **Clinical** > **Observations Settings**.

Setting	Description	Default value
Observations name	Display the observation name.	N/A
Type	Display the type of each observation. The choices are List, Numerical and Free text.	N/A
Unit	Display the unit of each numerical observation. **NOTE** To change the unit of **Height**, **Weight** or **Beside glucose** in the **Parameter Settings** menu, enable the numerical observation in the **Observations Settings** menu first.	N/A
In use	Select to enable one observation. The device supports up to 10 observations to be used.	N/A (if the device has no EWS license) Enabled for **Air or oxygen?**, **Consciousness** and **Hourly urine** (if the device has EWS license)

Setting	Description	Default value
Details	Select the **View** button to check the details of one observation, including parameter type, unit, range, precision or list options depending on the observation's type.	N/A

3.2.5 EWS settings

Select the **Configurations** > **Advanced** > **Clinical** > **EWS Settings**.

NOTE
The **EWS Settings** menu displays only when the device has the EWS license.

Setting	Description	Default value
EWS name	Display the EWS protocol name.	N/A
Parameters	Display the parameters that each EWS is made of.	N/A
In use	Select to enable one EWS protocol.	Enabled for NEWS2
Details	Select the **View** button to check the details of one EWS, including the scoring rule, total score and clinical response.	N/A

3.2.6 Date/time settings

Select the **Configurations** > **Advanced** > **Clinical** > **Date/time**.

Setting	Description	Default value
Current time	Displays the current time on the device.	N/A
24-hour format	Select if enable 24-hour format. If disabled, the device is 12-hour format.	Enabled
Date	Select the date from calendar.	N/A
Time		
Hour	Set the current hour with plus/minus spinner.	N/A
Minutes	Set the current minutes with plus/minus spinner.	N/A

3.2.7 Print Settings

Select the **Configurations** > **Advanced** > **Clinical** > **Print Settings**.

Setting	Description	Default value
Print patient name	Select if enable patient name to be printed.	Enabled
Print caregiver info	Select if enable caregiver information to be printed.	Enabled

3.3 Advanced settings - Service

The service settings generally include configuration, calibration and maintenance, software and firmware installation, diagnosis and service log, etc. For more information about the service settings, please see related chapters in this manual.

4 Pre-installation requirements

4.1 Unpacking

CAUTION

PACKAGING DISPOSAL.

Dispose of the packaging material, observing the applicable waste control regulations.

1. Confirm that the packing box is undamaged. If the box is damaged, contact the shipper.
2. Open the top of the box and carefully unpack all components.
3. Confirm that all components are undamaged. If any of the components is damaged, contact the shipper.
4. Confirm that all components are included. If any of the components is missing, contact your GE HealthCare distributor.

4.2 Pre-installation checklist

Before you start installing a monitor ensure the following:

- All the system components are compatible.
- The wired and wireless network infrastructure is properly installed, configured and tested.
- Mounting solutions are properly installed.
- The installation site meets power and environmental requirements.
- Get the completed Advanced Clinical Settings Worksheet and EWS Worksheets from clinicians, if required.

4.3 Checking the compatibility of all system components

WARNING

BEFORE INSTALLATION.

Compatibility is critical to safe and effective use of this device. Verify the compatibility of all system components and device interfaces, including hardware and software versions, prior to installation and use.

Check the compatibility of all the system components before installing the monitor.

1. Refer to Supplies and accessories, for compatible accessories, supplies and mountings.
2. Refer to User's manual, for compatible devices, including input-output devices, and network devices.

4.4 Important security information

Failure to appropriately implement Network Access Controls on the network and enable them on the monitors, and all security protections (as outlined in the Portrait Network Infrastructure - Enterprise Configuration Guide, and this manual) may result in risks to the functionality and performance of the monitors. As disclosed in the warning statements of these documents, this can impact patient monitoring data and functionality (for example, loss of monitoring), which could contribute to a delay in treatment or missed patient events, potentially leading to serious injury.

4.5 Network infrastructure

Ensure that an applicable network infrastructure is in place before the installation of a monitor.

Collect the network configuration information from the hospital IT or the related project documentation and installation files.

Refer to Connecting network section and Configuration chapter for the required information ready for network configurations.

4.6 Mounting solutions

GE HealthCare devices provide reliable mounting attachments to the mounts listed in the Supplies and accessories. Follow mount manufacturer instructions for installation and loading.

Ensure that all the needed mounting hardware is properly installed.

4.7 Power and environmental requirements

Check the patient monitor’s user's manual for power and environmental requirements.

4.7.1 Checking power requirements

Ensure that the installation site has hospital-grade grounded power outlets and power cords for all system components.

4.7.2 Checking environmental requirements

WARNING

INACCURATE RESULTS.

Do not use or store the equipment outside the specified temperature, humidity, or altitude ranges, or outside the specified performance range. Using or storing the equipment outside the specified operating environment or outside the specified performance range may cause inaccurate results.

WARNING

Environmental conditions may cause inaccurate readings and alarms, decreased perfusion, and or low signal strength of SpO_2:

Electromagnetic interference

Excessive ambient light

Electrical interference

Electrosurgery

Defibrillation - May cause inaccurate reading for a short amount of time.

Excessive patient/sensor motion. Artifact can simulate an SpO_2 reading, so that the device fails to sound an alarm. In order to ensure reliable patient monitoring, the proper application of the probe and the signal quality must be checked at regular intervals.

1. Install the monitor to a location that meets the specified environmental requirements of operating temperature, humidity and atmospheric pressure.
2. Place each device in a location with sufficient ventilation. Observe the ventilation openings of a device and make sure not to obstruct them.

4.7.3 EMC warnings

WARNING

EMC.

Other equipment may interfere with the system, even if that other equipment complies with CISPR emission requirements.

WARNING

ESD.

Pins of connectors identified with the ESD warning symbol should not be touched. Connections should not be made to these connectors unless electrostatic discharge (ESD) precautions are used.

WARNING

EQUIPMENT DAMAGE AND PATIENT SAFETY.

Do not use the device in high electromagnetic fields (for example, during magnetic resonance imaging).

WARNING

EMC.

Magnetic and electrical fields are capable of interfering with the proper performance of the device. For this reason make sure that all external devices operated in the vicinity of the monitor comply with the relevant EMC requirements. X-ray equipment or MRI devices are a possible source of interference as they may emit higher levels of electromagnetic radiation. Changes or modifications to this device/system not expressly approved by GE HealthCare may cause EMC issues with this or other equipment. This device/system is designed and tested to comply with applicable standards and regulations regarding EMC and needs to be installed and put into service according to the EMC information stated as follows: This device/system is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes. Mains power should be that of a typical commercial or hospital environment. Device is compliant to Class A.

WARNING

ERRONEOUS READINGS.

The device/system should not be used adjacent to, or stacked with, other equipment. Consult qualified personnel regarding device/system configuration.

WARNING

DEGRADED PERFORMANCE.

Do not use portable RF communications equipment (including peripherals such as antenna cables and external antennas) closer than 30 cm (12 inches) to any part of this device/system, including cables specified by the manufacturer. Otherwise, the performance of this device/system may degrade.

4.7.4 EMC cautions

CAUTION

DEGRADED PERFORMANCE.

Use of known RF sources, such as cell/portable phones, RFID, electronic article surveillance (EAS) systems, diathermy, or other radio frequency (RF) emitting equipment near the system may cause unexpected or adverse operation of this device/system. Consult qualified personnel regarding device/system configuration.

4.8 Advanced clinical settings and Customized EWS settings

Collect the Advanced Clinical Settings and Customized EWS configuration information from clinicians, or use the related worksheet delivered by GE clinical application team.

5 Hardware installation

5.1 Hardware installation

WARNING

PERSONAL INJURY.

To avoid personal injury to users or any other persons moving in the vicinity of the cables or tubing, route all cables and tubing in such a way that they do not present a tripping hazard.

WARNING

EXPLOSION.

Do not use this system in the presence of flammable anesthetics, vapors or liquids.

WARNING

After transferring or reinstalling the device, always check that it is properly connected and all parts are securely attached.

WARNING

If you accidentally drop the monitor, have it checked by authorized service personnel prior to clinical use.

WARNING

EXCESSIVE TOUCH CURRENT.

To avoid excessive patient leakage current, do not simultaneously touch the patient and the electrical connectors in the monitor, or within the module housing.

CAUTION

LOSS OF MONITORING.

Leave space for circulation of air to prevent the device from overheating. The manufacturer is not responsible for damage to device caused by improperly vented cabinets, improper or faulty power, or insufficient wall strength to support device mounted on such walls.

WARNING

Never install equipment above the patient.

5.2 Mounting the monitor

The device can be mounted on the roll stand or on an arm.

For the monitor, please install the mounting plate first to facilitate mounting options.

Refer to the Supplies and accessories for details of the compatible mountings for the patient monitor.

Figure 5-1 Samples of mounting

Install the monitor to the mounting hardware according to the instructions provided by mounting manufacturer.

Required tool for install mounting plate

- Insulated PH2 screwdriver.

5.2.1 Installing mounting plate to monitor

1. Remove 4 screws on the bottom of the monitor.

2. Put the mounting plate on the bottom of the monitor.

3. Install 4 screws with isolate bases, the torque should be 15kgf.cm +/-10%. The isolate bases are used for electrical isolation.

NOTE
Please use the long screws delivered with mounting plate, but not the original monitor's screws.

5.3 Mounting the recorder

The recorder can be mounted on the roll stand or the wall mounting. Follow the roll stand or wall mounting's user instruction for installation.

5.4 Connecting a display

NOTE
All installations must be compliant with IEC 60601-1 clause 16 and local electrical codes.

NOTE
Make sure that all cables are securely connected.

You can connect one secondary, clone display to the monitor.

1. Check the compatibility of the display.

   The resolution of the external display should be 1280*800.

2. Connect the display to the HDMI connector of monitor.
3. Refer to the display's user manual for more information about the display installation.

5.5 Connecting the B1X5-REC recorder

1. Using the recorder connector line, connect the recorder connector to **X1** on the right side of monitor.
2. When the monitor is powered on, make sure the power indicator on recorder is lit.

5.5.1 Inserting the B1X5-REC recorder

NOTE
It's recommended to mount the recorder on a roll stand, or a wall mount bracket through their insertion guides.

1. Align the recorder to the insertion guides.
2. Push down the recorder until it clicks.

5.5.2 Removing the recorder

NOTE
If the recorder is mounted on the roll stand, remove the top basket first, refer to the roll stand's instructions.

1. Disconnect the recorder connector line.
2. If necessary, pull the recorder upwards by the tab. Make sure not to drop it when it comes out.

5.6 Connecting to the mains power

1. Connect power cords to a wall outlet and to the mains power supply inlet on all system components that require AC mains power input.
2. Secure all power cords by routing through the retaining clips, as applicable.

NOTE
Before taking the monitor into use for the first time, the battery should be fully charged. Keep the monitor connected to the mains until the battery charge symbol disappears.

5.7 Connecting the RFID beacon

The RFID beacon is a small, coin cell beacons which to be affixed to the device for asset tracking. It has ultra-low RF transmit powers for increased locate accuracy and improved performance in high density deployments.

See the Supplies and accessories for part number to re-order.

1. Take off the adhesive sticker at the back of the RFID beacon.
2. Attach the RFID beacon to the back side of monitor.

5.8 Routing the cables

Route all cables and tubing properly to avoid personal injury to users or any other persons moving in the vicinity of the cables or tubing.

1. If necessary, use the Welch Allyn temperature holder for cable management.

NOTE
The temperature holder is available only when Welch Allyn temperature is ordered.

5.9 Connecting network

5.9.1 Network compatibility

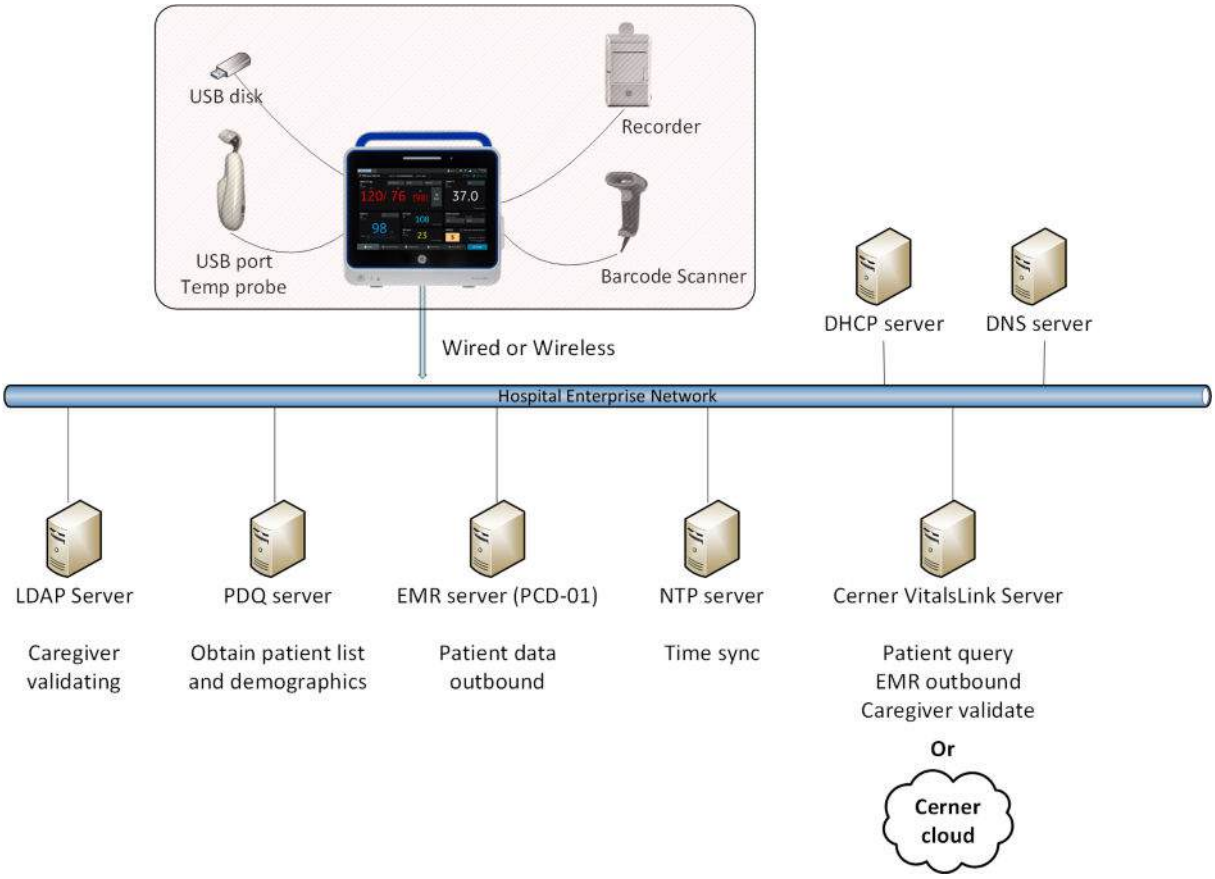
The monitor is capable of Hospital Information System (HIS) connectivity over a wired or wireless network.

The following connectivity options are available for using the monitor with an HIS.

Item	Version	Description
PDQ (Patient Demographics Query)	HL7 v2.5	The device queries patient demographics from server using the HL7 v2.5.
PCD-01	HL7 v2.6	The device sends patient data to server using the HL7 v2.6.
EMR Gateway Pro	V2	The device achieves the PDQ inbound and PCD-01 outbound using the EMR Gateway Pro.
LDAP (Lightweight Directory Access Protocol)	V3	The device validates caregiver identity from HIS using the LDAP.
Cerner iBus (traditional)	V6.5.3 and above	The device integrates with Cerner server using the Cerner iBus (traditional or cloud): • patient demographics query • caregiver authentication • outbound patient measurement data
Cerner iBus Cloud	No regulation	

5.9.2 Network diagram

Figure 5-2 Network architecture



- LDAP caregiver validation
- PDQ inbound patient demographics
- PCD-01 vital signs outbound
- NTP time synchronization
- Cerner Vitalslink

NOTE
Need LDAP, PDQ, PCD-01 and Cerner license.

5.9.3 Connecting to wired network

Tools needed: a network patch cable.

1. Connect the one RJ-45 connector to the network port on the patient monitor.
2. Connect the other RJ-45 connector to the corresponding port on the wall-box.
3. Turn on the monitor and setup the network configuration, if needed.
4. Check that the network symbol is displayed on the right corner of screen.

5.10 After hardware installation

After hardware installation, please:

- Configure the monitor: refer to Chapter: Configuration
- Perform installation checkout: refer to Chapter: Installation check

6 Configuration

6.1 Platform Configuration

The configuration of a monitor consists of platform configuration and clinical configuration.

This chapter describes:

- How to configure the platform ready to take the monitor into use for the first time.
- The configuration tasks need for administration and maintenance.

For information on how to perform the clinical configuration, refer to the monitor's User's Manual.

NOTE
For details about how to set up the advanced clincial settings, see 3.2 Advanced settings - Clinical on page 27.

Only the service users can access the **Configurations** > **Advanced** > **Service** menu.

6.2 Password management

6.2.1 Setup password at first time to use

When first time turn on the monitor, the password setup wizard will be displayed on the screen. You need to setup all the monitor's passwords, including clinical passwords and service passwords.

There are 2 ways to setup password: from USB disk to import setting file, or setup manually.

6.2.1.1 Import settings from USB at first time to use

The setting file can be exported from other monitor, refer to 6.9.3.1 Exporting settings on page 88.

1. Select **Import Settings From USB Disk** tab.
2. Select the related setting file from **Setting files** list.
3. Enter the decryption **Key for the file**.
4. Select **Activate & restart**.

The monitor's settings and password have been setup, and the monitor will restart.

6.2.1.2 Setup password manually

1. Select **Setup Password Manually** tab.
2. Enter and retype the passwords for **clinical** and **service**.

   The passwords are case sensitive. 8 characters at least.

3. If necessary, export password recovery key:

   The recovery key is used to reset password when you forget.

   NOTE
   Make sure the file system format of USB disk is FAT32.

   3.1. Insert USB disk to monitor.

   3.2. Select the checkbox **Export password recovery key to USB disk**.

4. Select **Activate & restart**.

The passwords have been set up, and the monitor will restart.

6.2.2 Changing passwords

NOTE
User name and password are case sensitive. You can view and change **Password Policy**.

1. Select the **Configurations** > **Advanced** tab.
2. Select **Change password?**.
3. Select **clinical** or **service** from the **Username** list.
4. Enter the old password.
5. Enter and retype the new passwords.
6. If necessary, export password recovery key:

   The recovery key is used to reset password when you forget.

   NOTE
   Make sure the file system format of USB disk is FAT32.

   6.1. Insert USB disk to monitor.

   6.2. Select the checkbox **Export password recovery key to USB disk**.

7. Select **Confirm**.

6.2.2.1 Setup the password policy

You can setup the password policy to enhance the security of the device.

1. Select the **Configurations** > **Advanced** > select **service** for **Username** and enter **Password**.
2. Select **Service** > **Password Policy**.
3. Setup the following items for **Basic policy**, if necessary.
   - **Password minimum length**: Configure minimum allowed password length.
   - **Uppercase letter minimum length**: Configure minimum number of uppercase letters (A ~ Z) in password.
   - **Lowercase letter minimum length**: Configure minimum number of lowercase letters (a ~ z) in password.
   - **Number minimum length**: Configure minimum number of numeric characters (0 ~ 9) in password.

- **Special characters minimum length**: Configure minimum number of special characters in password.

4. Select **Advanced policy** tab, select the check box and setup the following items, if necessary.
   - **Maximum repeating character length**: Configure maximum number of forbidden repeated characters in password.
   - **Maximum monotonic sequence length**: Configure maximum number of forbidden sequential characters in password.
   - **Save historical passwords**: Configure number of historical passwords be checked when set new password.
   - **Maximum error attempts**: Configure password lockout attempts. The user name will be locked after error attempts reach the setup time.
   - **Password expired duration(month)**: Configure password lifetime duration.

6.2.2.2 Password expired

After password is expired, if user tries to use old password to **Login**, the device will pop up the **Change Password** menu directly.

To change password is the necessary process. It is recommended you should change password immediately.

NOTE
If give up to change password, user still can return to the normal screen. But can't enter the **Advanced** menu.

6.2.2.3 Generate and export recovery key

You can generate and export the recovery key to USB disk. The recovery key is used to reset password when you forget.

NOTE
Make sure the file system format of USB disk is FAT32.

1. Insert the USB disk to monitor.
2. Select the checkbox **Export password recovery key to USB disk** when you change or reset the password.
3. Select **Confirm** or **Activate**.

The recovery key have been generated and exported to USB disk.

6.2.3 Reset passwords

You can reset the password if needed. There are two ways for resetting passwords:

- Via activation code, which contact GE HealthCare service to get
- Via recovery key, which saved in USB disk

6.2.3.1 Resetting password via activation code

1. Connect GE HealthCare service to get the Expiration Date and Activation Code.

2. Select the **Configurations** > **Advanced** tab.
3. Select **Reset password?**.
4. Select the radio button of **Option 1**.
5. Enter the **Expiration date** and **Activation code**.
6. Select **Confirm**.
7. Enter and retype the new passwords for **clinical** and **service**.
8. If necessary, select the **Password policy** key (at the right corner of screen) to view and adjust settings.
9. If necessary, export password recovery key:

   The recovery key is used to reset password when you forget.

   NOTE
   Make sure the file system format of USB disk is FAT32.

   9.1. Insert USB disk to monitor.

   9.2. Select the checkbox **Export password recovery key to USB disk**.
10. Select **Activate**.

6.2.3.2 Resetting password via recovery key in USB

If you have generated recovery key in USB before, you can use the recovery key to reset password.

1. Insert USB disk with recovery key files to the monitor.
2. Select the **Configurations** > **Advanced** tab.
3. Select **Reset password?**.
4. Select the radio button of **Option 2**.
5. Select **Confirm**.
6. Enter and retype the new passwords for **clinical** and **service**.
7. If necessary, select the **Password policy** key (at the right corner of screen) to view and adjust settings.
8. If necessary, export password recovery key:

   The recovery key is used to reset password when you forget.

   NOTE
   Make sure the file system format of USB disk is FAT32.

   8.1. Insert USB disk to monitor.

   8.2. Select the checkbox **Export password recovery key to USB disk**.
9. Select **Activate**.

6.3 Configuring advanced clinical settings

1. Confirm requirements with clinical users.

2. Select the **Configurations** > **Advanced** > **Clinical**.
3. The following are advanced clinical settings that are password protected. For details about the configuration menu and default settings, see 3.2 Advanced settings - Clinical on page 27
   - Workflow
   - Alarm settings: configure allowed alarm volume, priorities, latching alarms, nurse call and others.
   - Parameter settings: set up parameter units and colors.
   - EWS settings: view EWS details and select which EWS to be in use.
   - Observation settings: view observation details and select which observations to be in use.
   - Date and time
   - Print settings

When first time to use the monitor, it's mandatory to set up the date and time. For other advanced clinical settings, they have factory default values and the monitor can function properly without any changes. However, if you need to change, check with clinical users first and fill in the related worksheet if have.

6.3.1 Setting time and date

1. Select the **Configurations** > **Advanced** > **Clinical** > **Date/time**.
2. Enable or disable the **24-hour format**. If disable, the device is 12-hour format.
3. Set up following items, then select **Save**.
   - **Date**
   - **Hour**
   - **Minutes**

6.4 Configuring connectivity

Configure the applicable selections of the following table. All the required fields are followed by a red asterisk.

NOTE
The monitor only supports TLS V1.2 and V1.3 when configured with PDQ, LDAP, PCD-01 or Cerner.

Item	Reference
Wired network	6.4.1 Configuring wired network on page 52 6.4.2 Configuring LAN 802.1X on page 52
WLAN	6.4.3 Configuring wireless network via USB disk on page 54 6.4.4 Configuring wireless network settings on page 55
PDQ	PDQ configurations on page 60
PCD-01	PCD-01 configurations on page 63
LDAP	LDAP configurations on page 65

Item	Reference
Cerner iBus	iBus configurations - PDQ query on page 61 iBus configurations - EMR outbound on page 64 iBus configurations - Caregiver on page 68
Cerner iBus cloud	6.4.8 Configuring Cerner iBus cloud on page 69
Hospital EMR encoding	6.4.9 Configuring hospital EMR encoding on page 71
Cerner EMR encoding	6.4.10 Configuring Cerner EMR encoding on page 74
Certificate management	6.4.11.1 Generating the Client Certificate on page 78 6.4.11.2 Importing certificate to the monitor on page 79

6.4.1 Configuring wired network

1. Select the **Configurations** > **Advanced** > **Service** > **Connectivity**.
2. Select **Ethernet** tab.
3. Enable or disable the **DHCP**.

   If you set **Enable** for **DHCP**, the device will capture IP address and configuration information automatically.
4. If you set **Disable** for **DHCP**, setup the below items.
   4.1. Enter an **IP address**.
   4.2. Enter a valid **Subnet mask** level.
   4.3. Enter a valid **Default gateway**.
   4.4. Enter a valid **DNS** if required.
5. Select the applicable **Speed and duplex** option.
6. Select **Save**.

The network configurations will be saved and active when the patient monitor is restarted.

6.4.2 Configuring LAN 802.1X

If IEEE 802.1X port based authentication is in use for accessing network. Please consult hospital IT for the required information.

1. Select the **Configurations** > **Advanced** > **Service** > **Connectivity**.
2. Select **Ethernet** tab.
3. Enable the toggle for **802.1x**.
4. Select the **EAP method**.

5. If **EAP Method** is **TTLS-MSCHAPv2**, **PEAP - MSCHAPv2** or **PEAP-GTC**, setup following settings and select **Save**.

Item	Description	Comments
Identity **Security key**	Enter the identity and security key at network **LAN 802.1X** menu.	Necessary. The identity and security key should be provided by hospital IT. Max length of this field is 64 and empty is also supported.
Anonymous ID	Enter an **Anonymous ID**.	Optional The Anonymous ID is being used for replacing the Username and Identity. The ID will be transmitted in plain text during outer authentication. Max length of this field is 64 and empty is also supported.
Select client certificate	It's specified for authenticating.	It's disabled if no certificate available.
Select private key	It's specified for authenticating.	It's disabled if no private key available.
Private key security key	Enter the **Private key security key** if have.	Optional It's specified only when a security key was set when creating the "Private key" and exactly match the one used for creating "Private key". Max length of this field is 64 and empty is also supported.
Select CA certificate	Choose the CA certificate been trusted. It's used for verifying server.	It's disabled if no certificate available.

6. If **EAP method** is **EAP TLS**, setup following settings and select **Save**.

Item	Description	Comments
Identity **Select client certificate** **Select private key**	1. Enter the **Identity**. 2. Select one client certificate. 3. Select one private key.	Necessary. Generate Client Certificate, and Private key first. 1. The monitor generates Certificate Signing Request (CSR), Private key, and Private key password (if required). 2. Export the CSR files to USB disk, and deliver to hospital IT. 3. Hospital IT generates the Client Certificate with the CSR file and save the Client Certificate back to the USB disk. 4. Import the Client Certificate to monitor. For more information, see: • 6.4.11.1 Generating the Client Certificate on page 78 • 6.4.11.2 Importing certificate to the monitor on page 79
Private key security key	Enter the **Private key security key** if have.	Optional It's specified only when a security key was set when creating the "Private key" and exactly match the one used for creating "Private key". Max length of this field is 64 and empty is also supported.
Select CA certificate	Choose the CA certificate been trusted. It's used for verifying server.	It's disabled if no certificate available.

6.4.3 Configuring wireless network via USB disk

You can export/import the monitor settings via USB disk. This way can transfer most of the network settings, but you still need to check and adjust some settings manually, such as **SSID** and **Security Key**. Please refer to following sections for details.

- 6.9.3.1 Exporting settings on page 88
- 6.9.3.2 Importing settings on page 89
- 6.4.4 Configuring wireless network settings on page 55

The second way to import wireless network settings, is to use WLAN configuration files. The WLAN configuration files are created by hospital IT and saved to the USB disk.

NOTE
Make sure the file system format of USB disk is FAT32.

NOTE
The WLAN configuration files should be stored in the following path on the USB disk: `/VSM/wlancfg/`.

NOTE
There is no special requirement for the name of the WLAN configuration files, but the characters in the name should be supported by Linux.

Please refer to following steps to configure WLAN settings.

1. Insert the USB disk to the monitor.
2. Import the WLAN configuration files to the monitor, refer to 6.9.3.2 Importing settings on page 89.
3. Select the **Configurations** > **Advanced** > **Service** > **Connectivity**.
4. Select **WLAN** tab > **Config**.
5. Enable **WLAN**, and then enable **Use file config** to check that the imported WLAN settings are correct.
6. Select the **Save** button.

6.4.4 Configuring wireless network settings

1. Select the **Configurations** > **Advanced** > **Service** > **Connectivity**.
2. Select **WLAN** tab > **Config**.
3. Configure the following wireless network basic settings.

Item	Description	Comments
toggle for **WLAN**	Enable/disable the WLAN radio.	
toggle for **Use file config**	Enable/disable to use configuration file.	
DHCP	Enable/disable DHCP.	If you set **Enable** for **DHCP**, the device will capture IP address and configuration information automatically.
IP address **Subnet mask** **Default gateway** **DNS 1** **DNS 2** **DNS 3**	1. Enter an IP address. 2. Enter a valid Subnet mask level. 3. Enter a valid Default gateway if required. 4. Enter a valid DNS if required.	Setup these items if you set **Disable** for **DHCP**.
Security	Choose the confidentiality method. • **WPA-PSK** • **WPA2-PSK** • **WPA-EAP** • **WPA2-EAP**	Only available when **Use file config** is disabled.

