GE Healthcare

MAC™ 800
Resting ECG Analysis System
Service Manual

Software Version 2.0.x
2060321-001 Revision L

Publication Information

The information in this manual applies only to MAC™ 800 Software Version 2.0.x. It does not apply to earlier product versions. Due to continuing product innovation, specifications in this manual are subject to change without notice.

The document part number and revision appear at the bottom of each page. The revision identifies the document's update level. The revision history of this document is summarized in the following table.

Revision	Date	Comments
A	1 March 2012	Initial release of document.
B	21 March 2012	Updated the Product Specifications: Certifications section.
C	31 May 2012	SPR HCSDM00135660 the following updates are: • In the Introduction Chapter, under Safety Hazards, a warning regarding the maintenance schedule was added. • In the Troubleshooting Chapter, under the Equipment Problems section, System Date/Time Settings section was added.
D	16 July 2012	Per SPR HCSDM00149939 the following changes were made: Updated Part Numbers of following parts: • MAC800 FRU LCD ASSEMBLY • MAC800 V2 FRU CD MANUAL • MAC800 V2 FRU PROGRAMMED SD CARD • All MAC 800 Data Matrix Barcode Scanner Kit part numbers were changed. FRU Wifi Channel section was added to the Parts List chapter. In the Troubleshooting Chapter the Start-up screen was updated.
E	13 June 2013	Per SPR HCSDM00206148, the following change is made: Replaced 2061821-001 MAC800 V2 FRU PROGRAMMED SD CARD with 2061821-002 MAC800 V2 FRU PROGRAMMED SD CARD-SW 2.0.4
F	4 August 2014	The following change is made: Replaced 2061821-002 MAC800 V2 FRU PROGRAMMED SD CARD-SW 2.0.4 with 2061821-003 MAC800 V2 FRU PROGRAMMED SD CARD-SW 2.0.5
G	5 February 2015	The following changes were made: • Replaced 2061821-003 MAC800 V2 FRU PROGRAMMED SD CARD-SW 2.0.5 with 2061821-004 MAC800 V2 FRU PROGRAMMED SD CARD with SW 2.0.6 • Removed "wherever ECG testing is performed to record ECG signals from surface electrodes" from the Indications for Use section in Chapter Instruction.
H	27 June 2016	Update the Wifi parameter information.
J	9 October 2016	Replaced 2061821-004 MAC800 V2 FRU PROGRAMMED SD CARD with SW 2.0.6 with 2061821-005 MAC800 V2 FRU PROGRAMMED SD CARD-SW 2.0.8.
K	17 April 2017	Added the new supplies and accessories manual information.
L	6 November 2017	Updated to phase in Silex wireless module.

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To access Original Equipment Manufacturer (OEM) manuals, go to the device manufacturer's website.

Service Manual Language Information

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.
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 пациент в резултат на токов удар или механична или друга опасност.
警告 (ZH-CN)	本维修手册仅提供英文版本。 • 如果维修服务提供商需要非英文版本，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人员，操作员或患者造成触电、机械伤害或其他形式的伤害。
警告 (ZH-TW)	本維修手冊只提供英文版。 • 如果客戶的維修人員有英語以外的其他語言版本需求，則由該客戶負責 提供翻譯服務。 • 除非您已詳閱本維修手冊並了解其內容，否則切勿嘗試對本設備進行維 修。 • 不重視本警告可能導致維修人員、操作人員或病患因電擊、機械因素或 其他因素而受到傷害。
UPOZORENJE (HR)	Ove upute za servisiranje dostupne su samo na engleskom jeziku. • Ukoliko korisnički servis zahtijeva neki drugi jezik, korisnikova je odgovornost osigurati odgovarajući prijevod. • Nemojte pokušavati servisirati opremu ukoliko niste konzultirali i razumjeli ove upute. • Nepoštivanje ovog upozorenja može rezultirati ozljedama servisnog osoblja, korisnika ili pacijenta prouzročenim električnim udarom te mehaničkim ili nekim drugim opasnostima.
VAROVÁNÍ (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 varování může dojít k poranění pracovníka prodejního servisu, obslužného personálu nebo pacientů vlivem elektrického proudu, respektive vlivem mechanických či jiných rizik.

Service Manual Language Information (cont'd.)

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 medmindre denne servicemanual har været konsulteret og er forstået. • Manglende overholdelse af denne advarsel kan medføre skade på grund af elektrisk, mekanisk eller anden fare for teknikeren, operatøren eller patienten.
WAARSCHUWING (NL)	Deze service manual is alleen in het Engels verkrijgbaar. • Indien het onderhoudspersoneel een andere taal nodig heeft, dan is de klant verantwoordelijk voor de vertaling ervan. • Probeer de apparatuur niet te onderhouden voordat deze service manual geraadpleegd en begrepen is. • Indien deze waarschuwing niet wordt opgevolgd, zou het onderhoudspersoneel, de gebruiker of een patiënt gewond kunnen raken als gevolg van een elektrische schok, mechanische of andere gevaren.
HOIATUS (ET)	Käesolev 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 technique n'est disponible qu'en anglais. • Si un service technique client souhaite obtenir ce manuel dans une autre langue que l'anglais, il devra prendre en charge la traduction et la responsabilité du contenu. • Ne pas tenter d'intervenir sur les équipements tant que le manuel technique 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.

Service Manual Language Information (cont'd.)

WARNUNG (DE)	Diese Serviceanleitung ist nur in englischer Sprache verfügbar. • Falls der Kundendienst eine andere Sprache benötigt, muss er für eine entsprechende Übersetzung sorgen. • Keine Wartung durchführen, ohne diese Serviceanleitung gelesen und verstanden zu haben. • Bei Zuwiderhandlung kann es zu Verletzungen des Kundendiensttechnikers, des Anwenders oder des Patienten durch Stromschläge, mechanische oder sonstige Gefahren kommen.
ΠΡΟΕΙΔΟΠΟΙΗΣΗ (EL)	Το παρόν 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. • Μην επιχειρήσετε 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.
FIGYELMEZTETÉS (HU)	Ez a szerviz kézikönyv kizárólag angol nyelven érhető el. • Ha a vevő szerviz ellátója angoltól eltérő nyelvre tart igényt, akkor a vevő felelőssége a fordítás elkészíttetése. • Ne próbálja elkezdeni használni a berendezést, amíg a szerviz kézikönyvben leírtakat nem értelmezték és értették meg. • Ezen figyelmeztetés figyelmen kívül hagyása a szerviz ellátó, a működtető vagy a páciens áramütés, mechanikai vagy egyéb veszélyhelyzet miatti sérülését eredményezheti.
AÐVÖRUN (IS)	Þessi þjónustuhandbók er eingöngu fáanleg á ensku. • Ef að þjónustuveitandi viðskiptamanns þarfnast annars tungumáls en ensku, er það skylda viðskiptamanns að skaffa tungumálaþjónustu. • Reynið ekki að afgreiða tækið nema þessi þjónustuhandbók hefur verið skoðuð og skilin. • Brot á að sinna þessari aðvörun getur leitt til meiðsla á þjónustuveitanda, stjórnanda eða sjúklingi frá raflosti, vélrænum eða öðrum áhættum.
PERINGATAN (ID)	Manual servis ini hanya tersedia dalam bahasa Inggris. • Jika penyedia jasa servis pelanggan memerlukan bahasa lain selain dari Bahasa Inggris, merupakan tanggung jawab dari penyedia jasa servis tersebut untuk menyediakan terjemahannya. • Jangan mencoba melakukan servis terhadap perlengkapan kecuali telah membaca dan memahami manual servis ini. • Mengabaikan peringatan ini bisa mengakibatkan cedera pada penyedia servis, operator, atau pasien, karena terkena kejut listrik, bahaya mekanis atau bahaya lainnya.

Service Manual Language Information (cont'd.)

AVVERTENZA (IT)	Il presente manuale di manutenzione è disponibile soltanto in Inglese. • Se un addetto alla manutenzione richiede il manuale in una lingua diversa, il cliente è tenuto a provvedere direttamente alla traduzione. • Si proceda alla manutenzione dell'apparecchiatura solo dopo aver consultato il presente manuale ed averne compreso il contenuto. • Il non rispetto della presente avvertenza potrebbe far compiere operazioni da cui derivino lesioni all'addetto, alla manutenzione, all'utilizzatore ed al paziente per folgorazione elettrica, per urti meccanici od altri rischi.
警告 (JA)	このサービスマニュアル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、十分に理解をした上で装置のサービスを行ってください。 • 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。
CẢNH BÁO (VI)	Tài Liệu Hướng Dẫn Sửa Chữa chỉ có bản tiếng Anh. • Nếu các đơn vị cung cấp dịch vụ cho khách hàng yêu cầu một ngôn ngữ nào khác tiếng Anh, thì khách hàng sẽ có trách nhiệm cung cấp các dịch vụ dịch thuật. • Không được sửa chữa thiết bị trừ khi đã tham khảo và hiểu Tài liệu Hướng dẫn Sửa chữa. • Không tuân thủ những cảnh báo này có thể dẫn đến các tổn thương cho người thực hiện sửa chữa, người vận hành hay bệnh nhân, do sốc điện, các rủi ro về cơ khí hay các rủi ro khác.
ЕСКЕРТУ (KK)	Бұл қызмет көрсету бойынша нұсқаулығы тек ағылшын тілінде қолжетімді. • Тұтынушының қызмет провайдері ағылшын тілінен басқа тілдегі нұсқаны талап етсе, аудару бойынша қызметтерімен қамтамасыз ету тұтынушы жауапкершілігінде болуы тиіс. • Бұл қызмет көрсету бойынша нұсқаулығын назарға алып, түсінбегенше, жабдыққа қызмет көрсетуден бас тартыңыз. • Бұл ескертуді елемеу қызмет провайдері, оператор немесе емделушінің электр шогынан, механикалық немесе басқа қауіптер нәтижесінде жарақат алуына әкелуі мүмкін.
BRĪDINĀJUMS (LV)	Šī apkalpotāju rokasgrāmata ir pieejama tikai angļu valodā. • Ja apkalpošanas sniedzējam nepieciešama informācija citā, nevis angļu, valodā, klienta pienākums ir nodrošināt tās tulkošanu. • Neveiciet aprīkojuma apkopi, neizlasot un nesaprotot apkalpotāju rokasgrāmatu. • Šī brīdinājuma neievērošana var radīt elektriskās strāvas trieciena, mehānisku vai citu risku izraisītu traumu apkopes sniedzējam, operatoram vai pacientam.
ĮSPĖJIMAS (LT)	Šis eksploatavimo vadovas yra prieinamas tik anglų kalba. • Jei kliento paslaugų tiekėjas reikalauja vadovo kita kalba - ne anglų, numatyti vertimo paslaugas yra kliento atsakomybė. • Nemėginkite atlikti įrangos techninės priežiūros, nebent atsižvelgėte į šį eksploatavimo vadovą ir jį supratote. • Jei neatkreipsite dėmesio į šį perspėjimą, galimi sužalojimai dėl elektros šoko, mechaninių ar kitų paslaugų tiekėjui, operatoriui ar pacientui.

Service Manual Language Information (cont'd.)

ADVARSEL (NO)	Denne servicehåndboken finnes bare på engelsk. • Hvis kundens serviceleverandør trenger 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 dostawca usług klienta wymaga języka innego niż angielski, zapewnienie usługi tłumaczenia jest obowiązkiem klienta. • Nie należy serwisować wyposażenia bez zapoznania się i zrozumienia niniejszego podręcznika serwisowego. • Niezastosowanie się do tego ostrzeżenia może spowodować urazy dostawcy usług, operatora lub pacjenta w wyniku porażenia elektrycznego, zagrożenia mechanicznego bądź innego.
AVISO (PT-BR)	Este manual de assistência técnica só se encontra disponível em inglês. • Se o serviço de assistência técnica do cliente não for GE, e precisar de outro idioma, será 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 por em perigo a segurança do técnico, operador ou paciente devido a choques elétricos, mecânicos ou outros.
AVISO (PT-PT)	Este manual técnico só se encontra disponível em inglês. • Se a assistência técnica do cliente solicitar estes manuais noutro idioma, é da responsabilidade do cliente fornecer os serviços de tradução. • Não tente reparar o equipamento sem ter consultado e compreendido este manual técnico. • O não cumprimento deste aviso pode provocar lesões ao técnico, ao utilizador ou ao paciente devido a choques eléctricos, mecânicos ou outros.
AVERTISMENT (RO)	Acest manual de service este disponibil numai în limba engleză. • Dacă un furnizor de servicii pentru clienți necesită o altă limbă decât cea engleză, este de datoria clientului să furnizeze o traducere. • Nu încercați să reparați echipamentul decât ulterior consultării şi înțelegerii 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.
ПРЕДУПРЕЖДЕНИЕ (RU)	Настоящее руководство по обслуживанию предлагается только на английском языке. • Если сервисному персоналу клиента необходимо руководство не на английском, а на каком-то другом языке, клиенту следует обеспечить перевод самостоятельно. • Прежде чем приступать к обслуживанию оборудования, обязательно обратитесь к настоящему руководству и внимательно изучите изложенные в нем сведения. • Несоблюдение требований данного предупреждения может привести к тому, что специалисты по обслуживанию, операторы или пациенты получат удар электрическим током, механическую травму или другое повреждение.

Service Manual Language Information (cont'd.)

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.
VAROVANIE (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 skôr, ako si neprečítate návod na obsluhu a neporozumiete mu. • Zanedbanie tohto varovania môže vyústiť do zranenia poskytovateľa služieb, obsluhujúcej osoby alebo pacienta elektrickým prúdom, mechanickým alebo iným nebezpečenstvom.
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.
ADVERTENCIA (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.
UYARI (TR)	Bu servis kılavuzunun sadece İngilizcesi mevcuttur. • Eğer müşteri teknisyeni bu kılavuzu İngilizce 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.

Service Manual Language Information (cont'd.)

ЗАСТЕРЕЖЕННЯ (UK)	Дане керівництво з сервісного обслуговування постачається виключно англійською мовою. • Якщо сервісний інженер потребує керівництво іншою мовою, користувач зобов'язаний забезпечити послуги перекладача. • Не намагайтеся здійснювати технічне обслуговування даного обладнання, якщо ви не читали, або не зрозуміли інформацію, надану в керівництві з сервісного обслуговування. • Недотримання цього застереження може призвести до травмування сервісного інженера, користувача даного обладнання або пацієнта внаслідок електричного шоку, механічного ушкодження або з інших причин невірного обслуговування обладнання.
CẢNH BÁO (VI)	Tài Liệu Hướng Dẫn Sửa Chữa chỉ có bản tiếng Anh. • Nếu các đơn vị cung cấp dịch vụ cho khách hàng yêu cầu một ngôn ngữ nào khác tiếng Anh, thì khách hàng sẽ có trách nhiệm cung cấp các dịch vụ dịch thuật. • Không được sửa chữa thiết bị trừ khi đã tham khảo và hiểu Tài liệu Hướng dẫn Sửa chữa. • Không tuân thủ những cảnh báo này có thể dẫn đến các tổn thương cho người thực hiện sửa chữa, người vận hành hay bệnh nhân, do sốc điện, các rủi ro về cơ khí hay các rủi ro khác.

Contents

1

Introduction

This document describes the MAC™ 800 Resting ECG Analysis System, also referred to as “the system” or “the device”.

This chapter provides general information required for the proper use of the system and the manual. Familiarize yourself with this information before using the system.

Indications for Use

The MAC™ 800 Resting ECG Analysis System is a portable ECG acquisition, analysis, and recording system intended to:

- acquire, analyze, display, and record information from adult and pediatric populations,
- be used under the direct supervision of a licensed health care practitioner,
- be used by trained operators in a hospital or medical professional's facility environment, as well as used in clinics, physician offices, outreach centers,
- offer two basic modes of operation: (1) resting ECG mode and (2) arrhythmia mode
- print 3- and 6 leads of ECG,
- be upgradeable to provide software options such as 12-lead ECG measurement and interpretive analysis,
- provide for the optional transmission and reception of ECG data to and from a central ECG cardiovascular information system.

NOTE:

Pediatric population is defined as patients between the ages of 0 and 15 years.

Arrhythmia detection is provided for the convenience of automatic documentation.

Contraindications

This MAC™ 800 device is NOT intended:

- to be used during patient transport,
- to be used for intracardiac applications,
- to be used as a vital signs physiological monitor,
- to provide alarms for arrhythmia detection.

Regulatory and Safety Information

This section provides information about the safe use and regulatory compliance of this device. Familiarize yourself with this information and read and understand all instructions before attempting to use this device. The system software is considered medical software. As such, it was designed and manufactured to the appropriate medical regulations and controls. Any exceptions are noted in the Compliance Information - Exceptions section.

NOTE:

Disregarding the safety information provided is considered abnormal use of this device and could result in injury, loss of data, and void any existing product warranties.

Safety Conventions

A **Hazard** is a source of potential injury to a person, property, or the product.

This manual uses the terms DANGER, WARNING, and CAUTION to point out hazards and to designate a degree or level of seriousness. Familiarize yourself with the following definitions and their significance.

Definitions of Safety Conventions

Safety Convention	Definition
DANGER	Indicates an imminent hazard, which, if not avoided, will result in death or serious injury.
WARNING	Indicates a potential hazard or unsafe practice, which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a potential hazard or unsafe practice, which, if not avoided, could result in minor personal injury or product/property damage.

Safety Hazards

The following messages apply to the system as a whole. Specific messages may also be provided elsewhere in the manual.

DANGER:
Do not use in the presence of flammable anesthetics.

WARNING:
CONNECTION TO MAINS. This is class I equipment.

The mains plug must be connected to an appropriately grounded power supply.

WARNING:
BATTERY OPERATION. If the integrity of the protective earth conductor is in doubt, operate the unit from its battery.

WARNING:
Failure on the part of all responsible individuals, or institutions, employing the use of this device to implement the recommended maintenance schedule may cause equipment failure and possible health hazards.

CAUTION:
This equipment contains no user serviceable parts. Refer servicing to qualified service personnel.

U.S. Federal law restricts this device to the sale by or on the order of a physician.

Parts and Accessories Information

WARNING:
PATIENT SAFETY — To ensure patient safety, use only parts and accessories manufactured or recommended by GE Healthcare.

Contact GE Healthcare for information before connecting any devices to this equipment that are not recommended in this manual.

If the installation of this equipment in the U.S.A. uses 240V rather than 120V, the source must be a center-tapped, 240V, single-phase circuit.

Parts and accessories must meet the requirements of the applicable 60601 safety standards, and/or the system configuration must meet the requirements of the 60601-1-1 Medical Electrical Systems standard.

Using accessory equipment that does not comply with the equivalent safety requirements of this equipment may lead to a reduced level of safety of the resulting system. Consideration relating to the choice shall include:

- Use of the accessory in the Patient Vicinity.
  Patient vicinity is defined as a space, within a location intended for the examination and treatment of patients, extending 6 ft. (1.83 m) beyond the normal location of the bed, chair, table, treadmill, or other device(s) supporting the patient during examination and treatment, and extending vertically to 8 ft. 2.4 in. (2.5 m) above the floor.
- Evidence that the safety certification of the accessory was performed in accordance with the appropriate 60601-1 and/or 60601-1-1 standard(s).

Responsibility of the Manufacturer

GE Healthcare is responsible for the effects of safety, reliability, and performance on GE-supplied hardware only if the following conditions are met:

- Assembly operations, extensions, readjustments, modifications, or repairs are carried out by persons authorized by GE Healthcare.
- The electrical installation of the relevant room complies with the requirements of the appropriate local, state, and other government regulations.
- The equipment is used in accordance with the instructions for use.

Responsibility of the Purchaser/Customer

The customer is responsible for providing appropriate desks, chairs, electrical wall outlets, network connections, analog phone lines, and for locating any of the system components described in this manual in compliance with all local, state, and national codes.

Equipment Symbols

See the MAC™ 800 Resting ECG Analysis System Operator's Manual for information about the symbols used on this product and its packaging.

Training

This manual is intended as a supplement to, not a substitute for, thorough product training. If you have not received training on the use of the device, you should request training assistance from GE Healthcare.

To see available training, go to the GE Healthcare training website (http://www.gehealthcare.com/usen/education/index.html) and select *Diagnostic Cardiology* under the *Technical Service Education* section.

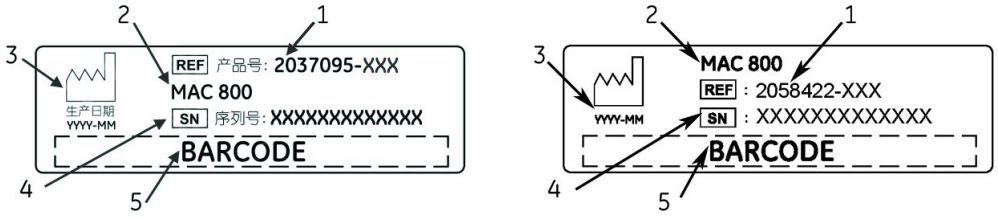
For more self-paced course offerings, tools, and reference guides you may find useful, please visit the GE Healthcare Education Store at www.gehealthcare.com/educationstore.

Equipment Identification

Every GE Healthcare device has a product label that identifies the product name, part number, manufacturing information, and unique serial number. This information is required when contacting GE Healthcare for support.