Item	Description	Comments
Encryption	Choose the Encryption method. • **TKIP** • **AES-CCMP**	Only available when **Use file config** is disabled. Please consult Hospital IT for the required Encryption.
toggle for **Fast roaming (802.11r)**	Enable/disable fast roaming.	Only available when **Encryption** is **AES-CCMP**. Roaming performance can be negatively impacted (e.g. additional waveform dropout) when using non-fast roaming supported security methods (e.g. WPA-Enterprise).
toggle for **HEX**	Enable/disable to use HEX string for the password.	Only available when **Security** is **WPA-PSK** or **WPA2-PSK**. The valid security key should be 8-63 ASCII case-sensitive characters (ASCII decimal 32 to 126), or 64 HEX characters (0-9 and A-F), if HEX have been selected.
SSID	Enter the Service Set Identifier (SSID), also known as the network name.	Only available when **Use file config** is disabled. The SSID of the wireless client must match the SSID of the wireless infrastructure. A valid SSID includes up to 32 case-sensitive ASCII characters, including space (ASCII decimal 32 to 126).
Security key	Enter the Wi-Fi security password.	Only available when **Security** is **WPA-PSK** or **WPA2-PSK**. Please consult Hospital IT for the security key.
EAP method	Select the Extensible Authentication Protocol (EAP) method: • **EAP-TLS** • **TTLS-MSCHAPv2** • **PEAP-MSCHAPv2** • **PEAP-GTC**	Only available when **Security** is **WPA-EAP** or **WPA2-EAP**. The selected EAP method may require the use of certificates (e.g. EAP-TLS). Please consult Hospital IT for the required EAP method.

Item	Description	Comments
Enter **Identity** **Select client certificate** **Select private key** Enter **Private key security key** **Select CA certificate**	1. Enter the **Identity**. 2. Select one Client Certificate. 3. Select one Private key. 4. Enter the Private key security key if have. 5. Select one CA certificate if have.	Available when **EAP method** is **EAP-TLS**. Generate Client Certificate, and Private key first. 1. The monitor generates Certificate Signing Request (CSR), Private key, and Private Key Password (if required). 2. Export the CSR files to USB disk, and deliver to hospital IT. 3. Hospital IT generates the Client Certificate with the CSR file and save the Client Certificate back to the USB disk. 4. Import the Client Certificate to monitor. For more information, see: • 6.4.11.1 Generating the Client Certificate on page 78 • 6.4.11.2 Importing certificate to the monitor on page 79
Identity and **Security key**	Enter the Identity and security key.	Necessary. Available when **EAP method** is **TTLS-MSCHAPv2**, **PEAP-MSCHAPv2** or **PEAP-GTC**. Please consult Hospital IT for the required identity and security key.
Enter **Anonymous ID** **Select client certificate** **Select private key** Enter **Private key security key** **Select CA certificate**	1. Enter an Anonymous identity if have. 2. Select one client certificate if have. 3. Select one private key if have. 4. Enter the private key security key if have. 5. Select one CA certificate if have.	Optional. Available when **EAP method** is **TTLS-MSCHAPv2**, **PEAP-MSCHAPv2** or **PEAP-GTC**. The Anonymous ID is being used for replacing the Username and Identity. Generate Client Certificate, and Private key first if required. Import the CA Certificate to monitor first if required, via USB disk. The CA certificate should be provided by hospital IT.
toggle for **Fast Reauth**	Enable the Fast Reauth.	Only available when **Security** is **WPA-EAP** or **WPA2-EAP**. This feature speeds up the authentication process for EAP methods that support it.

Item	Description	Comments
Frequency band	Select the frequency band for the WLAN radio: • 2.4 GHz • 5 GHz • 2.4 and 5 GHz	The WLAN radio can communicate on the following frequency bands, protocols and data rates: • 2.4 GHz, IEEE 802.11b, up to 11 Mbps • 2.4 GHz, IEEE 802.11g, up to 54 Mbps • 5 GHz, IEEE 802.11a, up to 54 Mbps • 2.4 and 5 GHz, IEEE 802.11n, up to 150 Mbps
Select Channel	Select channels for **2.4 GHz** or **5 GHz**.	The patient monitor supports IEEE 802.11d specifications. By factory default, all supported wireless channels are enabled. This means that the patient monitor can use any of the wireless channels that are allowed in the country of operation. Use this submenu only if further restriction of wireless channels is required to reduce the scanning time and improve roaming performance. Please consult with the IT department to determine which channels are in use.
Roaming Aggressiveness	Select the back ground scan cycle: • Off • Low • Medium • High	Only available when **Use file config** is disabled. • Off: scanning is disabled. • Low: when rssi > -65 dBm, one scan will occur every 5 seconds; when the RSSI is < -65 dBm, one scan will occur every 2 seconds. • Medium:when the RSSI is > -55 dBm,one scan will occur every 5 seconds; when the RSSI is < -55 dBm, one scan will occur every 2 seconds. • High:when the RSSI is > -45 dBm, one scan will occur every 5 seconds;when the RSSI is <-45 dBm, one scan will occur every 2 seconds.
Fragmentation threshold	Configure the Fragmentation threshold value.	Fragmentation threshold specifies the maximum frame size a wireless device can transmit without fragmenting the frame. Use the default Fragmentation threshold value, unless otherwise specified in the wireless network design. A valid Fragmentation threshold is a numeric value within the range of 64 to 2346.

Item	Description	Comments
RTS threshold	Configure the RTS threshold value.	Use the default RTS threshold value, unless otherwise specified in the wireless network design. A valid RTS threshold is a numeric value within the range of 64 to 2347.

4. Configure the following WLAN advanced settings if required.

Item	Description	Comments
toggle for **FIPS 140-2 Mode**	Enable FIPS 140-2 validated firmware.	FIPS 140-2 Inside #3257.
Antenna	Configure the antenna configuration. • 2.4GHz Primary Only, 5GHz Primary Only • 2.4GHz Primary & Secondary, 5GHz Primary Only • 2.4GHz Primary & Secondary, 5GHz Primary & Secondary	The antenna configuration options are: • Primary antenna only in 2.4GHz and 5GHz frequency band • Primary and Secondary antenna worked in the same time in 2.4GHz frequency band, primary antenna only in 5GHz frequency band • Primary and Secondary antenna worked in the same time in 2.4GHz and 5GHz frequency band

5. Select **Save**.

6.4.5 Configuring PDQ query

Users can obtain patient list and demographics from server when the device is configured with PDQ, Cerner iBus or Cerner iBus Cloud. All of them require a license to use.

NOTE
Before start, make sure the device has been configured with the necessary license. For more information, see 6.10 License management on page 90.

NOTE
The following contents in **PDQ** menu, **iBus** menu and Cerner **iBusCloud** menu shall be associated configuration items, and they shall always keep the same selected value in the above pages.

- Query barcode input
- Require authenticated caregiver
- Allow manual patient search

1. Select the **Configurations** > **Advanced** > **Service** > **Connectivity**.
2. Select **PDQ Query** tab.

3. Select the **Protocol** in use. The full choices are **None**, **PDQ**, **iBus**, **iBusCloud**.

NOTE
The choice item appears in the **Protocol** list only when the device has been configured with related license.

- If you choose **None**, the PDQ query feature will be disabled. The device cannot interact with server for patient demographics query.
- If you choose **PDQ**, setup below items.

Table 6-1 PDQ configurations

Item	Description	Comments
Query method	Select a query method.	Default value: **Standard**. Additionally support to query patient by **Visit number** when **Modified** is selected.
Server address	Enter the server address.	Obtain input from Hospital IT.
Outbound port	Enter the outbound port.	
Timeout (seconds)	Enter timeout in seconds.	
Use SSL	Enable/disable the SSL.	Default value: **Disabled**.
CA certificate	Select one CA certificate.	Only available when **Use SSL** is **Enabled**. Import the CA certificate to monitor first, via USB disk. The CA certificate should be provided by hospital IT. For more information, see 6.4.11.2 Importing certificate to the monitor on page 79.
Client certificate **Private key** **Private key password**	2.1.Select one client certificate. 2.2.Select one private key. 2.3.Enter the **Private key password**.	Only available when **Use SSL** is **Enabled**. Generate Client Certificate, and Private key first. 2.1.The monitor generates Certificate Signing Request (CSR), Private key, and Private key password (if required). 2.2.Export the CSR files to USB disk, and deliver to hospital IT. 2.3.Hospital IT generates the Client Certificate with the CSR file and save the Client Certificate back to the USB disk. 2.4.Import the Client Certificate to monitor. For more information, see: • 6.4.11.1 Generating the Client Certificate on page 78 • 6.4.11.2 Importing certificate to the monitor on page 79

Table 6-1 PDQ configurations (Table continued)

Item	Description	Comments
Query list size	Select the required limit for retrieved query results. The option is 5 or 10.	Default value: **5**.
Receiving application	Enter the name of the application that receives the package data.	Obtain HL7 standard input or contexts from Hospital IT.
Receiving facility	Enter the name of the facility that receives the package data.	
Assigning authority	Enter the name of the authority that assigns the patient ID.	
Sending application	Enter the name of the application that sends the package data.	
Sending facility	Enter the name of the facility that sends the package data.	
Query barcode input	Enable/disable automatic patient search.	If enabled, configure barcode paser on the device. For more information, see 6.8 Configuring barcode parser on page 83.
Require authenticated caregiver	Enable/disable if the caregiver must be authenticated to use PDQ query.	If disabled, PDQ can be made by anyone who has access to the monitor. Patient confidentiality may be compromised.
Escape characters	Enable/disable escaping special characters for user input.	The user input here means the **PID 1** used to query patient demographics.
Allow manual patient search	Enable/disable manual input for patient search data.	If disabled, scanning barcode is the only method for searching a patient.

- If you choose **iBus**, setup below items.

Table 6-2 iBus configurations - PDQ query

Item	Description	Comments
Server address	Enter the server address.	Obtain input from Hospital IT.
Outbound port	Enter the outbound port.	
Use SSL	Enable/disable the SSL.	Default value: **Disabled**.
CA certificate	Select one CA certificate.	Only available when **Use SSL** is **Enabled**. Import the CA certificate to monitor first, via USB disk. The CA certificate should be provided by hospital IT. For more information, see 6.4.11.2 Importing certificate to the monitor on page 79.
Username	Enter the username which is used to establish a connection.	Obtain input from Hospital IT.

Table 6-2 iBus configurations - PDQ query (Table continued)

Item	Description	Comments
Password	Enter the password for connection.	
OrgId	The Organization ID for the concerned organization. Parameter that will be used to perform patient lookups, post of signed results and caregiver authentication.	Obtain iBus installation input from Hospital IT.
Base	Enter the iBus root context.	
Patient path	Enter the REST URL path for patient information.	
Encounter path	Enter the REST URL path for barcode duplicate checking.	
Query barcode input	Enable/disable automatic patient search.	If enabled, configure barcode paser on the device. For more information, see 6.8 Configuring barcode parser on page 83.
Require authenticated caregiver	Enable/disable if the caregiver must be authenticated to use PDQ query.	If disabled, PDQ can be made by anyone who has access to the monitor. Patient confidentiality may be compromised.
Allow manual patient search	Enable/disable manual input for patient search data.	If disabled, scanning barcode is the only method for searching a patient.

- If you choose **iBusCloud**, ensure that you setup items in **Cerner iBus Cloud** menu. For more information, see 6.4.8 Configuring Cerner iBus cloud on page 69.

4. Verify that you have set up correctly, see 8.5.12 Testing PDQ query on page 110.

6.4.6 Configuring EMR outbound

Users can send patient clinical data to HIS when the device is configured with PCD-01, Cerner iBus or Cerner iBus Cloud. All of them require a license to use.

NOTE
Before start, make sure the device has been configured with the necessary license. For more information, see 6.10 License management on page 90.

1. Select the **Configurations** > **Advanced** > **Service** > **Connectivity**.
2. Select **EMR Outbound** tab.
3. Select the **Protocol** in use. The full choices are **None**, **PCD-01**, **iBus**, **iBusCloud**.

NOTE
The choice item appears in the **Protocol** list only when the device has been configured with related license.

- If you choose **None**, the EMR outbound feature will be disabled. The device cannot send data to EMR or Cerner server anymore. And the **Status** column will disappear from the **Patients & Records** menu.

- If you choose **PCD-01**, setup below items.

Table 6-3 PCD-01 configurations

Item	Description	Comments
Server address	Enter the server address.	Obtain input from Hospital IT.
Outbound port	Enter the outbound port.	
Use SSL	Enable/disable the SSL.	Default value: **Disabled**.
CA certificate	Select one CA certificate.	Only available when **Use SSL** is **Enabled**. Import the CA certificate to monitor first, via USB disk. The CA certificate should be provided by hospital IT. For more information, see 6.4.11.2 Importing certificate to the monitor on page 79.
Client certificate **Private key** **Private key password**	2.1.Select one client certificate. 2.2.Select one private key. 2.3.Enter the **Private key password**.	Only available when **Use SSL** is **Enabled**. Generate Client Certificate, and Private key first. 2.1.The monitor generates Certificate Signing Request (CSR), Private key, and Private key password (if required). 2.2.Export the CSR files to USB disk, and deliver to hospital IT. 2.3.Hospital IT generates the Client Certificate with the CSR file and save the Client Certificate back to the USB disk. 2.4.Import the Client Certificate to monitor. For more information, see: • 6.4.11.1 Generating the Client Certificate on page 78 • 6.4.11.2 Importing certificate to the monitor on page 79
Retry limits	Select the number of times the monitor tries to send patient information. The options are 0, 1, 2, 3.	For example, if set at 3, an error message will be displayed after the third unsuccessful attempt.
Patient records	Select whether patient can be unidentified or must be identified or verified before his/her data can be sent to the EMR (requires a license).	**Unidentified** means that identifier field can be empty. **Identified** means that ID field should have some identifier. **Verified** means that identifier has been checked from HIS.
Caregiver identity	Select whether the caregiver can be unidentified or must be identified or verified (requires a license).	
Delete sent records	Enable/disable whether records will be deleted after successful delivery to EMR.	Default value: **Disabled**.

Table 6-3 PCD-01 configurations (Table continued)

Item	Description	Comments
Receiving application	Enter the name of the application that receives the package data.	Obtain HL7 standard input or contexts from Hospital IT.
Receiving facility	Enter the name of the facility that receives the package data.	
Sending application	Enter the name of the application that sends the package data.	
Sending facility	Enter the name of the facility that sends the package data.	
Assigning authority	Enter the name of the authority that assigns the package data.	
Escape characters	Enable/disable escaping special characters for user input.	The user input here includes **PID 1**, **First name**, **Last name** sent to network.

- If you choose **iBus**, setup below items.

Table 6-4 iBus configurations - EMR outbound

Item	Description	Comments
Server address	Enter the server address.	Obtain input from Hospital IT.
Outbound port	Enter the outbound port.	
Use SSL	Enable/disable the SSL.	Default value: **Disabled**.
CA certificate	Select one CA certificate.	Only available when **Use SSL** is **Enabled**. Import the CA certificate to monitor first, via USB disk. The CA certificate should be provided by hospital IT. For more information, see 6.4.11.2 Importing certificate to the monitor on page 79.
Retry limits	Select the number of times the monitor tries to send patient information. The options are 0, 1, 2, 3.	For example, if set at 3, an error message will be displayed after the third unsuccessful attempt.
Patient records	Select the condition of patient records. The options are Unidentified, Identified and Verified.	
Caregiver identity	Select the condition of caregiver identity. The options are Unidentified, Identified and Verified.	
Delete sent records	Enable/disable whether records will be deleted after successful delivery to EMR.	Default value: **Disabled**.
Username	Enter the username which is used to establish a connection.	Obtain input from Hospital IT.
Password	Enter the password for connection.	

Table 6-4 iBus configurations - EMR outbound (Table continued)

Item	Description	Comments
OrgId	The Organization ID for the concerned organization. Parameter that will be used to perform patient lookups, post of signed results and caregiver authentication.	
Base	Enter the iBus root context.	
Chartdoc path	Enter the path to chartdoc.	

- If you choose **iBusCloud**, ensure that you setup items in **Cerner iBus Cloud** menu. For more information, see 6.4.8 Configuring Cerner iBus cloud on page 69.

4. Verify that you have set up correctly, see 8.5.13 Testing EMR outbound on page 110.

6.4.7 Configuring caregiver

Users can validate caregiver identity from HIS when the device is configured with LDAP, Cerner iBus or Cerner iBus Cloud correctly. All of them require a license to use.

NOTE
Before start, make sure the device has been configured with the necessary license. For more information, see 6.10 License management on page 90.

NOTE
Before LDAP setup, make sure that the device can ping the LDAP Server IP address successfully. Otherwise, the LDAP does not work even though the settings are complete. For more information about ping, see 11.1.4.1 Pinging a TCP/IP network device on page 133.

1. Select the **Configurations** > **Advanced** > **Service** > **Connectivity**.
2. Select **Caregiver** tab.
3. Select the **Protocol** in use. The full choices are **None**, **LDAP**, **iBus**, **iBusCloud**.

NOTE
The choice item appears in the **Protocol** list only when the device has been configured with related license.

- If you choose **None**, the caregiver validation feature will be disabled. The device cannot interact with LDAP or Cerner server.
- If you choose **LDAP**, setup below items.

Table 6-5 LDAP configurations

Item	Description	Comments
Allow login with empty password	Enable or disable caregiver to login with empty password.	It's mandatory to enter password when **LDAP** protocol is selected and **Allow login with empty password** is disabled.

Table 6-5 LDAP configurations (Table continued)

Item	Description	Comments
Server address	Enter the IP address, host name, or fully qualified domain name.	Allowed values: A valid ldap or ldaps URL The server address should be provided by hospital IT. **NOTE** You can secure some communication channels with encryption and authentication. GE HealthCare recommends that you use the encrypted channels. For example: • LDAPS with CA certificate provides encryption and server authentication. • LDAPS without CA certificate and LDAP with TLS only provides encryption.
Port	Enter a valid LDAP service port number.	Allowed values: 0 to 65535 The port number should be provided by hospital IT.
Use TLS	Enable/disable the TLS.	If this option is enabled, the connection to the configured LDAP server is encrypted. If this option is disabled, the connection to the configured LDAP server is not encrypted. Default value: Disabled
CA certificate	Select one CA certificate.	This field is enabled if the **Use TLS** is enabled. Import the CA Certificate to monitor first, via USB disk. The CA certificate should be provided by hospital IT. For more information, see 6.4.11.2 Importing certificate to the monitor on page 79.
Authentication method	Select the desired authentication method. The choices are: • **Simple** • **Digest_MD5** • **Kerberos**	Authentication mode should be provided by LDAP server administrator. It's not recommended to choose **Simple** as authentication method.
Anonymous Bind	Enable or disable anonymous bind.	If you select **Yes**, **Username** and **Password** are not required. If you select **No**, **Username** and **Password** are necessary. Default value: Disabled

Table 6-5 LDAP configurations (Table continued)

Item	Description	Comments
Username	Enter the valid username.	The LDAP user profiles are managed by the LDAP server administrator. Obtain your username from the LDAP server administrator. This account has read only access to the LDAP hierarchy that contains the details of all users who logs on to the system. Username can be entered in the following formats: • Name • Domain\Name
Password	Enter the valid password.	The LDAP user profiles are managed by the LDAP server administrator. Obtain your password from the LDAP server administrator. The maximum number of characters allowed on the device is 256. Different LDAP servers have their own limit. Allowed values: • A to Z • a to z • 0 to 9 • All special characters
Kerberos realm **Kerberos DC host** **Kerberos DC port**	2.1.Enter the Kerberos realm. It must be entered in upper case. 2.2.Enter the Distribution Center host name. 2.3.Enter a valid Distribution Center port number.	These fields appear only when **Kerberos** authentication mode is selected. Obtain the domain name, host name, and the DC port number from the LDAP server administrator.
Search scope base	Enter the search base.	Obtain the search base from the LDAP server administrator.
Search path	Select one search path. The choices are:	
	LDAP Scope Base (default value)	Indicates that only the entry specified as the search base should be considered. None of its subordinates will be considered.
	LDAP Scope OneLevel	Indicates that only the immediate children of the entry specified as the search base should be considered. The base entry itself should not be considered, nor any descendants of the immediate children of the base entry.
	LDAP Scope Subtree	Indicates that the entry specified as the search base, and all of its subordinates to any depth, should be considered.
Search filter	Enter filter for search results.	Obtain the search base from the LDAP server administrator. For more information about LDAP filter specification, see 6.4.7.1 LDAP syntax filters on page 69.

Table 6-5 LDAP configurations (Table continued)

Item	Description	Comments
Login format	Enter the login format.	User Login Format is provided by LDAP server administrator. This is a comma separated list of LDAP user name attributes. For example: cn.
LDAP timeout	Select one server timeout value. The choices are **15 sec**, **30 sec**, **60 sec** and **120 sec**.	Select the LDAP server query timeout in seconds. Default value: **30 sec**
Automatically follow referrals	Enabled/disabled the auto following referrals.	A referral is a type of LDAP response that indicates that the server could not process the requested operation, but suggests that the request might succeed if you try it somewhere else.

- If you choose **iBus**, setup below items.

Table 6-6 iBus configurations - Caregiver

Item	Description	Comments
Server address	Enter the server address.	Obtain input from Hospital IT.
Outbound port	Enter the outbound port.	
Use SSL	Enable/disable the SSL.	Default value: **Disabled**.
CA certificate	Select one CA certificate.	This field is enabled if the **Use SSL** is enabled. Import the CA Certificate to monitor first, via USB disk. The CA certificate should be provided by hospital IT. For more information, see 6.4.11.2 Importing certificate to the monitor on page 79.
Username	Enter the username which is used to establish a connection.	Obtain input from Hospital IT.
Password	Enter the password for connection.	
OrgId	The Organization ID for the concerned organization. Parameter that will be used to perform patient lookups, post of signed results and caregiver authentication.	
Base	Enter the iBus root context.	
Personnel path	Enter the path to caregiver name through caregiver ID.	
Login basic path	Enter the path of caregiver name and password authentication.	

- If you choose **iBusCloud**, ensure that you setup items in **Cerner iBus Cloud** menu. For more information, see 6.4.8 Configuring Cerner iBus cloud on page 69.

4. Verify that you have set up correctly, see 8.5.14 Testing caregiver setup on page 110.

6.4.7.1 LDAP syntax filters

A filter specifies the conditions that must be met for a record to be included in the recordset (or collection) that results from a query. An LDAP filter has one or more clauses, each enclosed in parentheses. Each clause evaluates to either True or False. An LDAP syntax filter clause is in the following form:

(<AD Attribute><comparison operator><value>)

The <AD Attribute> must the LDAP Display name of an Active Directory attribute. For example: cn (acronym for Common Name).

The allowed comparison operators are as follows:

Search type	Operator	Description
Equality	=	Returns entries containing attribute values that exactly match the specified value.
Greater than or equal to	>=	Returns entries containing attributes that are greater than or equal to the specified value.
Less than or equal to	<=	Returns entries containing attributes that are less than or equal to the specified value.

The <value> in a clause will be the actual value of the Active Directory attribute. The value is not case sensitive and should not be quoted. The wildcard character "*" is allowed, except when the <AD Attribute> is a DN attribute.

An example LDAP syntax filter clause is: (cn=Jim Smith)

This filters on all objects where the value of the cn attribute is equal to the string "Jim Smith" (not case sensitive). Filter clauses can be combined using the following operators:

Search type	Operator	Description
AND	&	All specified filters must be true for the statement to be true.
OR	|	At least one specified filter must be true for the statement to be true.
NOT	!	The specified statement must not be true for the statement to be true. Only one filter is affected by the NOT operator.

For example, the following specifies that either the cn attribute must be "Jim Smith", or the givenName attribute must be "Jim" and the sn attribute must be "Smith":

```
|(cn=Jim Smith)(&(givenName=Jim)(sn=Smith))
```

Conditions can be nested with parentheses, but make sure the parentheses match up.

6.4.8 Configuring Cerner iBus cloud

Users can perform patient query, EMR outbound and validate caregiver identity when the device is configured with Cerner iBus Cloud correctly.

NOTE
Before start, make sure the device has been configured with the license. For more information, see 6.10 License management on page 90.

1. Select the **Configurations** > **Advanced** > **Service** > **Connectivity**.
2. Select **Cerner iBus Cloud** tab.
3. Set up below items.

Item	Description	Comments
Server address	Enter the server address.	Obtain input from Hospital IT.
OrgId	The Organization ID for the concerned organization. Parameter that will be used to perform patient lookups, post of signed results and caregiver authentication.	
Authentication type	Select authentication method to access cloud server. The options are: **Basic** or **Bearer**.	When **Basic** authentication is selected, obtain username and password from Hospital IT. When **Bearer** authentication is selected, obtain **Bearer Token** from Cerner/GE HealthCare and import it to the monitor. For more information, see 6.9.3.2 Importing settings on page 89.
Username	Enter the username which is used to establish a connection.	Obtain input from Hospital IT.
Password	Enter the password for connection.	
Tenant id	Enter the client ID to access cloud server.	
Tenant short name	Enter the client name to access cloud server.	
CA certificate	Select one CA certificate.	Import the CA certificate to monitor first, via USB disk. The CA certificate should be provided by hospital IT. For more information, see 6.4.11.2 Importing certificate to the monitor on page 79.
Retry limits	Select limit how many times one message is retried to send to server. The options are: 0, 1, 2, 3.	
Patient records (EMR Outbound)	Select the condition of patient records. The options are Unidentified, Identified and Verified.	
Caregiver identity (EMR Outbound)	Select the condition of caregiver identity. The options are Unidentified, Identified and Verified.	
Connection timeout	Enter Cerner query timeout in seconds.	
Delete sent records	Enable/disable whether records will be deleted after successful delivery to EMR.	Default value: **Disabled**.
Query barcode input	Enable/disable automatic patient search.	If enabled, configure barcode paser on the device. For more information, see 6.8 Configuring barcode parser on page 83.

Item	Description	Comments
Require authenticated caregiver	Enable/disable if the caregiver must be authenticated to use PDQ query.	If disabled, PDQ can be made by anyone who has access to the monitor. Patient confidentiality may be compromised.
Allow manual patient search	Enable/disable manual input for patient search data.	If disabled, scanning barcode is the only method for searching a patient.

4. If necessary, select **iBusCloud** from the **Protocol** list in **PDQ Query**, **EMR Outbound** or **Caregiver** menu.
5. Verify that you have set up correctly, see 8.5.14 Testing caregiver setup on page 110, 8.5.12 Testing PDQ query on page 110 or 8.5.13 Testing EMR outbound on page 110.

6.4.9 Configuring hospital EMR encoding

1. Select the **Configurations** > **Advanced** > **Service** > **Connectivity**.
2. Select **Hospital EMR Encoding** tab.

NOTE
By default, these fields are blank and the system sends the following default values to EMR when using PCD-01.

Field	EMR Encoding (default values)	Description
SpO2	150456^MDC_PULS_OXIM_SAT_O2^MDC	SpO_2
Perfusion_Index	150488^MDC_BLD_PERF_INDEX^MDC	PI
Pulse_Rate	149530^MDC_PULS_OXIM_PULS_RATE^MDC	PR
NIBP_Pulse_Rate	149546^MDC_PULS_RATE_NON_INV^MDC	NIBP PR
Systolic	150021^MDC_PRESS_BLD_NONINV_SYS^MDC	NIBP SYS
Mean	150023^MDC_PRESS_BLD_NONINV_MEAN^MDC	NIBP MAP
Diastolic	150022^MDC_PRESS_BLD_NONINV_DIA^MDC	NIBP DIA
Temperature	150344^MDC_TEMP^MDC	Temperature
Respiration_Rate	151562^MDC_RESP_RATE^MDC	RR
mmHg	mm[Hg]^mm[Hg]^UCUM	NIBP unit
percent	%^%^UCUM	SpO_2 unit
beatsPerMin	{beats}/min^{beats}/min^UCUM	PR unit
breathsPerMin	{breath}/min^{breath}/min^UCUM	RR unit
C	Cel^Cel^UCUM	Temperature unit
F	[degF]^[degF]^UCUM	Temperature unit
kPa	kPa^kPa^UCUM	NIBP unit
unitless	{unitless}^{unitless}^UCUM	No unit

Field	EMR Encoding (default values)	Description
None	None	NIBP measurement site, if not selected
EarLobe	460272^MDC_HEAD_EAR^MDC	SpO_2 measurement site: Earlobe
Nose	460304^MDC_HEAD_NOSE^MDC	SpO_2 measurement site: Nose
Finger	460500^MDC_UPEXT_FINGER^MDC	SpO_2 measurement site: Finger
Toe	460368^MDC_LOEXT_TOE^MDC	SpO_2 measurement site: Toe
Other	None	SpO_2 measurement site: Other
Temporal	460604^MDC_HEAD_REGIONAL_TEMPORAL^MDC	Temperature measurement site, Exergen: Temporal
Forehead	460272^MDC_HEAD_EAR^MDC	Temperature measurement site, HeTaida: Forehead
AxillaryAdult	460492^MDC_UPEXT_AXILLA^MDC	Temperature measurement site, Welch Allyn: Adult axillary
AxillaryPediatric	460492^MDC_UPEXT_AXILLA^MDC	Temperature measurement site, Welch Allyn: Pediatric axillary
Rectal	460420^MDC_TRUNK_BUTTOCK^MDC	Temperature measurement site, Welch Allyn: Rectal
Oral	460292^MDC_HEAD_MOUTH^MDC	Temperature measurement site, Welch Allyn: Oral
LeftArmLower	460521^MDC_UPEXT_FOREARM_L^MDC	NIBP measurement site: lower left arm
LeftArmUpper	460533^MDC_UPEXT_ARM_UPPER_L^MDC	NIBP measurement site: upper left arm
RightArmLower	460522^MDC_UPEXT_FOREARM_R^MDC	NIBP measurement site: lower right arm
RightArmUpper	460534^MDC_UPEXT_ARM_UPPER_R^MDC	NIBP measurement site: upper right arm
LeftLegLower	460357^MDC_LOEXT_LEG_L^MDC	NIBP measurement site: lower left leg
LeftLegUpper	460365^MDC_LOEXT_THIGH_L^MDC	NIBP measurement site: upper left leg
RightLegLower	460358^MDC_LOEXT_LEG_R^MDC	NIBP measurement site: lower right leg
RightLegUpper	460366^MDC_LOEXT_THIGH_R^MDC	NIBP measurement site: upper right leg
NEWS2_TotalScore	None	NEWS2 total score
SpO2_SubScore	None	SpO_2 subscore
Pulse_Rate_SubScore	None	PR subscore
Temp_SubScore	None	Temperature subscore
NIBP_SYS_SubScore	None	NIBP SYS subscore
RR_SubScore	None	RR subscore
Air_Or_Oxygen_SubScore	None	Air or oxygen subscore

Field	EMR Encoding (default values)	Description
Air_Or_Oxygen_Observation	None	Air or oxygen observation
Consciousness_SubScore	None	Consciousness subscore
Consciousness_Observation	None	Consciousness observation
Hourly_Urine_SubScore	None	Hourly urine subscore
Hourly_Urine_Observation	None	Hourly urine observation
MEWS_TotalScore	None	MEWS total score
Customized_Protocol_Name_TotalScore	None	Customized protocol name total socre
NIBP_DIA_SubScore	None	NIBP DIA subscore
NIBP_MAP_SubScore	None	NIBP MAP subscore
CRT_SubScore	None	CRT subscore
CRT_Observation	None	CRT observation
Mucous_Color_SubScore	None	Mucous color subscore
Mucous_Color_Observation	None	Mucous color observation
GMFCS_SubScore	None	GMFCS subscore
GMFCS_Observation	None	GMFCS observation
Muscle_Strength_SubScore	None	Muscle strength subscore
Muscle_Strength_Observation	None	Muscle strength observation
Feeding_Type_SubScore	None	Feeding type subscore
Feeding_Type_Observation	None	Feeding type observation
Beside_Glucose_SubScore	None	Bedside glucose subscore
Beside_Glucose_Observation	None	Bedside glucose observation
Pain_Score_SubScore	None	Pain score subscore
Pain_Score_Observation	None	Pain score observation
Fluid_Inputs_SubScore	None	Fluid inputs subscore
Fluid_Inputs_Observation	None	Fluid inputs observation
Fluid_Outputs_SubScore	None	Fluid outputs subscore
Fluid_Outputs_Observation	None	Fluid outputs observation
Height_SubScore	None	Height subscore
Height_Observation	None	Height observation
Weight_SubScore	None	Weight subscore
Weight_Observation	None	Weight observation
Airway_Free_Text	None	Airway free text
Breathing_Free_Text	None	Breathing free text
Edema_Free_Text	None	Edema free text
Drainage_Free_Text	None	Drainage free text

Field	EMR Encoding (default values)	Description
Wound_Free_Text	None	Wound free text
Nutrition_Free_Text	None	Nutrition free text
ml	mL^mL^UCUM	unit
cm	cm^cm^UCUM	unit
mmol_Per_L	mmol/L^mmol/L^UCUM	unit
kg	kg^kg^UCUM	unit
mg_per_dL	mg/dL^mg/dL^UCUM	unit
lb	[lb_av]^[lb_av]^UCUM	unit
in	[in_i]^[in_i]^UCUM	unit

3. If necessary, enter the user-defined values for the required fields.

NOTE
If none of measurement EMR encoding is customized, the system shall use default EMR encoding and send all valid measurement parameters.