Product Label

The product label is laid out in the following format. Depending on the product, the label may vary slightly in format, but it contains the same information.

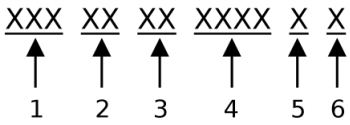


Product Label Format

Item	Description
1	Product part number
2	Product description
3	Date of manufacture in YYYY-MM format
4	Unit serial number (See "Serial Number Format" on page 19 for more information.)
5	Product barcode

Serial Number Format

Each device has a serial number that uniquely identifies the device and provides important information about the device. The serial number format is shown in the following illustration:



Serial Number Format

Item	Name	Description
1	Product Code	Three-letter code that uniquely identifies the product line. Refer to "Product Codes" on page 20 for more information.
2	Year Manufactured	Two-digit code identifying the year the device was manufactured. Values range from 00 to 99 For example: 00 = 2000, 04 = 2004, 05 = 2005 (and so on).

Serial Number Format (cont'd.)

Item	Name	Description
3	Fiscal Week Manufactured	Two-digit code identifying the week the device was manufactured. Values range from 01 to 52. GE Healthcare's fiscal weeks correspond to the calendar week. For example, 01 = first week in January.
4	Product Sequence	Four-digit number identifying the order in which this device was manufactured. Values range from 000 to 9999.
5	Manufacturing Site	One-letter code identifying the site where the device was manufactured. For example, F = Milwaukee, N = Freiburg, P = Bangalore
6	Miscellaneous Characteristic	For example, P = unit is a prototype, R = unit was refurbished, U = unit was upgraded to meet the specifications of another product code.

Product Codes

The product code identifies specific system platforms. You need the product code before servicing or requesting support for your device.

You can identify the product code using the serial number listed on the product label located on the base of the system.

Service Information

This section provides information pertaining to the maintenance and servicing of the device. Familiarize yourself with this information before requesting service from GE Healthcare or its authorized representatives.

Service Requirements

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 safety hazards.

Regular maintenance, irrespective of usage, is essential to ensure that the components of this system are always functional when required.

Additional Assistance

GE Healthcare maintains a trained staff of application and technical experts to answer questions and respond to issues and problems that may arise during the installation, maintenance, and use of this product.

Contact your local GE Healthcare representative to request additional assistance.

Manual Information

This section provides information for the correct use of this manual.

Keep this manual with the equipment at all times and periodically review it. You should request training assistance from GE Healthcare, if needed.

Intended Audience

This manual is intended for the person who uses, maintains, or troubleshoots this equipment.

Manual Purpose

This manual supplies technical information for service representatives and technical personnel so they can maintain the equipment to the assembly level. Use it as a guide for maintenance and electrical repairs considered field repairable. Where necessary, the manual identifies additional sources of relevant information and/or technical assistance.

See the *MAC™ 800 Resting ECG Analysis System Operator's Manual* for the instructions necessary to operate the equipment safely in accordance with its function and intended use.

Document Conventions

This manual uses the following conventions.

Typographical Conventions

Convention	Description
Bold Text	Indicates keys on the keyboard, text to enter, or hardware items such as buttons or switches on the equipment.
Italicized-Bold Text	Indicates software terms that identify menu items, buttons or options in various windows.
CTRL+ESC	Indicates a keyboard operation. A plus (+) sign between the names of two keys indicates that while holding the first key, you should press and release the second key. For example, Press **CTRL+ESC** means to press and hold the **CTRL** key and then press and release the **ESC** key.
<space>	Indicates that you must press the spacebar. When instructions are given for typing a precise text string with one or more spaces, the point where you must press the spacebar is indicated as: **<space>**. This ensures that the correct number of spaces are inserted in the correct positions within the literal text string. The purpose of the < > brackets is to distinguish the command from the literal text within the string.

Convention	Description
Enter	Indicates that you must press the **Enter** or **Return** key on the keyboard. Do not type ***Enter***.
>	The greater than symbol, or right angle bracket, is a concise method to indicate a sequence of menu selections. For example, the statement "From the main menu, select ***System*** > ***Setup*** > ***Options*** to open the ***Option Activation*** window" replaces the following: 1. From the main menu, select ***System*** to open the ***System*** menu. 2. From the ***System*** menu, select ***Setup*** to open the ***Setup*** menu. 3. From the ***Setup*** menu, select ***Options*** to open the ***Option Activation*** window.

Illustrations

All illustrations in the manual are provided as examples only. Depending on system configuration, screens that appear in the manual may differ from the screens as they appear on your system.

All patient names and data are fictitious. Any similarity to actual persons is coincidental.

Notes

Notes provide application tips or additional information that, while useful, are not essential to the correct operation of the product. They are called out from the body text through a flag word and indentation, as follows:

NOTE:
The tip or additional information appears indented below the **NOTE** flag word.

Related Documents

You can find additional information in the following documents:

Documents Related to the MAC 800 Resting ECG Analysis System Service Manual

Part Number	Document Title
2060026-001	*MAC™ 800 Resting ECG Analysis System Operator's Manual*
2102946-001	*Supplies and Accessories Guide, Diagnostic Cardiology*

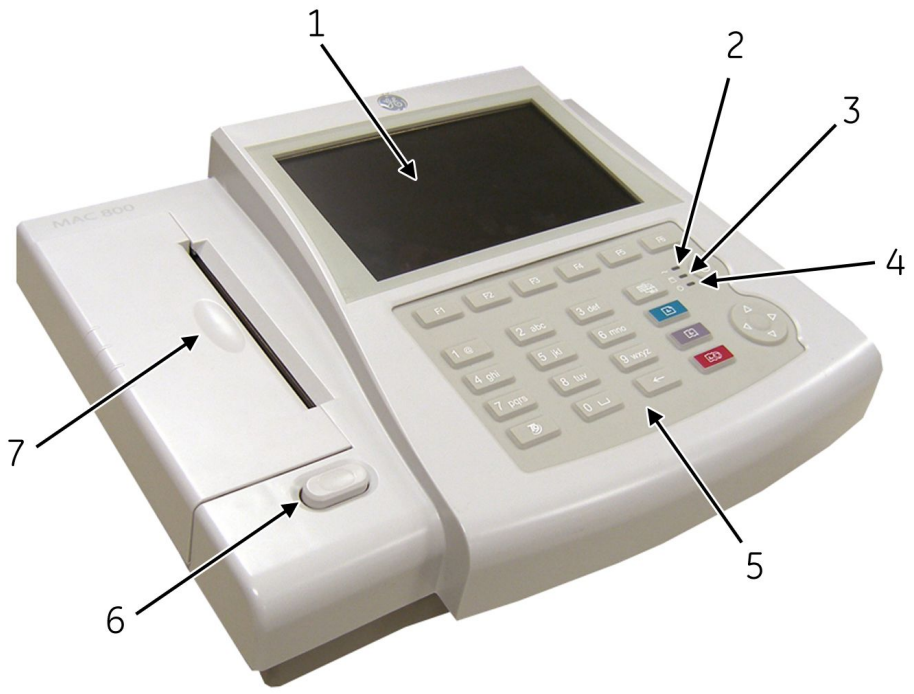
2

Equipment Overview

The device is a 3- and 6-lead print, 12-channel display system with a 7 inch (17.78 cm) diagonal display, active patient cable, battery operation, and options for communication capabilities.

Equipment Description

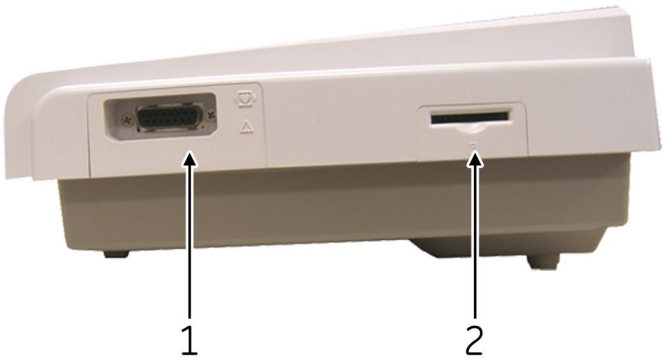
Front View



Item	Name	Description
1	Screen	Displays waveform and text data.
2	AC LED	Indicates when the unit is connected to AC power.

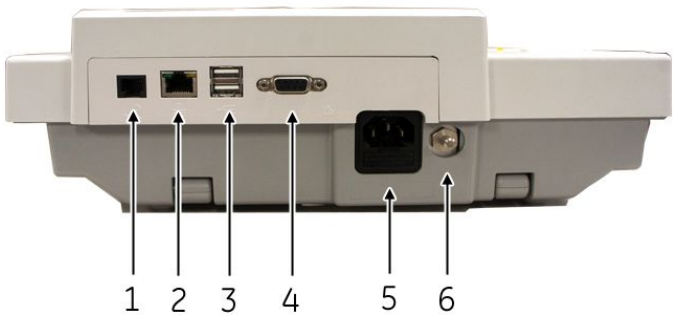
Item	Name	Description
3	Battery LED	Indicates current battery status. • Solid indicates the battery is charging. • Flashing indicates the battery is low. • Off indicates the battery is fully-charged or is discharging but not at a low state.
4	Power LED	Indicates when the unit is powered on.
5	Keypad	Controls the system or enters data. See "Keypad Layout" on page 26 for more information.
6	Writer Door Button	Opens printer door.
7	Writer	Prints reports.

Side View



Item	Name	Description
1	ECG signal input connector	D-sub 15–pin female connector for the acquisition cable.
2	SD card slot	Secure Digital card slot. Insert card as indicated by the icon. The system supports only SD cards formatted for the FAT16 or FAT32 file systems.

Rear View

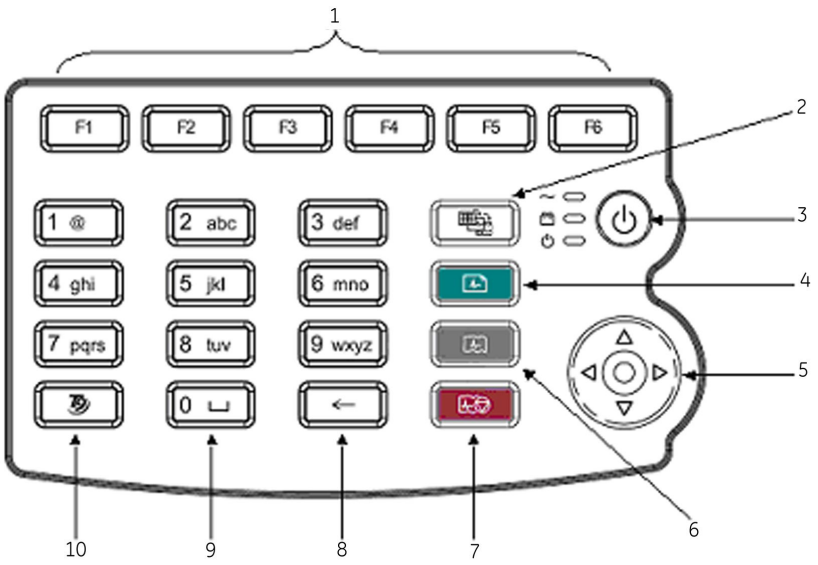


Item	Name	Description
1	Modem Port	RJ11 connector from the optional internal modem to an analog phone line.
2	LAN connection	RJ45 network connector. The LEDs indicate LAN status. • The steady green LED to the right of this port indicates a good ethernet connection. • The flashing amber LED to the left of this port indicates network traffic.
3	USB connector	Universal Serial Bus connector for USB devices, such as an optional barcode reader, a magnetic card reader, an external USB keyboard, a laser printer, or a USB WiFi device.
4	COMM Port	Serial connector for data communication with CASE/CardioSoft or the MUSE system with a serial cable.
5	AC power connector	Standard connector for the AC power cable.
6	Equipotential grounding lug	Used to connect non-grounded peripheral devices to ensure equipotential.

Bottom View

Item	Name	Description
1	Battery	Rechargeable lithium-ion battery.
2	Carrying handle	Handle for carrying the device.

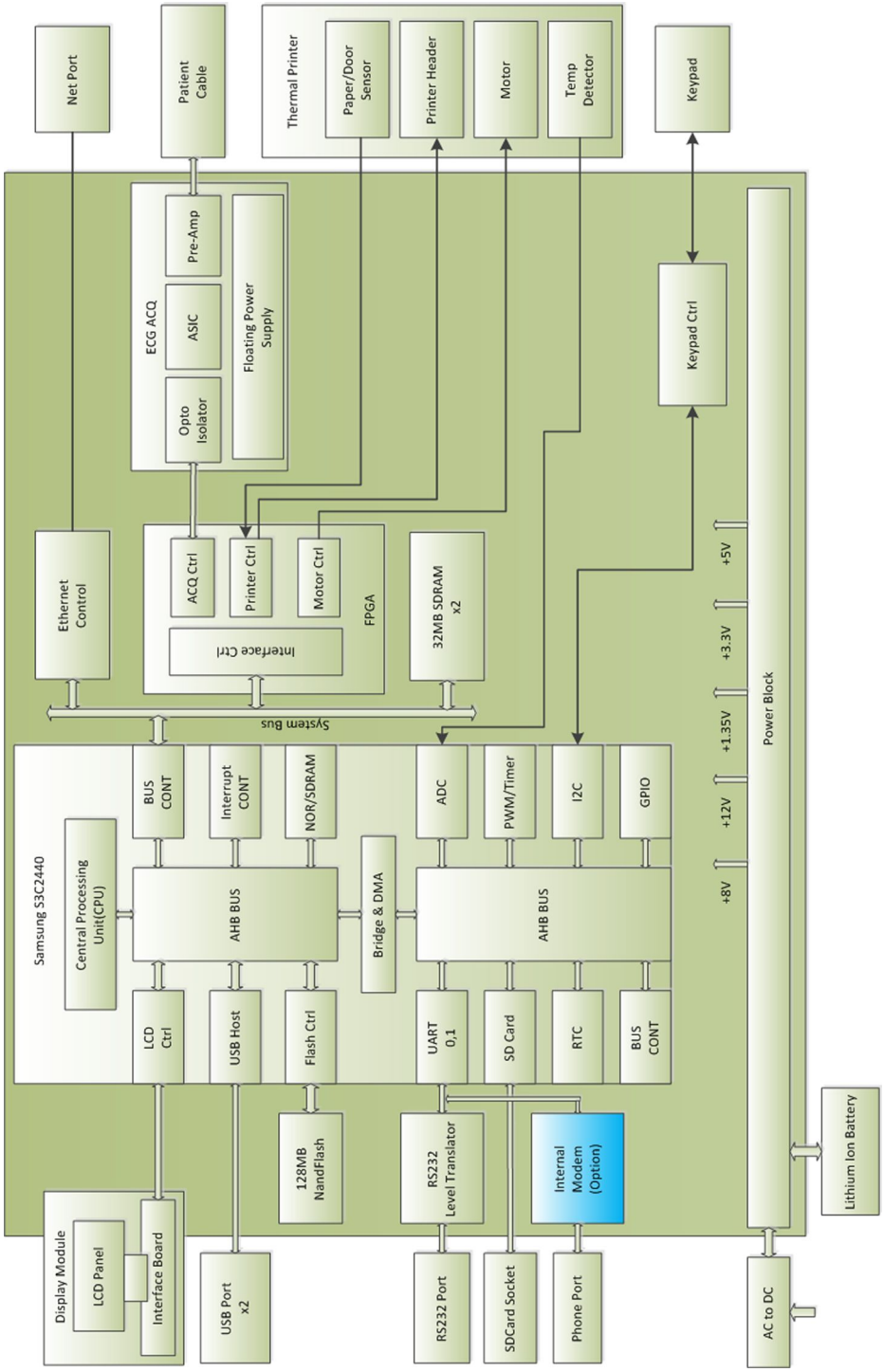
Keypad Layout



Item	Name	Description
1	Function Keys (**F1** through **F6**)	Selects menu options on the screen.
2	**Leads** key	Changes the leads when the screen is displaying waveforms.
3	Power Button	Turns the system on and off.
4	**ECG** key	Acquires a resting ECG and prints a 10-second report in ***Arrhythmia*** mode.
5	Trimpad	The arrows move the cursor left, right, up, or down to highlight a menu or screen item. Pressing the center button selects the highlighted item.
6	**Rhythm** key	Prints a continuous, real-time rhythm strip. Press **Stop** to stop the rhythm strip from printing. (The Rhythm report is not stored and cannot be transmitted.)
7	**Stop** key	Stops the writer from printing.
8	**Backspace** Key	Deletes characters.
9	**Space** Key	Adds a space between typed characters.
10	**T9** Key	Switches between different input methods. For more information on using the T9 key, refer to the *MAC™800 Resting ECG Analysis System Operator's Manual*.

System Architecture

Hardware Block Diagram



Hardware/Firmware Architecture

The hardware and firmware subsystems include the following:

Hardware Subsystems

- CPU core
- Display
- Keyboard
- ECG Acquisition subsystem
- Thermal printer
- Power supply
- Housing

Firmware Subsystems

- CE OS (Board-Support-Package)
- FPGA (Firmware for the Printer)

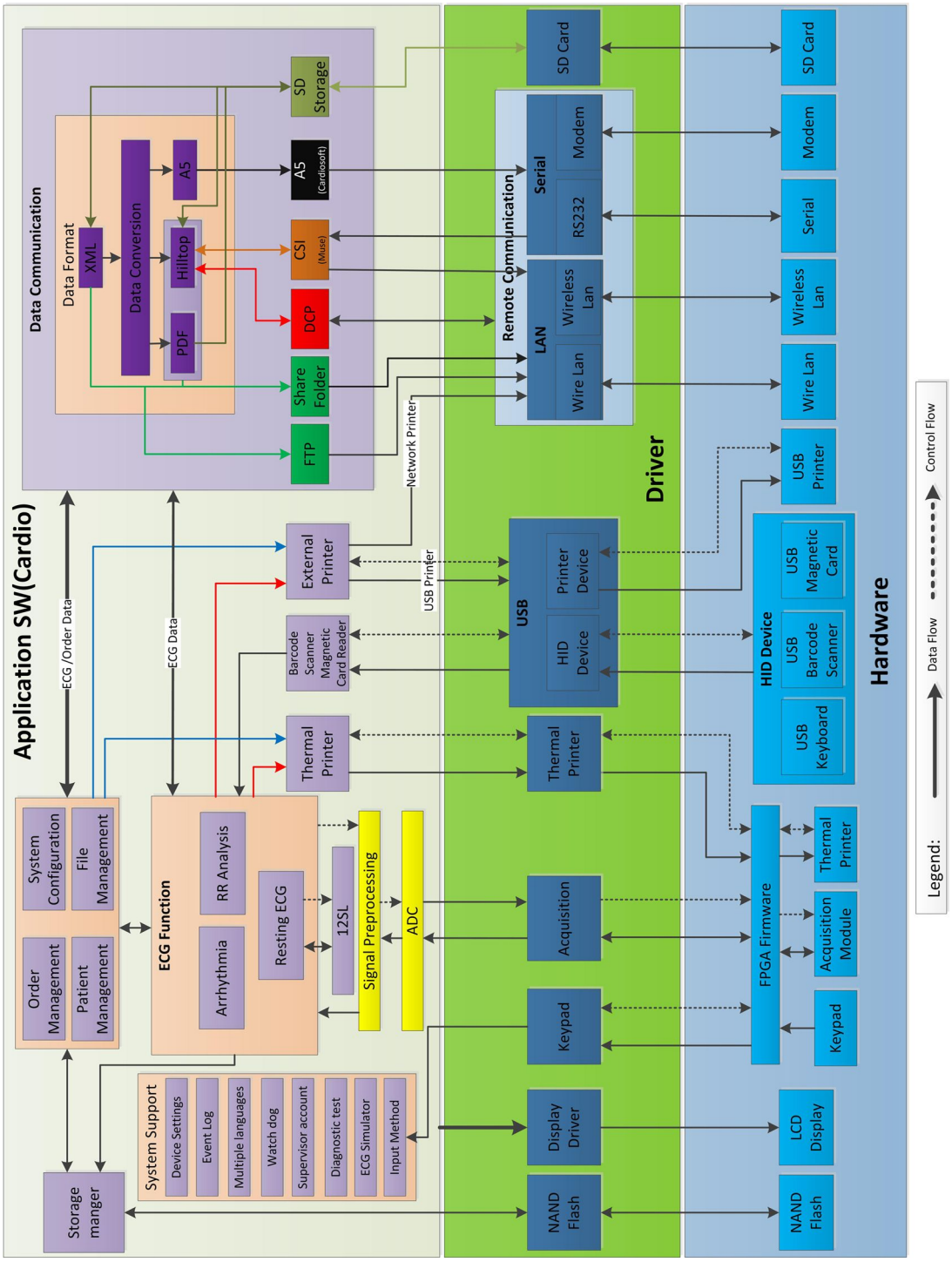
Product Interfaces

The system offers the following interfaces for connecting to external devices for data communication, software updates, and the control of workload devices:

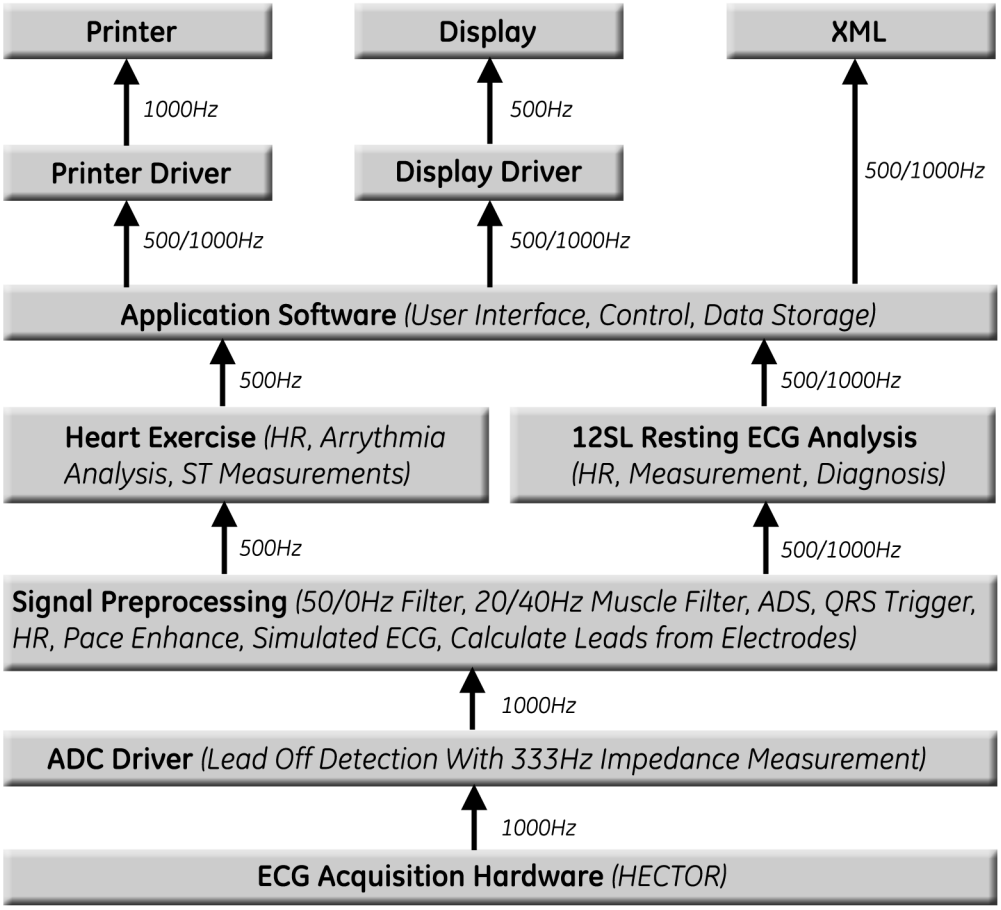
Interface Device	Description
RS232 port (1)	Connects to external systems, such as the MUSE system or the CardioSoft system.
RJ-45 port (1)	Connects to networks via 100baseT ethernet connector via an external medical isolator.
USB connector (2)	Connects to USB-capable devices, such as an optional barcode reader or an external USB keyboard.
Secure Digital (SD) Card slot	Interfaces with a Secure Digital card, which stores ECGs, to flash the device with software updates, and to connect memory/future I/O extensions.
RJ-11 port (1)	Connects an internal medical grade Analog Modem (optional) to a phone line.