6.4.10 Configuring Cerner EMR encoding

1. Select the **Configurations** > **Advanced** > **Service** > **Connectivity**.
2. Select **Cerner EMR Encoding** tab. The fields are auto filled with the following default values.

Field	EMR Encoding (default values)	Description
SpO2|SpO2_NM|Nomenclature	MDC_PULS_OXIM_SAT_O2| 150456 |MDC	SpO_2 measurement
Perfusion_Index| Perfusion_Index_NM| Nomenclature	MDC_BLD_PERF_INDEX| 150488|MDC	Perfusion Index measurement
Pulse_Rate |Pulse_Rate_NM| Nomenclature	MDC_PULS_OX-IM_PULS_RATE|149530|MDC	Pulse Rate measurement
NIBP_Pulse_Rate |NIBP_Pulse_Rate_NM| Nomenclature	MDC_PULS_RATE_NON_INV| 149546|MDC	NIBP_Pulse_Rate measurement
Systolic|Systolic_NM| Nomenclature	MDC_PRESS_BLD_NON-INV_SYS|150021|MDC	NIBP sys measurement
Diastolic|Diastolic_NM| Nomenclature	MDC_PRESS_BLD_NON-INV_DIA|150022|MDC	NIBP dia measurement
Mean|Mean_NM|Nomenclature	MDC_PRESS_BLD_NON-INV_MEAN|150023|MDC	NIBP mean measurement
Temperature|Temperature_NM| Nomenclature	MDC_TEMP|150344|MDC	Temperature measurement
Respiration_Rate| Respiration_Rate_NM| Nomenclature	MDC_RESP_RATE|151562| MDC	Respiration Rate measurement
Air_or_O2|Air_or_O2_NM| Nomenclature	Customizable fields	Air or oxygen? measurement

Field	EMR Encoding (default values)	Description
Consciousness|**Consciousness_NM**|**Nomenclature**	Customizable fields	Consciousness measurement
Hourly_Urine|**Hourly_Urine_NM**|**Nomenclature**	Customizable fields	Hourly urine measurement
CRT|**CRT_NM**|**Nomenclature**	Customizable fields	CRT measurement
Mucous_color|**Mucous_color_NM**|**Nomenclature**	Customizable fields	Mucous color measurement
GMFCS|**GMFCS_NM**|**Nomenclature**	Customizable fields	GMFCS measurement
Muscle_strength|**Muscle_strength_NM**|**Nomenclature**	Customizable fields	Muscle strength measurement
Feeding_type|**Feeding_type_NM**|**Nomenclature**	Customizable fields	Feeding type measurement
Bedside_glucose|**Bedside_glucose_NM**|**Nomenclature**	Customizable fields	Bedside glucose measurement
Pain_score|**Pain_score_NM**|**Nomenclature**	Customizable fields	Pain score measurement
Fluid_inputs|**Fluid_inputs_NM**|**Nomenclature**	Customizable fields	Fluid inputs measurement
Fluid_outputs|**Fluid_outputs_NM**|**Nomenclature**	Customizable fields	Fluid outputs measurement
Height|**Height_NM**|**Nomenclature**	Customizable fields	Height measurement
Weight|**Weight_NM**|**Nomenclature**	Customizable fields	Weight measurement
Airway|**Airway_NM**|**Nomenclature**	Customizable fields	Airway measurement
Breathing|**Breathing_NM**|**Nomenclature**	Customizable fields	Breathing measurement
Edema|**Edema_NM**|**Nomenclature**	Customizable fields	Edema measurement
Drainage|**Drainage_NM**|**Nomenclature**	Customizable fields	Drainage measurement
Wound|**Wound_NM**|**Nomenclature**	Customizable fields	Wound measurement
Nutrition|**Nutrition_NM**|**Nomenclature**	Customizable fields	Nutrition measurement
Unitless_Unit|**Unitless_Unit_NM**|**Nomenclature**	{unitless}|UCUM|MDC	Unitless units measurement
mmHg_Unit|**mmHg_Unit_NM**|**Nomenclature**	mm[Hg]|UCUM|MDC	mmHg units measurement
Percent_Unit|**Percent_Unit_NM**|**Nomenclature**	%|UCUM|MDC	Percent units measurement

Field	EMR Encoding (default values)	Description
Beats_Per_Min_Unit|**Beats_Per_Min_Unit_NM**|**Nomenclature**	{pulse}/min|UCUM|MDC	{pulse}/min units measurement
Breaths_Per_Min_Unit|**Breaths_Per_Min_Unit_NM**|**Nomenclature**	{breath}/min|UCUM|MDC	{breath}/min units measurement
C_Unit|**C_Unit_NM**|**Nomenclature**	Cel|UCUM|MDC	Celsius units measurement
F_Unit|**F_Unit_NM**|**Nomenclature**	[degF]|UCUM|MDC	Fahrenheit units measurement
kPa_Unit|**kPa_Unit_NM**|**Nomenclature**	kPa|UCUM|MDC	kPa units measurement
mmol_Per_L_Unit|**mmol_Per_L_Unit_NM**|**Nomenclature**	mmol/L|UCUM|MDC	mmol/L units measurement
cm_Unit|**cm_Unit_NM**|**Nomenclature**	cm|UCUM|MDC	Centimeter units measurement
in_Unit|**in_Unit_NM**|**Nomenclature**	[in_i]|UCUM|MDC	Inch units measurement
ml_Unit|**ml_Unit_NM**|**Nomenclature**	mL|UCUM|MDC	Milliliter units measurement
kg_Unit|**kg_Unit_NM**|**Nomenclature**	kg|UCUM|MDC	Kilogram units measurement
lb_Unit|**lb_Unit_NM**|**Nomenclature**	[lb_av]|UCUM|MDC	Pound units measurement
mg_Per_dL_Unit|**mg_Per_dL_Unit_NM**|**Nomenclature**	mg/dL|UCUM|MDC	mg_per_dL units measurement
TotalScore	Customizable fields	EWS total score measurement
TotalScore_NM		
SpO2_SubScore	Customizable fields	SpO_2 SubScore measurement
SpO2_SubScore_NM		
Pulse_Rate_SubScore	Customizable fields	Pulse Rate SubScore measurement
Pulse_Rate_SubScore_NM		
Temp_SubScore	Customizable fields	Temperature SubScore measurement
Temp_SubScore_NM		
NIBP_SYS_SubScore	Customizable fields	NIBP Sys SubScore measurement
NIBP_SYS_SubScore_NM		
NIBP_DIA_SubScore	Customizable fields	NIBP Dia SubScore measurement
NIBP_DIA_SubScore_NM		
NIBP_MAP_SubScore	Customizable fields	NIBP Mean SubScore measurement
NIBP_MAP_SubScore_NM		
RR_SubScore	Customizable fields	Respiration Rate SubScore measurement
RR_SubScore_NM		

Field	EMR Encoding (default values)	Description
Air_or_O2_SubScore	Customizable fields	Air or oxygen? SubScore measurement
Air_or_O2_SubScore_NM		
Consciousness_SubScore	Customizable fields	Consciousness SubScore measurement
Consciousness_SubScore_NM		
Hourly_urine_SubScore	Customizable fields	Hourly urine SubScore measurement
Hourly_urine_SubScore_NM		
CRT_SubScore	Customizable fields	CRT SubScore measurement
CRT_SubScore_NM		
Mucous_color_SubScore	Customizable fields	Mucous color SubScore measurement
Mucous_color_SubScore_NM		
GMFCS_SubScore	Customizable fields	GMFCS SubScore measurement
GMFCS_SubScore_NM		
Muscle_strength_SubScore	Customizable fields	Muscle strength SubScore measurement
Muscle_strength_SubScore_NM		
Feeding_type_SubScore	Customizable fields	Feeding type SubScore measurement
Feeding_type_SubScore_NM		
Bedside_glucose_SubScore	Customizable fields	Bedside glucose SubScore measurement
Bedside_glucose_SubScore_NM		
Pain_score_SubScore	Customizable fields	Pain score SubScore measurement
Pain_score_SubScore_NM		
Fluid_inputs_SubScore	Customizable fields	Fluid inputs SubScore measurement
Fluid_inputs_SubScore_NM		
Fluid_outputs_SubScore	Customizable fields	Fluid outputs SubScore measurement
Fluid_outputs_SubScore_NM		
Height_SubScore	Customizable fields	Height SubScore measurement
Height_SubScore_NM		
Weight_SubScore	Customizable fields	Weight SubScore measurement
Weight_SubScore_NM		

3. If necessary, adjust the default values for the required fields.

NOTE
Obtain input from Hospital IT.

6.4.11 Certificate build up and import

6.4.11.1 Generating the Client Certificate

You can generate the Client Certificate and Private key. The Client Certificate should be imported to monitor before using.

1. Discharge the patient.
2. Select the **Configurations** > **Advanced** > **Service** > **Connectivity**.
3. Select **Certificate Management** > **Private key** tab.
4. Select **Create** to enter the **Create CSR** menu.
5. Insert the USB disk to monitor.

NOTE
Make sure the file system format of USB disk is FAT32.

6. Enter the **Private key name**.
7. Select the **Algorithm** with key size for Private key. The options for **Algorithm** and key size are as below.

Algorithm	Key size options unit: bit
RSA	1024/2048/4096
DSA	1024/2048

Algorithm	ECparam options
Elliptic curve	secp224r1/secp256k1/secp384r1/secp521r1

8. If needed, select **Enable password** and enter the **Password** for Private key.

NOTE
Remember to record the password for the Private key. When configuring the certificate, this Private key password needs to be entered.

9. Enter the related information of the **CSR**, which follows **X.509** (An International Telecommunication Union (ITU) standard) and should be provided by hospital IT.

DN	Information	Description	Sample
CN	**Common name**	This is the name of the device that the certificate is being generated for (i.e., unique per device). This can be a fully qualified domain name.	VSM-<serial number> or VSM-<MAC Address>
O	**Organization name**	Typically the legal name of a company or entity and should include any suffixes such as Ltd., Inc., or Corp.	Wikimedia Foundation, Inc.

DN	Information	Description	Sample
OU	**Organizational unit name**	Internal organization department/division name.	IT
L	**Locality name**	Town, city, village, etc. names.	San Francisco
ST	**State or province name**	Province, region, county or state. Should not be abbreviated (e.g. West Sussex, Normandy, New Jersey).	California
C	**Country name (2 capital letters)**	The two-letter ISO code for the country where your organization is located.	US
EMAIL	**Email address**	Organizational contact, usually the certificate administrator or a contact in the IT department.	

NOTE
If the request is successful, the certificate authority will send back an identity certificate that has been digitally signed using the private key of the certificate authority.

10. Select **Create** to create the Private key and CSR. And the device starts to export the CSR files to USB disk automatically.
11. Deliver the CSR files to hospital IT, they generate the Client Certificate and save back to the USB disk.

6.4.11.2 Importing certificate to the monitor

The certificate is provided by hospital IT. They saved the certificate to the USB disk.

NOTE
Make sure the file system format of USB disk is FAT32.

NOTE
The certificate files should be stored in following path in USB disk: `/VSM/ssl/certs/`.

NOTE
The device supported HASH algorithm are as following:

- SHA-1
- SHA-224
- SHA-256
- SHA-384
- SHA-512

NOTE
The device supported certificate formats are as following:

- PEM
- DER
- P12
- PFX

Cerner only supports PEM.

1. Insert the USB disk to the monitor.
2. Select the **Configurations** > **Advanced** > **Service** > **Connectivity**.
3. Select **Certificate Management** > **Certificate** tab > **Add Certificate**.
4. Select the related certificate file for **Browse files**, then select **Import**.

6.5 Setting time zone

The **Time Zone** menu is enable only when the monitor is not connected to the network and patient is discharged.

1. Select the **Configurations** > **Advanced** > **Service** > **Time Zone**.
2. Select the **Daylight savings** tab.
3. Select **Daylight savings setup**: **OFF**, **ON** or **Auto**.
4. Set up the time for the **Daylight savings offset (HH:MM)**.

NOTE
The settings are enable only when **Daylight saving setup** is set to **ON** or **Auto**.

5. Set up the **DST adjustment (24-hour format)**, including **Begins** and **Ends** time.

NOTE
The settings are enable only when **Daylight savings setup** is set to **Auto**.

6. Select the **Time Zone** > **NTP** tab to set up Network Time Protocol settings.

Option	Description
Different from GMT (HH:MM) + if later **Hour** **Minute**	**Set offset hours : minutes from GMT.**
NTP server x where x = 01-05	**Enter the NTP server address. You can set up to 5 NTP servers.**
NTS	**Enable or disable Network Time Security (NTS) feature for the related NTP server. The NTS provides cryptographic security for the client-server mode of the Network Time Protocol (NTP).**
Select certificate	**Select the NTS certificate.** The setting is active only when **NTS** is enable.

Option	Description
	The NTS certificate has been imported to the monitor via USB disk. The certificate should be provided by hospital IT. For more information, see 6.4.11.2 Importing certificate to the monitor on page 79.

7. Select **Save**.

NOTE
The NTP server's root distance should be no more than 3 s, or else the monitor may not successfully sync time from server.

6.6 Configuring customized EWS

Early Warning Score (EWS) is an optional, license-based feature. EWS scores are tools used by hospital care teams to recognize the early signs of clinical deterioration in order to initiate early intervention and management, such as increasing nursing attention, informing the provider, or activating a rapid response or medical emergency team.

Users can customize an EWS protocol if necessary.

Perform the following steps to add one new EWS protocol.

NOTE
Before start, make sure that the necessary observations have been enabled in **Configurations** > **Advanced** > **Clinical** > **Observations Settings** menu.

NOTE
Before start, make sure that the unit of vital signs and observations which are required by the hospital are the same in **Configurations** > **Advanced** > **Clinical** > **Parameter Settings** menu.

1. Select the **Configurations** > **Advanced** > **Service** > **Customized EWS**.
2. Select **Add new protocol**.

   NOTE
   The device supports up to 5 different customized EWS protocols.

3. Define the EWS protocol name.
   3.1. **Choose a protocol to start with**. The choices are **Blank** or the existing protocols.
   3.2. Enter the **EWS protocol name**.
   3.3. Select **Next** to save the settings and move to the next step.
4. Select parameters that will contribute to score calculation.
   4.1. Select the parameters (**Vital signs** and/or **Observations**) which will contribute to the EWS calculation.
   4.2. Select **Subscore weighting**. The choices are **0 - 2**, **0 - 3** or **0 - 4**. If you select "**0 - 3**", that means the possible subscore could be 0, 1, 2 or 3.
   4.3. Select the color indication for each subscore.
   4.4. If required, you can select **Back** at any time to return to previous step.

4.5. Select **Next** to save the settings and move to the next step.

5. Setup rule about how the score is calculated.

   The **Setup rule** menu displays all the parameters you select in Step 4. And the subscore scale is displayed per the **Subscore weighting** and color indication settings.

   5.1. Select the parameter that requires to define or edit the scoring rule.

   5.2. Select the **Edit** to open **Edit parameter** menu.

   5.3. Select **Condition**.

   5.4. For numerical parameter, enter the data range for each subscore and make sure the whole range has been covered.

   For selection type parameter, select the applicable option for each subscore and make sure all the list options have been covered.

   5.5. Select **Save** and return to the **Setup rule** menu.

   5.6. Repeat the above steps for next parameter.

   5.7. If required, you can select **Back** at any time to return to previous step.

   5.8. Select **Next** to save the settings and move to the next step.

6. Setup response (recommended clinical actions) for the total score ranges.

   NOTE
   When setting up the response on the device, make sure that no fields are empty. Otherwise, the settings cannot be saved successfully on the monitor.

   NOTE
   The **MIN** and **MAX** value can be the same, and the **MAX** value should be within the range.

   6.1. Define one **Total score** range by entering the **MIN** and **MAX** value.

   6.2. Select the **Total EWS Score** color.

   6.3. Enter the **Clinical response**.

   6.4. Select the **Monitoring frequency (h)**.

   6.5. Enable or disable the **Single parameter triggering rule**.

   6.6. Select **Add** to add more lines and repeat the above steps to complete all the **Total score** ranges.

   6.7. If required, select the checkbox(es) of any unnecessary line(s), and then select the **Delete** to delete.

   6.8. If required, you can select **Back** at any time to return to previous step.

   6.9. Select **Done** to complete all the steps.

6.6.1 Managing customized EWS

1. Select the **Configurations** > **Advanced** > **Service** > **Customized EWS**.
2. You can view the **EWS name**, **Status**, **Parameters** for all the available customized EWS protocols.

3. Select **View** to check the details of EWS protocol.
4. To edit any EWS protocol, perform the following steps:
   4.1. Select the EWS protocol's checkbox.
   4.2. Select the **Edit**.
   4.3. Edit the settings in the same way as you add a new EWS protocol.
   4.4. Select **Done** after completing all the changes in **Edit protocol** menu.
5. To delete any unnecessary EWS protocols, perform the following steps:
   5.1. Select the EWS protocols' checkboxes.
   5.2. Select the **Delete**.
6. If required, you can select **Add new protocol** to add one new EWS protocol. Follow the steps in 6.6 Configuring customized EWS on page 81.

6.7 Setting language and national requirements

1. Select the **Configurations** > **Advanced** > **Service** > **Country Settings**.
2. Select the **Language**.
3. Select the applicable option for **National requirements**.

Value	Description
None	Normal defaults
France	Enables: • No **Reminder Volume** item in **Alarm Settings**. • Reminder beep will sound every 2 minutes when alarms have been silenced permanently.

6.8 Configuring barcode parser

Barcode reader can be used to scan information to a single text field or to several text fields at a time:

You need to configure the parser if you use a barcode reader to scan complex barcodes with several data items to multiple fields in the caregiver login menu or patient **Admit New** menu. The correct parser configuration ensures that the data items in the barcode string are correctly populated to the related fields in the caregiver login menu or patient **Admit New** menu.

Before you start configuring the parser:

1. Acquire detailed specifications of the character-delimited or length-delimited barcode string that the hospital uses.
2. Acquire sample barcodes, to verify that you have completed the parser configuration correctly.

NOTE
The barcode reader has an internal, configurable setting for keyboard locale. The factory default value is US English. Configure first the keyboard locale setting of the barcode reader to be the same as the monitor's interface. Follow the instructions provided with the barcode reader.

NOTE
See the Supplies and accessories for compatible accessories.

The supported barcode symbologies and characters are listed in the table below:

Symbology	Supported characters
Aztec Code	All 8-bit values can be encoded. The default interpretation should be: 1. For values 0 - 127, ANSI X3.4 (ASCII) 2. For values 128 - 255, ISO 8859-1 Latin alphabet number 1 See the IEC 24778 standard.
Code 128	Encodes the full ASCII set 0 - 127. See the IEC 15417 standard.
Code 39 (Extended)	Code 39 is restricted to 44 characters, symbols 0-9, A-Z, '-', '.', '$', '/', '+', '%' and space. The Code39 Extended encodes the full ASCII set 0 - 127. Extended characters are encoded by a pair of normal Code 39 characters. See the IEC 16388 standard.
Data Matrix	Encodes all 8-bit values. The maximum length is 1556 ASCII (8 bit), 2335 alphanumerical or 3116 numeric characters. See the IEC 16022 standard.
Interleaved Code 2 Of 5	Restricted to symbols 0-9. See the IEC 16390 standard.
Pdf417	Encodes all-8 bit values. The maximum length is 1108 ASCII (8 bit), 1850 alphanumerical, 2725 numeric characters. See the IEC 24728 standard.

6.8.1 Selecting and configuring the barcode parser

1. Select the **Configurations** > **Advanced** > **Service** > **Patient Barcode Setting** or **Caregiver Barcode Setting**.

   NOTE
   The below settings apply to both patient barcode and caregiver barcode.

2. If necessary, set up the following barcode configuration before using **Character delimited** parser type.

   2.1. Select the **Character Delimited** tab.

   2.2. Enter the **Field delimiter** character that separates the data items in the barcode string.

   The field delimiter can be any ASCII character between 33-126.

   NOTE
   If the character selected as a field delimiter exists within a data item in the barcode string, it will be misinterpreted as a field delimiter.

   2.3. Enter the **Male code** / **Female code** character or number. (**Patient Barcode Setting** only)

   2.4. Enter the sequence number of each data item included in the barcode string into the **Item slot input** column.

See 6.8.2 General notes about parser configuration on page 85 and 6.8.3 Data item specific notes on page 86 for more information to complete the parser configuration.

2.5. A preview of decoded barcode will be displayed in **Item preview** column.

2.6. Select **Save**.

3. If necessary, set up the following barcode configuration before using **Length delimited** parser type.

3.1. Select the **Length Delimited** tab.

3.2. Enter the starting **Position** and **Length** of each data item included in the barcode string.

See 6.8.2 General notes about parser configuration on page 85 and 6.8.3 Data item specific notes on page 86 for more information to complete the parser configuration.

3.3. Select **Save**.

4. Select the **Select Scanner Parser** tab and select the following parser type.

Option	Description
None	**Simple barcode that contains one piece of information, but no data control. There is no need for a parser.**
Character delimited	**Barcode that specifies a special character that separates each data item in the barcode string.**
Length delimited	**Barcode that specifies the beginning position and length of each data item in the barcode string.**

5. Verify that you have configured the parser correctly. See 8.5.9 Testing the barcode reader on page 109.

6.8.2 General notes about parser configuration

Follow these general instructions when configuring the barcode parser:

- You can configure the barcode parser to populate the following data items from a barcode string into the related fields in the caregiver login menu:
  - **ID**
  - **First name**
  - **Last name**

  or in the patient **Admit New** > **Admit from List** menu (when the network and PDQ / Cerner iBus are configured correctly):
  - **PID 1**

  or in the patient **Admit New** > **Admit Manually** menu (when no network or PDQ / Cerner iBus license):
  - **PID 1**
  - **First name**
  - **Last name**
  - **Day of birth**
  - **Month of birth**

- **Year of birth**
- **Age**
- **Gender**
- **PID 2**
- **Age unit**

- The maximum length of the barcode string is 300 characters. The maximum length of a single data item within the barcode string is 99, except for the following data items that have a fixed length, if included:

Data item	Number of characters
Day of birth	2
Month of birth	2
Year of birth	4
Gender	1

- The **Day of birth** and **Month of birth** fields have a fixed length of 2 characters. '0' and space are accepted as padding characters. For example, "01", "<space>1" and "1<space>" are all accepted and will be interpreted as 1, whereas "1" is not accepted because it has only one character.
- If the data item in the barcode is longer than the space reserved for it in the related field, the rest of the characters are truncated.
- The barcode string can contain data items that have no related field in the caregiver login menu or patient **Admit New** menu. Omit these data items when configuring the parser.
  - In the length-delimited parser configuration: leave the starting **Position** and **Length** fields empty for all data items that are not included in the barcode string.
  - In the character-delimited parser configuration: leave the sequence number in the **Item slot input** field empty for all data items that are not included in the barcode string.
- The data items can be located anywhere within the barcode. They do not have to be in the same consecutive order as they appear in the parser configuration menu or in the caregiver login menu or patient **Admit New** menu.
- If decimal numbers are allowed for a data item, both period (.) and comma (,) are accepted as the decimal symbol.

6.8.3 Data item specific notes

Data item / field name	Maximum number of characters		Valid values in bar-code string	Comments
	Admit New	Barcode string		
PID 1	18	99	Both letters and num-bers	NA
First name	16	99		
Last name	16	99		

Data item / field name	Maximum number of characters		Valid values in bar-code string	Comments
	Admit New	Barcode string		
Day of birth	2	2	1-31	If you configure **Day of birth**, configure also: • **Month of birth** • **Year of birth**
Month of birth	2	2	1-12	If you configure **Month of birth**, configure also: • **Day of birth** • **Year of birth**
Year of birth	4	4	1880 to current year	If you configure **Year of birth**, configure also: • **Day of birth** • **Month of birth**
Age	Depends on the selected **Age unit**	99	Numeric (decimal numbers are not allowed)	If you configure **Age**, configure also **Age unit**.
Age unit		99	For Custom configuration: • A, Y, YR, YRS (years) • MO, MOS (months) • WK, WKS (weeks) • D, DAY, DYS (days)	If **Age unit** is included in the barcode, select **Custom** and enter the starting position and length for the data item. If **Age unit** is not included in the barcode, select one of the following: • **Years** • **Months** • **Days** • **Weeks**
Gender	1	1	For Custom configuration, the allowed characters are between ASCII 32 and ASCII 127	If you configure **Gender**, you must specify the **Male code** and **Female code**. M or 1 in the barcode is automatically identified as a male, and all other characters as female.
PID 2	18	99	Both letters and numbers	NA
ID	18	99	Both letters and numbers	NA

6.9 Settings management

6.9.1 Resetting to factory settings

You can reset the current settings of a monitor to factory default.

NOTE
Resetting to factory defaults does not affect the following settings:

- licenses
- passwords
- software language
- E-manual language

1. Discharge the patient.
2. Select the **Configurations** > **Advanced** > **Service** > **Set/Test/Save**.
3. Select **Reset**.

The settings reset will be activated immediately.

6.9.2 Saving settings as default

You can save current settings to target patient type.

1. Select the **Configurations** > **Advanced** > **Service** > **Set/Test/Save**.
2. Select **Save** to save current settings as **Adult / Pediatric default** or **Neonatal default**.

6.9.3 Transferring settings from a monitor to another

6.9.3.1 Exporting settings

You can save the following user settings to the USB storage device.

- **Main settings**
- **EWS settings & observations** (display only when the device has EWS license)
- **System log**
- **License**

NOTE
Make sure the file system format of USB disk is FAT32.

1. Discharge the patient. Insert the USB storage device to the USB port of the monitor.
2. Select the **Configurations** > **Advanced** > **Service**.
3. Select the **USB Import/export** > **Export** tab.
4. Choose the required **Export item** and select **Export**.
5. The **Export to USB Disk** menu pops out. The **USB status** is displayed as follows:
   - **Connected**: indicates successful connection to the device.
   - **Not detected**: indicates incompatible USB disk format. FAT32 format is required.
6. **Create key** of encryption for the settings' file, the length of key shall be at least 6. (This key will be used when import settings).

7. Select **Export**.

   NOTE
   Do not disconnect USB while export is in progress.

   When finish to export settings, a **Success** message "**Exported to USB Disk. The USB Disk can now be safely removed.**" displays on the screen.

8. Remove the USB disk.
9. When fail to export settings, an **Export failed** message "**An internal error occurred. Error while processing export request.**" displays on the screen. Then repeat the above steps to export the settings again.

6.9.3.2 Importing settings

The device supports the following user settings to be imported:

- **Main settings**
- **EWS settings & observations** (display only when the device has EWS license)
- **License**
- **Custom WLAN Configuration file** (display only when the device has WLAN license)
- **Bearer token**

You can import the saved user settings from the USB storage device when:

- first time to use the monitor, refer to 6.2.1.1 Import settings from USB at first time to use on page 47 for more details.
- other time, see following instructions.

User settings are saved to the following locations of USB respectively.

- The main settings files are saved to the `VSM/settings/v1/` folder of the USB disk.
- The EWS settings & observations files are saved to the `VSM/EWS_settings/` folder of the USB disk.
- The license files are saved to the `VSM/license/` folder of the USB disk.
- The custom WLAN configuration files are saved to the `VSM/wlancfg/` folder of the USB disk.
- The Bearer token files are saved to the `VSM/cerner/` folder of the USB disk.

1. Discharge the patient. Insert the USB storage device to the monitor's USB port.
2. Select the **Configurations** > **Advanced** > **Service**.
3. Select the **USB Import/export** > **Import** tab.
4. Choose the required **Import item** and select **Import**.
5. The **Import from USB Disk** menu pops out. The **USB status** is displayed as follows:
   - **Connected**: indicates successful connection to the device.
   - **Not detected**: indicates incompatible USB disk format. FAT32 format is required.
6. Select the settings' file from **Browse files**.
7. **Enter key** of decryption for the settings' file.
8. Select **Import**.

9. The **Confirm import** window pops out on the screen. It reads that "**Settings will be imported and will replace the existing settings. Do you want to import?**". Select **Confirm** to proceed.

   NOTE
   Do not disconnect USB while import is in progress.

   When finish to import settings, a **Success** message "**Imported from USB Disk. The USB Disk can now be safely removed.**" displays on the screen.

10. Remove the USB disk.
11. Restart the monitor.
12. When fail to import settings, an **Import failed** message "**An internal error occurred. Error while processing import request.**" displays on the screen. Then repeat the above steps to import the settings again.

6.10 License management

- You can upload a license file that contains all acquired activation codes for license by the USB storage device.

  1.1. Discharge the patient. Insert the USB storage device with license file.

  1.2. Select the **Configurations** > **Advanced** > **Service** > **License**.

  1.3. Select **Import** and follow the procedure in 6.9.3.2 Importing settings on page 89.

- Alternatively, you can manually enter the required activation codes for license one by one. Select **Input** for the required **Item**.

  NOTE
  Check SpO_2 type (GE TruSignal, Masimo or Nellcor) before inputting the SpO_2 license. Make sure the SpO_2 license matches the current SpO_2 type.

Restart is needed after importing the license.

Contact authorized service personnel to acquire license file or activation codes for licenses.

NOTE
Make sure the file system format of USB disk is FAT32.

NOTE
The license file should be named as SN and stored in following path in USB disk: `VSM/license/SXXXXXXXXXXXX.txt`.

7 Calibration and adjustments

7.1 NIBP calibration

NIBP calibration shall be performed:

- If the NIBP Calibration Check failed.
- If the measured value is not within the specification limits.
- After replace manifold.

7.1.1 Required tools for NIBP

- Adult NIBP hose
- Adult NIBP cuff
- A rigid cylinder or pipe
- Digital manometer with a range of at least 0 to 1000 mmHg and accuracy 0.5% FS.
- Tubing parts to connect a manometer to the NIBP cuff and hose.

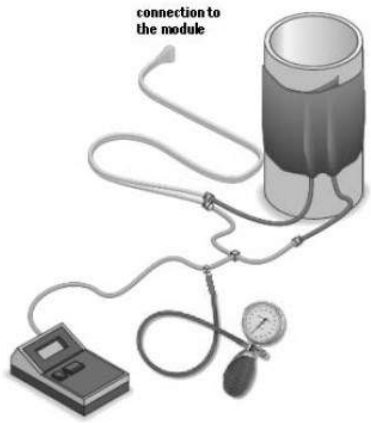
NOTE
Use only accurate, properly maintained, calibrated and traceable calibration tools for the parameter calibration to ensure measurement accuracy.

NOTE
See the Supplies and accessories for compatible accessories.

7.1.2 Making connections

1. Connect an adult NIBP hose to the NIBP connector.
2. Connect an adult NIBP cuff to the hose.
3. Wrap the cuff around a rigid cylinder or pipe.
4. Connect the pressure manometer with pressure pump to the NIBP hose and NIBP cuff with a piece of tubing.

5. Ensure that all of the connections are leak-proof.



7.1.3 Calibrating NIBP

1. Select the **Configurations** > **Advanced** > **Service** > **Parameter Service**.
2. Select **NIBP** tab > **Calibration**.
3. Disable the **Calibration check** toggle.
4. Disable the **Protection** toggle.

   The **Start** button for **Calibration** now is enabled.
5. Select **Start** to start calibration. The NIBP calibration sequence starts with automatic zeroing. Wait until the message **Zeroing** is replaced by the message **Zeroed**.
6. Pump a 200 mmHg static pressure according to the manometer. The pressure measured by the monitor is updated in real time to the calibration menu.
7. When the pressure is stabilized, check the pressure reading from the manometer shall be 200 mmHg.
8. Select **Calibrate 200 mmHg** to make sure the two readings are the same.
9. Wait until a message **Calibrated** is shown.
10. Set the **Protection** toggle back to enable.

NOTE
You can use the calibration check function to verify the calibration after the calibration is completed.

7.2 Temperature calibration check

A temperature calibration check is recommended to verify the temperature accuracy:

- during planned maintenance, or
- when the clincial accuracy is in question.

If the calibration check failed, contact the temperature probe's manufacturer to replace.

7.2.1 Required tools for temperature calibration check

For Welch Allyn temperature calibration check:

- Welch Allyn Calibration key (PN: 2068729-006)
- Welch Allyn 9600 Plus Calibration tester (PN: 2068729-007)

For Exergen temperature calibration check:

- Calibration verification kit (PN: EX129003)
- Calibration verification heat generator (PN: EX129012)

NOTE
The Calibration tester, Calibration verification kit and heat generator have expiration date, please check their own IFU.

7.2.2 About Welch Allyn temperature calibration check

- Using Calibration key: test WA module only
- Using Calibration tester: test WA module with probe

Step	Using Calib key	Using Calib tester	Solution
1	Pass	-	If no need to check probe accuracy, end testing.
2	Fail	Pass	Calib key issue, replace Calib key.
3	Fail	Fail	Contact GE HealthCare service to replace WA module.
4	Pass	Pass	Optional. Both WA module and probe are OK, end testing.
5	Pass	Fail	Optional. Replace probe (if still fail, consider replace Calib key to check again).

7.2.2.1 Welch Allyn temperature calibration check using calibration key

This method uses a fixed value to verify the Welch Allyn temperature module's accuracy.

NOTE
The Calibration key test does not test the accuracy of the probe.

1. Remove any probe currently connected to monitor. Remove the probe from the probe well.
2. Connect the Calibration key to monitor. Insert the probe well to monitor.
3. Place the thermometry probe to probe well and then remove it.
4. Wait until a temperature value is shown on screen. The temperature should be 36.3 ± 0.1°C or 97.3 ± 0.2°F.
5. Remove the Calibration key.
6. Connect the original probe back to the monitor.

If the reading from the Calibration key is not within specified range or you are having other problems with the use of the Calibration key, perform the temperature accuracy testing using the Calibration tester and a temperature probe. If problem persists, contact GE HealthCare service.

7.2.2.2 Welch Allyn temperature calibration check using calibration tester

This method uses a Calibration tester to verify the accuracy of the Welch Allyn temperature module with a specific temperature probe.

1. Turn the monitor on. Make sure the temperature probe is properly stored in the probe well.
2. Adjust Calibration tester to 96.8°F (36.0°C) and wait until the temperature is reached.
3. Place Welch Allyn temperature probe into tester.
4. If monitor unit of measurement for temperature is set to °C, switch the temperature unit to °F. Refer to 3.2.3 Parameter settings on page 32.
5. Measure the temperature. When predictive measurement ends and the snail icon appears on screen, select the snail icon to switch to the Monitor-mode temperature measurement.
6. Record and verify that the reading on the temperature display is 96.8°F ± 0.2°F.
7. Set the tester to 101.3°F (38.5°C) and repeat step #6.
8. Record and verify that the reading on the temperature display is 101.3° F ± 0.2°F.
9. Set the tester to 105.8° F (41.0°C) and repeat step #6.
10. Record and verify that the reading on the temperature display is 105.8° F ± 0.2°F.
11. If necessary, switch the temperature unit back to °C.
12. Confirm all test results are recorded in check form.
13. Calibration check is complete. If the monitor does not pass the calibration check, contact GE HealthCare service.

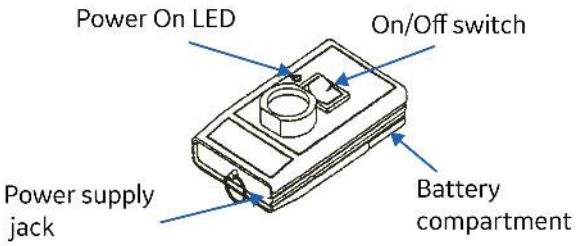
7.2.3 Exergen temperature calibration check

Exergen temperature accuracy can be verified using the Calibration verification kit (P/N: EX 129003). The Calibration verification kit includes a portable blackbody heat generator (PN: EX129012) providing a stable source of heat in a small cavity. This is used as a target reference to verify the accuracy of the Exergen temporal scanner against an Exergen Certified Master (CM) reference instrument, also included in the kit.

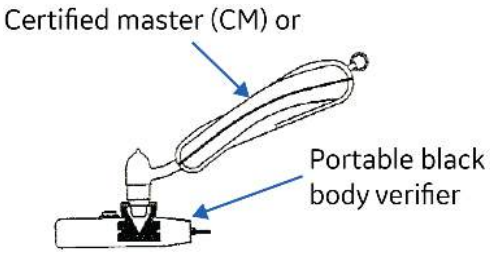
The CM instrument must be the same model and calibration as the Exergen units to be tested (serial labels on the instruments indicate if device is oral or arterial and Celsius or Fahrenheit). If this is not the case, contact GE HealthCare service.

NOTE
Comparisons between the CM and the instrument being tested should always be conducted under the same conditions.

1. Turn on the verifier device, using either a 9-volt battery or the power supply. Make sure the red LED is illuminated.



2. Allow the device approximately 5 minutes for warm-up and stabilization time.
3. Allow the certified master and the instrument to be tested to acclimate in the same ambient temperature for at least 10 minutes.
4. For all instruments, make sure the lens at the tip of the probe is clean. To clean, use an alcohol prep or a swab dipped in alcohol, followed by a damp wipe with water to remove any residue.
5. Alternately insert the reference instrument and the instrument being verified into the aperture opening, comparing the readings.



6. Record and verify that the difference between the temperature reading of the CM and the instrument being verified is ± 0.2°C (± 0.4°F).

   If the readings differ by more than the acceptable field limits, repeat this procedure. If the readings still differ by more than the acceptable limits, the device fails.
7. Confirm that test results are recorder on the check form.

8 Checkout procedures

8.1 About the checkout procedures

This chapter describes the checkout procedures for the monitor.

The installation check covers the following devices:

- Monitor
- B1X5-REC recorder

The planned and corrective maintenance checks cover the following devices:

- Monitor
- B1X5-REC recorder

The cleaning precautions, cleaning requirements, cleaning procedures, and recommended cleaning solutions are described in the monitor's user manual.

For details about cleaning, disinfecting and sterilizing the accessories, see the instructions for use in the accessory package.

To help ensure the equipment remains in proper operational and functional order and maintains its essential performance and basic safety, follow the corrective and planned maintenance recommendations. The tests that are related to the essential performance and basic safety are marked with an asterisk *.

Record the results of the check procedures to the eCheckforms.

8.2 Required checkout procedures

Perform the following tests during installation, planned maintenance and corrective maintenance:

Checkout procedure		**Required check procedure**		
		Visual inspections	**Electrical safety test**	**Functional check**
Installation check		Yes	No, if there is less than 12 months since the monitor was Manufactured. Check the date of manufacture of the device from the device plate.	Yes
Planned maintenance check[1]		Yes	Yes	Yes
Corrective maintenance check[2] (After detaching, replacing or upgrading:)	B1X5-REC recorder	Yes	No	Start-up Test recorder
	Main board, SpO_2 board, parameter input boards inside the monitor	Yes	Yes	All functional check steps

Checkout procedure		Required check procedure		
		Visual inspections	Electrical safety test	Functional check
	Any other part inside the monitor	Yes	Yes, except the patient leakage current tests.	All functional check steps

1 You can skip PM tasks if a previous service action is performed in 3 months.

2 After replace mainboard, calibration for NIBP is needed.

8.2.1 Installation check

The purpose of the installation check is to ensure that the patient monitoring system, including the connected devices, is properly installed and configured for use.

Perform the installation check after the hardware installation and platform configuration is completed before taking the monitor into clinical use.

The manufacturer has performed the electrical safety test for the monitor during final inspection. You do not have to perform the electrical safety tests during the installation checkout, if there is less than 12 months since the monitor was manufactured. Check the date of manufacture of the device from the device plate.

8.2.2 Planned maintenance check

The purpose of the planned maintenance check is to periodically check that the product remains safe to use and maintains its performance characteristics.

Perform the planned maintenance check every two years after installation.

WARNING

SAFETY HAZARD.

To avoid risks to personnel and patient, or damage to the equipment, only perform maintenance procedures described in this manual. Unauthorized modifications can lead to safety hazards.

WARNING

Planned maintenance should be carried out at recommended interval. Failure to implement the recommended maintenance schedule may cause equipment failure and possible health hazards.

NOTE

The manufacturer does not, in any manner, assume the responsibility for performing the recommended maintenance schedule, unless an Equipment Maintenance Agreement exists. The sole responsibility rests with the individuals, hospitals, or institutions utilizing the device.

8.2.3 Corrective maintenance check

The purpose of the corrective maintenance check is to ensure that the product was repaired correctly, and to check that the product is safe to use and maintains its performance characteristics. Perform the

corrective maintenance check after any corrective maintenance, before taking the monitor back into clinical use.

8.3 Performing visual inspection

Perform the following visual inspection to the installed monitoring system:

1. Check that all product labeling, markings and symbols are intact and readable.
2. Check that the monitor and the connected devices do not have any visible damage.
3. Check that the monitor and the connected devices are properly mounted with specified mounting solutions.
4. Check that the cables between the patient monitor and the connected devices are intact, properly connected and secured to the right connectors.

8.4 Electrical safety tests *

Electrical safety tests provide a method of determining if potential electrical health hazards to the patient or operator of the device exist.

WARNING

EXCESSIVE LEAKAGE CURRENT.

Do not use a multiple socket outlet or extension cord in an ME system.

WARNING

EXCESSIVE LEAKAGE CURRENT.

A display or printer that is a non-medical grade device and is used within the patient environment, must always be powered from an additional transformer providing at least basic isolation (isolating or separating transformer). Using without an isolating transformer could result in unacceptable enclosure leakage currents.

WARNING

EXCESSIVE LEAKAGE CURRENT.

To avoid summation of leakage currents when interfacing the device with other equipment, the devices may only be interconnected with each other or to parts of the system when it has been determined by qualified biomedical personnel that there is no danger to the patient, the operator, or the environment as a result. In those instances where there is any element of doubt concerning the safety of the connected devices, the user must contact the manufacturers concerned (or other informed experts) for proper use. In all cases, safe and proper operation should be verified with the applicable manufacturer’s instructions for use, and system standards IEC60601-1 must be complied with.

8.4.1 Test setup

The electrical safety test procedure described in this service manual is intended for the following system components:

- Monitor

All system components must be properly connected to the monitor during the electrical safety tests.

Test conditions

Perform electrical safety tests under normal ambient conditions of temperature, humidity and pressure.

Test equipment

The test equipment required to perform electrical safety tests is listed below.

Tool	Part number / requirement
Safety Analyzer / Leakage Current Tester	Perform the electrical safety tests using an electrical safety analyzer according to IEC 60601-1; 3.1 edition, AAMI ES60601-1 + C1 + A1 + A2, EN 60601-1 or CSA CAN/CSA-C22.2 NO. 60601-1:14. The schematics in this section show the principle of the test equipment. The actual configuration of the test equipment may vary. Refer to the instructions delivered with the safety analyzer to perform each test.

The patient monitor being tested should be placed on an insulating surface.

NOTE
Before proceeding, make sure that all test equipment is properly calibrated, maintained and functioning.

8.4.2 Verifying power outlet

1. Verify that the power outlet is wired correctly according to the country's electrical code standard before starting the following electrical safety tests.

The results of the following tests will be inaccurate unless a properly wired power outlet is used.

8.4.3 Verifying power cord and plug

WARNING

Use only AC power cords recommended or manufactured by GE HealthCare.

1. Verify that the power cord being used with the patient monitor is undamaged:
   1.1. Inspect the power cord for wear or damage. If damage is suspected, test for continuity through each conductor of the power cord connector.
   1.2. Replace the power cord, as necessary, with a regulatory-approved cord for the country of use.

8.4.4 Ground integrity check

There are two alternative methods for checking the ground (earth) integrity:

- Ground continuity test

- Impedance of protective earth connection

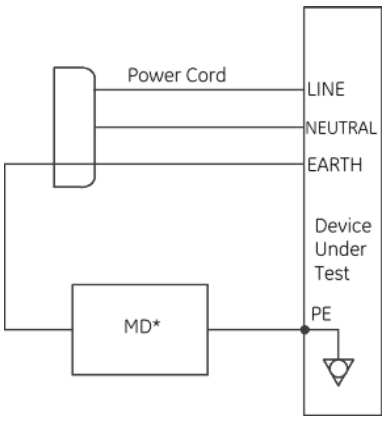
These tests determine whether the device's exposed metal and power inlet's ground connection has a power ground fault condition.

Perform the test in accordance to your local regulations.

NOTE
Refer to the instructions delivered with the safety analyzer to perform each test.

8.4.4.1 Testing ground continuity

The measuring device (MD) in the diagram below may be a digital multimeter or part of the safety analyzer.



Acceptance criteria:

- For equipment without a power supply cord, the impedance between the protective earth terminal and any accessible metal part which is protectively earthed shall not exceed 0.1 ohms.
- For equipment with a power supply cord, the impedance between the protective earth pin in the mains plug and any accessible metal part which is protectively earthed shall not exceed 0.2 ohms.

8.4.4.2 Checking impedance of protective earth connection

This test is normally only required as a manufacturing production test to receive safety agency compliance. Some country agencies do require this test after field equipment repairs (i.e., Germany's DIN VDE 0751 standards). Consult your country/local safety agency if in doubt.

Preferably use a safety analyzer and test the equipment with the power supply cord.

Check compliance as follows:

1. A current of 25A from a current source with a frequency of 50 or 60 Hz with a no-load voltage not exceeding 6 V is passed for at least 5 seconds, but not more than 10 seconds, through the protective earth terminal or the protective earth pin in the mains plug and each accessible metal part which could become live in case of failure in basic insulation.
2. The voltage drop between the parts described is measured and the impedance determined from the current and voltage drop. It shall not exceed the values indicated.

   When taking this measurement, flex the unit's power cord along its length. There should be no fluctuations in resistance.

Acceptance criteria:

- For equipment without a power supply cord, the impedance between the protective earth terminal and any accessible metal part which is protectively earthed shall not exceed 0.1 ohms.
- For equipment with a power supply cord, the impedance between the protective earth pin in the mains plug and any accessible metal part which is protectively earthed shall not exceed 0.2 ohms.

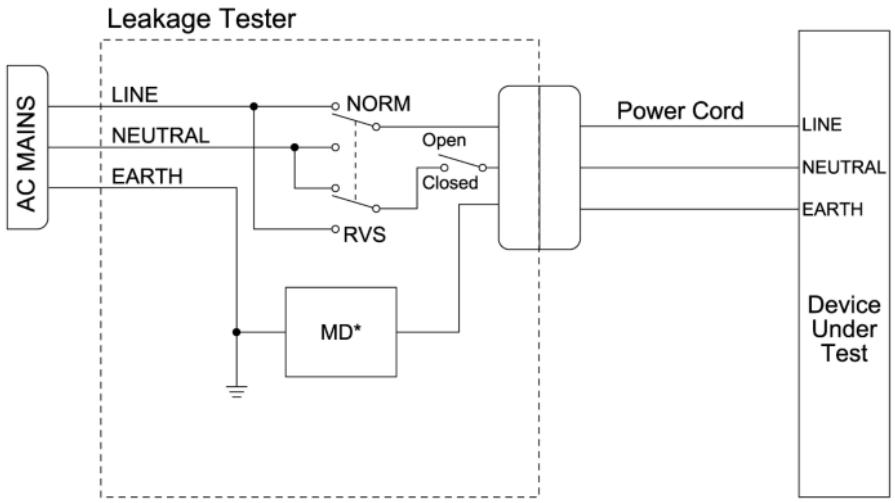
8.4.5 Testing earth leakage current

This test measures the current leakage flowing from the mains part through or across the insulation into the protective earth conductor of the device under test.

Perform this test both in Normal Condition (NC) and in a Single Fault Condition (SFC), where one of the supply conductors is open at a time. Perform the test with normal and reverse polarity

The test sequence described below is for reference only. You can also perform the subtests in a different order.

NOTE
Refer to the instructions delivered with the safety analyzer to perform this test.



* The measuring device (MD) represents the network and voltage measuring instrument and its frequency characters according to IEC 60601-1.

1. Configure the safety analyzer as follows (NC):
   - Polarity: NORMAL
   - Neutral: CLOSED
2. Power on the device under test.
3. Read and record the current leakage indicated on the safety tester.
4. Configure the safety analyzer as follows (SFC):
   - Polarity: NORMAL
   - Neutral: OPEN
5. Read and record the current leakage indicated on the safety tester.
6. Configure the safety analyzer as follows (SFC):
   - Polarity: REVERSED

- Neutral: OPEN

7. Read and record the current leakage indicated on the safety tester.
8. Configure the safety analyzer as follows (NC):
   - Polarity: REVERSED
   - Neutral: CLOSED
9. Read and record the current leakage indicated on the safety tester.
10. Power off the device under test.

Acceptance criteria in Normal Condition (NC):

- All readings shall be less than or equal to 5 mA for installations that require compliance to EN/IEC 60601-1 requirements.
- All readings shall be less than or equal to 3 mA for installations that require compliance to ANSI/AAMI ES60601-1 requirements.

Acceptance criteria in Single Fault Condition (SFC) – one of the supply conductors open at a time:

- All readings shall be less than or equal to 10 mA.

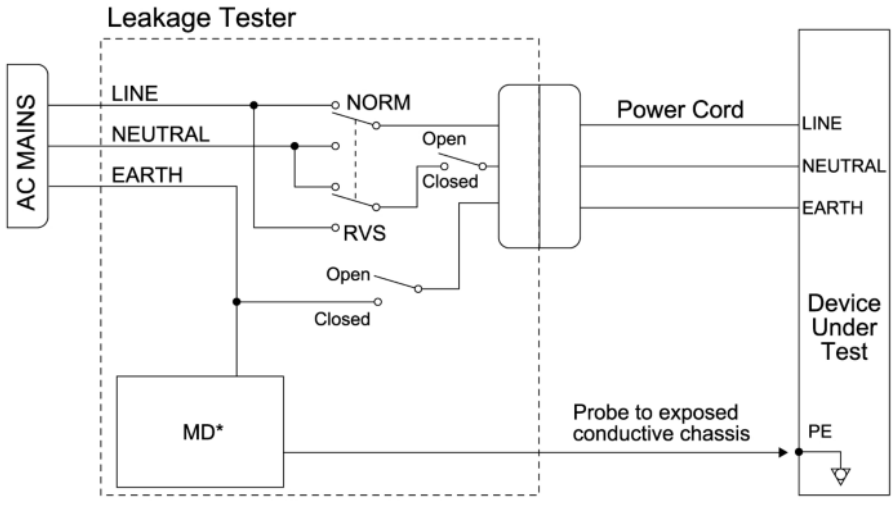
8.4.6 Testing touch leakage current

This test measures current leakage through the exposed conductive parts on the device under test.

Perform the test in Normal Condition (NC) and in two different Single Fault Conditions (SFC): 1) earth open and 2) one of the supply conductors open at a time. Perform the test with normal and reverse polarity.

The test sequence described below is for reference only. You can also perform the subtests in a different order.

NOTE
Refer to the instructions delivered with the safety analyzer to perform this test.



* The measuring device (MD) represents the network and voltage measuring instrument and its frequency characters according to IEC 60601-1.

1. Configure the safety analyzer as follows (NC):
    - Polarity: NORMAL
    - Neutral: CLOSED
    - Earth (GND): CLOSED
2. Power on the device under test.
3. Read and record the current leakage indicated on the safety tester.
4. Configure the safety analyzer as follows (SFC):
    - Polarity: NORMAL
    - Neutral: OPEN
    - Earth (GND): CLOSED
5. Read and record the current leakage indicated on the safety tester.
6. Configure the safety analyzer as follows (SFC):
    - Polarity: NORMAL
    - Neutral: CLOSED
    - Earth (GND): OPEN
7. Read and record the current leakage indicated on the safety tester.
8. Configure the safety analyzer as follows (SFC):
    - Polarity: REVERSED
    - Neutral: CLOSED
    - Earth (GND): OPEN
9. Read and record the current leakage indicated on the safety tester.
10. Configure the safety analyzer as follows (SFC):
    - Polarity: REVERSED
    - Neutral: OPEN
    - Earth (GND): CLOSED
11. Read and record the current leakage indicated on the safety tester.
12. Configure the safety analyzer as follows (NC):
    - Polarity: REVERSED
    - Neutral: CLOSED
    - Earth (GND): CLOSED
13. Read and record the current leakage indicated on the safety tester.
14. Power off the device under test.

Acceptance criteria in Normal Condition (NC):

- All readings shall be less than or equal to 100 µA

Acceptance criteria in Single Fault Condition (SFC) – earth open or one of the supply conductors open at a time:

- All readings shall be less than or equal to 300 µA for installations that require compliance to ANSI/AAMI ES60601-1 requirements.
- All readings shall be less than or equal to 500 µA for installations that require compliance to EN 60601-1 / IEC 60601-1 requirements.

8.4.7 Patient leakage current tests

Patient leakage current tests consist of patient (source) leakage current tests and patient (sink) leakage current tests. Perform these patient leakage current tests for the SpO_2 connector for monitor.

8.4.7.1 Testing patient (source) leakage current

This procedure measures the leakage current from an applied part connector of the device to ground.

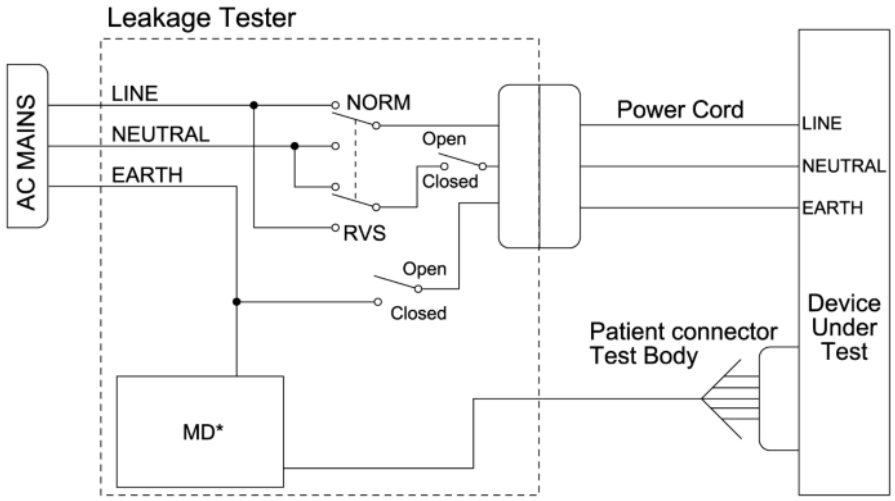
Perform this test for the SpO_2 connector for the monitor.

Perform the test in Normal Condition (NC) and in two different Single Fault Conditions (SFC): 1) earth open and 2) one of the supply conductors open at a time.

Perform the test with normal and reverse polarity.

The test sequence described below is for reference only. You can also perform the subtests in a different order.

NOTE
Refer to the instructions delivered with the safety analyzer to perform this test.



* The measuring device (MD) represents the network and voltage measuring instrument and its frequency characters according to IEC 60601-1.

1. Configure the safety analyzer as follows (NC):
   - Polarity: NORMAL
   - Neutral: CLOSED
   - Earth (GND): CLOSED
2. Power on the device under test.
3. Read and record the current leakage indicated on the safety tester.

4. Configure the safety analyzer as follows (SFC):
    - Polarity: NORMAL
    - Neutral: OPEN
    - Earth (GND): CLOSED
5. Read and record the current leakage indicated on the safety tester.
6. Configure the safety analyzer as follows (SFC):
    - Polarity: NORMAL
    - Neutral: CLOSED
    - Earth (GND): OPEN
7. Read and record the current leakage indicated on the safety tester.
8. Configure the safety analyzer as follows (SFC):
    - Polarity: REVERSED
    - Neutral: CLOSED
    - Earth (GND): OPEN
9. Read and record the current leakage indicated on the safety tester.
10. Configure the safety analyzer as follows (SFC):
    - Polarity: REVERSED
    - Neutral: OPEN
    - Earth (GND): CLOSED
11. Read and record the current leakage indicated on the safety tester.
12. Configure the safety analyzer as follows (NC):
    - Earth (GND): REVERSED
    - Neutral: CLOSED
    - Earth (GND): CLOSED
13. Read and record the current leakage indicated on the safety tester.
14. Power off the device under test.

Acceptance criteria in Normal Condition (NC):

- All readings shall be less than or equal to 10 µA (d.c.).

Acceptance criteria in Single Fault Condition (SFC) – earth open or one of the supply conductors open at a time:

- All readings shall be less than or equal to 50 µA (d.c.).

8.4.7.2 Testing patient (sink) leakage current

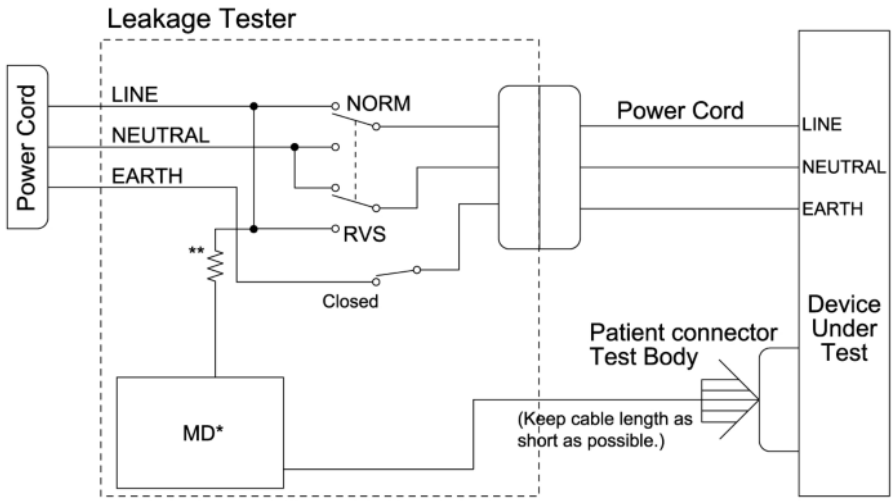
This procedure measures the leakage current from an applied part connector of the device to ground when the applied part connector is connected to 250 V.