Software Architecture

Layered Structure of Application Software



ECG Data Flow with Sampling Rates



3

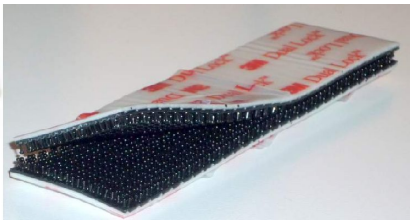
Installing the USB Powered Silex Wireless Bridge

This chapter only describes the hardware installation. For detailed guidance on configuration and setup, refer to *MobileLink Wireless Communication Installation Manual For GEH-BR-4600 Wireless Bridge (2053535-080).*

The new Silex wireless bridge kit (PN 2098761-001 for global version, PN 2095170-001 for US) comes with Silex wireless module, ethernet cable, USB power cable and dual locks (2 pcs).

Installing the Silex Wireless Bridge

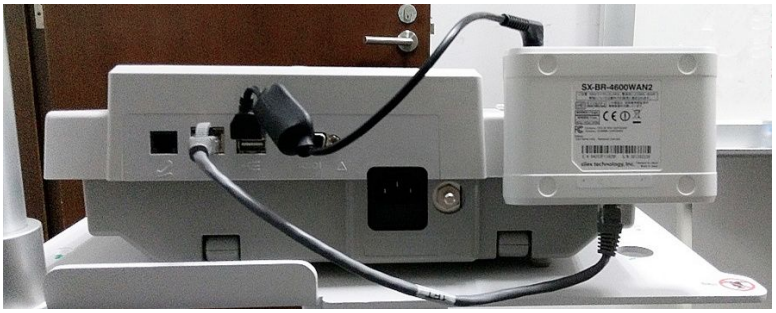
1. Select the **Dual Locks** from the **Silex Wireless Bridge Kit** and engage the hook and loop surface of the **Dual Locks** against each other to form a pair.



2. Remove the adhesive liner from one side of the dual lock and adhere each pair to the flat surface of Silex wireless bridge module.

3. Remove the adhesive liner and carefully position the Silex Module on the MAC 800 unit by placing it to the rear of the printer side. The LAN port and power switch should be visible from the rear of the MAC 800 device.

4. Route and connect the Ethernet and USB power cables from the Silex wireless module to the MAC 800 unit.



5. Continue with the appropriate functional checkout procedure for this FRU.

   See "Functional Checkout" on page 87 for more information.

6. Verify the installation by performing the following steps:

   a. Turn on the MAC 800 device.

   b. Press ***File Manager***.

   c. Select the ECG you would like to transmit.

      NOTE:
      If no ECGs are available on the device, download one from an SD card or take a flat line ECG with no patient ID number on it an store it on the SD Card.

   d. Verify that the ECG transmits successfully and can be found in the ***MUSE Edit*** list.

      For more information on how to transmit an ECG from the cart, refer to the MAC 800 ECG Analysis System Operator's Manual (2060026–001).

4

Troubleshooting

General Fault Isolation

Refer to the *MAC™ 800 Operator's Manual*, Chapter 2, "Equipment Overview: Getting Started" to verify operation of the device.

Power-Up Self-Test

On power-up, the system automatically runs an internal self-test. If all tests pass, you see the following start-up screen.

The next screen to open depends on the ***Power Up*** mode selected in ***System Configuration***. The ***Resting ECG*** mode is the default ***Power Up*** mode.

If the equipment is not working properly, consider the following:

- Is the device turned on?
- Have there been any changes in the use, location, or environment of the equipment that could cause the failure?
- Has the equipment hardware or software been modified since the last use?
- Is operator error the cause of the problem?
  Try to repeat the scenario exactly and compare that to the proper operation of the equipment described in the manual.
- Is the battery installed?
- When connected to the AC wall outlet, does the green AC power light glow?

Poor Quality ECGs

Several factors can cause poor ECGs including:

- Factors in the environment.
- Inadequate patient preparation.
- Hardware failures related to the acquisition module.
- Leadwires, cables, or problems in the device.

Visual Inspection

A thorough visual inspection of the equipment can save time. Small things, such as disconnected cables, foreign debris on circuit boards, missing hardware, or loose components, can frequently cause symptoms and equipment failures that may seem to be unrelated and difficult to track.

NOTE:
Take the time to make all the recommended visual checks before starting any detailed troubleshooting procedures.

Visual Inspection Checklist

Area	Look for the following problems
I/O connectors and cables AC power cord	• Fraying or other damage • Bent prongs or pins • Cracked housing • Loose screws in plugs
Interface cables	• Excessive tension or wear • Loose connection • Strain reliefs out of place
Circuit boards	• Moisture, dust, or debris (top and bottom) • Loose or missing components • Burn damage or smell of over-heated components • Socketed components not firmly seated • PCB not seated properly in edge connectors • Solder problems: cracks, splashes on board, incomplete feedthrough, prior modifications or repairs
Ground wires/wiring	• Loose wires or ground strap connections • Faulty wiring • Wires pinched or in vulnerable position
Fasteners	Loose or missing screws or other hardware, especially fasteners used as connections to ground planes on PCBs

Visual Inspection Checklist (cont'd.)

Area	Look for the following problems
Power source	• Faulty wiring, especially AC outlet • Circuit not dedicated to system **NOTE:** Power source problems can cause static discharge, resetting problems, and noise.
Keyboard	• Cuts or cracks in keyboard membrane • Illegible labels
LCD display filter	Scratches, cracks, or an opaque display filter (transparent part of the keyboard bezel) that impair viewing
Battery pack	• Cracked, swollen, or leaky battery pack enclosure • Debris on battery pack electrical contacts
SD card	• Cracked SD card • Broken gold contacts • Dirt, scratches, or debris on contacts

Event Logging

Setting Up Event Logging

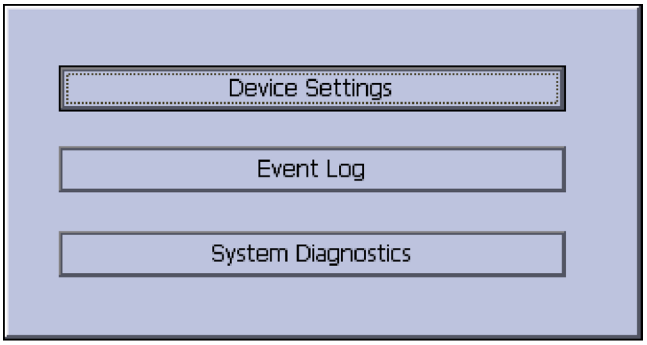
You can set up the system to create an ***Event Log*** in XML format. To configure the system for the level of severity of messages written to the ***Event Log***, use the following steps:

1. Power on the system by pressing the **Power** button.
2. On the Main Menu, press **F4** to select ***System Configuration***.
3. Press ***More*** > ***More*** > ***Service Setup***.

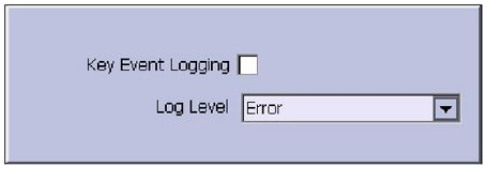
   A window opens prompting you to enter the ***Service password***.

   Contact GE Healthcare support if you do not know the service password.

4. Type the service password and press **F6** to select *OK* to open the ***Service Setup*** menu.



5. Use the **trimpad** to highlight ***Event Log*** and press the center button.



6. Enable or disable event logging.
   - To enable event logging, select the ***Key Event Logging*** check box.
     or
   - To disable event logging, deselect the ***Key Event Logging*** check box.
7. Select a level of severity to log from the ***Log Level*** list:
   - Select ***None*** to log nothing to the ***Event Log***.
   - Select ***Error*** to log only errors to the ***Event Log***.
   - Select ***Warning*** to log errors and warnings to the ***Event Log***.
   - Select ***Information*** to log errors, warnings, and information to the ***Event Log***.
8. Press ***Save*** to save your settings.

Exporting the Event Log

1. Repeat steps 1 through 5 in "Setting Up Event Logging".
2. Insert the SD card into the SD card slot in right side as shown.

The gold contacts are face-down.

3. Press ***Export Log Files***.

   The current ***Event Log*** file, `log_0.log`, is copied to a ***log*** directory on the SD card.

   NOTE:
   To access the log file, insert the SD card into an SD card reader that is connected to a computer with a Windows operating system and a text editor such as ***Notepad*** or ***WordPad***. If GE Healthcare technical service requests the ***Event Log*** for troubleshooting an issue, send the file as an email attachment.

Performing Diagnostic Tests

Accessing the System Diagnostics Function

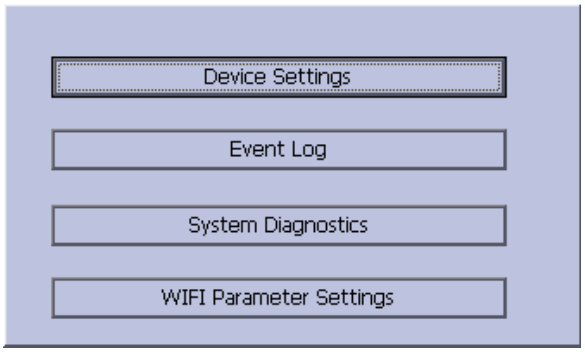
Use the ***System Diagnostics*** menu to perform functional diagnostic tests. Use the following procedure to access the ***System Diagnostics*** menu.

1. Power on the system by pressing the **Power** button.
2. On the Main Menu, press **F4** to select ***System Configuration***.
3. Press ***More*** > ***More*** > ***Service Setup***.

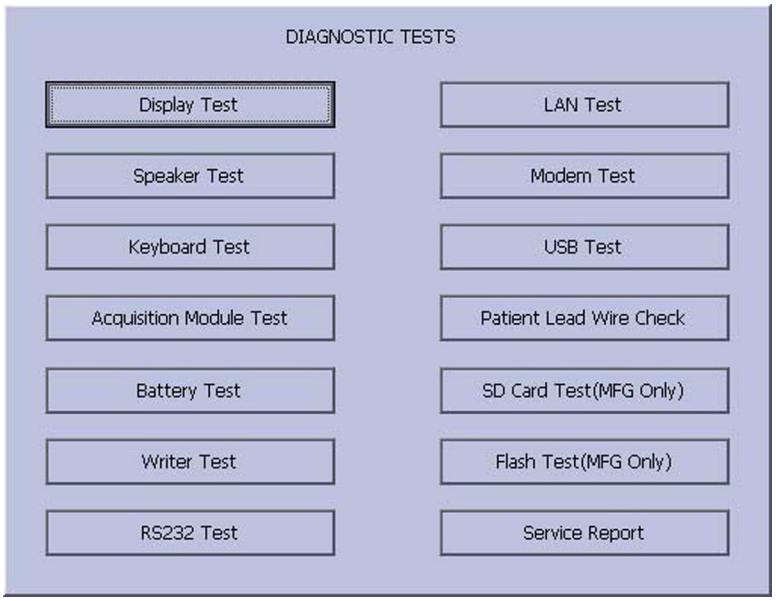
   A window opens prompting you to enter the ***Service password***.

   Contact GE Healthcare support if you do not know the service password.

4. Type the service password and press ***F6*** to select ***OK*** to open the ***Service Setup*** menu.



5. Use the **trimpad** to highlight ***System Diagnostics*** and press the center button to open the ***Diagnostic Tests*** window.



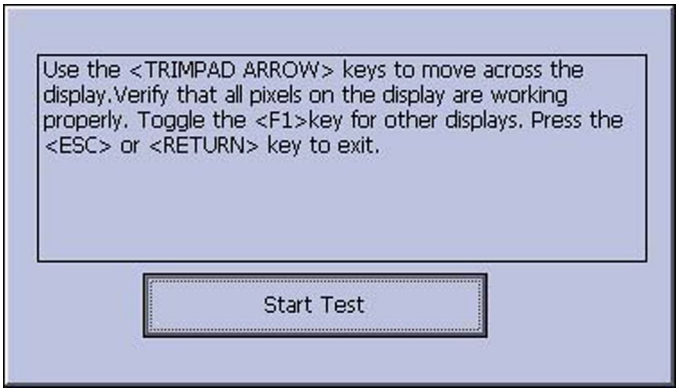
The following sections describe how to perform the specific diagnostic tests. Proceed to the appropriate section for the test you need to perform.

Display Test

Use the ***Display Test*** to determine if the display pixels are working properly.

1. Open the ***Diagnostic Tests*** window as described in "Accessing the System Diagnostics Function" on page 39.
2. Select ***Display Test***.

   The ***Start Test*** window opens.



3. Select ***Start Test***.

   The following window opens.

4. Press the **right arrow** on the **Trimpad** repeatedly to move the color bars horizontally across the screen.
5. Verify that the color band pattern (red, green, blue, white) scrolls across the screen.

   Pass the test if the pattern is replicated without discoloration.
6. Press **F1** to switch to horizontal color bars.
7. Press the **down arrow** on the **Trimpad** repeatedly.
8. Verify that the color band pattern (red, green, blue, white) scrolls down the screen.

   Pass the test if the pattern is replicated without discoloration.
9. Press **F1** to cycle through the solid color pane (red, green, blue, white).

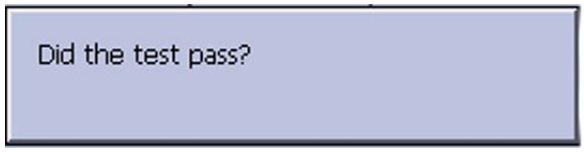
   For each pane, check for black pixels.

Pass the test if no more than 4 black pixels are observed on any single color pane.

NOTE:
A black pixel observed on one pane will probably be observed on every pane.

10. Press the center button of the trimpad when the test is complete.

    The following window opens.



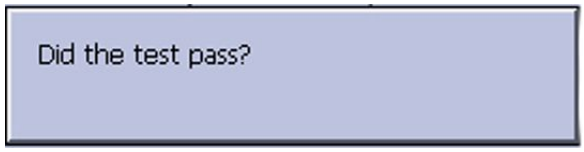
11. Select pass or fail:
    - If the test passed, press ***Yes***.
    - If the test failed, press ***No***.
      If the display test failed, replace the display assembly as described in "Replacing the LCD Assembly" on page 72.

Speaker Test

Use the ***Speaker Test*** to determine if the speaker is working properly.

1. Open the ***Diagnostic Tests*** window as described in "Accessing the System Diagnostics Function" on page 39.
2. Select ***Speaker Test***.
3. Listen for a brief audible tone coming from the speaker.

   The following window opens.



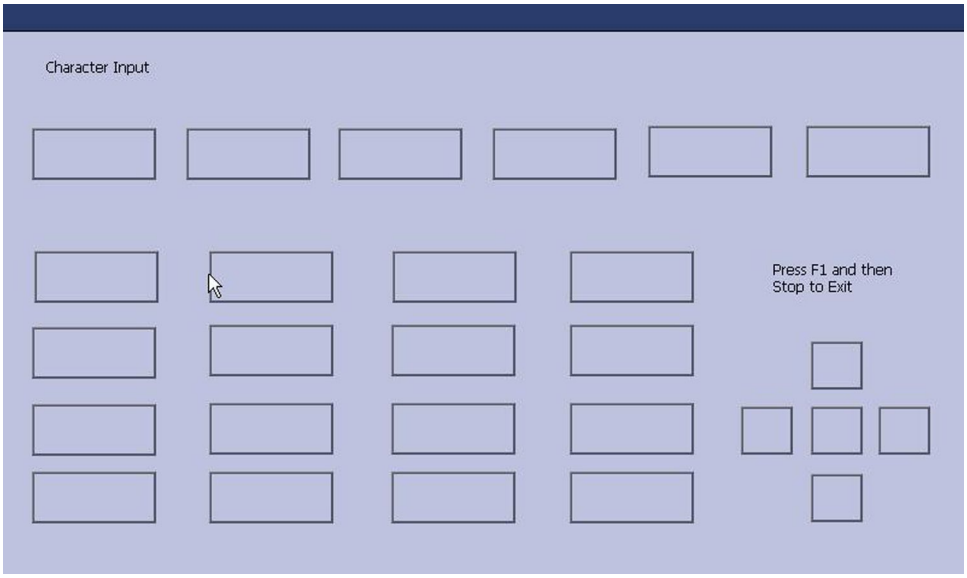
4. Select pass or fail:
   - If you heard an audible tone, press ***Yes***.
   - If you did not hear an audible tone, press ***No***.
     If the speaker test failed, replace the mainboard assembly as described in"Replacing the Mainboard Assembly" on page 76.

Keyboard Test

Use the ***Keyboard Test*** to determine if the keyboard is working properly.

1. Open the ***Diagnostic Tests*** window as described in "Accessing the System Diagnostics Function" on page 39.
2. Select ***Keyboard Test***.

   The following window opens.

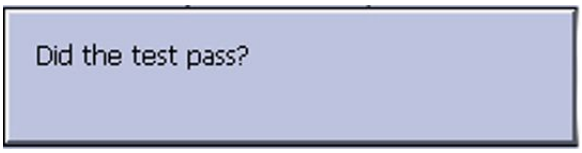


3. Press each key on the keyboard and verify the value appears in the corresponding representation of that key on the screen.

   A key passes the test if its value appears on the screen when the corresponding key is pressed.
4. To test for *sticky keys*, continue to press keys and verify that the screen representation of the key is refreshing with each subsequent key press.

   A key passes if the key on the screen refreshes with each repeated key press.
5. When the test is complete, press ***F1 > Stop***.

   The following window opens.



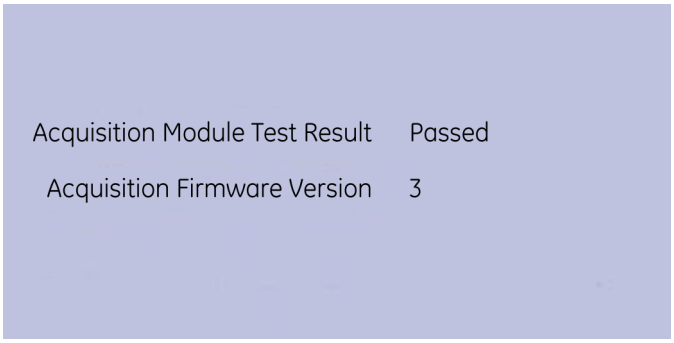
6. Select pass or fail:
   - If every key passes the tests, press ***Yes***.
   - If any key fails the tests, press ***No***.
     If the keyboard test failed, replace the keyboard assembly as described in "Replacing the Keypad Assembly" on page 72.