Perform this test for the SpO_2 connector for the monitor.

Perform the test in Normal Condition (NC) with normal and reverse polarity.

The test sequence described below is for reference only. You can also perform the subtests in a different order.

NOTE
Refer to the instructions delivered with the safety analyzer to perform this test.



* The measuring device (MD) represents the network and voltage measuring instrument and its frequency characters according to IEC 60601-1.

** According to IEC-60601, the impedance to protect the circuitry and the person performing the test, but low enough to accept currents higher than the allowable values of the leakage current to be measured.

WARNING

SHOCK HAZARD.

The following step causes high voltage at the test body. Do not touch the test body.

1. Configure the safety analyzer as follows:
   - Polarity: NORMAL
   - Neutral: CLOSED
   - GND: CLOSED
2. Power on the device under test.
3. Read and record the current leakage indicated on the safety tester.
4. Configure the safety analyzer as follows:
   - Polarity: REVERSED
   - Neutral: CLOSED
   - GND: CLOSED
5. Read and record the current leakage indicated on the safety tester.
6. Power off the device under test.

Acceptance criteria:

- All readings shall be less than or equal to 50 µA (d.c.).

8.4.8 Completing electrical safety tests

1. Disconnect the safety analyzer from the power outlet.
2. Disconnect the test equipment from the patient monitor.
3. Disconnect the patient monitor's power cord from the leakage tester.

8.5 Performing functional check

8.5.1 Checking the startup

1. Turn on the power by press ON/OFF button more than 3 seconds.
2. Verify that the patient monitor starts up normally:
   - The yellow, red and blue alarm lights are lit momentarily.
   - The speaker gives an audible beep.
   - The normal welcoming screen appears with a status bar indicating the progress of the startup procedure.
   - Normal monitoring screen appears and there are no error messages on the screen.

   NOTE
   If you receive a **Condition battery** or a **Battery failure** message, refer to the troubleshooting instructions for battery conditioning or replacement.
3. Verify that the battery is fully charged.

   If the battery is not fully charged, keep the monitor connected to the mains until the battery is fully charged. The battery must be fully charged before taking the monitor into use for the first time.

8.5.2 Checking display

8.5.2.1 Checking screen display quality

1. Check that all text is readable and all images are clear on screen.
2. Check that the display brightness is good. Adjust if necessary.

8.5.2.2 Testing touchscreen control

1. Verify the operation of a touchscreen by touching a main menu key. Verify that the related menu is opened.

8.5.3 Checking the time and date

1. Select the **Configurations** > **Advanced** > **Clinical** > **Date/time**.
2. Check that the **Current Time** is correct, adjust the time and date if necessary.

3. Select **Save**.
4. Select the **Configurations** > **Advanced** > **Service** > **Time Zone**.
5. Check and adjust the settings if necessary.

8.5.4 Checking the alarm settings

1. Print out the related worksheet, if have.
2. Select the **Configurations** > **Advanced** > **Clinical** > **Alarm Settings**.
3. Check the alarm settings if match with the worksheet, adjust if necessary.

8.5.5 Checking the EWS settings

1. Print out the related worksheet, if have.
2. Select the **Configurations** > **Advanced** > **Clinical** > **EWS Settings**.
3. Check if the correct EWS protocol is in use.
4. Select **View** for each customized EWS protocol and check if match with the worksheet.
5. If necessary, adjust customized EWS settings through the **Configurations** > **Advanced** > **Service** > **Customized EWS**.

8.5.6 Checking the Observations settings

1. Print out the related worksheet, if have.
2. Select the **Configurations** > **Advanced** > **Clinical** > **Observations Settings**.
3. Check if the correct observations are in use.

8.5.7 Checking the device information

1. Select the **Configurations** > **Monitor Setup** > **Monitor Info** vertical tab.
2. Verify the version, language and network information.

8.5.8 Testing the B1X5-REC recorder

1. Select the **Patients & Records**.
2. To start the printing, select the historical record(s) and select **Print**.
3. Check that the recorder starts printing.
4. Let the recorder print for approximately 10 seconds.
5. Select the to stop printing.
6. Check that the printout is readable.

8.5.9 Testing the barcode reader

Perform this test only if a barcode reader is connected to the device and when no network is connected.

NOTE
Before start, please prepare the sample barcodes, the data content must be known and in compliance with the completed parser configuration.

1. Length delimited or Character delimited parser:
   1.1. Scan the test barcode.
   1.2. • Test caregiver barcode settings: select **Caregiver** in the pop-up **Scan type** window.
   • Test pateint barcode settings: select **Patient** in the pop-up **Scan type** window.
   1.3. Verify that the data content in the barcode is correctly populated to the related fields.
2. No parser:
   2.1. • Test caregiver barcode settings: Select the **User ID** field in the caregiver login menu.
   • Test patient barcode settings: Select the **Patient ID** field or other unique ID field in the patient **Admit New** > **Admit Manually** menu.
   2.2. Scan a sample barcode that only contains one piece of information (for example, a Serial Number barcode from the device label).
   2.3. Verify that the data is correctly populated into the field.

8.5.10 Testing wired network

Perform the following test only if the patient monitor is connected to a wired network.

1. Check that a network symbol is displayed in the upper right corner of the screen.
2. Select the **Configurations** > **Monitor Setup** > **Monitor Info**.
3. Check the Ethernet connection status.
4. Verify connectivity with the target network device using **Ping**. For more information, see 11.1.4.1 Pinging a TCP/IP network device on page 133.

8.5.11 Testing wireless network

Perform the following test only if the monitor supports WLAN communication.

The purpose of this test is to ensure that each wireless monitor is correctly configured. The monitor is stationary during the test.

1. Disconnect the monitor under test from the wired network, if connected.
2. Check that the wireless network connection and signal strength indicator is displayed in the upper right corner of the screen.
3. Select the **Configurations** > **Advanced** > **Service** > **Connectivity**.
4. Select the **WLAN** tab > **Status**.
5. Check the connection status and other network information if necessary.

6. Verify connectivity with the target network device using **Ping**. For more information, see 11.1.4.1 Pinging a TCP/IP network device on page 133.

8.5.12 Testing PDQ query

Perform the following test only if the monitor is connected to network (wired/wireless) and the device has installed PDQ or Cerner iBus/Cloud license.

1. Scan a patient barcode if the function has been configured, or select the **Admit New** > **Admit from List** tab.

   NOTE
   The method also depends on settings of **Query barcode input** and **Allow manual patient search**.

2. If you scan the barcode, select the **Patient** in the pop-up **Scan type** window. If you choose the manual entry, then enter the ID in the **Search PID** box.
3. Check that if the search returns the required patient information on the screen.
4. Select **Cancel** to exit the menu.

8.5.13 Testing EMR outbound

Perform the following test only if the monitor is connected to network (wired/wireless) and the device has installed PCD-01 or Cerner iBus/Cloud license.

1. Ensure the device is in **Spot Check** mode.
2. Admit a patient. For more information, see the User's Manual.
3. Manual input a temperature value.
4. Select the **Send** key on the main menu area.

   NOTE
   If the **Confirm report before send / save (Spot Check)** is enabled in the **Workflow** menu, then select the **Next** key first.

5. Check if the sent **Success** message pops up on the screen.
6. Discharge the patient manually if location **Fixed** is enabled in the **Advanced** > **Workflow** menu.

8.5.14 Testing caregiver setup

Perform the following test only if the monitor is connected to network (wired/wireless) and the device has installed LDAP or Cerner iBus/Cloud license.

1. Scan a caregiver barcode if the function has been configured, or select the **Login** on the caregiver information area.

2. If you scan the barcode, select the **Caregiver** in the pop-up **Scan type** window. If you choose the manual entry, then obtain the **User ID**, **Username** and **Password** from LDAP server administrator or hospital IT and enter them by selecting the areas you can edit.

   NOTE
   Whether the **User ID** or **Username** is mandatory or optional for caregiver login depends on **Mandatory fields for caregiver login** settings in the **Advanced** > **Workflow** menu.

3. Select **Login** to validate the login credentials.
4. If the caregiver identification was validated by the LDAP or Cerner server, the system will return to the main screen, and `caregiver name` will be displayed.

   NOTE
   The caregiver name or ID can be hidden with *** using the **Caregiver info display** settings in the **Advanced** > **Workflow** menu.

   NOTE
   If the caregiver identification was not validated, you can select **Cancel** first to exit the menu and then start troubleshooting.

5. After you complete the testing, log out current cargiver by selecting the caregiver information area and choosing **Log out** from the selection list.

8.5.15 Checking parameters for installation

1. Connect the accessories to monitor (no need to connect to simulator or patient).
2. Admit a patient. For more information, see the User's Manual.
3. Verify the following:
   3.1. SpO_2: After connecting the SpO_2 cable and sensor, the sensor will be lit.
   3.2. NIBP: Select **Start** or **Start manual** in NIBP parameter window, **NIBP cuff loose** will display on the screen.
   3.3. Temperature: Take a temperature reading on yourself. For more information, see the User's Manual.
   - For Welch Allyn: verify that 1) the monitor sounds one beep after the probe is removed from the probe well in seconds; 2) the temperature displays in the Temp parameter window after the probe is placed at a measurement site (>34°C or 93.2°F).
   - For Exergen and HeTaida: verify that the temperature displays on both the thermomether and in the Temp parameter window on the monitor.

8.5.16 Checking parameters for maintenance

8.5.16.1 Required tools for functional check

NOTE
See the Supplies and accessories for compatible accessories.

- Temperature
  - Welch Allyn Calibration key (PN: 2068729-006)
  - Welch Allyn 9600 Plus Calibration tester (PN: 2068729-007)
  - Calibration verification kit (PN: EX129003)
  - Calibration verification heat generator (PN: EX129012)
- For SpO2:
  - SpO_2 interconnect cable
  - SpO_2 finger sensor
- For NIBP:
  - Adult NIBP hose
  - Adult NIBP cuff
  - A rigid cylinder or pipe
  - Digital manometer with a range of at least 0 to 1000 mmHg and accuracy 0.5% FS.
  - Tubing parts to connect a manometer to the NIBP cuff and hose.

8.5.16.2 Making connections for functional check

1. Turn the monitor on and wait until the normal screen appears.
2. Connect SpO_2:
   2.1. Connect the SpO_2 simulator to the SpO_2 connector on the monitor with the applicable SpO_2 and/or simulator accessories.
3. Connect NIBP:
   3.1. Connect an adult NIBP hose to the NIBP connector.
   3.2. Connect an adult NIBP cuff to the hose.
   3.3. Wrap the cuff around a rigid cylinder or pipe.
   3.4. Connect the pressure manometer with pressure pump to the NIBP hose and NIBP cuff with a piece of tubing.
   3.5. Ensure that all of the connections are leak-proof.

8.5.16.3 Configuring monitor for functional check

1. Configure SpO_2:

   1.1. Select the **Configurations** > **Parameter Setup** > **SpO2** vertical tab. Select **Waveform** from **Show on main screen** list.

2. Configure NIBP:

   2.1. Select the **Configurations** > **Parameter Setup** > **NIBP** vertical tab.

   2.2. Select **Adult** from **Cuff size** list.

   2.3. Select **Use default inflation pressure**.

8.5.16.4 Testing SpO_2 measurement *

1. Connect the SpO_2 sensor to your finger and wait until a pulse is found.
2. Check that:
   - The SpO_2 reading appears in the parameter window.
   - The plethysmographic waveform appears on the screen.

   You can verify the functionality of a pulse oximeter probe and monitor with a functional SpO_2 tester but you cannot evaluate their accuracy with such a device. For more information, refer to the standard ISO 80601-2-61 Annex FF (Simulators, calibrators and functional testers for pulse oximeter equipment).

8.5.16.5 Testing NIBP measurement *

1. Check the NIBP tubing system for leaks and check if NIBP calibration is required.

   1.1. Select the **Configurations** > **Advanced** > **Service** > **Parameter Service**.

   1.2. Select **NIBP** tab > **Calibration**.

   1.3. Enable the **Calibration check** toggle.

   1.4. Pump a 200 mmHg static pressure according to the manometer. The pressure measured by the device is updated in real-time to the calibration menu. Wait for a while until the pressure stabilizes.

   1.5. Use the following table to evaluate the NIBP leakage and NIBP calibration status.

Observed results	Conclusion	Recommended action
NIBP is leaking.	Test failed. The NIBP tubing is leaking if the pressure does not stabilize and drops at a rate of 1 mmHg or more for every five seconds.	Troubleshoot the root cause for the NIBP leakage and correct the problem. 1. Check that the external NIBP test setup is not leaking. Correct the root cause for the leak and repeat the NIBP measurement test. 2. Check that the internal NIBP tubing is not leaking. Re-perform all the check out procedures required after performing corrective maintenance to the module.

Observed results	Conclusion	Recommended action
NIBP is out of calibration.	Test failed. NIBP calibration is required, if the readings in the manometer and in the NIBP calibration menu differ more than ±1 mmHg.	1. Calibrate NIBP. 2. Perform functional check to retest the NIBP measurement.
No leakage and NIBP is accurate.	Test passed. NIBP is working properly, if it is not leaking and it shows accurate readings.	Perform the next step of this procedure.

2. If required, check that the pump and valves are working properly through the **Parameter Service** > **NIBP** tab > **Pneumatics** settings.
3. Disconnect the NIBP cuff and manometer from the module.

8.5.16.6 Testing temperature measurement

Perform the temperature calibration check during maintenance. For more information, see 7.2 Temperature calibration check on page 92.

1. Check that if the temperature difference is within the required range:
   - Welch Allyn: ± 0.1°C or ± 0.2°F (for Calibration key), ± 0.2°F (for Calibration tester)
   - Exergen: ± 0.2°C (± 0.4°F)

   NOTE
   If the measured value is not within the range, contact the temperature probe's manufacturer to replace.
2. There are no error messages on the screen.

8.5.17 Completing the check procedure

1. Discharge the patient to discard any changes made to the patient monitor configuration during checkout.

   NOTE
   The discharging process is affected by the **Advanced** > location **Fixed** settings (password protected). For more information, refer to "Discharging a patient" in User's manual.
2. Disconnect the test setup.
3. Complete the check form.

9 Software download

9.1 About this introduction

This instruction describes how to install the software, firmware and e-manuals to the Portrait™ VSM Vital Signs Monitor.

These packages are delivered in a USB storage device. Please check and make sure that you use the correct USB part.

9.2 Contents of the USB storage device

- All versions of software package and related e-manuals
- All versions of firmware package
- Download instruction: this document

9.3 Installing software, firmware and e-manuals

9.3.1 Preparing the USB disk

If need to copy the electronic package to your own USB disk, you should follow specific folder structure and naming rules.

NOTE
The namings are capital sensitive.

1. Make sure the file system format for USB disk should be FAT32, if not, please format the disk.
2. Create the related folders in the root of disk, the folder name and route as following:
   - "VSM/software/v1/VSM_x.x.x.x": for device main software
   - "VSM/software/v1/VSM_x.x.x.x/EManual": for the e-manuals
   - "VSM/firmware/NIBP/NIBP_x.x.x.x": for NIBP firmware
   - "VSM/firmware/RECX/RECX_x.x": for recorder firmware
   - "VSM/firmware/STP/STP_x.x.x.x": for STP firmware (when the SpO_2 license is GE TruSignal)
   - "VSM/firmware/TP/TP_x.x.x.x": for TP firmware (when the SpO_2 license is Masmo or Nellcor)
3. Copy the target version of software/firmware package to the above related folder, rename the target package name if necessary:
   - “VSM_x.x.x.x”: for device main software and e-manuals
   - “NIBP_x.x.x.x”: for NIBP firmware
   - “RECX_x.x”: for recorder firmware

- “TP_x.x.x.x”: for Masimo or Nellcor TP firmware
- "STP_x.x.x.x": for STP firmware

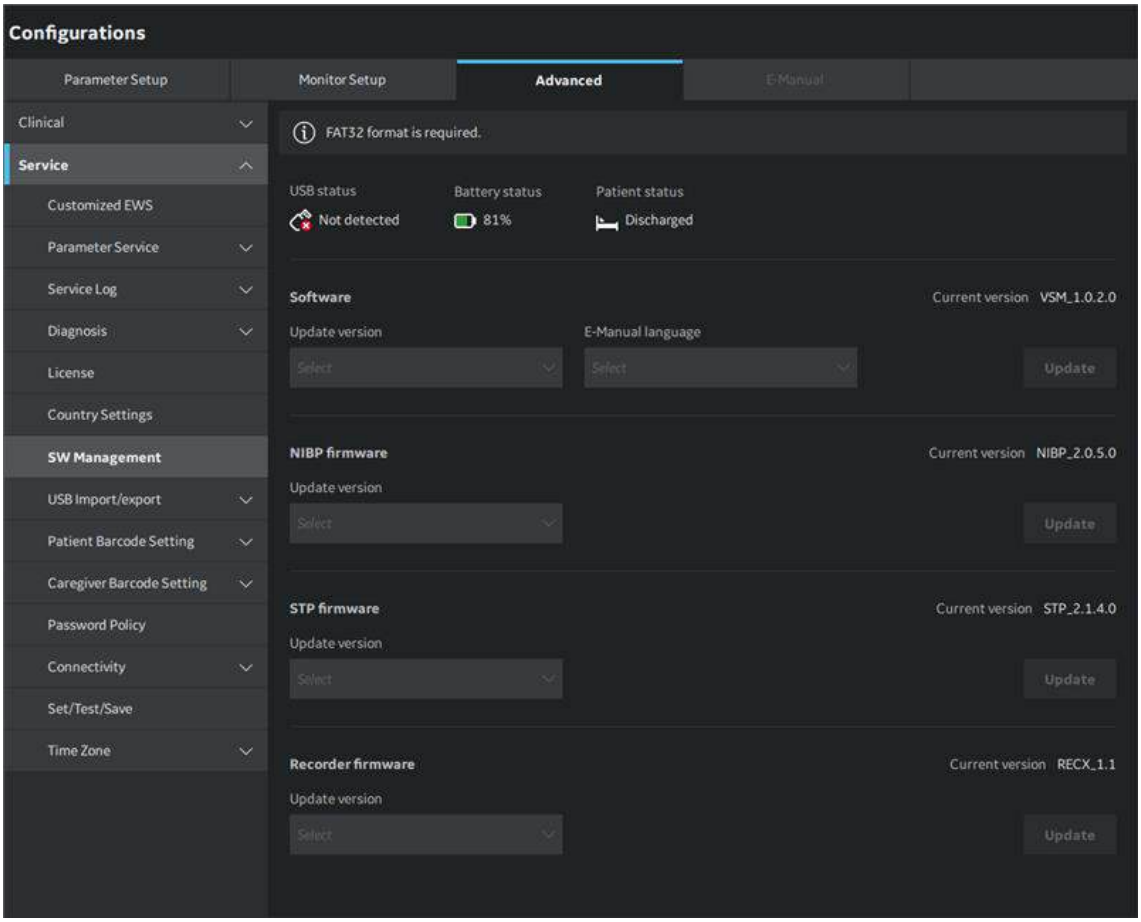
X is the version number.

For example:

```
VSM/software/v1/VSM_X.X.X.X/detailed files
VSM/software/v1/VSM_X.X.X.X/EManual/detailed files
VSM/firmware/NIBP/NIBP_X.X.X.X/detailed files
VSM/firmware/RECX/RECX_X.X/detailed files
VSM/firmware/STP/STP_X.X.X.X/detailed files
VSM/firmware/TP/TP_X.X.X.X/detailed files
```

9.3.2 Transferring the software, e-manuals, and firmware with USB

1. Discharge the patient.
2. Insert the USB disk with the target software to monitor.
3. Select the **Configurations** > **Advanced** > **Service** > **SW Management**.



3.1. For software: select the version for target **Update version** and **E-manual language**. Select **Update** for target software and e-manual.

3.2. For firmware: select the **Update version** for related firmware. Select **Update** for target firmware.

A **Success** message will display on the screen when the firmware is successfully updated.

For main software, the monitor will automatically restart after successfully download.

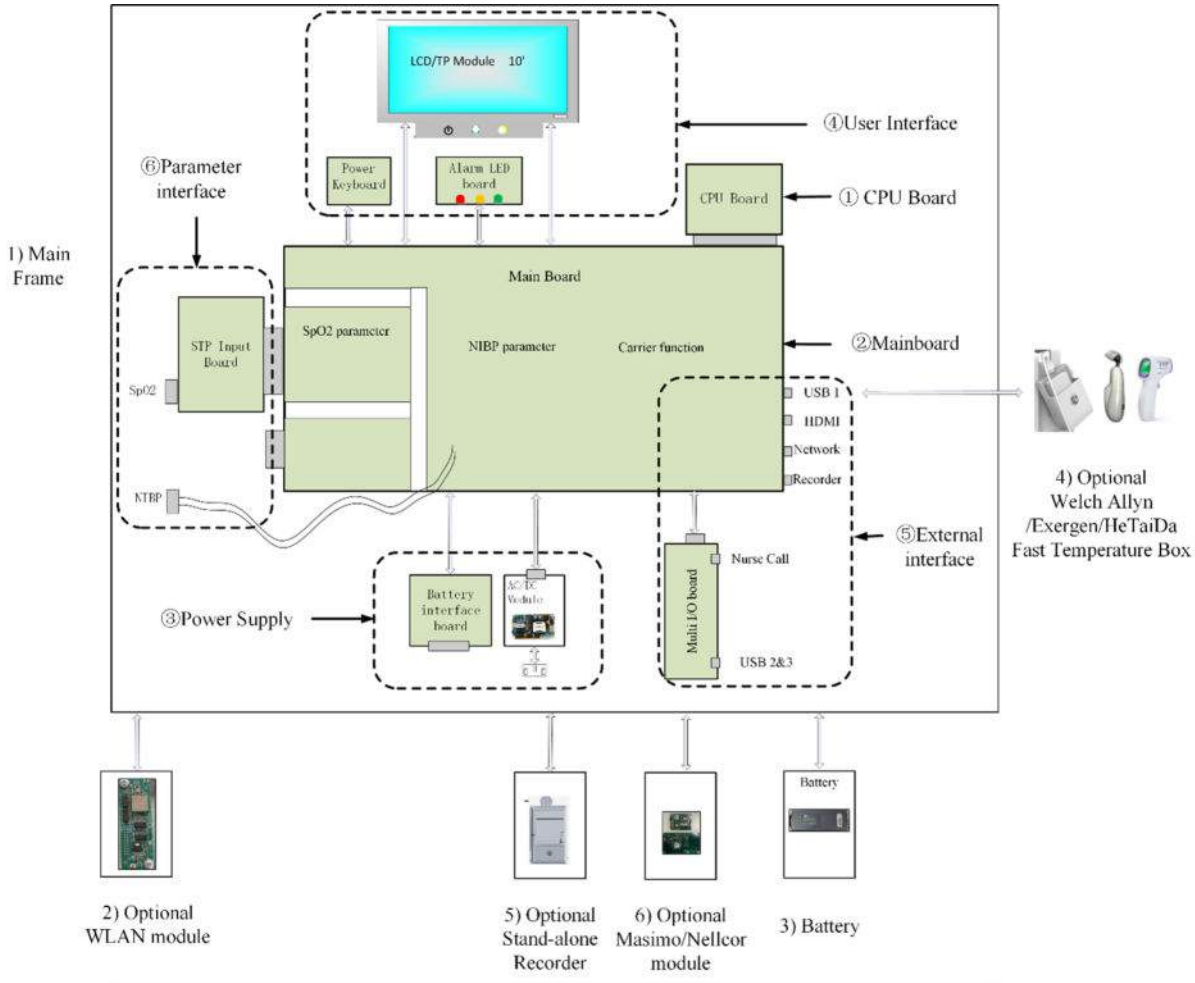
9.4 Performing post checkout

1. Select the **Configurations** > **Monitor Setup** > **Monitor Info** vertical tab.
2. Verify that the related software/firmware versions are correct.

NOTE
There is no need to do any electrical safety tests and maintenance checkout after software/firmware, e-manuals download.

10 Theory of operation

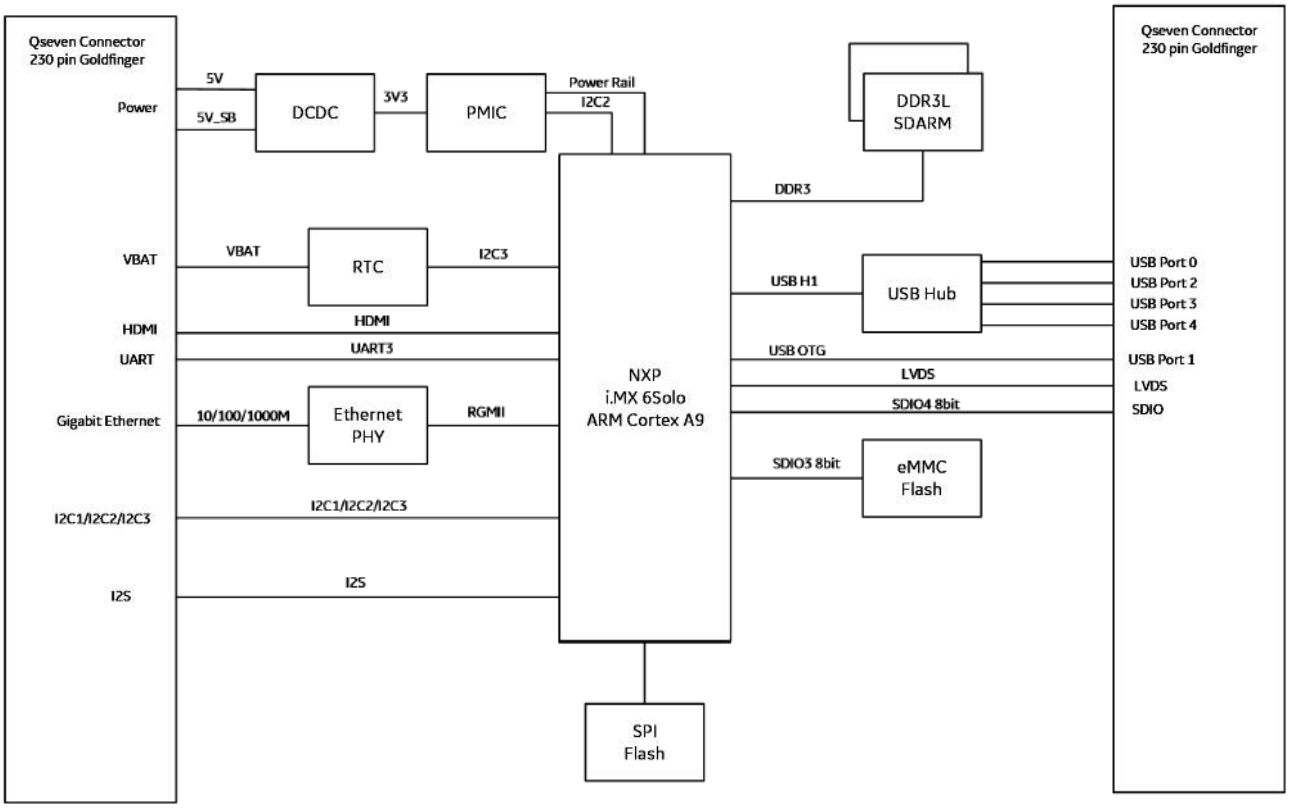
10.1 System block diagram



10.2 Main components

10.2.1 CPU board

Figure 10-1 CPU board block diagram



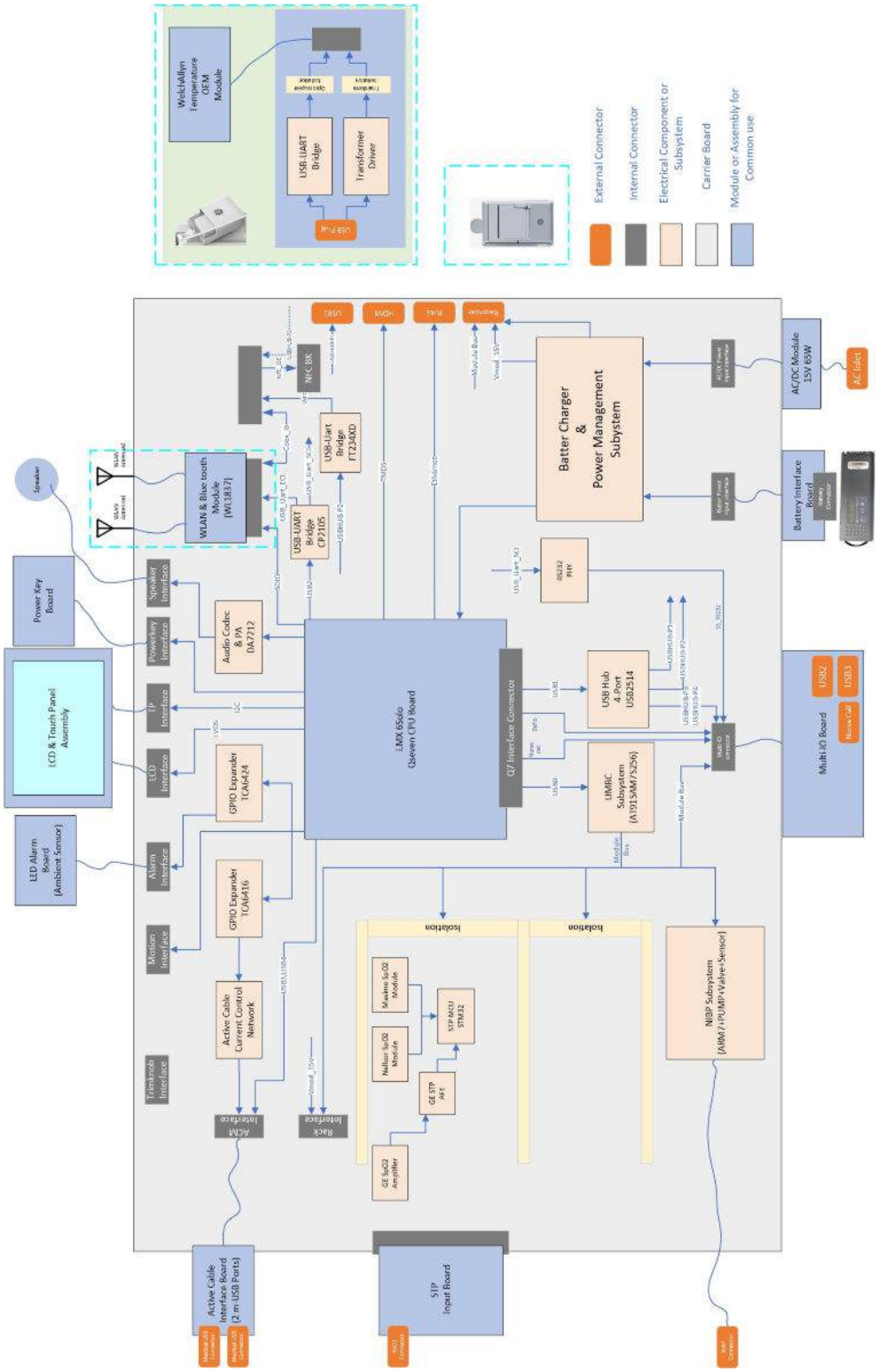
The main specifications are:

- NXP i.MX6 Solo ARM Cortex A9
- Up to 1.0 GHz[*1]
- L2 cache 512kB
- 512MB, DDR3L, SDARM

[*1] Core Frequency: 1.0 GHz for commercial grade, 800 MHz for industrial grade

10.2.2 Main board

Figure 10-2 Main board block diagram



The main board functions include the following functions.