Acquisition Module Test

Use the ***Acquisition Module Test*** to determine if the acquisition board is working properly.

1. Open the ***Diagnostic Tests*** window as described in "Accessing the System Diagnostics Function" on page 39.
2. Select ***Acquisition Module Test***.

   A window similar to the one shown in the following illustration opens.



3. Note the test result and press ***Cancel***.

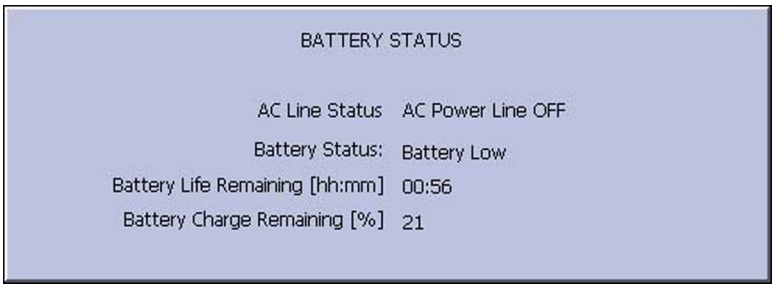
If the result of the ***Acquisition Module Test Result*** is ***Failed***, replace the mainboard assembly as described in "Replacing the Mainboard Assembly" on page 76.

Battery Test

Use the ***Battery Test*** to determine the status of the Lithium-Ion battery. You must perform this test while running on battery power.

1. Open the ***Diagnostic Tests*** window as described in "Accessing the System Diagnostics Function" on page 39.
2. Select ***Battery Test***.

   A window similar to the one shown in the following illustration opens.



3. Note the battery status information and press ***Cancel*** to close the ***BATTERY STATUS*** window.

If the ***Battery Status*** was ***Failed***, replace the battery as described in "Replacing the Battery Assembly" on page 67.

Writer Test

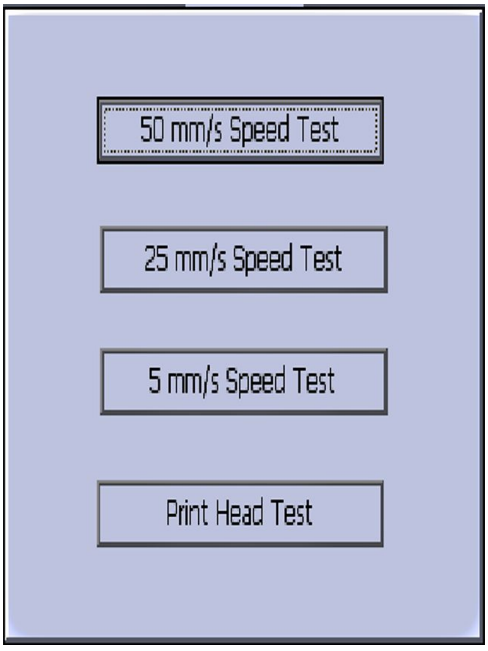
Use the ***Writer Test*** to determine if the writer is working properly.

NOTE:
Before performing the ***Writer Test***, be sure that thermal paper is properly loaded in the writer tray.

Refer to your system's Operator Manual for instructions on loading paper.

1. Open the ***Diagnostic Tests*** window as described in "Accessing the System Diagnostics Function" on page 39.
2. Select ***Writer Test***.

   The following window opens.

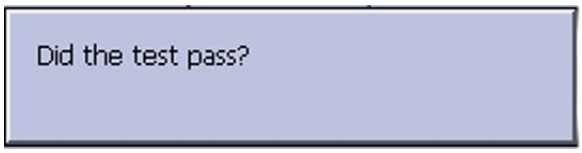


3. Perform the ***50mm/s Speed Test***.
   a. Select ***50mm/s Speed Test***.

      The writer prints the 50 mm/s speed test report.

   b. When one page of the report has printed, press **Stop**.

      The following window opens.



c. Examine the printed report.

Use the following criteria to determine if the writer passed or failed the 50mm/s speed test.

- If one cycle of the square wave spans 50 mm on paper, measured from corner to corner of the wave, with an allowable tolerance of 1.0 mm, the test passes.
- If this criteria is not met, the test fails.

d. If the test passed, press ***Yes***.

If the test failed, press ***No***.

4. Repeat the previous step for the other speed tests. The pass-fail criteria for each of the remaining tests are as follows:

- ***25mm/s Speed Test***
  If one cycle of the square wave spans 25 mm on paper, measured from corner to corner of the wave, with an allowable tolerance of 0.5 mm (2%), the test passes.
  If this criteria is not met, the test fails.
- ***5mm/s Speed Test***
  If one cycle of the square wave spans 5 mm on paper, measured from corner to corner of wave, with allowable tolerance of 0.25 mm, the test passes. If this criteria is not met, the test fails.

5. Perform the ***Print Head Test***.

a. Select ***Print Head Test***.

The writer prints a 1–page print head test report.

b. Verify that there are no gaps in any of the lines printed.

- If there are no gaps in the lines on the printed report, press ***Yes***.
- If there are gaps in the lines on the printed report, press ***No***.

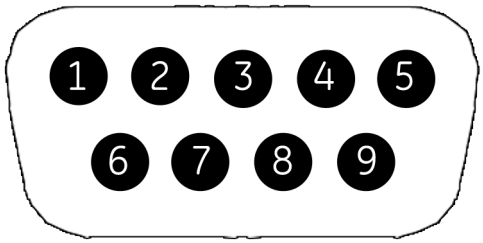
Replace the printer as described in "Replacing the Printer Assembly" on page 73.

6. When all writer tests are completed, press ***Cancel*** to close the window.

RS232 Test

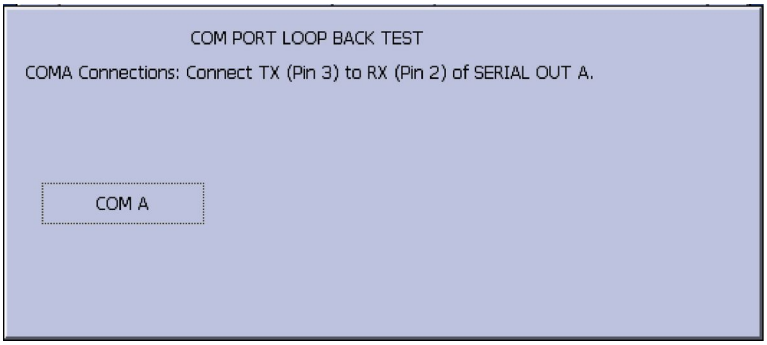
Use the ***RS232 Test*** to determine if the COM ports are working properly.

1. Open the ***Diagnostic Tests*** window as described in "Accessing the System Diagnostics Function" on page 39.
2. Use a paper clip to short pins 2 and 3 in the COM port.



3. Select ***RS232 Test***.

   The following window opens:



4. Perform the ***COM Port Loop Back Test*** on COM A.
   a. Select ***COM A***.

      The results of the ***COM Port Loop Back Test*** are displayed.

   b. Note the results of the ***COM Port Loop Back Test***.

      If the test failed, replace the mainboard assembly as described in "Replacing the Mainboard Assembly" on page 76.
5. When the test is done, press **Esc** or ***Cancel*** to close the results window.

LAN Test

Use the ***LAN Test*** to test connectivity between networks or IP addresses.

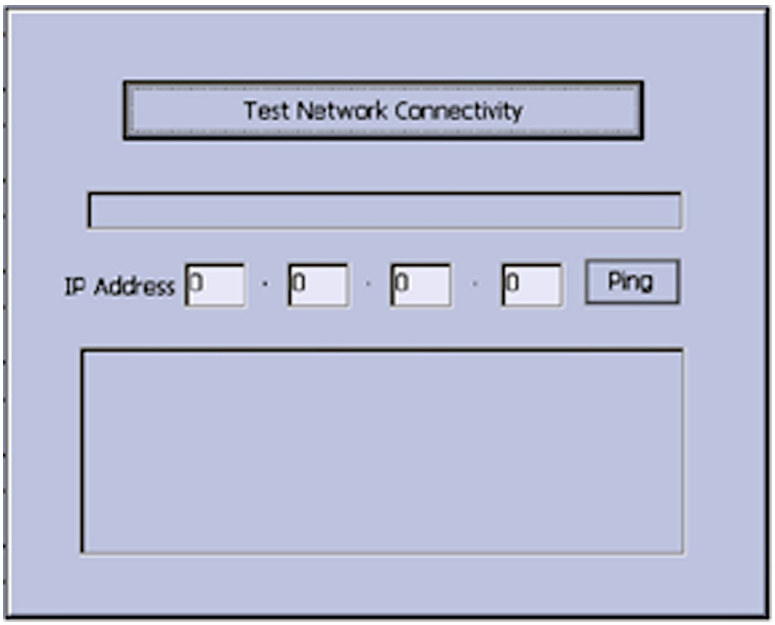
Network Connectivity

1. Connect the device to an active LAN.

   Ensure that the LAN is an active network. If you connect to an inactive network tap, the test result may be a false negative.
2. Open the ***Diagnostic Tests*** window as described in "Accessing the System Diagnostics Function" on page 39.

3. Select ***LAN Test***.

   The following window opens:



4. Select ***Test network connectivity***.

   The following message is displayed: ***Checking connectivity. Please wait.***

   Then the test results are displayed.

   - If the following message is displayed in the window, the test passes: ***System Connected to Network***.
   - If the following message is displayed in the window, and you are sure the system is connected to an active network, the test fails: ***Network Unavailable***.

   Replace the mainboard assembly as described in "Replacing the Mainboard Assembly" on page 76.

5. When the test is done, press **Esc** or ***Cancel*** to close the results window.

IP Address Connectivity

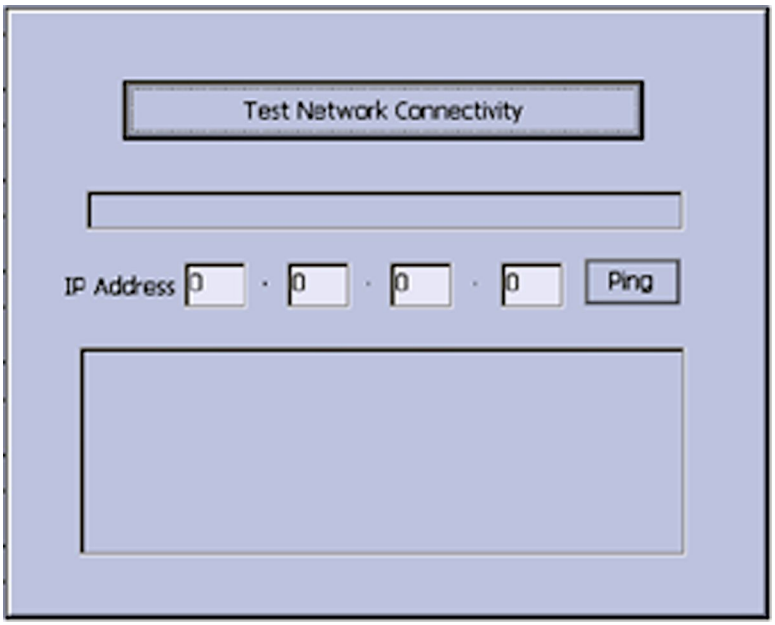
1. Connect the device to an active LAN.

   Ensure that the LAN is an active network. If you connect to an inactive network tap, the test result may be a false negative.

2. Open the ***Diagnostic Tests*** window as described in "Accessing the System Diagnostics Function" on page 39.

3. Select ***LAN Test***.

   The following window opens:



4. Use the **trimpad** to move the cursor to the ***IP Address*** field.
5. Type the ***IP Address*** and press the center button on the **trimpad** to enter.
6. Select ***Ping*** and press the center button on the **trimpad** to start test.
   - If the IP address connected successfully, the IP address connection status is displayed in the window
   - If the IP address ping is unsuccessful, the following message is displayed in the window: ***PING failed***.

Modem Test

The ***Modem Test*** can be used to test the internal modem.

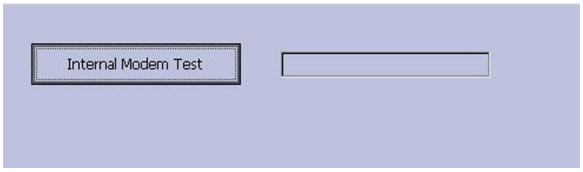
1. Connect the device to an active analog phone line.

   Ensure that the phone line is active. If you connect to an inactive phone line, the test result may be a false negative.

2. Open the ***Diagnostic Tests*** window as described in "Accessing the System Diagnostics Function" on page 39.

3. Select the ***Modem Test*** button.

   The following window opens:



4. Select the ***Internal Modem Test*** button.

   The following message is displayed in the window: ***Test in Progress. Please wait.***

   Then the results of the test are displayed.

   - The test passes if the following message is displayed in the window: ***Passed***.
   - The test fails if the following message is displayed in the window: ***Failed***. If the ***Internal Modem Test*** fails, replace the internal modem as described in "Replacing the Internal Modem (option)" on page 80.

USB Test

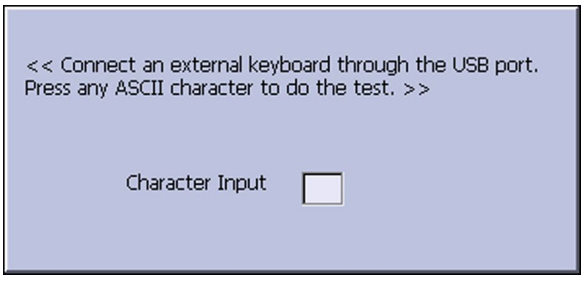
Use the ***USB Test*** to test the USB port.

1. Open the ***Diagnostic Tests*** window as described in "Accessing the System Diagnostics Function" on page 39.
2. Connect a USB keyboard to the USB port on the rear panel of the device.

   NOTE:
   The USB keyboard used for this test must match the language that is selected in setup.

3. Select ***USB Test***.

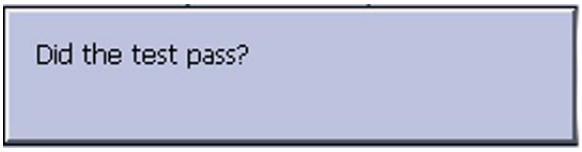
   The following window opens:



4. Press any key on the USB keyboard and verify pass or fail:
   - If the character that appears in the ***Character Input*** field matches the key you pressed, the test passed.
   - If the character does not match the key you pressed, or no character appears in the ***Character Input*** field, the test failed.

5. When the test is done, press **Esc** or ***Cancel***.

   The following window opens:



6. Do one of the following:
   - If the test passed, press ***Yes***
   - If the test failed, press ***No***.

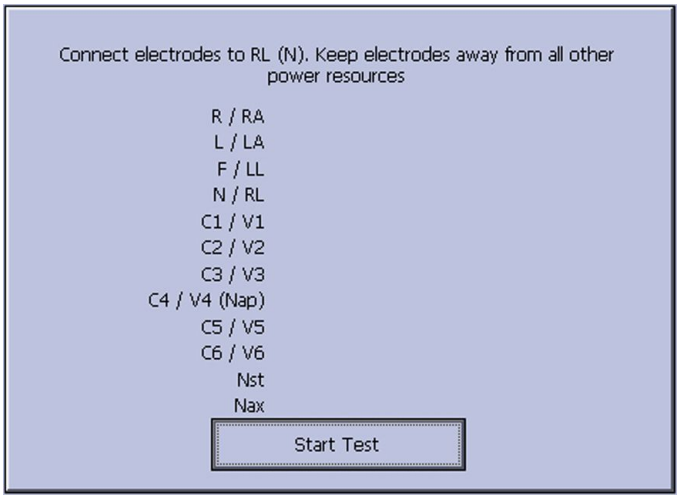
   Replace the mainboard assembly as described in "Replacing the Mainboard Assembly" on page 76.

Patient Lead Wire Test

Use the following procedure to test the patient leadwires:

1. Open the ***Diagnostic Tests*** window as described in "Accessing the System Diagnostics Function" on page 39.
2. Connect a patient cable with leadwires to the device's patient cable connector.
3. Connect all leads to a patient simulator or shorting bar.
4. Select ***Patient Lead Wire Check***.

   The following window opens:



5. Select ***Start Test***.

   The test results are displayed for each leadwire.
   - If the following message is displayed, the leadwire passed the test: ***Connected***.
   - If the following message is displayed, the leadwire failed the test: ***Disconnected***.

6. Press **F6** (***Cancel***) when the test is complete.

7. Replace every leadwire that failed the test.
8. Repeat the test.

   If the lead wire still fails the test, replace the mainboard assembly as described in "Replacing the Mainboard Assembly" on page 76.

Equipment Problems

ECG Data Noise

If the acquired ECG data displays unacceptable noise levels:

- Be sure the problem is not caused by poor skin preparation, placement, or condition of the electrodes when troubleshooting noise or signal quality.
  Careful skin preparation is the key to an interference-free ECG. Refer to the *Patient Preparation* chapter of the *Operator's Manual*.
  Signal quality is indicated using ***Hookup Advisor***.
  Hookup Advisor can be turned on or off in the ECG menu. Select ***Main Menu*** > ***System Configuration*** > ***Resting ECG Setup*** > ***Page Down***.
- Check for defective or date-expired electrodes.
- Check for defective, broken, or disconnected leadwires.
- Run the ***Acquisition Module Tests*** in the ***Diagnostic*** menu and make sure all lead wires pass the noise test.
  Refer to the "Acquisition Module Test" on page 44.

System Date/Time Troubleshooting

The Date and/or Time is wrong in system.

The recommended method is as follows:

1. Correct the settings in ***Date/Time Setup***.
2. Remove the power cord and battery; then power OFF the device.
3. Plug in power cord and re-install battery, power ON the device and check the Date and Time.

If the Date and Time is not corrected and/or the device is five or more years-old; replace the Real-Time Clock (RTC) Battery. See "Replacing the Real-time Clock (RTC) Battery" on page 68.

Error Codes

No action is necessary for isolated error occurrences. However, if the system is malfunctioning and any of the following error messages are repeating and unrecoverable, replace the FRUs in the order listed.

Acquisition Error Codes

If you repeatedly receive any of the following acquisition error codes, replace the mainboard assembly as described in "Replacing the Mainboard Assembly" on page 76.

Acquisition Error Codes	
Error Code	**Cause**
Acquisition Error -1	General acquisition error
Acquisition Error 3	Sequence number error in 100ms ECG Packet
Acquisition Error 9	Acquisition self test error

Printer Error Codes

If you repeatedly receive any of the following printer error codes, replace the printer assembly as described in "Replacing the Printer Assembly" on page 73.

Printer Error Codes	
Error Codes	**Cause**
Printer Internal Error 2	Printhead temperature is too hot or too cold to print
Printer Internal Error 3	Printer driver could not be opened
Printer Internal Error 4	Printer driver communication error
Printer Internal Error 5	Printer driver timeout error
Printer Internal Error 6	Printer driver miscellaneous error
Printer Internal Error 7	Undefined printer status was received

Frequently Asked Questions

Maintenance

NOTE:
Refer to the *System Configuration* information in the *Operator's Manual* for this system.

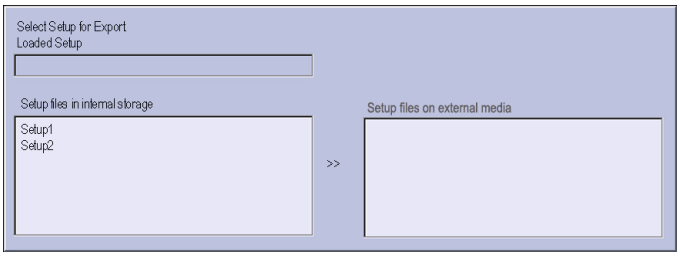
Save System Setups to SD Card

Q: How do I save changes I have made to the ***System Configuration***?

A: Perform the following steps:

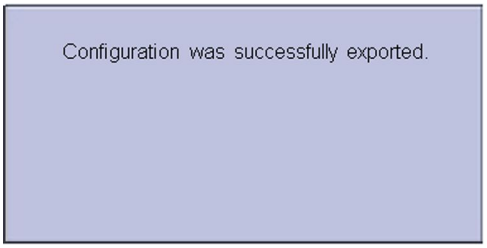
1. Insert the SD card into the SD card slot in right side as shown.

2. Push the SD card into the slot to seat it in place.
3. On the ***Main Menu***, press **F4** to select ***System Configuration***.
4. Press ***More*** > ***More*** > ***Export Setup***.



5. On the list on left side of the window, highlight the setup file you want to save to the SD card.
6. Press ***Export***.

   The following window opens.



7. Press ***OK***.
8. Eject the SD card by pushing it in once.

   Store it in a secure location.

Storing ECGs

Q: Why won't any of the ECGs I perform save to the SD card?

A: Verify the following:

- The SD card is fully inserted into the drive.
- The SD card is 128 MB or greater.

- The SD card is not write-protected.
- Try a new SD card.
- Your system is set up to automatically save records.
- If your system is not set up to automatically save records, you pressed ***Store***.

Cleaning

Q: Should I clean the device?

A: Clean the exterior surfaces of all the equipment and peripheral devices monthly, or more frequently if needed.

- Use a clean, soft cloth and a mild dishwashing detergent diluted in water.
- Wring the excess water from the cloth.
  Do not drip water, or any liquid, on the writer assembly, and avoid contact with open vents, plugs, and connectors.
- Dry the surfaces with a clean cloth or paper towel.

Refer to the *Supplies and Accessories Guide, Diagnostic Cardiology* for details on cleaning the device.

MAC Address

Q: I need to provide the address of the device to the network administrator to enable the LAN communication option. How do I obtain the address?

A: Follow these steps to obtain the address of the device:

1. Open the ***DIAGNOSTIC TESTS*** window as described in "Accessing the System Diagnostics Function" on page 39.
2. Select ***Service Report*** and press the center button on the **trimpad**.
3. Find the address on the printed service report.

Calibration

Q: How do I calibrate the device?

A: When it becomes necessary, you can calibrate the device using the following procedure:

1. Using a standardizing waveform generator, produce a 1.00 ± 0.01 -mV pulse signal with a rise-time no greater than 5 ms and a width no greater than 100 ms.
2. Connect the pulse signal to all available channels and set the gain to 10 mm/mV.
3. Verify that the display pulses have an amplitude within ± 5% of the amplitude obtained when the 1.00 ± 0.01 -mV signal is applied.
4. Repeat the test for all fixed gain settings to verify that the standardization pulse correctly reflects the gain setting.

   NOTE:
   The error must be less than ±5% of the expected value or 0.5 mm, whichever is greater.

5. Verify that the standardization signal appears on all channels.

System Setup

Location Number

Q: When entering in the patient data, how do I get the ***Location*** field to automatically populate with the same number?

A: You can set the ***Location*** number in ***Basic Setup*** so you do not need to enter it for each test.

1. On the ***Main Menu***, press **F4** to select ***System Configuration***.
2. Press ***Basic Setup***.
3. Use the **Trimpad** to move the cursor to the ***Location*** field.
4. Type the desired ***Location*** number.
5. Press ***Save*** > ***Main Menu***.

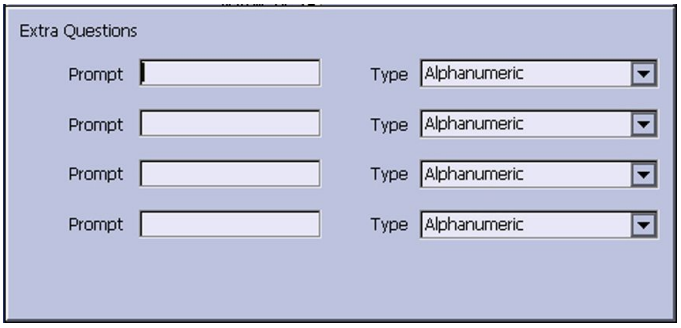
Patient Questions

Q: How do I change the questions I see when I am entering the patient data?

A: The patient questions you see on the ***Patient Data*** window when starting a test were set up in ***Patient Setup***.

1. On the ***Main Menu***, press **F4** to select ***System Configuration***.
2. Press **F6** (***More***) > **F4** (***Patient Setup***) > **F4** to select ***Page Down***.
3. Use the **Trimpad** to move the cursor to ***Extra Questions...*** and press the center button.

   The following window opens.



4. For each extra question you wish to ask in the ***Patient Data*** window:
   a. Type the ***Prompt***.
   b. Select the type of question from the ***Type*** list:
      - ***Alphanumeric***
      - ***Numeric***
      - ***Yes/No/Unknown***
5. In the ***Extra Questions...*** window, press ***Save***.
6. In the ***Test Information Setup*** window, press ***Save***.
7. Return to the ***Main Menu***.

Passwords

Q: The system was setup for ***High Security Mode*** and I forgot my password. How do I access the system?

A: Use the following steps to access the system:

1. Contact GE Healthcare Technical Support and provide the serial number of the device you want to access.

   GE Healthcare Technical Support will generate a temporary, device-specific name and password that you can use for 24 hours.
2. Log into the system with the password provided by GE Healthcare Tech Support.
3. Immediately after logging into the system, verify your device's user name and password.
4. Record this information and store it in a secure location for future reference.

Clinical

Resting ECG Report Format

Q: How do I change the way an ECG looks (format) when it prints out?

A: Follow these steps to change the ECG format:

1. On the ***Main Menu***, press **F4** to select ***System Configuration***.
2. Press ***Resting ECG***.
3. Press **F4** (***Page Down***) three times.
4. On the ***10s ECTG Report Format*** list, select which type of ECG report you want to change.
5. On the ***Report Copies*** list, select the number of copies you want.
6. If you want the 12SL Interpretation included on the ECG, select the ***Print Interpretation*** check box.
7. If you do not want the 12SL Interpretation to print on the ECG, clear the ***Print Interpretation*** check box.
8. Press **F6** to save the setup.

Editing

Q: Can you edit the interpretation on the device, and then transmit the edited record to the MUSE system as an unconfirmed record?

A: This device does not support edit interpretation.

Navigating the User Interface

Q: How do I navigate from the startup screen to the ***Main Menu***?

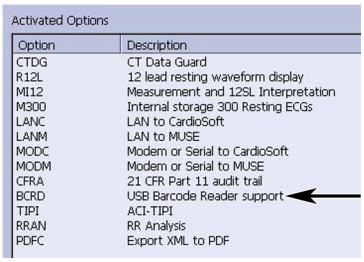
A: The system can be configured in a number of different ways. Some of these configuration choices determine the actions that need to be performed in order to proceed from the power up display to the ***Main Menu***.

There are three configurations that determine the initial window that appears at power up and what actions the user will need to perform to navigate to the ***Main Menu***.

Power Up mode currently selected in ***Basic Setup***:

High Security mode enabled in ***Basic Setup***:

USB Barcode Reader support option activated - yes or no.



The various steps in this section describe how to navigate from the ***power up*** screen to the ***Main Menu*** for the various system configurations. Use the steps that apply to your system configuration settings.

- If your system is configured to power up in the ***Resting ECG*** mode, go to "Resting ECG Power Up Mode" on page 58.
- If your system is configured to power up in the Arrhythmia mode, go to "Arrhythmia Mode Power Up Mode" on page 59.
- If your system is configured to power up in the ***Main Screen*** mode, go to "Main Screen Power Up Mode" on page 59.

Resting ECG Power Up Mode

These steps describe how to navigate to the ***Main Menu*** after powering on the system when ***Resting ECG*** is selected for ***Power up mode*** in ***Basic Setup***.

NOTE:
If you need to perform system setup functions, be sure you log in as a user who is assigned setup editing privileges.

1. If the ***High Security Mode*** is enabled, proceed with steps a through d after the window opens prompting for a ***User ID*** and ***Password***.

   If the password prompt is not displayed, go to step 2.

   a. Type your user ID in the ***User ID*** field.

   b. Press the **down arrow** on the **Trimpad** to move the cursor to the ***Password*** field.

c. Type your password in the ***Password*** field.

d. Press ***Login***.

2. Press ***Cancel*** > ***More*** > ***Main Menu***.

Arrhythmia Mode Power Up Mode

These steps describe how to navigate to the ***Main Menu*** after powering on the system when ***Arrhythmia*** is selected for ***Power up mode*** in ***Basic Setup***.

NOTE:
If you need to perform system setup functions, be sure you log in as a user who is assigned setup editing privileges.

1. If the ***High Security Mode*** is enabled, proceed with steps a through d after the window opens prompting for a ***User ID*** and ***Password***.

   If the password prompt is not displayed, go to step 2.

   a. Type your user ID in the ***User ID*** field.

   b. Press the **down arrow** on the **Trimpad** to move to the ***Password*** field.

   c. Type your password in the ***Password*** field.

   d. Press ***Login***.

   If the barcode reader option is enabled, a window opens prompting you to ***Scan the Patient barcode***.

   NOTE:
   If the barcode prompt is not displayed, go to step 3.

2. Press ***Cancel***.

3. Press ***Cancel*** > ***More*** > ***Main Menu***.

Main Screen Power Up Mode

These steps describe how to navigate to the ***Main Menu*** after powering on the system when ***Main Screen*** is selected for ***Power up mode*** in ***Basic Setup***.

NOTE:
If you need to perform system setup functions, be sure you log in as a user who is assigned setup editing privileges.

1. If ***High Security Mode*** is enabled, proceed with steps a through d after the window opens prompting for a ***User ID*** and ***Password***.

   If the password prompt is not displayed, go to step 2.

   a. Type your user ID in the ***User ID*** field.

   b. Press **Enter** or the **down arrow** on the **Trimpad** to move the cursor to the ***Password*** field.

   c. Type your password in the ***Password*** field.

   d. Press ***Login***.

   The ***Main Menu*** is displayed.

2. If the system is configured for ***Main Screen Power up mode*** and does not have the ***High Security Mode*** enabled, the ***Main Menu*** is displayed after powering up the system. You do not need to press any other keys in order to display the ***Main Menu***.

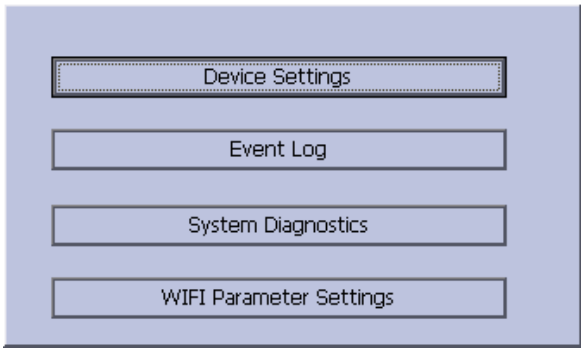
Setting the WIFI Parameter

Using the following procedures to setup the WIFI parameter.

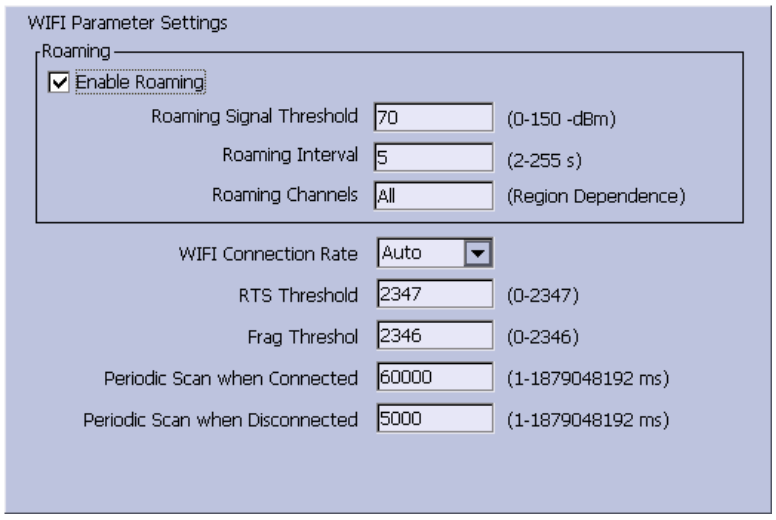
1. On the Main Menu, press ***F4*** to select ***System Configuratio***n.
2. Press ***More*** > ***More*** > ***Service Setup***.

   A window opens prompting you to enter the ***Service password***.

   Contact GE Healthcare support if you do not know the service password.
3. Type the service password and press ***F6*** to select ***OK*** to open the ***Service Setup*** menu.



4. Use the trimpad to highlight ***WIFI Parameter Settings*** and press the center button to open the ***WIFI Parameter Settings*** window.



5. The following tables describe each setting available on ***WIFI Parameter Settings***.

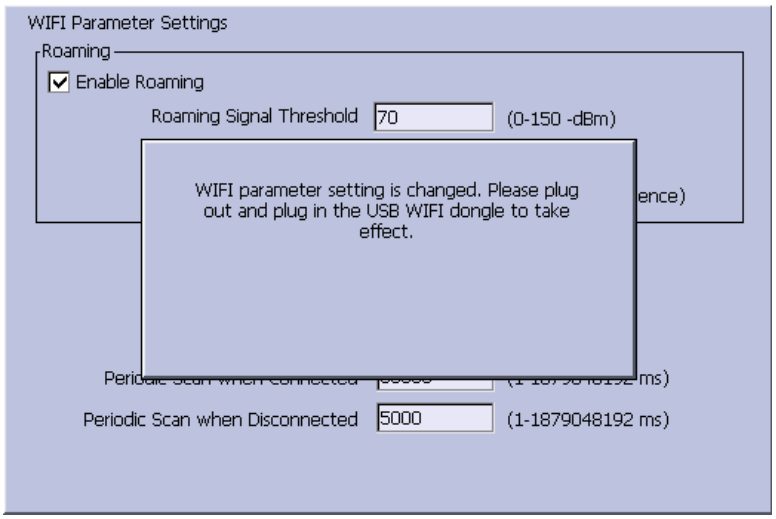
Field	Description
Enable Roaming	This field allows the roaming function of the system to be enabled or disabled.
Roaming Signal Threshold	Identifies the roaming signal threshold to enable roaming. This field is available only if the ***Enable Roaming*** field is checked. The default value is 70 (-dbm). Values range from 0 - 150 -dbm.

Field	Description
Roaming Interval	Identifies the roaming interval to scan and connect to wireless access point. This field is available only if the ***Enable Roaming*** field is checked. The default value is 5 (s). Values range from 2 - 255 s.
Roaming Channels	Identifies the roaming channels the system scan for, for example, This field is available only if the ***Enable Roaming*** field is checked. The default value is ***All*** which means the system scans all the roaming channels. The value is changed depending on the region. The range of 1 to 13 is used in the countries support ETSI; the range of 1 to 11 is used in the countries support FCC. **NOTE:** This field should be configured according to the label on the WiFi Dongle.
WIFI Connection Rate	Determines the WIFI connection rate of the system. Options are: • ***Auto*** • ***1 Mbps*** • ***2 Mbps*** • ***5 Mbps*** • ***6 Mbps*** • ***9 Mbps*** • ***11 Mbps*** • ***12 Mbps*** • ***18 Mbps*** • ***24 Mbps*** • ***36Mbps*** • ***48 Mbps*** • ***54 Mbps*** **NOTE:** If the connection rate is **≤ *11 Mbps***, the USB dongle works at 802.11b mode.
RTS Threshold	Determines the threshold for WIFI dongle to send the RTS request. If the packet size is smaller than the threshold, the WIFI dongle will not send the RTS request. Values range from 0 - 2347. Select 0 to allow the WIFI dongle to send the RTS request to wireless access point for every package, and select 2347 to stop the WIFI dongle to send the RTS request to wireless access point. The default value is ***2347***.

Field	Description
Fragment Threshold	Determines the maximum size for per data packet before being fragmented into multiple packets. The default value is ***2346***. Values range from 0 - 2346.
Periodic Scan when Connected	Determines time-out value in milliseconds to retry a valid configuration. The default value is ***60000*** ms.
Periodic Scan when Disconnected	Determines time-out value in milliseconds to recover from a failed configuration. The default value is ***5000*** ms.

6. To reset the values in the ***WIFI Parameter Settings*** window to default values, press ***Reset To Default***.
7. To save all the settings in the ***WIFI Parameter Settings*** window, press ***Save***.

   The following message displays.



   Press ***OK*** and then re-plug in WIFI USB dongle to bring the settings into effect.
8. To discard current changed settings and close the ***WIFI Parameter Settings*** window, press ***Cancel***.

5

Maintenance

Regular maintenance, irrespective of usage, is essential to ensure that the equipment will always be functional when required. See the *Supplies and Accessories Guide, Diagnostic Cardiology* for cleaning procedures. GE recommends that electrical safety checks be performed annually.

WARNING:

MAINTENANCE RESPONSIBILITIES — Failure on the part of all responsible individuals, hospitals or institutions employing the use of this device to implement the recommended maintenance schedule may cause equipment failure and possible health hazards. 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 for performing the recommended maintenance schedule rests with the individuals, hospitals, or institutions utilizing the device.

Required Tools and Supplies

The following tools are required to perform the procedures described in this chapter:

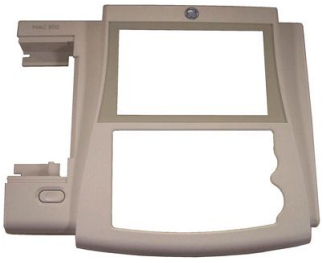
- ECG simulator
- Phillips #1 screwdriver
- Hexagonal screw drivers
- Current leakage tester
- Anti-static wrist strap
- *MAC™ 800 Resting ECG Analysis System Service Manual*
- *MAC™ 800 Resting ECG Analysis System Operator's Manual*

NOTE:

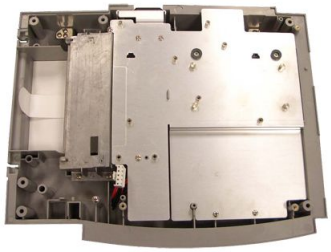
Always use an anti-static wrist strap while opening the device to avoid possible damage due to static electricity.

High-Level FRU Identification

Top Cover Assembly



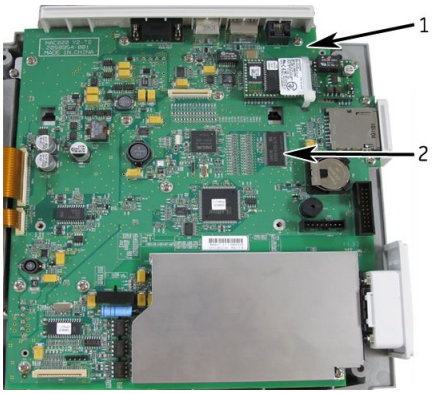
Bottom Assembly



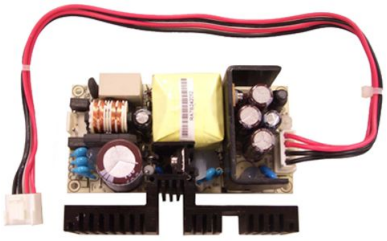
Battery

LCD Assembly

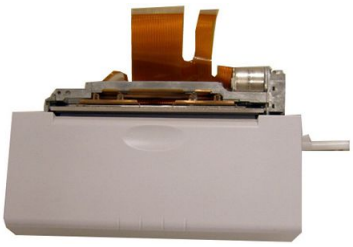
Internal Modem (1, option) and Mainboard (2)



Power Supply Assembly



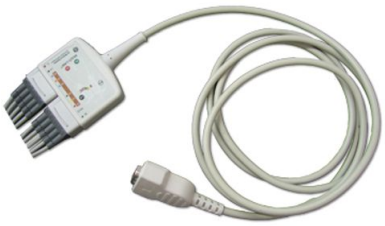
Writer Assembly



Keypad Assembly

Barcode Reader (option)

Patient Cable



Real-time Clock Battery

FRU Replacement Procedures

Preparing System for FRU Replacement

Prior to performing any disassembly procedures, perform the following steps:

NOTE:
Take strict precautions against electrostatic discharge damage while replacing field replaceable units.

1. Power off the system.
2. Disconnect the device from the AC wall outlet.
3. Disconnect the power cord from the rear panel connector.
4. Disconnect the patient cable from the device as described in “Replacing the Patient Cable” on page 66.
5. Remove the battery as described in “Replacing the Battery Assembly” on page 67.

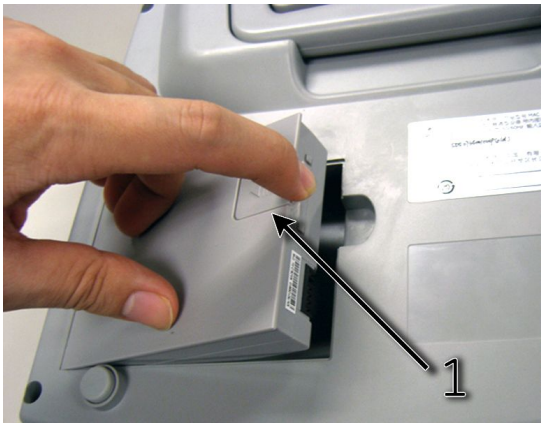
Replacing the Patient Cable

1. Disconnect the device from AC power.
2. Disconnect the patient cable from the side panel connector as shown in the following photograph.

3. Connect a new patient cable to side panel connector.
4. Continue with the following functional checkout procedures for this FRU.

Replacing the Battery Assembly

1. Disconnect the device from AC power.
2. Turn the device over.
3. Press the battery release tab (1) and raise the battery from its compartment to remove it.



WARNING:

ENVIRONMENTAL HAZARD Improper disposal of the battery can cause environmental and health hazards.

Do NOT dispose of the battery by burning.

Follow local environmental guidelines concerning disposal and recycling.

4. Insert the new battery and press the latch until it snaps into place.

NOTE:

A fully-charged battery is capable of printing approximately 1000 single-page reports or 2 hours of continuous operation (without printing).