- The power supply subsystem converts the output voltage of AC/DC unit and battery voltage to various supply voltages for the electronics of monitor. It provides:
  - 5V, 3.3V for system power
  - 3.3V, 6V for parameters
  - 12V for LCD
  - 15V for recorder
- The Parameter subsystem provides:
  - NIBP
  - SpO2
- The UMBC subsystem with RS-485 module bus communication to following functions:
  - Transfer parameter information from NIBP and SpO2 Subsystem to main CPU;
  - Transfer print information from main CPU to thermal recorder interface;
  - Output defib out signal to the Multi-IO Board interface.
- Active cable assembly (Reserved for future use)
- The main board provide following internal interfaces:
  - Power button
  - Speaker
  - Alarm LED
  - WLAN (to WLAN board)
  - LCD and touch
  - Battery holder
  - AC/DC module
  - STP (to STP input board)
  - SpO2 (to Masimo/Nellcor board)
  - NIBP (to NIBP connector)
  - Multi-IO (to Multi-IO board)
  - Active cable (Reserved for future use)
- The main board provide following external connectors:
  - RJ45 (Ethernet)
  - USB type A
  - HDMI
  - Recorder

10.2.3 AC/DC power supply

The AC/DC unit is a compact, medical, and switched-mode power supply with a universal AC input. The high-efficiency design minimizes heat dissipation.

It is designed for 65 W continuous output power, and 15V output voltage. It connects to the main board, the AC input may vary between 90-264 Vac, 50/60 Hz.

The AC/DC unit has over-temperature, overcurrent, and overvoltage protections.

10.2.3.1 Battery

The main power source of the monitor is from the AC power grid. The AC/DC module inside the monitor converts the AC power to DC 15V power. The lithium-ion battery pack inside the monitor works the secondary power source if the main power is lost. The power management subsystem on the main board is responsible for the battery charging control.

The screen symbols and monitor LED indicators indicate the battery charging level and possible failure.

10.2.4 Display subsystem

10.2.4.1 Display

The device has an integrated 10.1" LCD panel with a LED backlight unit.

The device provides wide viewing angle and supports WXGA (1280 * 800) resolution. The CPU Board outputs LVDS image signals to the display through the carrier board.

10.2.4.2 LED backlight unit

The LCD module has an integrated, long-life LED backlight unit that is used to illuminate the LCD display. The LED backlight unit receives the +12 V input voltage from the main board. The backlight enable signal and brightness control is received from the CPU board.

10.2.4.3 Touchscreen

The device has a capacitive touchscreen in the front of the LCD panel. The touchscreen detects the presence and location of a touch within the display area and communicates the information to the CPU board.

10.2.5 B1X5-REC Recorder

The optional recorder assembly consists of a 50 mm recorder and a recorder board.

10.2.6 User interface parts

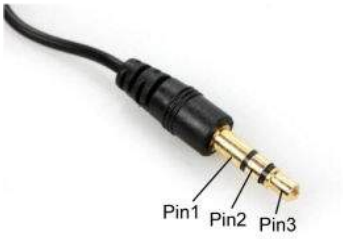
- Power button
- Speaker
- Alarm LED
- LCD touch panel

10.3 Non-standard connectors and signals

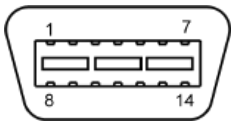
10.3.1 X4 Nurse call connector

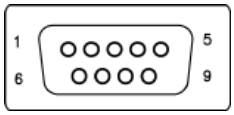
X4 Nurse call connector	Pin number	Signal
	1	GND
	2	NC
	3	NURSE_CALL

Recommended cable design:



10.3.2 B1X5-REC recorder connectors

X1 Recorder connector, (On the monitor)	Pin number	Signal
	1	GND
	2	RS485-
	3	RS485+
	4	GND
	5	NC
	6	NC
	7	GND
	8	VMOD (15V)
	9	VMOD (15V)
	10	VMOD (15V)
	11	GND
	12	GND
	13	GND
	14	GND

Serial port connector (On the recorder)	Pin number	Signal
	1	NC
	2	GND
	3	MOD_VDD (+15V power supply)
	4	GND
	5	RS485+
	6	NC
	7	GND
	8	MOD_VDD (+15V power supply)
	9	RS485–

10.4 Measurement principle

10.4.1 Pulse oximetry measurement principle

A pulse oximeter measures the light absorption of blood at two wavelengths, one in the near infrared (about 940 nm) and the other in the red region (about 660 nm) of the light spectrum. These wavelengths are emitted by LEDs in the SpO_2 probe, the light is transmitted through peripheral tissue and is finally detected by a PIN-diode opposite the LEDs in the probe. The pulse oximeter derives the oxygen saturation (SpO_2) using an empirically determined relationship between the relative absorption at the two wavelengths and the arterial oxygen saturation SaO_2.

In order to measure the arterial saturation accurately, pulse oximeters use the component of light absorption giving variations synchronous with heart beat as primary information on the arterial saturation.

A general limitation of pulse oximetry is that due to the use of only two wavelengths, only two hemoglobin species can be discriminated by the measurement.

The modern pulse oximeters are empirically calibrated either against fractional saturation SaO_2frac;

$$SaO_2frac = \frac{HbO_2}{HbO_2 + Hb + Dyshemoglobin}$$ Formula 1

or against functional saturation SaO_2func;

$$SaO_2func = \frac{HbO_2}{HbO_2 + Hb}$$ Formula 2

Functional saturation is more insensitive to changes of carboxyhemoglobin and methemoglobin concentrations in blood.

The oxygen saturation percentage SpO_2 measured by the module is calibrated against functional saturation SaO_2func. The advantage of this method is that the accuracy of SpO_2 measurement relative

to SaO_2func can be maintained even at rather high concentrations of carboxyhemoglobin in blood. Independent of the calibration method, pulse oximeters are not able to correctly measure oxygen content of the arterial blood at elevated carboxyhemoglobin or methemoglobin levels.

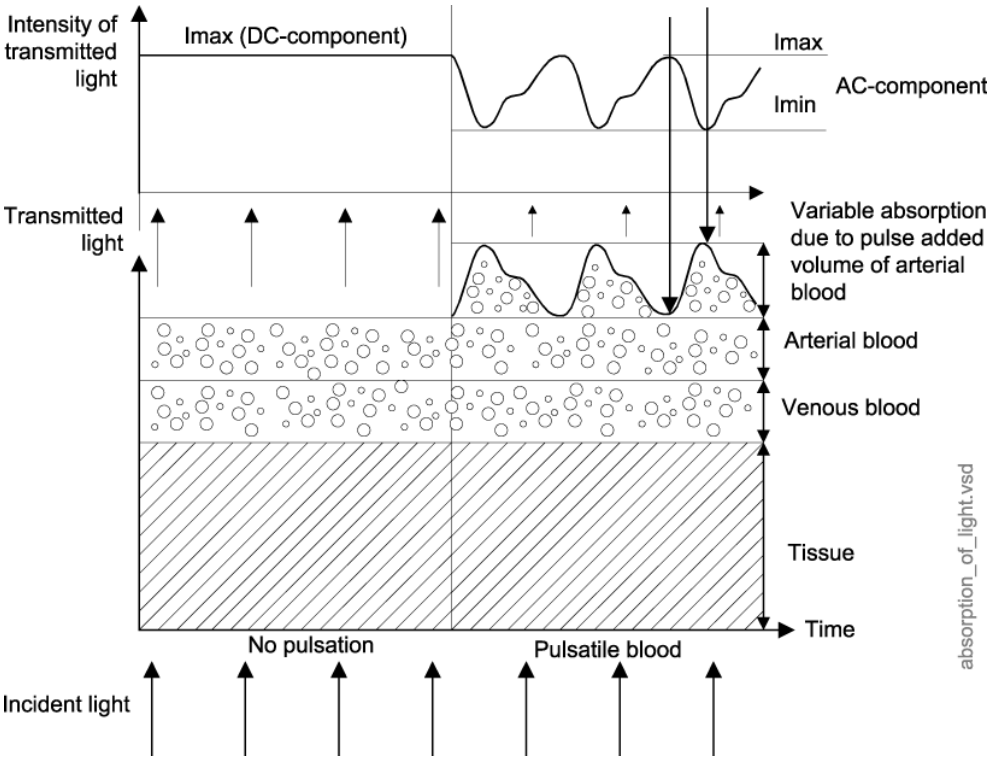
10.4.1.1 Plethysmographic pulse wave

The plethysmographic waveform is derived from the IR signal and reflects the blood pulsation at the measuring site. Thus the amplitude of the waveform represents the perfusion.

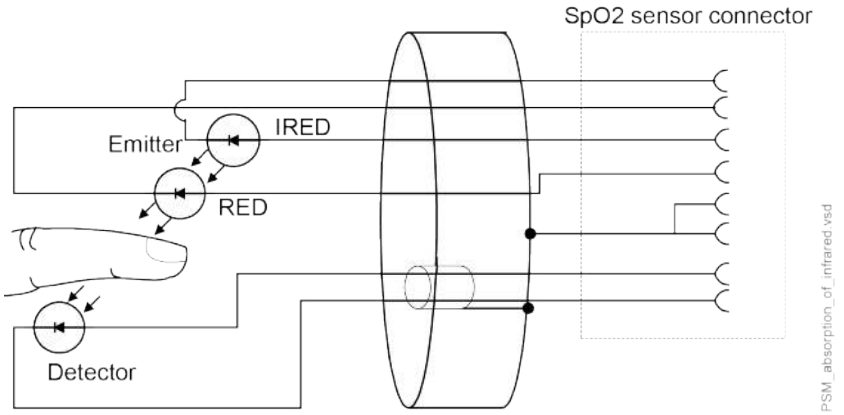
10.4.1.2 Pulse rate

The pulse rate calculation is done by peak detection of the plethysmographic pulse wave. The signals are filtered to reduce noise and checked to separate artifacts.

The following illustration shows the absorption of infrared light in the finger:



The following illustration shows the layout and schematic diagram of pulse oximetry probe parts:



The standard probe is a finger clamp probe which contains the light source LEDs in one half and the photodiode detector in the other half. Different kinds of probes are available from GE HealthCare.

10.4.2 NIBP and pulse rate measurement principle

NIBP (Non-Invasive Blood Pressure) is an indirect method for measuring blood pressure. And the pulse rate can be derived from an NIBP determination.

The NIBP measurement is performed according to the oscillometric measuring principle. The cuff is inflated with a pressure slightly higher than the presumed systolic pressure, and deflated at a speed based on the patient's pulse, collecting data from the oscillations caused by the pulsating artery. Based on these oscillations, values for systolic, mean, diastolic pressures, and pulse rate are calculated.

The following parts are necessary for the NIBP measurement:

- a parameter module
- twin hose (adult or infant model)
- blood pressure cuffs (various sizes)

10.4.3 Welch Allyn temperature measurement principle

The Welch Allyn (WA) temperature probes contain a heating element that preheats the probe to reduce determination time. The heating function is controlled by the Welch Allyn board. The WA probes also contain a thermistor that indicates the temperature. When the probe is attached to the temperature connector and patient, the signal generated by the thermistor that senses temperature is routed to the WA board. When the probe makes contact with the patient, the resistance of the thermistor is sensed by circuitry on the WA board. The motherboard then processes the digital signal and transfers the patient temperature to the display and printer in degrees Celsius or Fahrenheit.

When the monitor is powered on, the monitor automatically calibrates the temperature circuit to account for ambient room temperature.

NOTE
If large changes occur in the ambient temperature, the temperature system can be recalibrated by cycling power using the On/Off button.

10.4.4 Exergen temperature measurement principle

The Exergen TemporalScanner™ uses ultrafast infrared scanning technology with arterial heat balance algorithms to quickly and noninvasively measure the patient's temperature. As the caregiver passes the scanner over the patient's skin, its infrared sensor samples the radiant heat emanating from the body at 1000 times per second, which reaches a maximum over the temporal artery. The scanner then derives the patient's body temperature from the peak infrared sensor readings and the local ambient temperature as measured by the scanner. A scan behind the ear is included in the use protocol to prevent errors due to perspiration.

Refer to the manufacturer's manual for complete instructions for use.

10.4.5 HeTaida temperature measurement principle

The HeTaida Non contact infrared body thermometer is hand-held, reusable, battery operated device, which can measure human body temperature on forehead, the skin temperature on one's forehead.

The operation principle is based on Infrared Sensor technology. The IR sensor can output different signal when measuring different object temperature or in different ambient temperature, and the ASIC can turn the signal from IR Sensor to a digital value and display it on the LCD.

11 Troubleshooting

11.1 Troubleshooting guidelines

This chapter focuses on troubleshooting technical problems. Refer to the user's manual for troubleshooting operation problems and clinical configuration issues.

If a problem remains, contact technical support for service. To ensure accurate problem solving, please be prepared to provide the following information:

- Product name and serial number or UDI
- Hardware, firmware, and software versions of the system
- Detailed problem description
- Error messages, if any
- Service Logs and system diagnosis information
- The remote diagnosis you have done

Perform the specified corrective maintenance check after any corrective maintenance to the product.

11.1.1 Performing basic troubleshooting

Before beginning any detailed troubleshooting, complete the following steps:

1. Check if there are any error messages shown.
2. Perform visual inspection to be sure that:
   - There is no physical damage.
   - All peripheral devices are connected properly.
   - This device and the connected peripheral devices are properly powered.
3. Verify the compatibility of all system components.

   For a list of the compatible devices, see the device's User's Manual.
4. Verify that the platform and clinical configurations are correct.
5. If you suspect loose parts or cable connections inside the device, disassemble the device to a level needed to perform an internal visual check. Check that:
   - All screws are tightened properly.
   - All cables are connected properly.
   - There are no loose objects inside the device.

   Perform the electrical safety test and the checkout procedure every time you have disassembled the device.

11.1.2 Viewing and downloading service log

11.1.2.1 Viewing service log

1. Select the **Configurations** > **Advanced** > **Service** > **Service Log**.
2. You can select **System Log** or **Alarm Log** to view.

   For **System Log**, you can filter by **Date**, **Keyword**, or enter **Search** contents.

11.1.2.2 Downloading logs to USB disk

You can download the system logs, and diagnostic logs to an USB storage device for service use.

NOTE
Make sure the file system format of USB disk is FAT32.

1. Discharge the patient. Insert the USB storage device to the monitor's USB port.
2. Select the **Configurations** > **Advanced** > **Service**.
3. Select the **Service Log** > **System Log** tab.
4. Use the following options to find the needed logs and select **Export**.
   - **Date**
   - **Keyword**
   - Search box with symbol
5. The **Export to USB Disk** menu pops out. The **USB status** is displayed as follows:
   - **Connected**: indicates successful connection to the device.
   - **Not detected**: indicates incompatible USB disk format. FAT32 format is required.
6. **Create key** of encryption for the logs file, the length of key shall be at least 6.

   This key will be used when open the logs.
7. Select **Export**.

   NOTE
   Do not disconnect USB while export is in progress.

   When finish to download logs, a **Success** message "**Exported to USB Disk. The USB Disk can now be safely removed.**" displays on the screen.
8. Remove the USB disk.
9. When fail to download logs, an **Export failed** message "**An internal error occurred. Error while processing export request.**" displays on the screen. Then repeat the above steps to download the logs again.

11.1.2.3 Viewing log files

To view the log files in USB storage device, you need to install the 7-Zip tool in PC:

1. Insert the USB storage device to the service PC, and open the USB storage device.

The log files are on `\VSM` folder of USB disk.

2. Using 7-Zip to open the related **.7z** or **.tar** file, and enter the key which you've set during export. Both of **.7z** and **.tar** files using the same key.
3. Using the Notepad to open detail files.

11.1.3 Viewing monitor diagnosis

1. Select the **Configurations** > **Advanced** > **Service** > **Diagnosis**.

   Following table shows detailed diagnosis information.

Category	Sub-category	System Diagnosis
Frame	Frame Status	Monitor Serial Number
		Main CPU Software
		Main Board
		CPU Board Revision
		CPU Board Serial Number
		UBoot Software version
		UMBC Firmware
		Frame temperature value
		RTC Status
		Ambient sensor value
	Battery Status	Battery Present
		Battery Quality
		Battery Charging Status
		Battery Remaining Time
		Battery Capacity Percent
		Battery Max Capacity Percent
		Battery Temperature
	Alarm Light Status	Alarm Type Normal
		Alarm Light Normal
	Screen Brightness Status	Screen Brightness Type Normal
		Screen Brightness Value Normal
SpO2	SpO2 Status	SpO2 Present
		TP Firmware
		TP Bootloader
		M-SAT version
		SpO2 Source Type
		SpO2 Cable Connected
		SpO2 Probe Connected
		SpO2 Faulty Probe

Category	Sub-category	System Diagnosis
		SpO2 Incompatible Probe
		SpO2 Module Error
Temp	Welch Allyn	Serial number
		Software version
		Final/Predicted Temp
		Current probe Temp
		Unit
		Current heater count/PWM
		Sample counter
		Active
		Physical probe type connected
		Current probe resistance
		Ambient Temp
		PTB resistance
		Battery voltage
		Method
		Algorithm
		SureTemp state
		Error code
		Possible cause
		Action
	HeTaiDa	Temp value
		Unit
		Measurement mode
		Status code
		Status
	Exergen	Product SN
		Product version
		Vendor ID
		Product ID
		Temp
		Unit
		Reference
		Status code
		Status
NIBP	NIBP Status	NIBP Present
		NIBP Firmware version

Category	Sub-category	System Diagnosis
		NIBP Bootloader version
		Call service
		Compatible NIBP
		NIBP Cuff Overpressure
Recorder	Recorder Status	Recorder Connected
		Recorder Firmware version
		Recording State
		Recorder Voltage is High
		Recorder Voltage is Low
		Recorder Overheated
		Recorder System Error
Ethernet	Ethernet	Auth type
		Auth status
		IP-address
		MAC
		Statistics
WLAN	WLAN	Connection status
		Auth type
		Auth status
		AP SSID
		AP BSSID
		Channel/freq
		IP-address
		MAC
		Security type
		Region
		Supplicant version
		Firmware version
		TX rate Mbps
		TX power dBm
		QoS mode
		RTS threshold
		Frag. threshold
		Statistics
		Quality dBm
		AP List
LED	LED	Red Led

Category	Sub-category	System Diagnosis
		Yellow Led
		Cyan Led
Connectivity Troubleshooting	Connectivity Troubleshooting flowchart	You can view all possible causes of connectivity problems and the corresponding solutions. For more information, see 11.3.9 Connectivity issues on page 144.

2. Select the **Configurations** > **Advanced** > **Service** > **Diagnosis** > **LED**.

   You can select the **Red LED**, **Yellow LED** and **Cyan LED** tab to test the alarm light function.

11.1.4 Network diagnostics

11.1.4.1 Pinging a TCP/IP network device

You can verify connectivity with a network device on the TCP/IP network using **Ping**.

1. Select the **Configurations** > **Advanced** > **Service**.
2. Select the **Connectivity** > **Diagnosis** tab.
3. In the **IP address** field, enter the IP address of a known device on the network.
4. Select **Ping**.

   The ping result will display on the screen: **Success** or **Fail**.

If you fail to ping the device, make sure that the monitor is connected to an active network.

NOTE
The monitor withstands a maximum packet loss of 5 packets per 1 million and maximum latency of 250 ms without performance degradation.

11.1.4.2 Tracing routers

You can trace the routers of a target IP address or host using **Traceroute**.

1. Select the **Configurations** > **Advanced** > **Service**.
2. Select the **Connectivity** > **Diagnosis** tab.
3. Configure the following traceroute parameter:
   - **Target** IP address or host name
   - **Timeout(s)** (the unit is second)
   - **Per hop num** (number of queries per hop)
   - **Max num of hops**
4. Select the **Trace** button.

The trace result will be displayed in the textbox.

11.1.4.3 Viewing wireless status

You can view the WLAN status and detected access points for troubleshooting WLAN related problems.

1. Select the **Configurations** > **Advanced** > **Service**.
2. Select the **Connectivity** > **WLAN** tab > **Status**.

Consult Hospital IT for WLAN configuration.

11.2 Messages

11.2.1 Messages related to various situations

For information regarding alarm priorities and escalation times, see the alarm specifications section.

Make sure you are familiar with the generic layout of the screen. This will help you identify where on screen the following messages appear. The message location is indicated with the following abbreviations:

- MF = message field
- PW = parameter window

NOTE
There are no physiological alarms in Spot Check mode.

Message	Location	Possible causes	Suggested actions
• **Patient admitted**	• MF	The current patient has been admitted.	• No action required.
• **Patient discharged**	• MF	The patient has been discharged.	• No action required.
• **Printing**	• MF	Printing is in progress.	• Wait for the printing to finish.
• **Recorder: out of paper**	• MF	The recorder is out of paper.	• Replace recorder paper.
• **Recorder: cover open**	• MF	The recorder cover is open.	• Close the recorder cover.
• **Recorder: input voltage high** • **Recorder: input voltage low**	• MF	There are problems with the recorder input voltage.	• Replace recorder.
• **Recorder: system error**	• MF	The local recorder is not working.	• Disconnect and reconnect the recorder cable. • Replace recorder.
• **Recorder: thermal array overheat**	• MF	There are problems with the recorder temperature. Printing for a long time.	• Try stopping the recording. • Replace the recorder.
• **Recorder module removed**	• MF	Recorder module has been removed.	• Reconnect the recorder module if necessary.
• **Battery empty**	• MF	The monitor is battery powered and less than 5 min of monitoring time is available with battery.	• Charge the battery by using the monitor on mains power.

Message	Location	Possible causes	Suggested actions
• **Battery low**	• MF	The monitor is battery powered and less than 20 min of monitoring time is available with battery.	• Charge the battery by using the monitor on mains power.
• **Battery temperature high**	• MF	The battery's temperature is too high.	• Replace the battery.
• **Certificate close to expiration**	• MF	The CA and client certificate in system time is 0-14 days before expire time.	• Contact authorized service personnel to install another CA certificate.
• **Certificate expired**	• MF	CA and client certificate is expired.	• Contact authorized service personnel to install another CA certificate.
• **Condition battery**	• MF	Battery is not working properly.	• Replace the battery.
• **E-Manual lost**	• MF	E-manual is not available.	• Re-install software with E-manual together.
• **Identical IP address noticed**	• MF	Two or more monitors on the network have the same IP address.	• Disconnect the patient monitor that has the identical IP address. • Change the IP address of the patient monitor that has the duplicate IP address.
• **License invalid**	• MF	License is invalid during start up.	• Check and reset the license.
• **No battery backup**	• MF	Battery missing from the battery compartments.	• Replace the battery
• **Replace battery**	• MF	Battery is not working properly.	• Replace the battery.
• **Restart needed**	• MF	The monitor should be restarted.	• Restart the monitor.
• **Frame temperature high**	• MF	The temperature inside the frame is over 70°C/158 °F.	• Turn off the monitor, wait for it cool down. • Make sure there is sufficient ventilation. • Check and clean monitor ventilation holes.
• **Audio fail**	• MF	The system can't communicate with audio clip hardware.	• Check the patient status. • If the problem persists, contact authorized service personnel.

11.2.2 Messages related to NIBP measurement

For information regarding alarm priorities and escalation times, see the alarm specifications section.

Make sure you are familiar with the generic layout of the screen. This will help you identify where on screen the following messages appear. The message location is indicated with the following abbreviations:

- MF = message field
- PW = parameter window

NOTE
There are no physiological alarms in Spot Check mode.

Message	Location	Possible causes	Suggested actions
• **Call service: Error x** where x = 0 - 18	• PW	• 0 = RAM test failure • 1 = ROM checksum failure • 2 = Pump on during idle or over current detected • 3 = Startup communication failure with safety CPU • 4 = Not in use • 5 = Calibration Not Protected • 6 = Valve stuck closed during cuff typing • 7 = Could not save calibration data • 8 = PT2 higher than 150 for greater than 15 seconds while idle, or pressure exceeds 15 mmHg for over 180 s for Adult, or pressure exceeds 5 mmHg for over 90 s for Neo. • 9 = Determination time too long • 10 = RTK 400Hz timer re-entry • 11 = RTK 50Hz timer re-entry • 12 = Not in use • 13 = RTK overrun • 14 = Too early AUTO START according to module check • 15 = Calibration data invalid on initialization or unit never calibrated • 16 = Communication timeout between main and safety CPU • 17 = Safety CPU report communication timeout • 18 = Wrong message rate in communication between main and safety CPU	• Update the NIBP firmware. • Replace the main board.
• **NIBP call service error**	• MF		
• **Check NIBP**	• MF	Systolic and/or diastolic results missing.	• Check patient status. • Check NIBP cuff and hoses. • Repeat the measurement.
• **Cuff loose**	• PW	Loose cuff or cuff hose.	• Check the cuff and cuff hose.
• **Cuff occlusion**	• PW	Occlusion during measurement or overpressured cuff.	• Check the cuff.
• **Cuff overpressure**	• PW	NIBP cuff has exceeded the maximum cuff pressure during an NIBP measurement.	• Check NIBP cuff and hoses. • Perform NIBP calibration.
• **NIBP cuff overpressure**	• MF		
• **Long measurement time**	• PW	The measurement time is long. The triggering values vary according to the module and inflation limits in use:	• Check patient status. • Check the cuff and hose connections. • Restart the measurement.

Message	Location	Possible causes	Suggested actions
• **NIBP long measurement time**	• MF	• >2 min for adult/child, 75 s to 80 s for infant	
• **NIBP manual**	• MF	During auto cycling • Loose cuff or cuff hose. • Long measurement time	• Check the cuff and cuff hose whether loose.
• **NIBP cuff loose**	• MF	Loose cuff or cuff hose.	• Check the cuff and cuff hose whether loose.
• **NIBP cuff occlusion**	• MF	Occlusion during measurement or overpressured cuff.	• Check the cuff.
• **NIBP measurement removed**	• MF	Lost NIBP measurement.	• Replace main board.
• **Unstable zero pressure**	• PW	Pressure is unstable at start of the NIBP measurement.	• Check patient status. • Check hose and cuff position. • Repeat the measurement. • Calibrate NIBP
• **Weak pulsation**	• PW	Weak or unstable oscillation signal.	• Check patient status. • Reposition the cuff. • Repeat the measurement.
• **NIBP weak pulsation**	• MF		

11.2.3 Messages related to SpO_2 measurement

For information regarding alarm priorities and escalation times, see the alarm specifications section.

Make sure you are familiar with the generic layout of the screen. This will help you identify where on screen the following messages appear. The message location is indicated with the following abbreviations:

- MF = message field
- PW = parameter window

NOTE
There are no physiological alarms in Spot Check mode.

Message	Location	Possible causes	Suggested actions
• **Check device**	• PW	Only for Masimo type. Module malfunction.	• Replace Masimo board. • If the problem persists, replace the main board.
• **Check SpO2 probe**	• MF	There is no detectable SpO_2 signal, the sensor is faulty or is detached from the patient.	• Check the sensor and connections.
• **Check probe**	• PW		
• **Faulty probe**	• PW	The sensor has failed, or not compatible.	• Replace the sensor.
• **Incompatible probe**	• PW	Only for GE TruSignal or Masimo type. The sensor is not compatible.	• Replace the sensor.
• **Incompatible SpO2 probe**	• MF		
• **Interference**	• PW	Only for Nellcor or Masimo type. The measurement is disturbed.	• Check the sensor.