5. Continue with the following functional checkout procedures.

Replacing the Real-time Clock (RTC) Battery

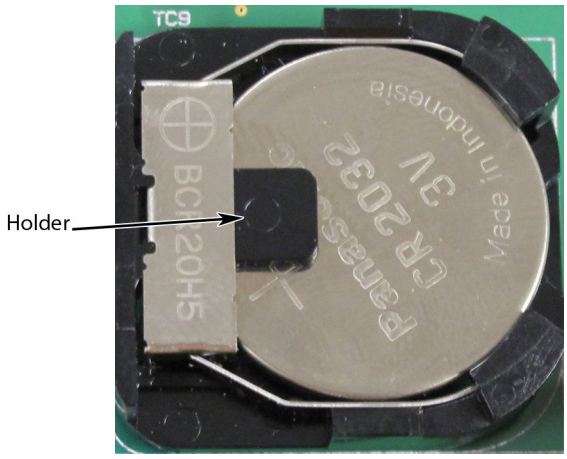
The RTC4574 has an internal 32.768KHz crystal unit. Serial communication between the CPU and the RTC4574, through the I/O port of the CPU, exchanges time and date information between the CPU and RTC. The RTC will not drift by more than 320 seconds per year. When the device is turned on with AC power, the RTC is powered by +3.3 V supply. When the device is turned off, the RTC battery powers the RTC to keep track of the time and date. The battery is a 3V Lithium Ion coin battery with 1000 mAH capacity, which can sufficiently supply the clock for a minimum of 5 years (worst case calculation). In the normal case, the functioning period is assumed to be more than 10 years.

NOTE:

Always use an anti-static wrist strap while opening the device to avoid possible damage due to static electricity.

1. Remove the Mainboard Assembly as instructed in "Removing the Mainboard Assembly" on page 77.
2. With the display connector at the top and facing upwards, locate the RTC battery BT on the right side of the Mainboard.

3. Pull up the battery from the battery holder to remove the battery.



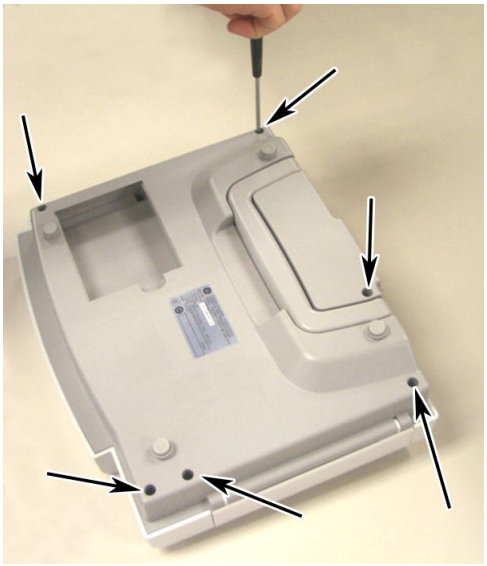
4. Insert the new battery into the battery holder on the mainboard.
5. Reassemble the Mainboard assembly as instructed in "Reassembling the Mainboard Assembly" on page 78.
6. Adjust the time and date.
7. Perform the functional checkout and visual inspection procedures.

   Refer to "Functional Checkout" on page 87.

   To check the RTC battery function, see "Real-time Clock Check" on page 94.

Replacing the Top Cover Assembly

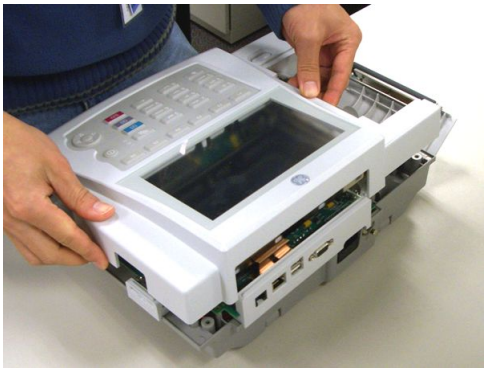
1. Disconnect the system from AC power.
2. Remove the battery assembly as described in "Replacing the Battery Assembly" on page 67.
3. Remove the six screws from the bottom of the device.



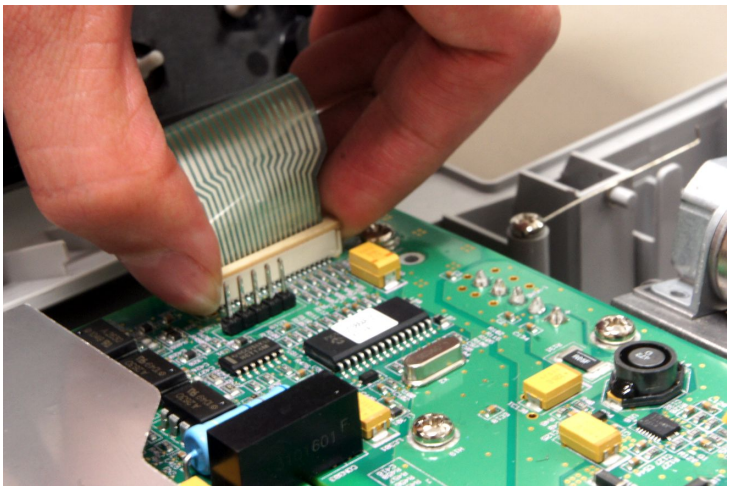
4. Turn the device right side up.

5. Press the printer button.

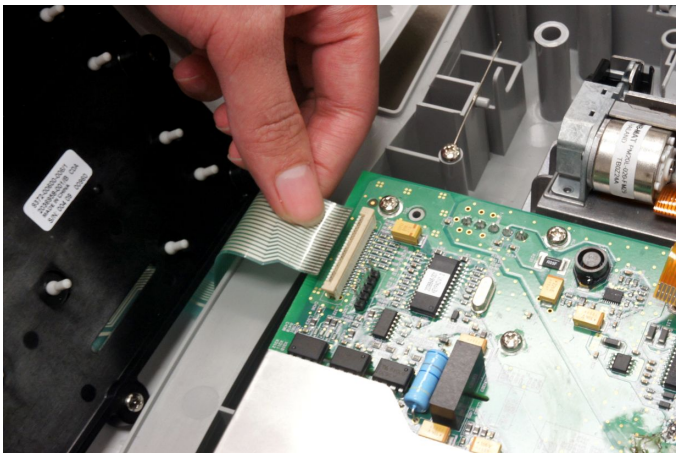
6. Open the printer door.
7. Lift the top assembly approximately 1 inch at the rear panel side.



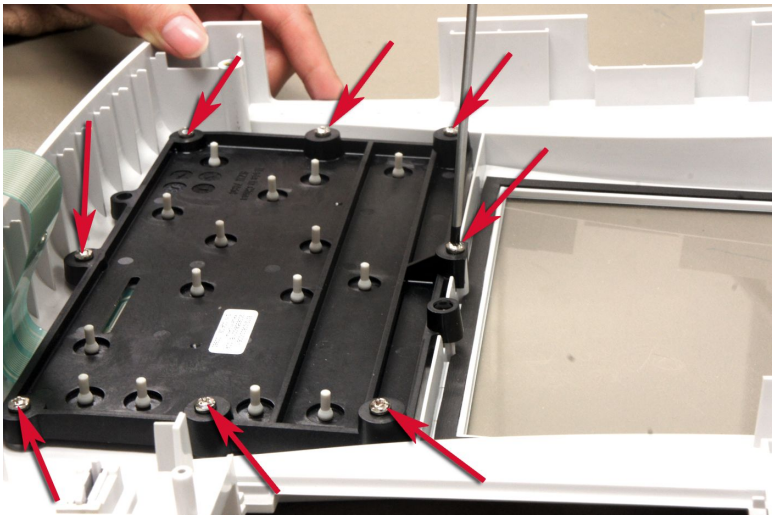
8. Pull up the lock-release tab on mainboard keypad connector.



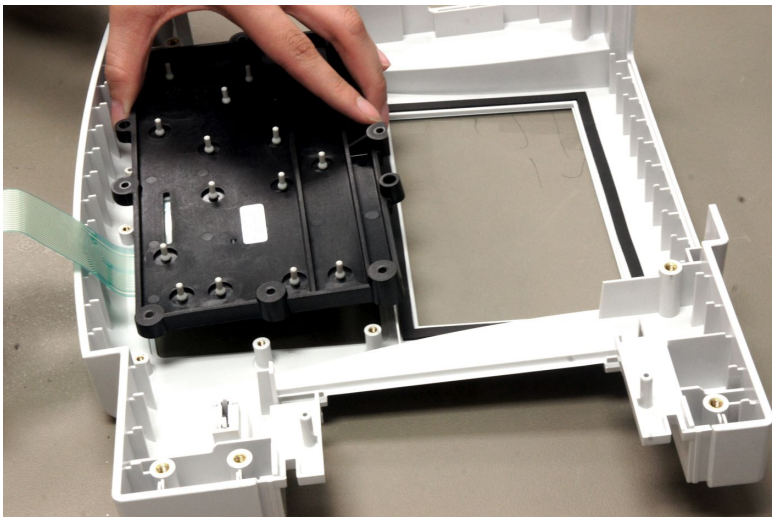
9. Disconnect the keypad cable as shown in the following illustration.



10. Remove the eight screws from the bottom of the top cover assembly.



11. Separate the keypad from the top cover assembly.



12. Reassemble a new top cover assembly by reversing the steps for removal.
13. Perform the applicable checkout procedures.

    Refer to "Functional Checkout" on page 87.

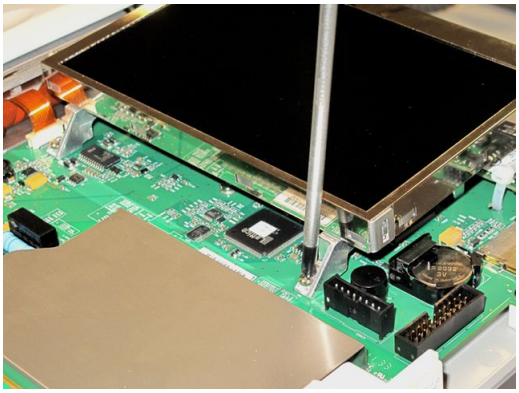
Replacing the Keypad Assembly

1. Perform step 1 to step 11 as described in "Replacing the Top Cover Assembly" on page 69.
2. Reassemble a new keypad assembly by reversing the steps for removal.
3. Perform the applicable checkout procedures.

    Refer to "Functional Checkout" on page 87.

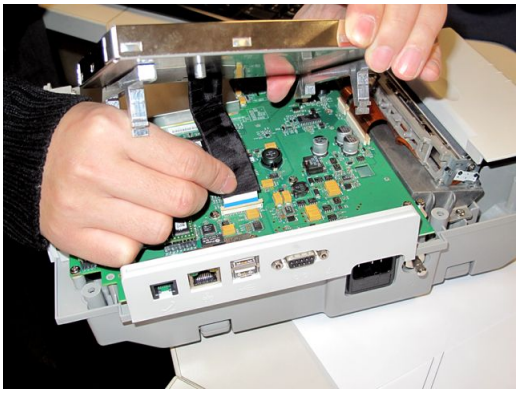
Replacing the LCD Assembly

1. Disconnect the system from AC power.
2. Remove the battery assembly as described in "Replacing the Battery Assembly" on page 67.
3. Remove the top cover assembly as described in "Replacing the Top Cover Assembly" on page 69.
4. Remove the two screws that hold the LCD assembly in place.



5. Push the LCD assembly forward and away from the rear panel.

6. Disconnect the LCD cable from the mainboard.



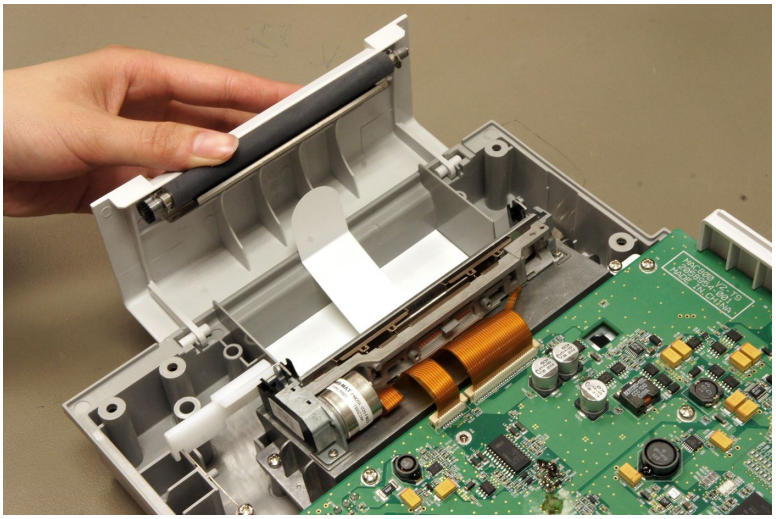
7. Lift the LCD assembly out of the bottom assembly.
8. Reassemble a new LCD assembly by reversing the steps for removal.
9. Perform the applicable checkout procedures.

   Refer to "Functional Checkout" on page 87.

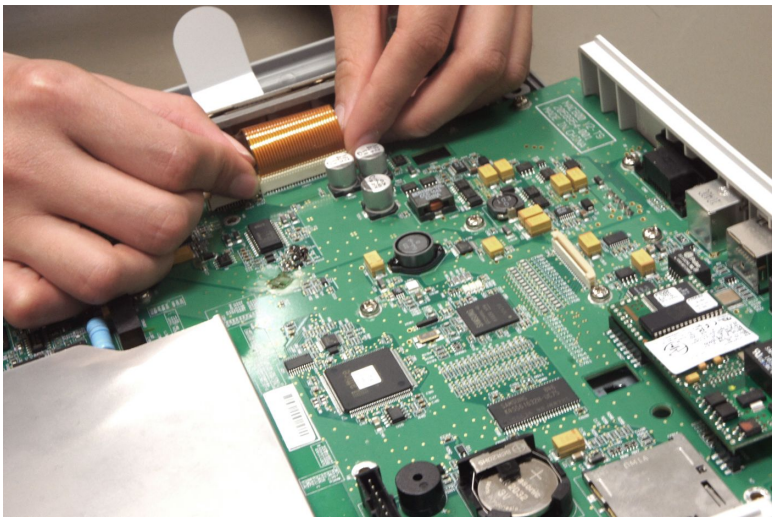
Replacing the Printer Assembly

Removing the Printer Assembly

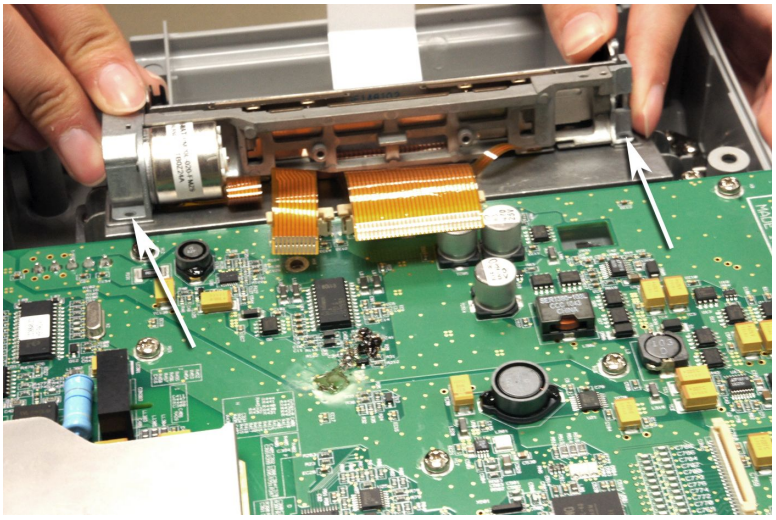
1. Disconnect the system from AC power.
2. Remove the battery assembly as described in "Replacing the Battery Assembly" on page 67.
3. Remove the top cover assembly as described in "Replacing the Top Cover Assembly" on page 69.
4. Remove the LCD Assembly as described in "Replacing the LCD Assembly" on page 72.
5. Remove the printer door from the bottom cover assembly as shown in the following illustration.



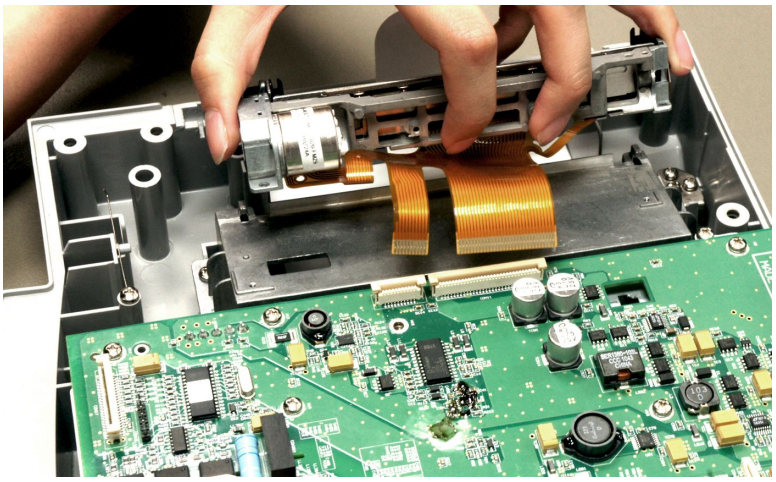
6. Disconnect the printer cable from the mainboard.



7. Remove the two screws from the printer mounting base as shown in the following illustration.

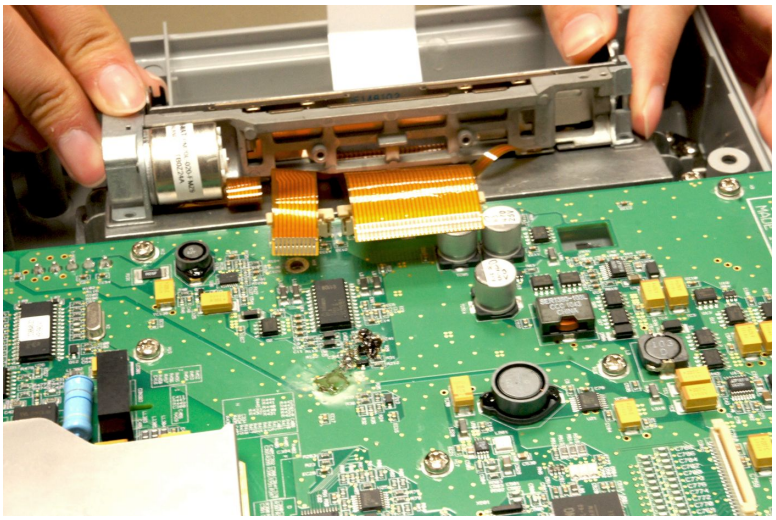


8. Remove the printer motor from the printer mounting base.



Reassembling the Printer Assembly

1. Replace a new printer motor on the bottom assembly as shown in the following illustration.



2. Replace the two mounting screws.
3. Reconnect the printer cable to the mainboard.
4. Replace the printer door.
5. Reassemble the LCD assembly.
6. Reassemble the top cover assembly.
7. Reassemble the battery assembly.
8. Perform the applicable checkout procedures.

   Refer to "Functional Checkout" on page 87.

Replacing the Mainboard Assembly

Processing ECGs in Internal Storage

Before replacing the mainboard, if the system has the internal storage option, transmit any ECGs remaining in storage to your archival system and/or print them to ensure you have a printed record.

Saving System Configuration Settings

1. Store the ***System Configuration*** settings to an SD card.
   a. Insert an SD card in the SD card slot of the device.
   b. On the ***Main Menu***, press **F4** to select ***System Configuration***.
   c. Press ***More*** > ***More*** > ***Export Setup***.
   d. Highlight the system setup file you want to export to the SD card.
   e. Press ***Export***.

f. When the following message is displayed, press ***OK***: ***Configuration was successfully exported***

g. Remove the SD card and store it in a secure location.

2. Print the ***System Setup Report*** if you feel you may need it for additional reference after the FRU replacement procedure.

   a. On the ***Main Menu***, press **F4** to select ***System Configuration***.

   b. Press ***More*** > ***Print Setup Report***.

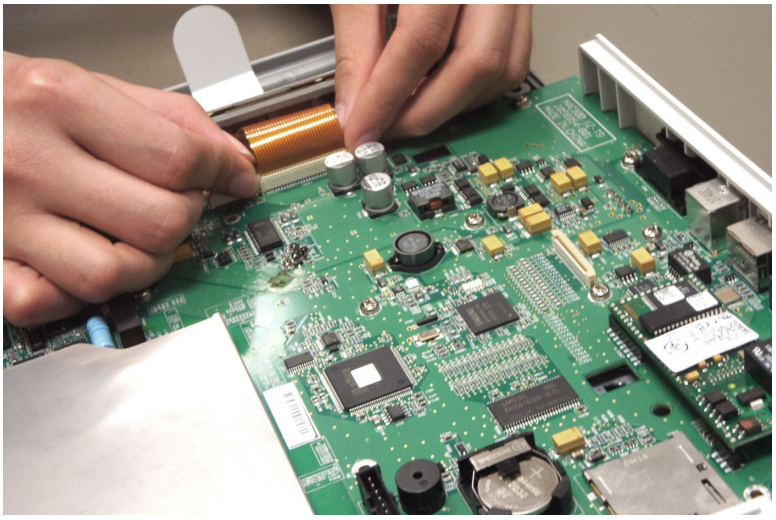
   c. Use the **trimpad** to highlight ***Complete Setup*** and press the center button.

   d. Save the printed setup report in a secure location.