Message	Location	Possible causes	Suggested actions
• **Low perfusion**	• PW	Only for Masimo type. Low perfusion at the measurement point.	• Check the sensor and sensor positioning. • Relocate the sensor to a better measurement site, if possible. • Make sure the patient is not shivering.
• **Low signal quality**	• PW	Only for Masimo type. The quality of the signal is questionable.	• Check the sensor and sensor positioning. • Relocate the sensor to a better measurement site, if possible. • Make sure the patient is not shivering.
• **No SpO2 probe**	• MF	Sensor is not connected to the monitor. Sensor is not compatible.	• Check connection between the sensor and the monitor. • Replace the sensor.
• **No probe**	• PW		
• **Poor signal**	• PW	Only for GE TruSignal type. When low perfusion is detected.	• Check the sensor and sensor positioning. • Relocate the sensor to a better measurement site, if possible. • Make sure the patient is not shivering.
• **Pulse search**	• PW	Defective or damaged sensor or cable. Sensor is off of the patient. Detection of a repeatable pulse has stopped.	• Check the sensor and cable. • Reposition or replace sensor.
• **Faulty SpO2 probe**	• MF	The sensor has failed, or is not compatible.	• Replace the sensor.
• **SpO2 measurement removed**	• MF	Only for Nellcor or Masimo type. Lost SpO_2 measurement.	• Replace Masimo or Nellcor board. • If the problem persists, replace the main board.
• **STP measurements removed**	• MF	Only for GE TruSignal type. Lost SpO_2 measurement.	• Replace GE TruSignal board. • If the problem persists, replace the main board.
• **SpO2 module error**	• MF	Only for Nellcor or Masimo type. SpO_2 module detects a communication problem.	• Replace Masimo or Nellcor board.
• **STP module error**	• MF	Only for GE TruSignal type. SpO_2 module detects a communication problem.	• Replace STP board.
• **Incompatible Masimo**	• MF	The Masimo version is not compatible.	• Replace the sensor.
• **SpO2 probe off**	• MF	The finger or earlobe may be too thin or the sensor is off the patient.	• Check patient status. • Reposition the SpO_2 sensor. • Replace the SpO_2 sensor.
• **Probe off**	• PW		

11.2.4 Messages related to temperature measurement

For information regarding alarm priorities and escalation times, see the alarm specifications section.

Make sure you are familiar with the generic layout of the screen. This will help you identify where on screen the following messages appear. The message location is indicated with the following abbreviations:

- MF = message field
- PW = parameter window

NOTE
There are no physiological alarms in Spot Check mode.

Message	Location	Possible causes	Suggested actions
• **Duplicate Temp modules**	• MF	Two or more temperature probes are connected to the same monitor.	• Remove the extra temperature probes.
• **Temp measurement removed**	• MF	Lost temperature measurement.	• Check connections of temperature probe or module. • Replace the temperature probe. • Replace the temperature module.
• **Temp probe too hot**	• MF	Only for Welch Allyn type. Probe temperature is too high.	• Wait unitil the probe temperature is stable.
• **Temp probe error**	• MF	Only for Welch Allyn type. Probe malfunction.	• Replace the temperature probe.
• **Temp module error**	• MF	Only for Welch Allyn type. Module malfunction.	• Restart the monitor. • Replace the temperature module.
• **Check Temp probe**	• MF	Only for Welch Allyn type. The temperature probe is disconnected.	• Attach the probe again.
• **Temp no determination**	• MF	Only for Welch Allyn type. The predictive measurement is not successful.	• Insert the probe to probe well and perform a new temperature measurement. • Select the snail icon to start Monitor mode and to display realtime measurement data.
• **Temp not available**	• MF	Only for Welch Allyn type. Probe temperature is too low. It takes too long for a predictive temperature measurement.	• Insert the probe to probe well and perform a new temperature measurement. • If the problem persists, replace the temperature probe.
• **Ambient Temp low**	• PW	Ambient temprature is low.	• Move the patient to a warmer place and take temperature measurement again if necessary.

Message	Location	Possible causes	Suggested actions
• **Ambient Temp high**	• PW	Ambient temperature is high.	• Move the patient to a cooler place and take temperature measurement again if necessary.
• **Measurement too low**	• PW	Body temperature is too low.	• Check patient status.
• **Measurement too high**	• PW	Body temperature is too high.	• Check patient status.
• **No Temp measurement**	• PW	No temperature probe or module is connected to the monitor.	• Connect one temperature probe to the monitor. • Replace the temperature module.
• **Interference detected**	• PW	Only for Welch Allyn type. Measurement is above or below the allowable patient or environmental temperature. Temperature module malfunction.	• Check patient temperature manually. • Replace the temperature module.
• **Probe too hot**	• PW	Only for Welch Allyn type. Probe temperature is too high.	• Wait unitil the probe temperature is stable.
• **Tissue contact lost**	• PW	Only for Welch Allyn type. The temperature probe is not in consistent tissue contact.	• Position the temprature probe correctly for the site being measured.
• **Probe well missing**	• PW	Only for Welch Allyn type. Probe well is missing or not installed properly.	• Verify the probe well is installed correctly.
• **Probe error**	• PW	Only for Welch Allyn type. Probe malfunction.	• Replace the temperature probe.
• **Module error**	• PW	Only for Welch Allyn type. Module malfunction.	• Replace the temperature module.
• **No probe**	• PW	Only for Welch Allyn type. The probe is not connected to the monitor.	• Attach the probe again.
• **No determination**	• PW	Only for Welch Allyn type. The predictive measurement is not successful.	• Insert the probe to probe well and perform a new temperature measurement. • Select the snail icon to start Monitor mode and to display realtime measurement data.
• **Not available**	• PW	Only for Welch Allyn type. Probe temperature is too low. It takes too long for a predictive temperature measurement.	• Insert the probe to probe well and perform a new temperature measurement. • If the problem persists, replace the temperature probe.
• **Battery low**	• PW	Only for Exergen type. The thermometer battery is low.	• Replace the battery.
• **Battery empty**	• PW	Only for Exergen type. The thermometer has no battery inside.	• Install a new battery.

Message	Location	Possible causes	Suggested actions
• **Internal error**	• PW	Only for Exergen type. The thermometer has internal error.	• Replace the temperature probe.

11.3 Problems and solutions

This section lists the possible problems and solutions, the recommended actions are from easy to complex. Please try the first one, if the problem still persists, then try next one by one.

11.3.1 Start-up failures

Problem	Possible causes	Recommended action
Failure to turn on the patient monitor, when the following conditions apply: • The patient monitor is connected to AC mains. • The Mains voltage indicator is not lit.	Power cord is loose.	Ensure that the power cord is connected properly to the wall outlet and to the patient monitor.
	Power cord is faulty.	Check the power cord for wear and damage, and replace if necessary.
	The internal cable is loose or fault.	Check the following cable is intact and properly connected. • Cable between ON/Off key and main board. • Cable between AC/DC module and the AC inlet • Cable between AC/DC module and the main board
	AC/DC module issue	Replace AC/DC module.
	Main board issue	Replace the main board.
Failure to turn on the patient monitor, when the following conditions apply: • The patient monitor is not connected to AC mains. • The monitor is powered from battery.	Battery empty Battery failure	Check battery status. Charge or replace the battery.
	Battery interface board loose or fault.	Check battery interface board is intact connected. Replace the battery interface board.
	On/Off key not lit: Main board issue.	Replace the main board.
	On/Off key lit: CPU board issue.	Replace the CPU board.
Failure to turn on the patient monitor, when the following conditions apply: • The patient monitor is connected to AC mains. • A full charged battery is installed.	On/off key fault	Check power key interface board is intact connected. Replace power key interface board. Replace front assembly.
	On/Off key not lit: Main board issue.	Replace the main board.
	On/Off key lit: CPU board issue.	Replace the CPU board.
The monitor starts, but the display remains black, or white.	The display cables are loose.	Check the display cable is intact and properly connected.
	The display issue.	Replace the display panel.
	CPU board issue.	Replace the CPU board.

Problem	Possible causes	Recommended action
The monitor can‘t start for 10 times in one start-up process, the screen will show "Monitor failed to start. Try again, or contact GE HealthCare Service for support."	Internal cables .	Check the internal cables are intact and properly connected.
	CPU board issue.	Replace the CPU board.
	Interface parts on main board broken.	Replace the main board.

11.3.2 User interface issues

Problem	Possible cause	Recommended action
Touchscreen is inoperative.	Touchscreen cable is loose.	Check the touchscreen cable is intact and properly connect to main board.
	Faulty touchscreen sensor.	Replace the front assembly.
Touchscreen is not responding to touch appropriately.	Emission interference.	Leave away or turn off EM disturbance sources
Alarm light does not illuminate. (audible alarms work and alarm message is visible)	Alarm light cable is loose.	Check the alarm light cable is intact connected.
	Alarm LED is fault.	Replace the alarm light board.
Audible alarms do not work.	Audible alarms are turned off.	Enable audible alarms from **Alarms Setup**.
	Speaker failure	Adjust alarm volume to check whether the speaker is worked. If not, replace the speaker.
	Tone generator or audio amplifier failure	Replace main board.

11.3.3 Barcode reader issues

Problem	Possible cause	Recommended action
Wrong character is displayed when a barcode is read.	The barcode reader’s language configuration is incorrect.	Refer to the instructions supplied with the barcode reader.
Barcode reader does not read a multi-field barcode correctly. The information is not populated correctly to the fields in the Admit menu.	The parser configuration is incorrect.	Configure the barcode settings.
	The parser configuration is incompatible: field lengths, field types, delimiters, symbologies etc.	Check the barcode information content and compare it to the current parser configuration.

11.3.4 Battery issue

Problem	Possible cause	Recommended action
The battery LED indicator orange flashing.	Battery over voltage. Battery precharge time-out fault Battery fast charge time-out fault	Replace the battery.

Problem	Possible cause	Recommended action
Can't charge battery	Battery issue	Replace the battery.
	Battery connection issue	Check the battery and chamber connection. Replace the battery chamber.
	Main board issue	Replace the main board.

11.3.5 B1X5-REC recorder issue

Problem	Possible cause	Recommended action
Recorder does not work.	The recorder connect cable is loose or fault.	Check the recorder connect cable is intact and properly connected.
	Recorder unit failure.	Replace the recorder unit.
	Host or frame's issue	See the corresponding host or frame's Technical Manual, troubleshooting section.
Recorder works but nothing appears on the paper.	Paper installed upside down.	Turn the paper roll over.
Record paper jam.	Not use the qualified paper.	Use qualified paper, recommend PN: 2106823-001.

11.3.6 External display issue

Problem	Possible cause	Recommended action
Bad display quality	The connection cable is incompatible.	Use the external display with HDMI connector.

11.3.7 Incorrect system time issue

Problem	Possible cause	Recommended action
System time is incorrect when monitor is not connected to network.	Time is not configured properly.	Configure date and time.
	CPU battery is empty.	1. Replace CPU battery. 2. Set date and time. 3. Restart the monitor.
System time is incorrect when monitor is connected to network.	Network device time synchronization error.	Contact the hospital IT for NTP server setup.

11.3.8 Hemo parameter issues

Table 11-1 Absence of parameter data

Problem	Possible cause	Recommended action
No parameter data	Parameter's accessories' issue.	Check the cable's compability and connection. Replace the related accessories.
	Related firmware issue.	Update to the latest firmware.

Table 11-1 Absence of parameter data

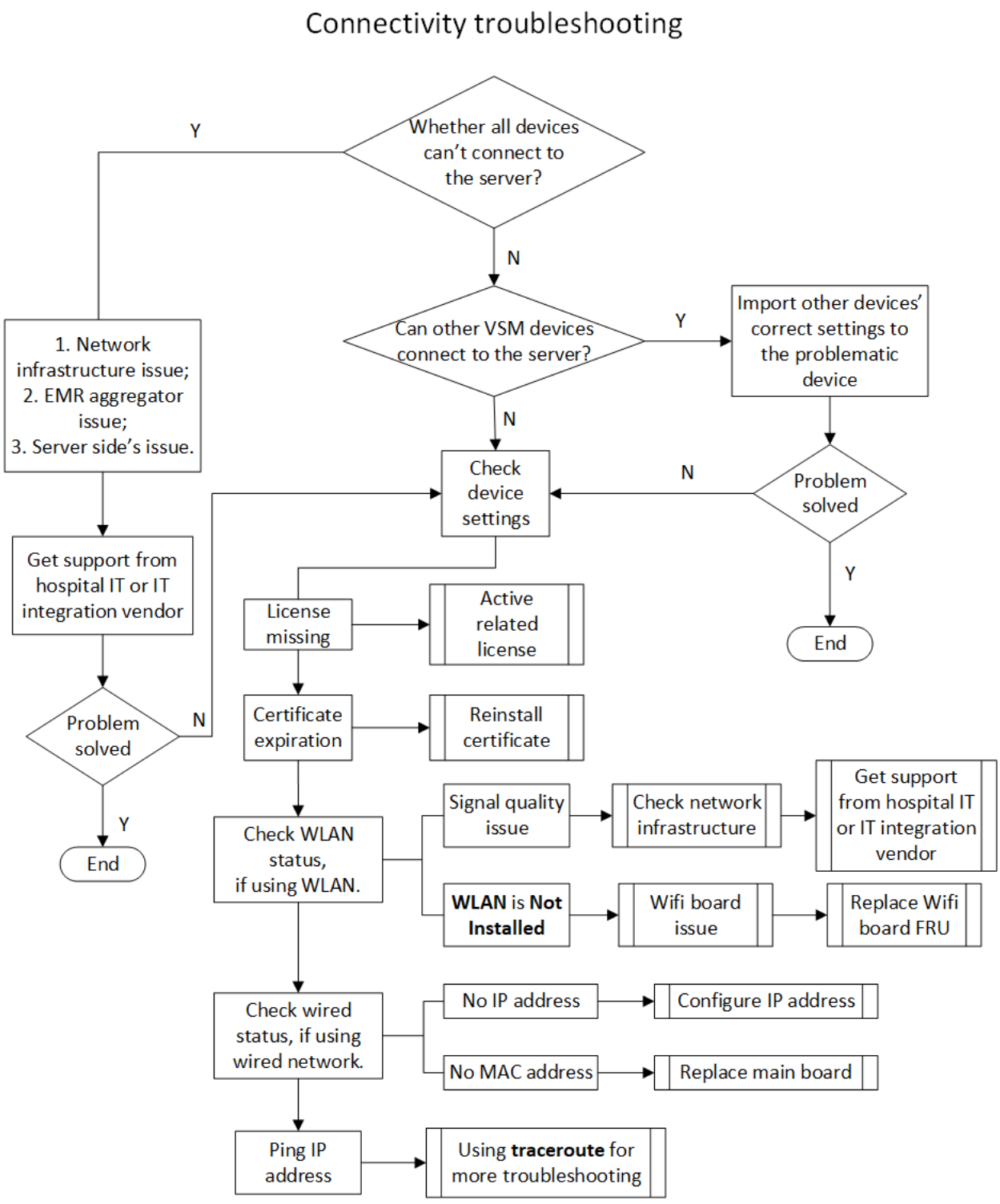
Problem	Possible cause	Recommended action
	STP input board fault for GE TruSignal SpO2	Check the related input board is intact connected. Replace the related input board.
	The entered SpO_2 license does not match the SpO2 module installed in monitor.	Re-input the correct license, refer to 6.10 License management on page 90.
	Masimo or Nellcor board fault for Masimo/Nellcor SpO2	Replace the Masimo or Nellcor board
	Main board fault	Replace the main board

Table 11-2 NIBP

Problem	Possible cause	Recommended action
Air leakage	Hose or cuff leaking.	Check hose and cuff whether intact connected. Replace cuff. Replace cuff hose.
	Leakage inside the device.	Open the device to check pneumatics connection.

11.3.9 Connectivity issues

The following graphic explains possible causes of connectivity problems.



When checking device settings, refer to the following paths in device.

- To check license, select the **Configurations** > **Advanced** > **Service** > **License**.
- When certificate is expired, **Certificate expired** will pop up in main field.
- To check WLAN status, select the **Configurations** > **Advanced** > **Service** > **Connectivity** > **WLAN** > **Status**.

- To check wired status, select the **Configurations** > **Advanced** > **Service** > **Connectivity** > **Ethernet** > **Status**.
- To check **IP address** and **Traceroute** , select the **Configurations** > **Advanced** > **Service** > **Connectivity** >**Diagnosis**.

12 Disassembly and reassembly

12.1 Disassembly guidelines

WARNING

ELECTRIC SHOCK.

Always disconnect the device from the power line before you start the disassembly.

WARNING

DISCONNECTION FROM MAINS.

When disconnecting the device from the power line, remove the plug from the wall outlet first. Then you may disconnect the power cord from the device. If you do not observe this sequence, there is a risk of coming into contact with line voltage by inserting metal objects, such as the pins of leadwires, into the sockets of the power cord by mistake.

WARNING

SAFETY GROUND.

Remove power cord from the mains source by grasping the plug. Do not pull on the cable.

NOTE
Only a qualified service technician should perform field replacement procedures.

NOTE
Perform the specified corrective maintenance check after any corrective maintenance to the product.

12.1.1 ESD precautions

All external connectors of the device are designed with protection from ESD damage. However, if the device requires service, exposed components and assemblies inside are susceptible to ESD damage. This includes human hands, non-ESD protected work stations or improperly grounded test equipment. The following guidelines may not guarantee a 100% static-free workstation, but can greatly reduce the potential for failure of any electronic assemblies being serviced:

- Discharge any static charge you may have built up before handling semiconductors or assemblies containing semiconductors.
- Wear a grounded, antistatic wristband or heel strap at all times while handling or repairing assemblies containing semiconductors.
- Use properly grounded test equipment.

- Use a static-free work surface while handling or working on assemblies containing semiconductors.
- Do not remove semiconductors or assemblies containing semiconductors from antistatic containers until absolutely necessary.
- Do not slide semiconductors or electrical/electronic assemblies across any surface.
- Do not touch semiconductor leads unless absolutely necessary.
- Store the semiconductors and electronic assemblies only in antistatic bags or boxes.
- Handle all PCB assemblies by their edges.
- Do not flex or twist a circuit board.

12.1.2 Reassembly precautions

Reassembly the device in reverse order of following disassembly instruction.

Pay attention to the following generic precautions when reassembling:

- Note the positions of any wires, cables or connectors. Mark them if necessary to ensure that they are reassembled correctly.
- Save and set aside all hardware for reassembly.
- GE HealthCare recommends using the new fasteners (screws, washers, etc.) provided in the FRU kits rather than reusing the old fasteners. Some fasteners are not intended to be re-used.

When you fasten the screws:

- Visually ensure that the screws are properly attached.
- Do not use too much force, as this may damage the existing thread patterns.
- If you use a battery-operated tool, ensure that it is equipped with torque limiter and the torque is properly adjusted.
- When you attach self-tapping screws to light metal parts without existing threads (new light metal FRU parts), use a higher torque than is recommended for reassembled parts, but still not more than 0.6 Nm, specific torque will note in detail steps.
- Use only new screws for the light metal parts. Before fastening a screw, turn it counterclockwise until it drops into an existing thread pattern.

12.1.3 Required tools

NOTE
Use torque wrench and torque screwdriver to comply with the given torques.

- Insulated PH1, PH2 screwdrivers, recommended length > 65 mm
- T15 torx screwdrivers
- M3 flange nut drivers, length=5.5mm, both manual and electric tools are available
- An antistatic ESD wristband
- Tweezers

12.1.4 Preparing for disassembly

1. Turn the monitor off.
2. Disconnect the monitor power cord, first from the wall outlet and then from the monitor.
3. Disconnect all external cables connected to the monitor.
4. Detach the monitor from the mounting.

12.2 Disassembly procedures

12.2.1 Remove Welch Allyn temperature module and holder

1. Remove rubbers and screws on Welch Allyn temperature holder.

2. Disconnect the cable from Welch Allyn temperature module.

3. Remove the Welch Allyn temperature module.

4. Remove 2 screws to remove the Welch Allyn temperature holder.

12.2.2 Replacing battery

1. Remove rubber and screw on the back cover.

2. Open the battery cover.

3. Pull out the battery from the cord.

12.2.3 Remove back cover

Disassemble first:

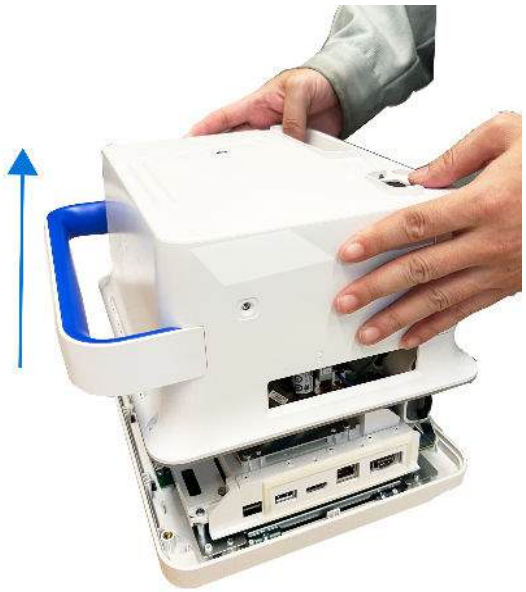
- 12.2.1 Remove Welch Allyn temperature module and holder on page 150

1. Remove 4 screws and equipotential connector on the back of the monitor.

2. Remove 4 screws on the bottom of the monitor.

NOTE
When installing 4 screws with isolated bases, the torque should be 15kgf.cm +/-10%.

3. Open the back cover.



12.2.4 Remove speaker, multi I/O, and battery chamber

Disassemble first:

- 12.2.3 Remove back cover on page 153

1. Disconnect the speaker cable and remove the speaker.

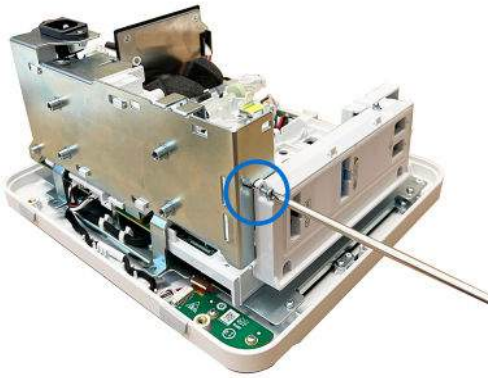
2. Disconnect the multi I/O cable.

3. Disconnect 2 snaps, and remove the multi I/O unit.

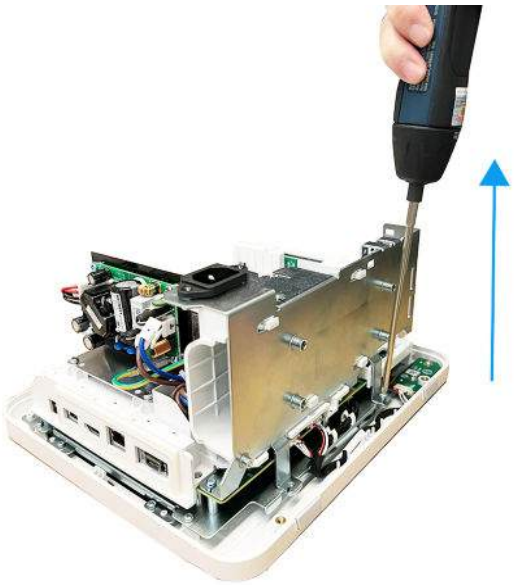
4. Remove 2 screws of the AC inlet.

5. Disconnect the DC cable.

6. Remove 4 screws on the bottom and side.



7. Remove the battery chamber.



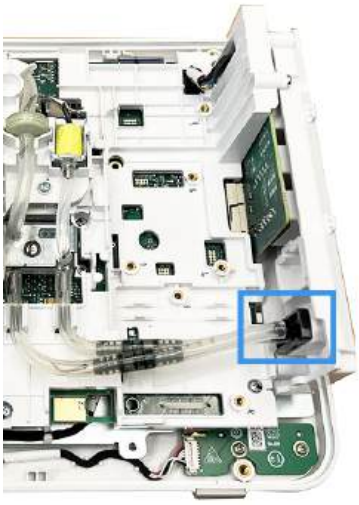
NOTE
Please left the spring with the monitor when removing the battery chamber.

12.2.5 Remove Hemo input assembly (parameter assembly)

Disassemble first:

- 12.2.3 Remove back cover on page 153

1. Disconnect the NIBP tubes.



IMPORTANT
When reassembly, please check the direction of the flow first, there are arrows on the air filter to indicate.

2. Disconnect the active cable assembly.

IMPORTANT
When reassembly, connect active cable assembly to Hemo input assembly first, then install the whole parameter assembly to patient monitor.

3. Remove 4 screws of the Hemo input assembly.

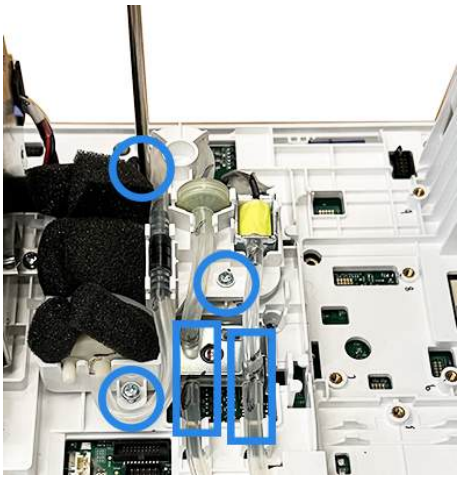
4. Remove the Hemo input assembly.

12.2.6 Remove NIBP pneumatic system and manifold

Disassemble first:

- 12.2.3 Remove back cover on page 153

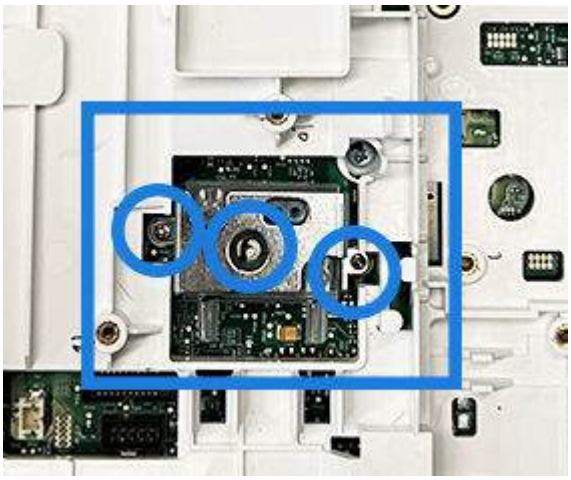
1. Remove 3 screws.
2. Remove the NIBP connector and tube.



IMPORTANT
When reassembly, please check the direction of the flow first, there are arrows on the air filter to indicate.

3. Remove the NIBP pneumatic system parts.

4. Remove 3 screws and remove the NIBP manifold.



IMPORTANT
When reassembly, please insert the manifold's tube to the sensor on mainboard.

12.2.7 Remove the Masimo/Nellcor board

Disassemble first:

- 12.2.3 Remove back cover on page 153

1. Masimo: Remove 3 screws.

   Nellcor: Remove 2 screws.

2. Remove the Masimo/Nellcor board.


, or

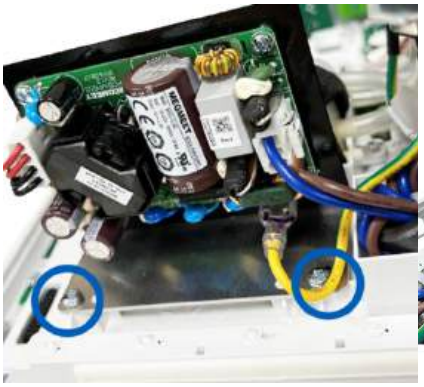

12.2.8 Remove AC/DC module with AC inlet

Disassemble first:

- 12.2.3 Remove back cover on page 153

1. Disconnect the cable from main board.

2. Disconnect the AC inlet from monitor, if haven't.
3. Remove 3 screws of the NIBP pneumatic system, if haven't.
4. Remove 3 screws for the AC/DC module.



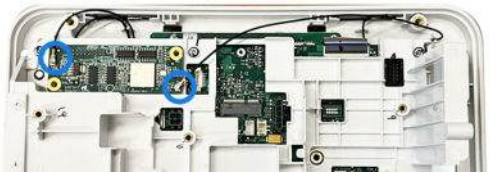

5. Remove the AC/DC module with AC inlet.

12.2.9 Remove WiFi board and antenna

Disassemble first:

- 12.2.3 Remove back cover on page 153

1. Disconnect the antennas cables, and remove two antennas.



2. Remove 2 screws.

3. Remove WiFi board.

IMPORTANT
When reassembly, please roll the antennas cables to the latches. Or else will impact the EMC performance.

12.2.10 Detach the middle unit from front unit

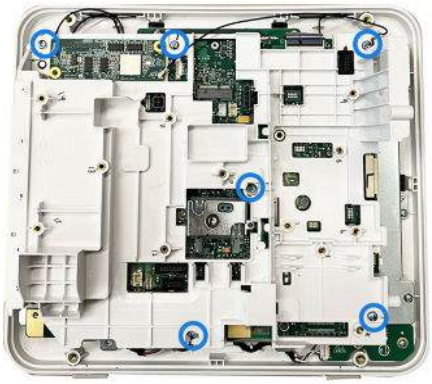
Disassemble first:

- 12.2.3 Remove back cover on page 153
- 12.2.4 Remove speaker, multi I/O, and battery chamber on page 154
- 12.2.5 Remove Hemo input assembly (parameter assembly) on page 157
- 12.2.6 Remove NIBP pneumatic system and manifold on page 158

- 12.2.7 Remove the Masimo/Nellcor board on page 159
- 12.2.8 Remove AC/DC module with AC inlet on page 160
- 12.2.9 Remove WiFi board and antenna on page 161

1. Disconnect the alarm light cable.

2. Remove 6 screws on the middle cover.



3. Disconnect the LCD cable.

4. Disconnect the touch panel cable, and power key cable.

5. Detach the middle unit from front unit.

12.2.11 Remove user interface parts (power key, alarm light)

Disassemble first:

- 12.2.3 Remove back cover on page 153
- 12.2.10 Detach the middle unit from front unit on page 161(Remove the middle unit with all parts in it together)

1. Disconnect the power key cable, and remove 2 screws.

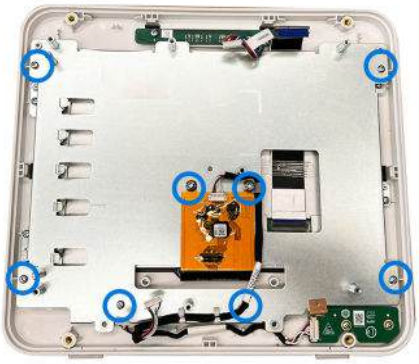
2. Remove the power key board and power key.
3. Remove the alarm light board.