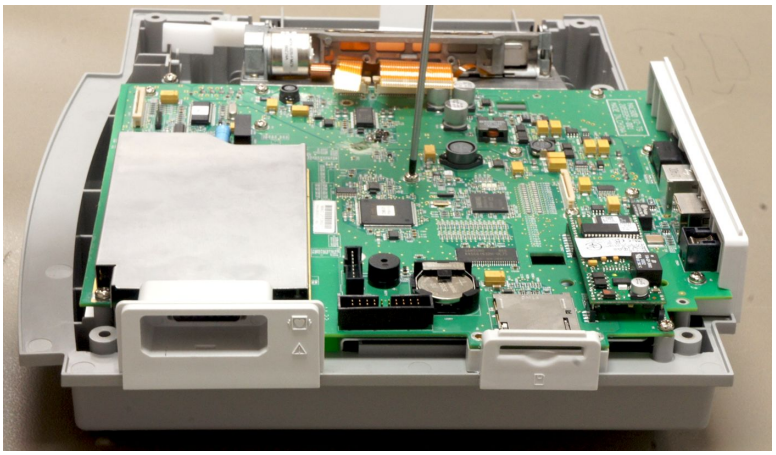
      You can use the report as a reference if you need to restore the system setup manually.

Removing the Mainboard Assembly

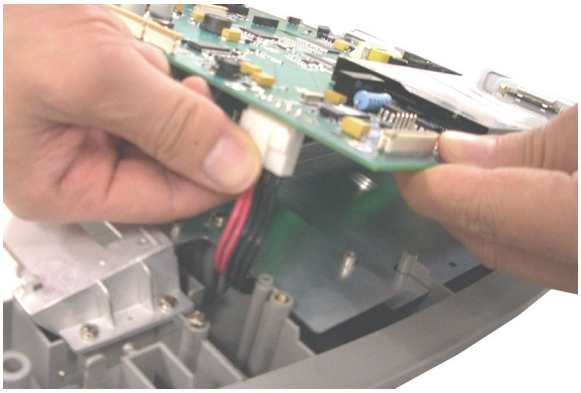
1. Disconnect the system from AC power.
2. Remove the battery assembly as described in "Replacing the Battery Assembly" on page 67.
3. Remove the top cover assembly as described in "Replacing the Top Cover Assembly" on page 69.
4. Remove the LCD Assembly as described in "Replacing the LCD Assembly" on page 72.
5. Disconnect the printer cable from the mainboard.



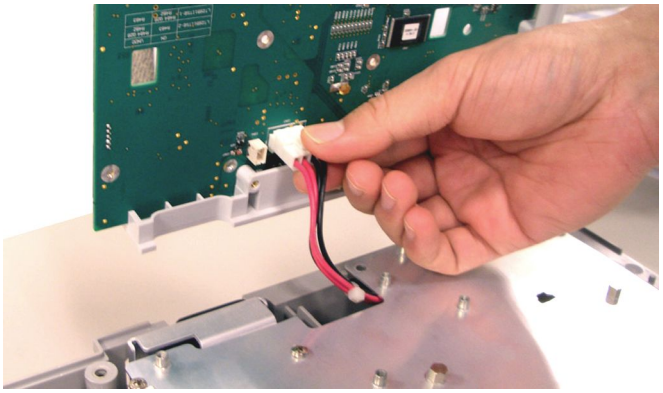
6. Remove the 10 screws that hold the mainboard in place.



7. Lift the mainboard assembly approximately 1.5 inches (3.81 cm).
8. Disconnect the battery cable from the bottom side of the mainboard.



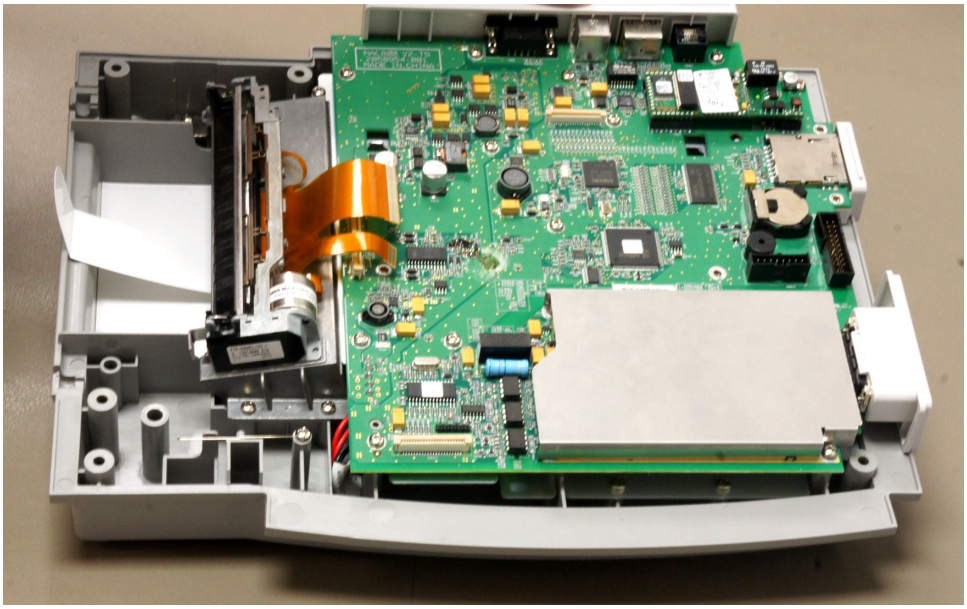
9. Disconnect the Power Supply cable from the bottom side of the mainboard.



Reassembling the Mainboard Assembly

1. Reconnect the Power Supply cable to the bottom of the new mainboard.
2. Reconnect the battery cable to the bottom of the new mainboard.

3. Replace the new the mainboard assembly on the bottom cover assembly as shown in the following illustration.



4. Replace the 10 screws that were removed in 6.
5. Reconnect the printer cable to the new mainboard.
6. Reassemble the LCD assembly
7. Reassemble the top cover assembly.
8. Reassemble the battery assembly.
9. Connect the power cord to AC power.
10. Restore system setups that were saved to the SD card.
11. Perform the applicable checkout procedures.

    Refer to "Functional Checkout" on page 87.

Serial Number

When the mainboard is replaced, the serial number of the device needs to be entered in the system.

The device's serial number is located on the product label on the bottom of the device.

1. On the ***Main Menu***, select **F4** (***System Configuration***) > **F6** (***More***) > **F6** (***More***) > **F5** (***Service Setup***).

   The system prompts for the service password.

   Contact GE Healthcare support if you do not know the service password.
2. Type the service password and press the center button on the **Trimpad**.

   The ***Service*** window opens.
3. Use the **Trimpad** to move the cursor to ***Device Settings*** and press the center button.

   The ***Device Settings*** window opens.
4. Type the device's serial number and press **F6** (***Save***).

External keyboard language

The default keyboard language of the device is English. You can also choose your preference keyboard language.

1. On the ***Main Menu***, select **F4** (***System Configuration***) > **F6** (***More***) > **F6** (***More***) > **F5** (***Service***).

   The system prompts for the service password.

   Contact GE Healthcare technical support if you do not know the service password.

2. Type the service password and press the center button on the **Trimpad**.

   The ***Service*** window opens.

3. Use the **Trimpad** to move the cursor to ***Device Settings*** and press the center button

   The ***Device Settings*** window opens.

4. Use the **Trimpad** to move highlight to ***Keyboard Language***.

5. Select your language and press the center button of the **Trimpad**.

   The device supports the following languages:

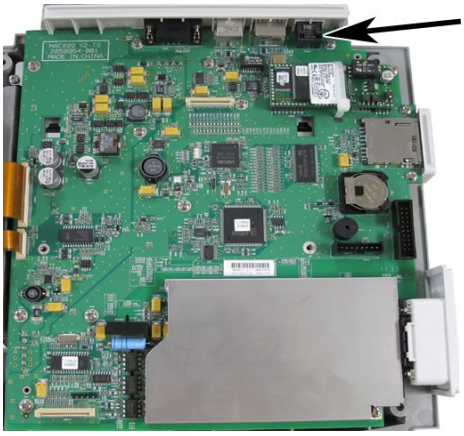
   - English
   - French
   - German
   - Italian
   - Spanish

6. Press **F6** (***Save***).

Replacing the Internal Modem (option)

1. Disconnect the system from AC power.
2. Remove the battery assembly as described in "Replacing the Battery Assembly" on page 67.
3. Remove the top cover assembly as described in "Replacing the Top Cover Assembly" on page 69.
4. Remove the LCD Assembly as described in "Replacing the LCD Assembly" on page 72.

5. Remove the internal modem from its socket on the mainboard.



6. Reassemble the internal modem by reversing the steps for removal.

   Align the contact pins with the sockets and align the hole with the plastic pin before pushing it into the sockets.

7. Perform the applicable checkout procedures.

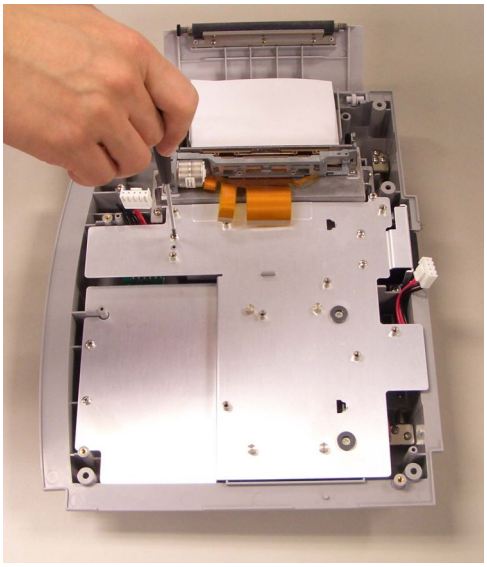
   Refer to "Functional Checkout" on page 87.

Replacing the Power Supply Assembly

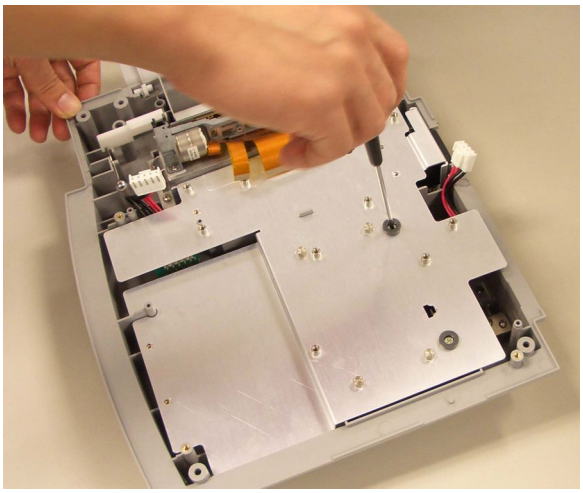
Removing the Power Supply Assembly

1. Disconnect the system from AC power.
2. Remove the battery assembly as described in "Replacing the Battery Assembly" on page 67.
3. Remove the top cover assembly as described in "Replacing the Top Cover Assembly" on page 69.
4. Remove the LCD Assembly as described in "Replacing the LCD Assembly" on page 72.
5. Remove the mainboard assembly as described in "Removing the Mainboard Assembly" on page 77.

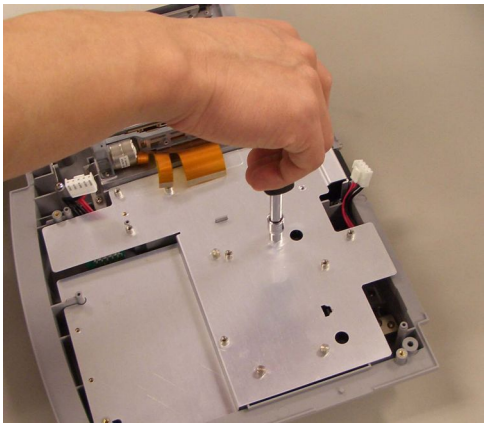
6. Remove the six M3X8 screws from the shield plate as shown in the following illustration.



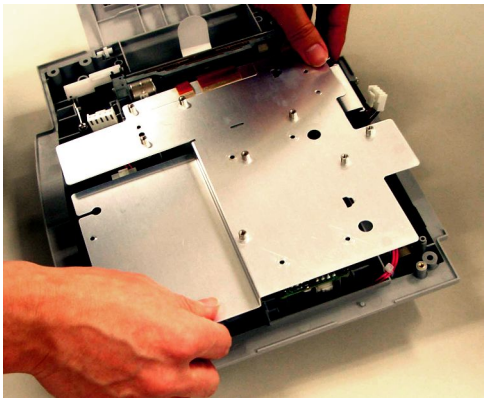
7. Remove the two M3X12 flat screws from the shield plate as shown in the following illustration.



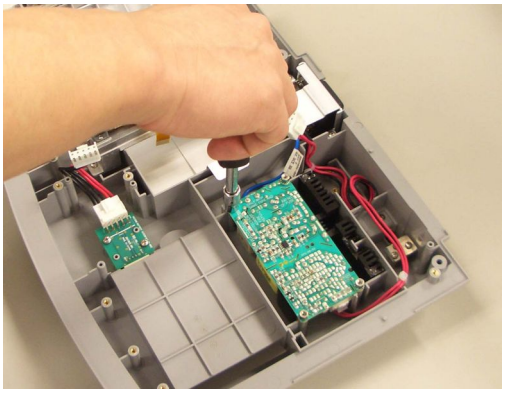
8. Remove the four hexagon screws from the shield plate as shown in the following illustration.



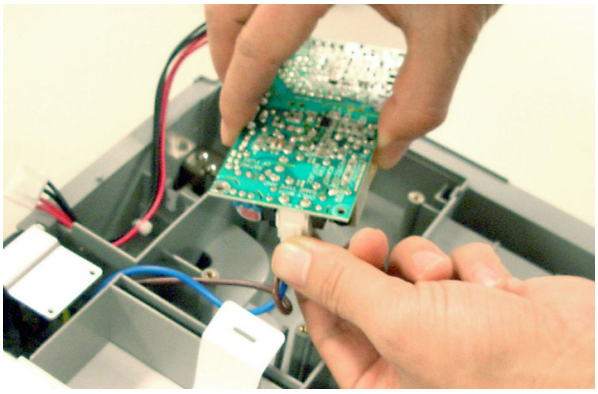
9. Remove the shield plate from the bottom cover assembly.



10. Remove the four hexagon screws of power supply assembly as shown in the following illustration.

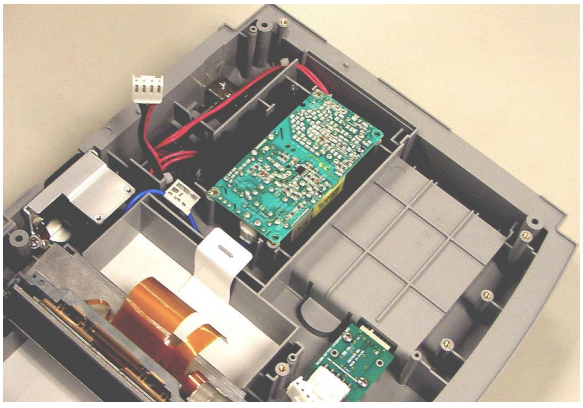


11. Lift the power supply assembly and disconnect the AC cable as shown in the following illustration.



Reassembling the Power Supply Assembly

1. Connect the AC cable to the new power supply assembly.
2. Place the new power supply assembly in the bottom cover assembly.
3. Replace the four hexagon screws.
4. Route the power supply cable for the mainboard as shown in the following illustration.



5. Replace the shield plate.

6. Replace the six M3X8 screws, two M3X12 flat screws, and four hexagon screws on the shield plate.
7. Reassemble the mainboard assembly.
8. Reassemble the printer assembly.
9. Reassemble the LCD assembly.
10. Reassemble the top cover assembly.
11. Reassemble the battery assembly.
12. Perform the applicable checkout procedures.

    Refer to "Functional Checkout" on page 87.

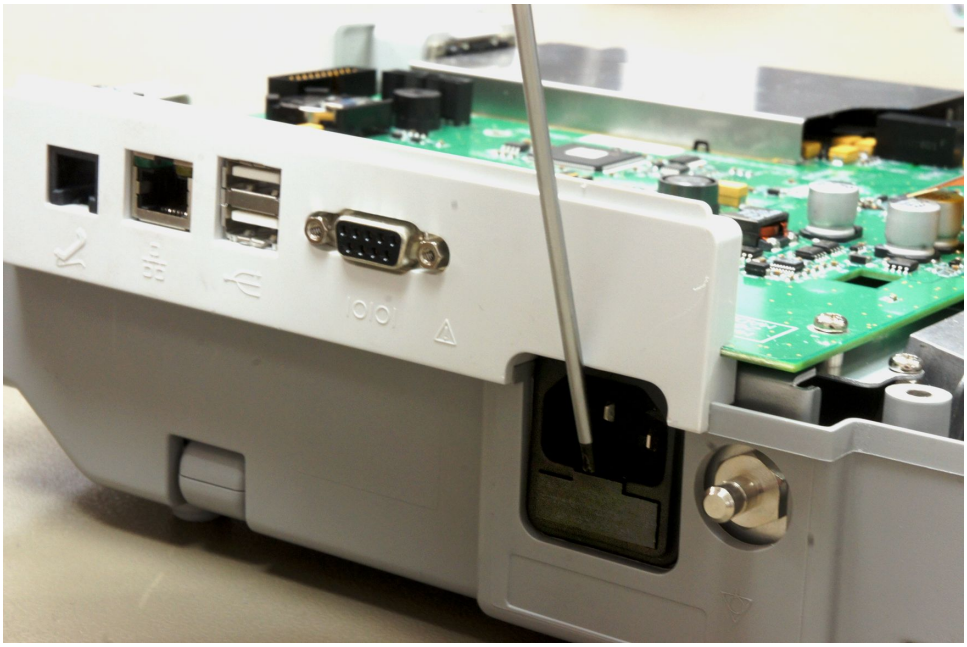
Replacing the Bottom Cover Assembly

1. Disconnect the system from AC power.
2. Remove the battery assembly as described in "Replacing the Battery Assembly" on page 67.
3. Remove the top cover assembly as described in "Replacing the Top Cover Assembly" on page 69.
4. Remove the LCD Assembly as described in "Replacing the LCD Assembly" on page 72.
5. Remove the printer assembly as described in "Removing the Printer Assembly" on page 73.
6. Remove the mainboard assembly as described in "Removing the Mainboard Assembly" on page 77.
7. Remove the power supply assembly as described in "Removing the Power Supply Assembly" on page 81.
8. Install the new bottom cover assembly.
9. Reassemble the power supply assembly.
10. Reassemble the mainboard assembly.
11. Reassemble the printer assembly.
12. Reassemble the LCD assembly.
13. Reassemble the top cover assembly.
14. Reassemble the battery assembly.
15. Perform the applicable checkout procedures.

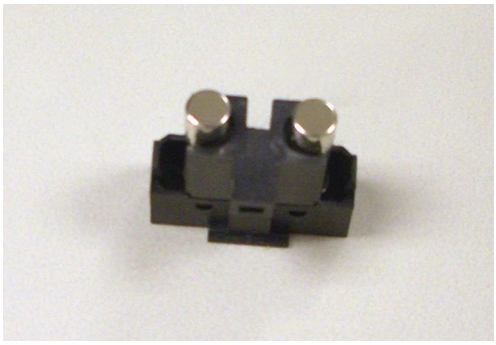
    Refer to "Functional Checkout" on page 87.

Replacing the Fuse

1. Disconnect the system from AC power.
2. Using a screw driver, take out the fuse holder from the AC plug inlet as shown in the following illustration.



3. Replace two new fuses in the fuse holder.



4. Reassemble the fuse holder into the AC plug inlet.

Functional Checkout

The following checkout procedures apply to your system.

NOTE:

The FRU checkout procedure for any listed FRU also applies to its internal PCBs and components.

If there is an asterisk (*) listed in the following tables, perform the applicable component or system configuration procedures.

FRU replacement procedures are in previous sections of this chapter of the manual.

Basic System FRU Repairs		
FRU Description	**Visual Inspection**	**Functional Checkout Procedures**
Patient Cable	1, 2, 7	1, 2, 3
Keypad Assembly	3, 6, 7	1, 2, 3, 7
Top Cover Assembly	6, 7	1, 2, 3, 14
LCD Assembly	3, 6, 7	1, 2, 3, 6
Printer Assembly	6, 7	1, 2, 3, 8
Mainboard Assembly	6, 7	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Power Supply Assembly	6, 7	1, 2, 3
Bottom Cover Assembly	6, 7	1, 2, 3
Battery Assembly	5	1, 2, 3, 11
Real-time Clock (RTC)	Refer to the Mainboard Assembly	Refer to the Mainboard Assembly
AC Power Cord	4	1, 2, 3
Non Listed FRUs	6, 7	1, 2, 3, *14[1]

[1] When AC Power Mains disturbed.

Optional System FRU Repairs		
FRU Description	**Visual Inspection**	**Functional Checkout Procedures**
Internal Modem	6, 7	1, 2, 3, 5, 13
Barcode Reader	6, 7	1, 2, 3

Non-FRU Repairs		
FRU Description	**Visual Inspection**	**Functional Checkout Procedures**
No parts replaced	4, 5, 6, 7	1, 2, 3, *4, 5
Software update	n/a	1, 2, 3, *4, 5
Hardware upgrade	6, 7	1, 2, 3, *4, 5
Annual Electrical Safety Checkout	1, 3, 4, 5	1, 2, 3, 6, 7, 8, 9, 10, 11, 12, 14, 13

Visual Inspection

Inspect the following for excessive wear and any signs of damage.

1. Check for broken patient cable/leadwires and out-of-date electrodes.
   a. Verify that patient cable/leadwires pass inspection.
   b. Verify that the electrodes pass inspection.
2. Discuss electrode placement, skin prep, and patient-related requirements with the ECG technician.