12.2.12 Remove the LCD

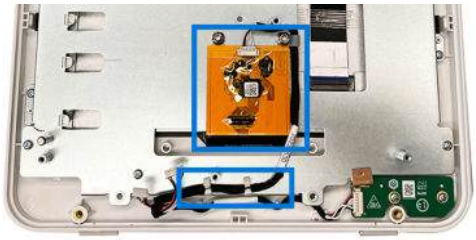
Disassemble first:

- 12.2.3 Remove back cover on page 153
- 12.2.4 Remove speaker, multi I/O, and battery chamber on page 154 (Remove the battery chamber)
- 12.2.10 Detach the middle unit from front unit on page 161 (Remove the middle unit with all parts in it together)

1. Remove 6 screws and 2 nuts.



2. Remove the Touch panel cable from latches.
3. Make the touch panel's FPC board with cable through the LCD frame's window (hole).



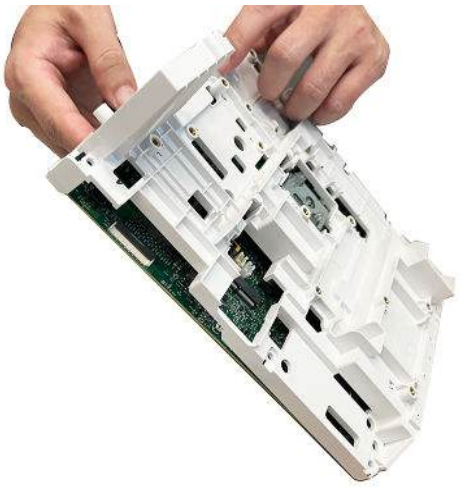
4. Detach the LCD from Touch panel with front cover.

12.2.13 Remove mainboard and CPU

Disassemble first:

- 12.2.3 Remove back cover on page 153
- 12.2.4 Remove speaker, multi I/O, and battery chamber on page 154
- 12.2.5 Remove Hemo input assembly (parameter assembly) on page 157
- 12.2.6 Remove NIBP pneumatic system and manifold on page 158
- 12.2.7 Remove the Masimo/Nellcor board on page 159
- 12.2.8 Remove AC/DC module with AC inlet on page 160
- 12.2.9 Remove WiFi board and antenna on page 161
- 12.2.10 Detach the middle unit from front unit on page 161

1. Detach the middle cover from the mainboard.



2. Replace the CPU RTC battery, if needed.

3. Remove 2 screws, remove the CPU board with heat sink.

12.2.13.1 After replace the mainboard

Calibration for NIBP is needed after replace the mainboard. Refer to "Calibration and adjustments" chapter for more details.

12.2.13.2 About CPU board replacement

To replace the CPU board, the monitor will lose:

- Software and e-manuals
- All of the settings
- license
- MAC address

12.2.13.3 Before replace the CPU board

1. Record the monitor’s serials number according to product label.
2. Record the monitor's country settings.

2.1. Select the **Configurations** > **Advanced** > **Service** > **Country Settings**.

2.2. Record **Language** and **National requirements**.

3. Export the user settings.

NOTE
Make sure the file system format of USB disk is FAT32.

3.1. Insert the USB disk to the monitor.

3.2. Select **Service** vertical tab > **USB Import/export** > **Export**.

3.3. Choose **Settings** from **Export item** list and select **Export**.

3.4. The **Export to USB Disk** menu pops out. The **USB status** is displayed as follows:

- **Connected**: indicates successful connection to the device.
- **Not detected**: indicates incompatible USB disk format. FAT32 format is required.

3.5. Enter an encryption **Create key** for the settings' file, the length of key shall not be less than 6. (This key will be used when import settings).

3.6. Select **Export**.

3.7. Remove the USB disk.

4. Log in the OAC website to get the license, put the license file to same USB disk: `/VSM/license/SN.txt`

http://oac.health.ge.com/oac/.

12.2.13.4 After replace the CPU board

NOTE
For replacement workflow, please refer to the instruction document No. 5929539 of CPU FRU.

1. Setup password when first time turn on the monitor after replacing the CPU board.

1.1. Select the > **Service** > enter **Username** and **Password**.

The initial password is the provided HLA password.

The **Change Password** menu displays.

1.2. Enter and retype the new passwords for **Service**.

1.3. Select **Confirm**.

2. Input serial number.

2.1. Select the > **Service** > enter **Username**: **service** and **Password**.

2.2. Select **Service** tab > **Page2** vertical tab > **Input Serial Number**.

2.3. Enter the serial number and input again to confirm.

2.4. Select **Save Serial Number**.

The monitor will automatically restart in 10 seconds.

3. Download the latest version of software and e-manual.

   For software and e-manual, please order the software USB FRU.

   For more information about how to download software and e-manual, please refer to the "Software download instruction".

4. Import the password and settings at first time to use.

   4.1. Insert the USB disk with user settings' file to the monitor.

   4.2. Select the **Settings Activation from USB Disk** tab.

   4.3. Select the related setting file from **Setting files** list.

   4.4. Enter the decryption **Key for the file**.

   4.5. Select **Activate & Restart**.

   The monitor's settings and password have been setup, and the monitor will restart.

5. Import the license.

   5.1. Insert the USB disk with license file to the monitor.

   5.2. Select **Service** tab > **License** > **Import** key.

   5.3. Restart the monitor according to message.

6. Perform the country settings.

   6.1. Select **Service** tab > **Country Settings**.

   6.2. Setup **National requirements** and **Language** according to the records above.

   6.3. The monitor will automatically restart in 10 seconds after Language is set.

13 Service parts

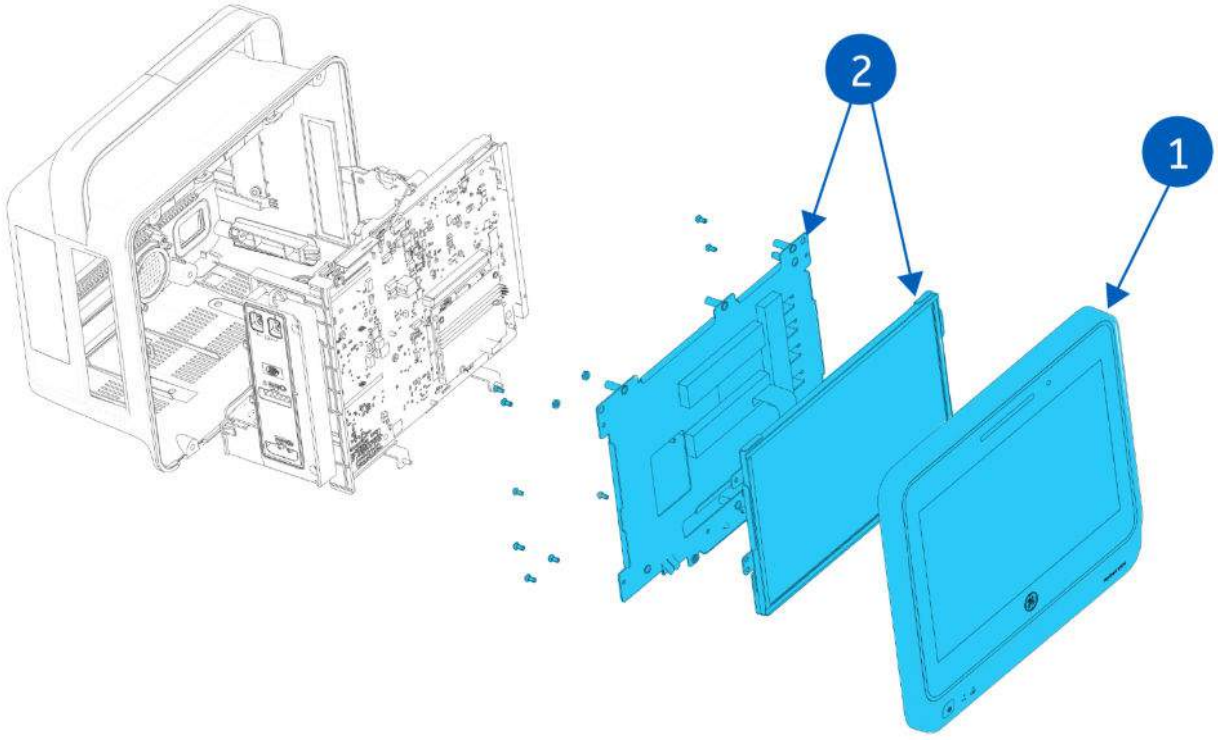
13.1 Service parts

Perform the specified corrective maintenance check after any corrective maintenance to the product.

Ordering parts

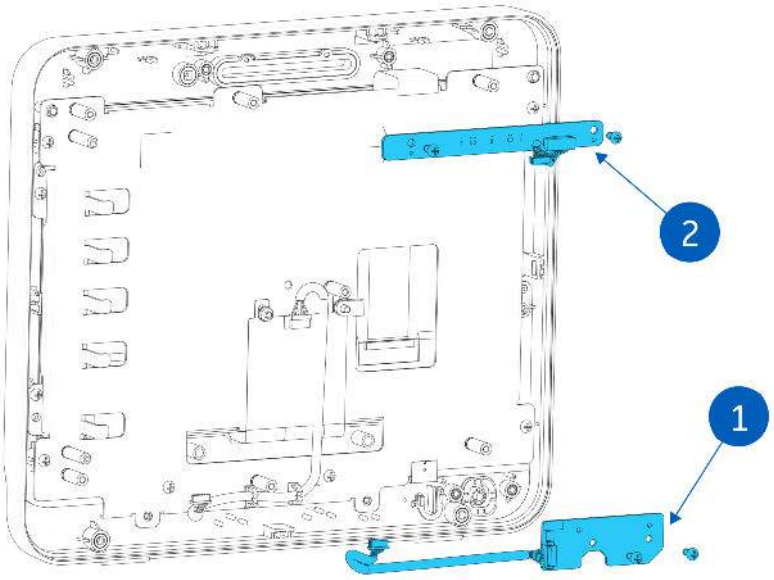
To order parts, contact your local GE HealthCare representative. Contact information is available at http://www.gehealthcare.com. Make sure you have all necessary information at hand.

13.1.1 Front cover and LCD



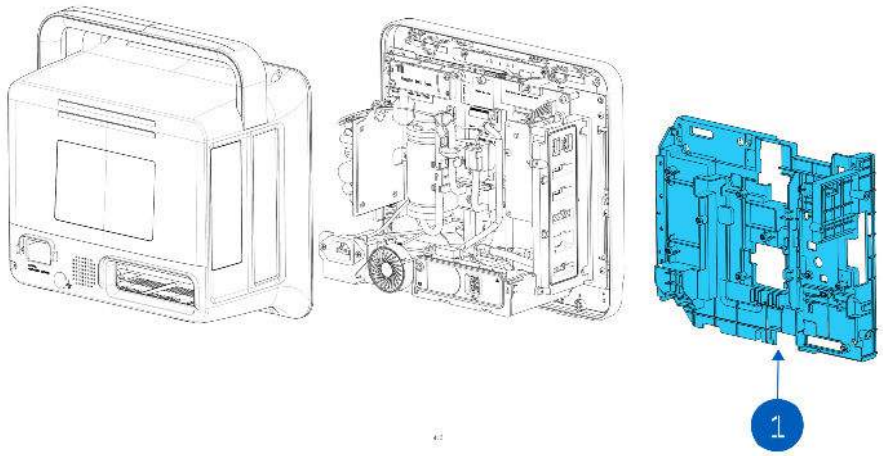
Item	Part number	Description
1	7808800-11	FRU VSM 10 INCH TP Assembly with Front Cover • VSM Front cover with TP • WiFi Antenna
2	6808800-10	FRU B105M/B105P BT1 10 INCH LCD Assembly • 10' LCD with holder and LCD plate • Screws

13.1.2 Power key and alarm light



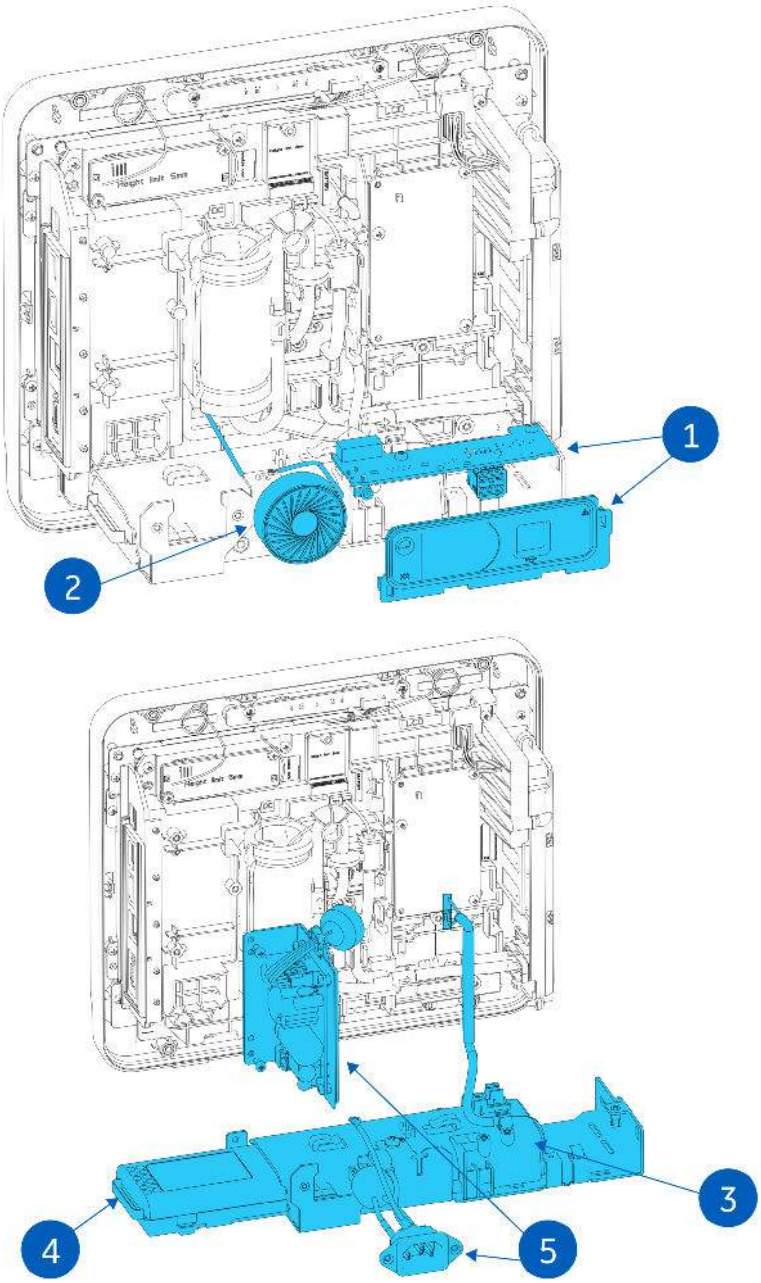
Item	Part number	Description
1	6808800-05	FRU B1X5M/B1X5P BT1 Power Key Assembly • Power key board • Power key cables • Screws
2	6808800-06	FRU B1X5M/B1X5P BT1 Alarm Board with Cable • Alarm LED board • Alarm LED cables • Screws

13.1.3 Inner frame



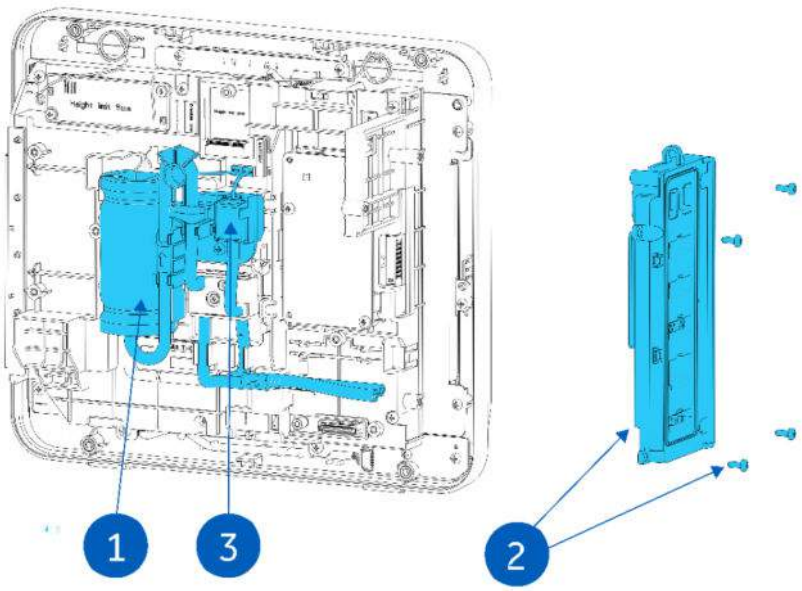
Item	Part number	Description
1	5808800-32	FRU B1X5M/B1X5P Inner Frame • Middle frame

13.1.4 Speaker, multi I/O, battery, battery chamber, and ACDC assembly



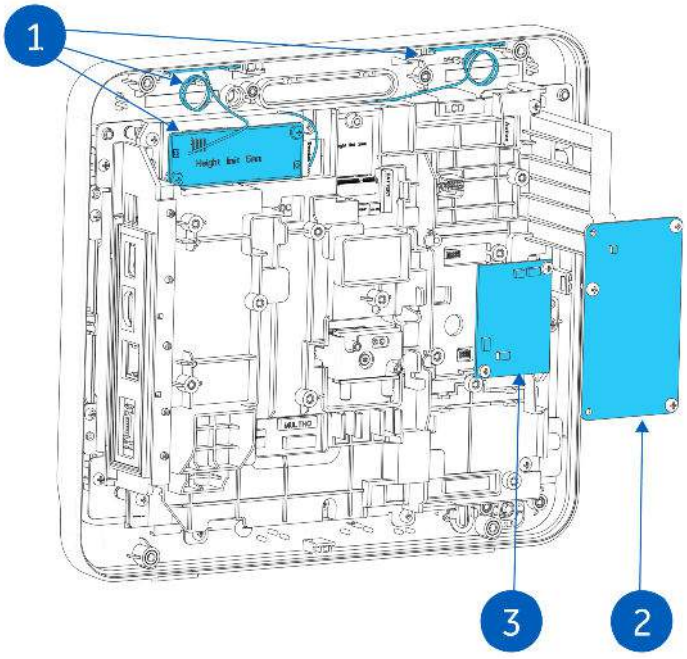
Item	Part number	Description
1	7808800-15	FRU VSM Multi-IO Board with Cable • Multi I/O board • Multi I/O cable • Multi I/O cover • Grounding clip-on • Screws
2	5808800-27	FRU B1X5M/B1X5P Speaker Assembly • Speaker
3	6808800-24	FRU B1X5M/B1X5P BT1 Battery Housing Assembly • Battery top cover • Mounting fixing plate • Battery board with cable • Related kinds of screws • Spring
4	2062895-001	BATTERY, FLEX-3S2P, 10.8V, 18650 LI-ION SMBUS
5	5808800-26	FRU B1X5M/B1X5P AC/DC Module • AC/DC module • AC-Inlet • Related kinds of screws **NOTE** Remove 3 screws of NIBP pneumatic system first before remove the AC/DC module.

13.1.5 Hemo input parts



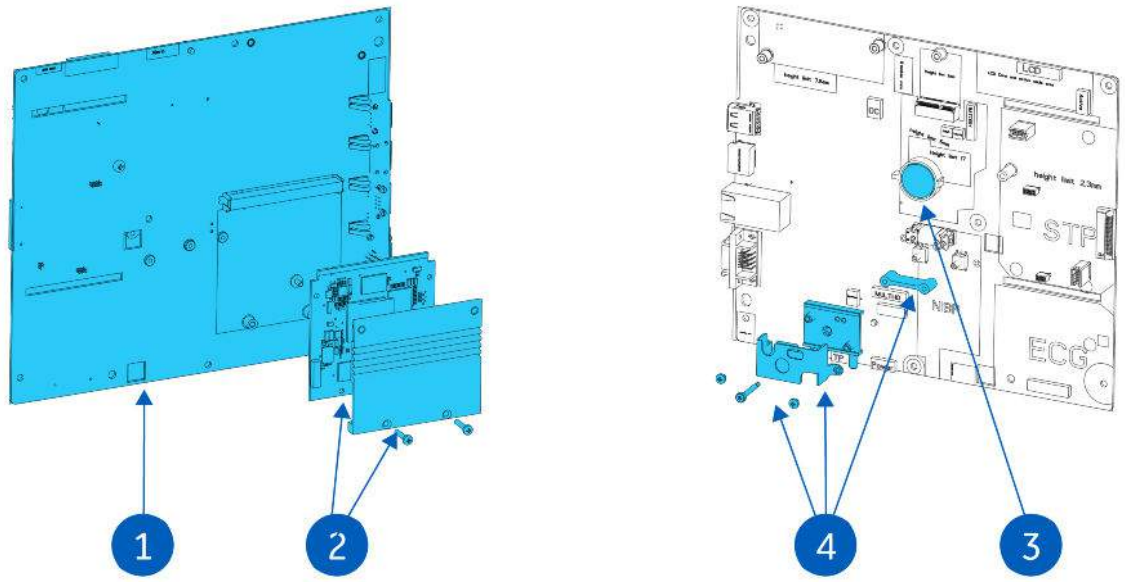
Item	Part number	Description
1	5808800-31	FRU B1X5M/B1X5P NIBP Pneumatic System • Pneumatic system
2	7808800-07	FRU VSM Parameter Assembly • Parameter interface module • Screws • STP input board • STP input sealing foam • NIBP connector with rubber • Parameter Label **NOTE** Active cable assembly is not included in.
3	5808800-50	FRU B1X5M/B1X5P new Dump Valve, 3/Box

13.1.6 WLAN, Masimo, and Nellcor SpO_2 board



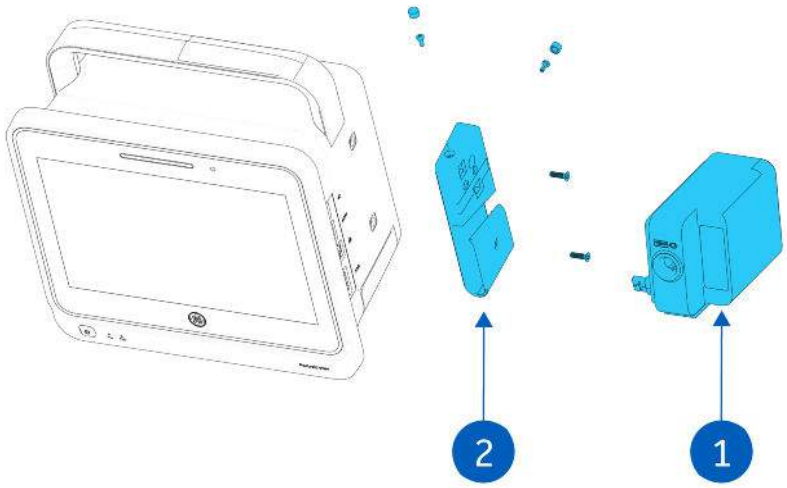
Item	Part number	Description
1	7808800-17	FRU VSM WiFi Board with Antenna • WLAN module board • 2 Wifi antenna, 26 cm • WiFi board cable management • Screws
2	5808800-43	FRU B1X5M Nellcor SpO2 Board • OEM, Nellcor SpO_2 board
3	5808800-42	FRU B1X5M Masimo SpO2 Board • OEM, Masimo SpO_2 board

13.1.7 NIBP manifold, mainboard and CPU board



Item	Part number	Description
1	7808800-02	FRU VSM Main Board for GE SpO2 • Main board for STP • NIBP Manifold • Related kinds of screws
1	7808800-03	FRU VSM Main Board for MASIMO/NELLCOR SpO2 • Main board for TP • NIBP Manifold • Related kinds of screws
2	7808800-01	FRU VSM CPU Board • CPU board • Screws
3	5808800-05	FRU B1X5M/B1X5P CPU RTC Battery • Battery, 2032 lithium, 3V
4	6808800-22	FRU B1X5M/B1X5P BT1 NIBP Manifold • NIBP manifold • Screws

13.1.8 Welch Allyn temperature module and holder



Item	Part number	Description
1	7808800-35	FRU VSM Welch Allyn Temperature Module
2	7808800-36	FRU VSM Welch Allyn Temperature Holder

13.1.9 Others

Part Number	Description
7808800-21	FRU VSM Software for Service Recovery(USB)
7808800-09	FRU VSM Parameter Label 5 PCS
7808800-45	FRU VSM Roll Stand Conductive Wheel
7808800-46	FRU VSM Roll Stand Top Basket 1 piece
5808800-45	FRU Grand Canal ten Battery covers

A Verification procedure for wireless network

A.1 Purpose and scope

The purpose of this test is to verify that wireless monitors operate reliably in customer's wireless network infrastructure. The test focuses on the wireless coverage areas that most likely have poor connectivity.

This test is recommended if the wireless monitors are going to be used in patient transfers within the wireless coverage area.

A.2 Test plan

Each wireless installation is unique. It is often impractical and uneconomical to verify the whole wireless coverage area. Therefore, prepare a site-specific test plan that covers the areas where the monitors are most likely to face issues with the wireless communication.

When preparing the test plan, utilize the information provided in the pre-quote questionnaire, existing wireless network design documentation and site survey results. Discuss with the hospital IT specialists and clinical staff to identify the areas that are most likely for poor wireless communication, and prepare a test plan accordingly.

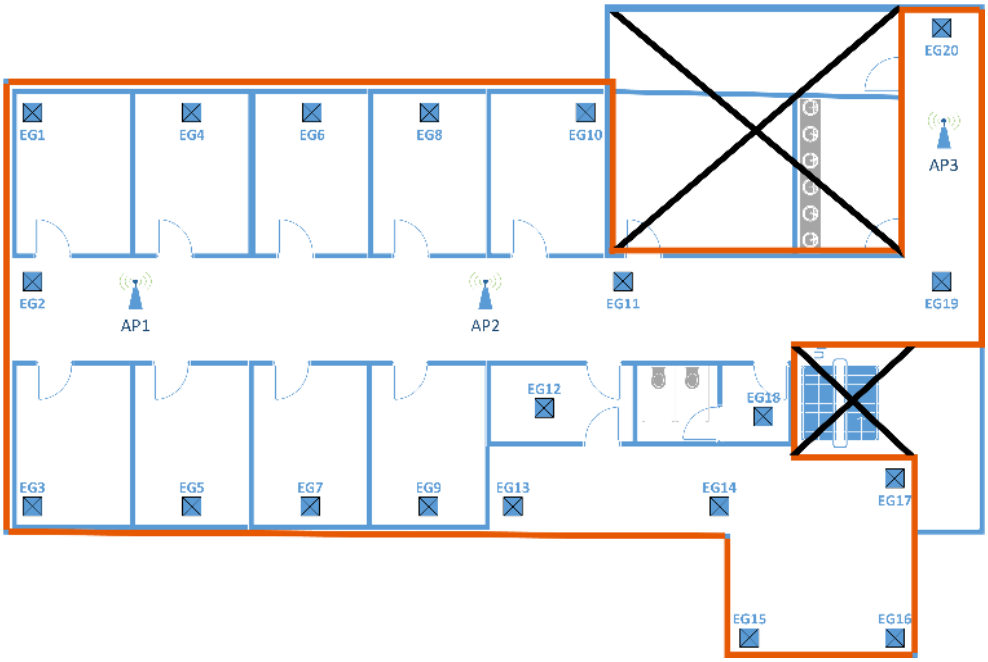
Consider the following aspects when you prepare the test plan:

- Identify areas with known or obvious low signal strength.
- Identify areas with known sources of radio frequency interference, causing high noise floor and/or poor signal-to-noise ratio.
- Identify the special characteristics in the building layout (floors, wings patient rooms) and construction material used.
- Identify the time and areas of congestion, with high number of wireless clients and a lot of network traffic.
- Identify intended clinical workflow paths, including bedside locations and transport routes.

Prepare the test plan by documenting the intended walking path and test points to the floor plan, preferably to copy of a site survey document that shows the wireless coverage area, the location of wireless access points, signal strengths and sources of known radio frequency interferences.

Due to the dynamic nature of a wireless environment this test provides only a snapshot of the wireless network at the time of the test. This is not a comprehensive test that covers all possible use situations, network traffic situations, radio frequency interferences and possible other changes in the wireless environment.

NOTE
In the sample floor plan below, EG1- EG20 represent possible test points. Take into account in your plan that some rooms and areas may not be accessible at the time of performing the survey.



A.3 Overview of the test procedure

The test procedure covers the following:

- A tester moves the wireless monitor along a preplanned route in the wireless coverage area and ensures that the signal strength and transmit rate are adequate.

A.4 Test equipment needed

Ensure that you have the following equipment and documentation available.

A.4.1 Wireless monitor, the transport monitor

- A patient monitor with wireless network connection.
- A roll stand for the patient monitor.

A.5 Setting up the wireless monitor

NOTE
Ensure that the patient monitor battery are fully charged.

1. Make sure the wireless monitor is connected to the network, and **WLAN** is open.
2. Install the wireless monitor on a roll stand.
3. Turn on the monitor.

A.6 Performing the test

Perform the test according to the test plan. Contact the nursing staff to ensure access to the needed areas before you start the test.

1. Move the roll stand to the starting point of the planned test route.
2. Stop at each test point and perform the following tasks:
   2.1. Select the **Configurations** > **Advanced** > **Service**.
   2.2. Select the **Connectivity** > **WLAN** tab > **Status**.
   2.3. Mark following items to the test form.
   - Test point: current point
   - Time: current time on monitor
   - RSSI: **Quality dBm** for **Signal**
   - Transmit rate: **TX rate Mbps**

   2.4. Verify that the RSSI in dBm is greater than or equal to -65 dBm.
   2.5. Verify that the Transmit rate in Mbps is greater than or equal to 5.5 Mbps.
3. If the RSSI or the Transmit rate is lower than specified:
   - Try to find the cause, for example, roaming or out of range situations.
4. Move the roll stand to the next test point along the walking path and repeat steps 2 and 3 at each test point until you have completed the test plan.

NOTE
Momentary signal losses up to 5 seconds are normal during roaming. If longer, or repeating waveform losses occur between test points, record the observations to the test form also.

A.7 Summarizing and reporting

1. Complete the test form.
2. Review and evaluate the test results together with GE HealthCare personnel and the hospital IT specialists. Summarize, if additional testing is needed and/or if the WLAN infrastructure needs to be changed.

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