   Verify that the customer is following the procedures recommended in the operator's manual.

   For more information, refer to "Preparing the Patient" in the operator's manual for your system.
3. Verify that the keyboard/LCD display filter passes inspection.

   Refer to "Visual Inspection" on page 36 for more information.
4. Verify that the AC power cord passes inspection.

   Refer to "Visual Inspection" on page 36 for more information.
5. Verify that the battery pack passes inspection.

   Refer to "Visual Inspection" on page 36 for more information.
6. Verify all harnesses and internal wiring are secure.

   Refer to "Visual Inspection" on page 36 for more information.
7. Verify fasteners are replaced and secure.

   Refer to "Visual Inspection" on page 36 for more information.

Functional Checkout Procedures

Perform the functional checkout procedures that are applicable to the replacement procedure performed.

Operational Checks

1. Verify that the system passes the power-up self-test.

   Refer to "Power-Up Self-Test" on page 35 for more information. If a software update was performed, verify that the new version of software is displayed on the ***Main Menu*** screen.

2. Verify the rhythm strip recorded successfully.

   For more information, refer to "Recording a Resting ECG" in the operator's manual for your system.

3. Verify an ECG recorded successfully.

   For more information, refer to "Recording a Resting ECG" in the operator's manual for your system.

4. Verify the ECG was stored successfully.

   For more information, refer to "Managing Internal Storage" in the operator's manual for your system.

5. Verify that simulated ECG data was transmitted successfully to a receiving product.

   For more information, refer to "Managing Internal Storage" in the operator's manual for your system.

Diagnostic Tests

1. Verify that the display test was successful.

   Refer to "Display Test" on page 41 for more information.

2. Verify that the keyboard test was successful.

   Refer to "Keyboard Test" on page 43 for more information.

3. Verify that the writer test was successful.

   Refer to "Writer Test" on page 45 for more information.

4. Verify that the acquisition module test was successful.

   Refer to "Acquisition Module Test" on page 44 for more information.

5. Verify that the patient leadwire check was successful.

   Refer to "Patient Lead Wire Test" on page 51 for more information.

6. Verify the battery test was successful.

   Refer to "Battery Test" on page 44 for more information.

7. Verify that the LAN test was successful.

   Refer to "LAN Test" on page 47 for more information.

8. Verify that the modem test was successful.

   Refer to "Modem Test" on page 49 for more information.

Electrical Safety Checks

Verify that the current leakage test results meet requirements.

Perform electrical safety checks when indicated. All indicated electrical safety checks require a pass/fail indication for the steps performed. Record the measurement values in your debrief.

Electrical Safety Checks					
Step		**Condition[1]**	**UUT — ON[2]**	**Result**	**Leakage Current Limits**
Earth Leakage Current					
1	Forward Polarity	NC	_____ µA	Pass/Fail	500 µA
2	Neutral Open, Forward Polarity	SFC	_____ µA	Pass/Fail	1,000 µA
3	Neutral Open, Reverse Polarity	SFC	_____ µA	Pass/Fail	1,000 µA
4	Reverse Polarity	NC	_____ µA	Pass/Fail	500 µA
Enclosure Leakage Current					
1	Forward Polarity	NC	_____ µA	Pass/Fail	100 µA
2	Neutral Open, Forward Polarity	SFC	_____ µA	Pass/Fail	500 µA
3	Ground Open, Forward Polarity	SFC	_____ µA	Pass/Fail	500 µA
4	Ground Open, Reverse Polarity	SFC	_____ µA	Pass/Fail	500 µA
5	Neutral Open, Reverse Polarity	SFC	_____ µA	Pass/Fail	500 µA
6	Reverse Polarity	NC	_____ µA	Pass/Fail	100 µA
Patient Leakage Current To Ground					
1	Forward Polarity	NC	_____ µA	Pass/Fail	10 µA
2	Neutral Open, Forward Polarity	SFC	_____ µA	Pass/Fail	50 µA

Electrical Safety Checks					
Step		**Condition[1]**	**UUT — ON[2]**	**Result**	**Leakage Current Limits**
3	Ground Open, Forward Polarity	SFC	_____ µA	Pass/Fail	50 µA
4	Ground Open, Reverse Polarity	SFC	_____ µA	Pass/Fail	50 µA
5	Neutral Open, Reverse Polarity	SFC	_____ µA	Pass/Fail	50 µA
6	Reverse Polarity	NC	_____ µA	Pass/Fail	10 µA
Ground Continuity					Resistance
1	AC power cord ground prong to exposed metal surface (ground lug)	N/A	_____ Ω	Pass/Fail	Less than 200 mΩ

[1] NC = Normal Condition; SFC = Single Fault Condition; N/A = Not Applicable

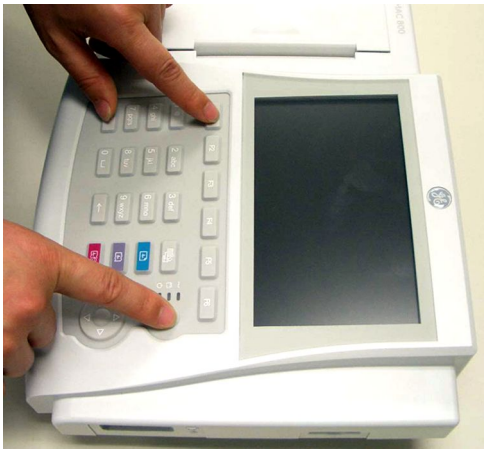
[2] UUT = Unit Under Test

Updating Software

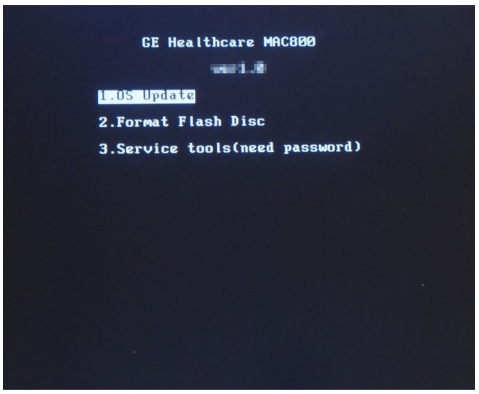
Software updates are provided on an SD card. Perform a software update as described in this section.

1. Insert the SD card with the software update (gold contacts down) in the SD card slot in the right side of the device, as shown in the following illustration.

2. Power up the system into ***Boot loader*** by pressing the **F1** + **T9** + **Power** keys at the same time, as shown in the following illustration.

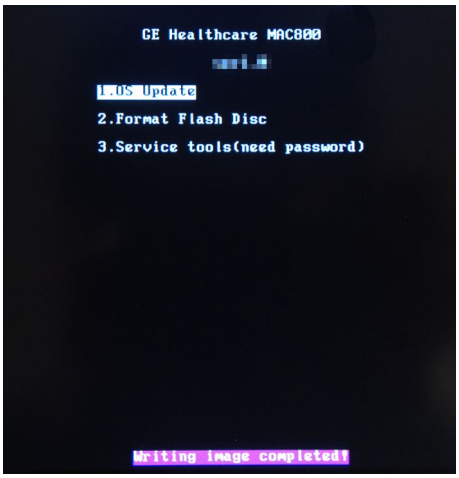


3. On the ***Boot loader Main Menu***, use the **trimpad** to highlight ***1= OS Update*** and press the center button of the **trimpad** to start the software update.



4. The ***Boot loader*** reads the software from the SD card and writes to Flash. Do not press any key until the following message displays:

   Writing image completed.



5. Press and hold the **Power** key until the system shuts down.
6. Press the **Power** key again to reboot the system.

   The system is now updated.

Conditioning the Battery Pack

To maintain the storage capacity of the battery pack installed in your device, GE Healthcare recommends that you condition the device's battery pack once every six months to reset the electronic fuel gauge inside the battery. A condition cycle consists of an uninterrupted "charge-discharge-charge" cycle.

You can condition the battery pack while it is installed in a device that you are not currently using to record tests on a patient.

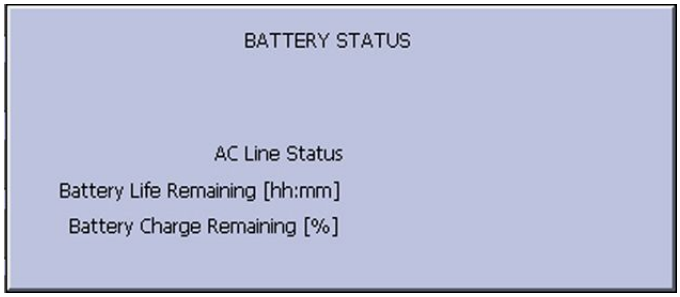
1. Disconnect the AC power from the device.
2. Display the ***BATTERY STATUS*** window:
   a. On the ***Main Menu***, press **F4** to select ***System Configuration***.
   b. Press ***More*** > ***More*** > ***Service Setup***.
   c. When prompted, enter the ***Service password*** and press ***OK***.

      If you do not know the service password, contact GE Healthcare Technical Support.

d. Select ***System Diagnostics***.

e. Select ***Battery Test***.

The ***BATTERY STATUS*** window opens.



3. Allow the battery to discharge until the Battery Charge Remaining [%] is less than 5%.
4. Turn off the device and reconnect it to the AC power.
5. Allow the battery to fully charge.

NOTE:
A solid amber battery LED indicates the battery is charging. When the battery LED turns off, this indicates that the battery is fully charged.

6. Remove the AC power and turn on the device.
7. Leave the device on and allow the battery to discharge until the device shuts off.
8. Reconnect the AC power to the device, leaving it turned off, and allow the battery to fully recharge.

   When the amber battery LED indicator stops flashing and turns a solid amber, the battery is fully charged and the conditioning cycle is complete.

Real-time Clock Check

To check that the time is functioning properly, perform the steps described in this section.

1. Record the time displayed on the device.
2. Power off the device for five minutes and then power it on again.
3. Check to make sure the time has advanced by five minutes.

6

Parts List

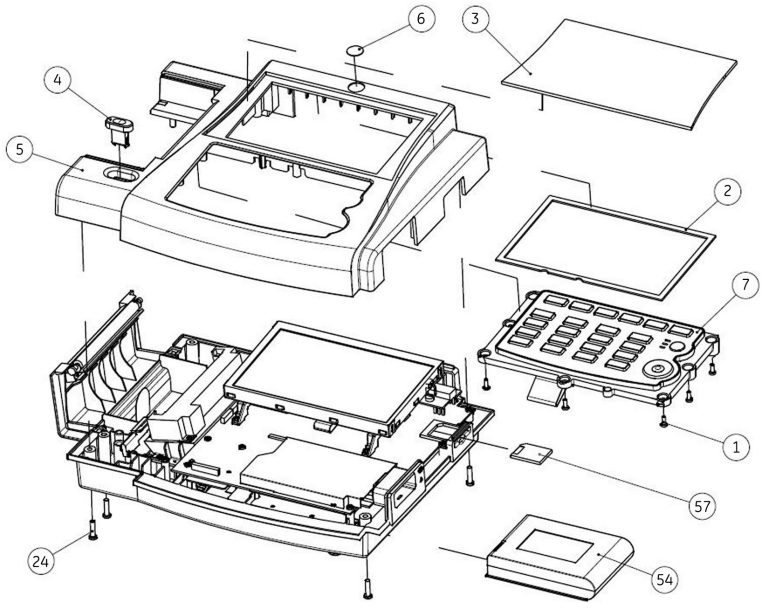
Ordering Parts

The FRU parts lists in this chapter supply enough detail for you to order parts for the assemblies, stand-alone FRUs, and FRU kits considered field serviceable. Only items, assemblies, and kits which have part numbers given in this chapter are available for purchase as FRUs. To order parts, contact GE Healthcare Service Parts.

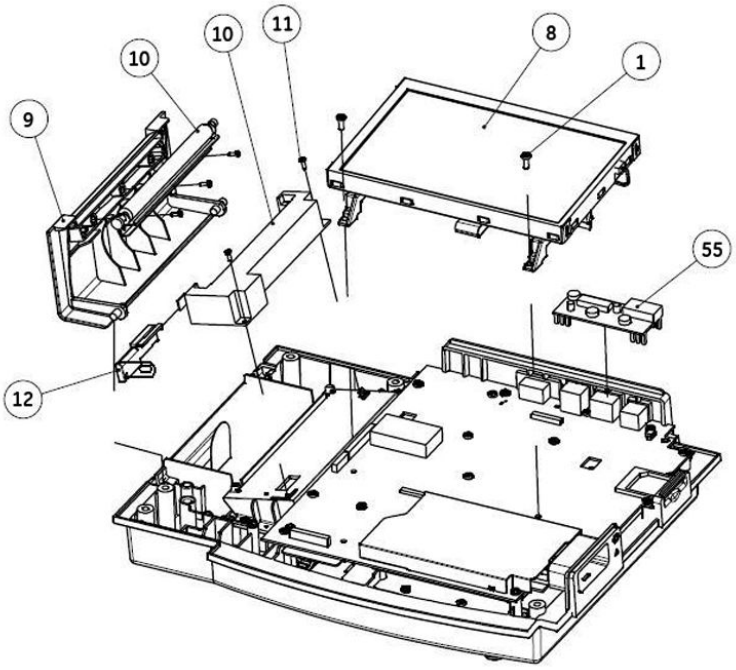
Field Replaceable Units (FRUs)

Upper Level Assembly Diagrams

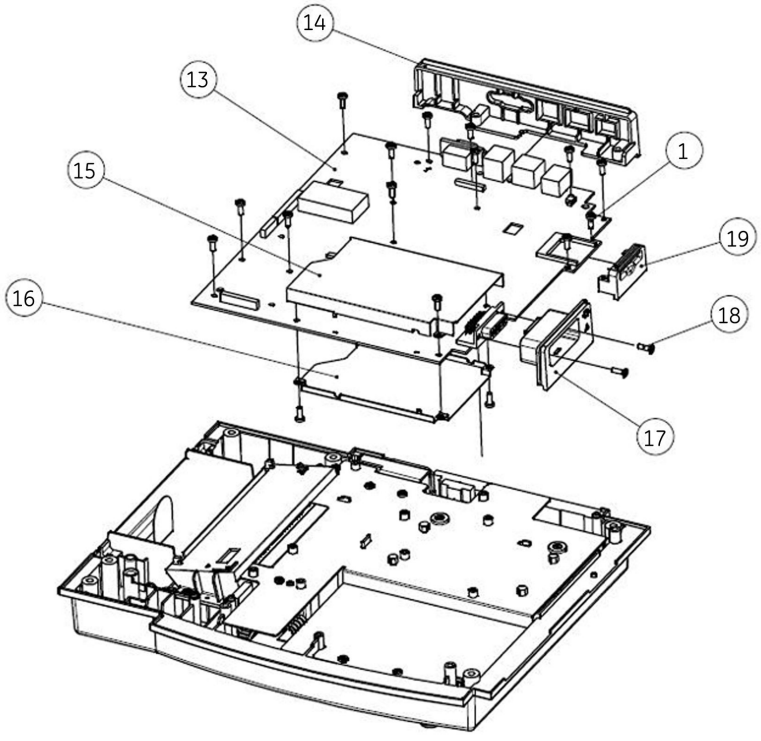
The following diagrams identify the field replaceable units of the system. The numbers in the call-outs reference part descriptions found in "Upper Level Assembly Part List" on page 98.



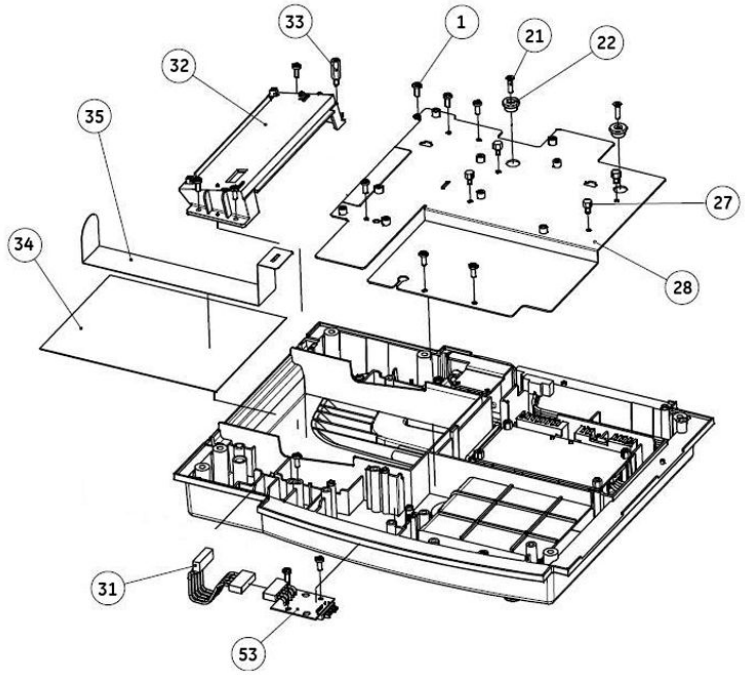
Top Cover and Keypad Assemblies



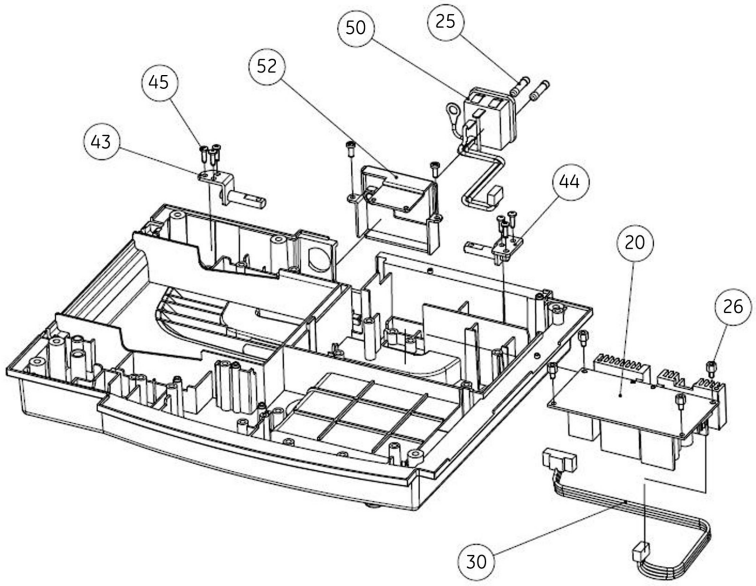
LCD and Printer Assemblies



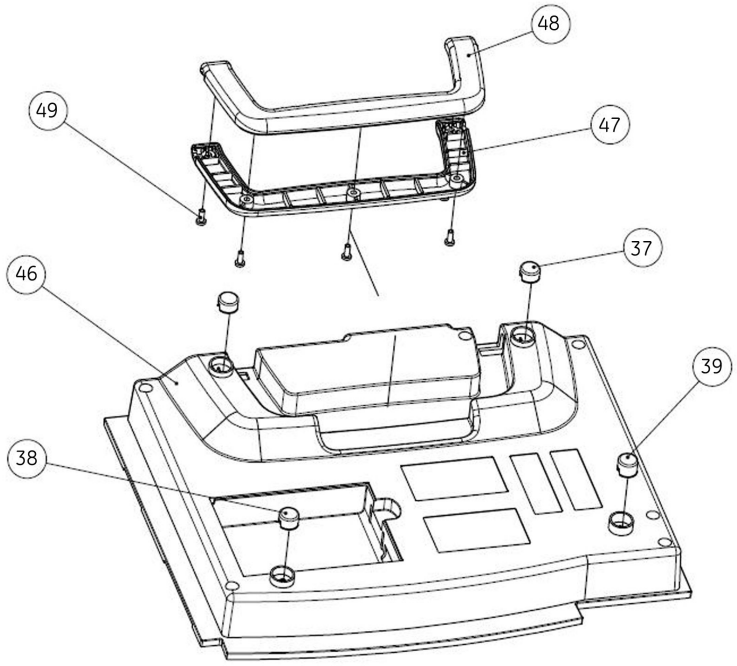
Mainboard, Power Supply and Battery Coin Assemblies



Bottom Cover Assemblies, 1 of 3



Bottom Cover Assemblies, 2 of 3



Bottom Cover Assemblies, 3 of 3

Upper Level Assembly Part List

The following table identifies the parts available for the system.

The numbers in the Item column refer to the call-outs from the diagrams found in "Upper Level Assembly Diagrams" on page 95.

The numbers in the Part Number column identify the GE Healthcare part number for orderable parts. Items without part numbers cannot be purchased independently of a FRU kit.

Upper Level Assembly

Item	Part Number	Item Description
1		M3X8 MACHINE SCREW PHILIPS PAN NI Included with: • "FRU Mainboard Assembly, PN 2061575–001" on page 104 • "FRU Bottom Cover Assembly, PN 2039943-001" on page 105 • "FRU Kits, PN 2039945-001" on page 108
2		LCD POLY FOAM Included with "FRU Top Cover Assembly, PN 2039939-001" on page 103
3		LCD LENS Included with "FRU Top Cover Assembly, PN 2039939-001" on page 103
4		PRINTER BUTTON included with "FRU Top Cover Assembly, PN 2039939-001" on page 103

Upper Level Assembly (cont'd.)

Item	Part Number	Item Description
5		TOP COVER Included with "FRU Top Cover Assembly, PN 2039939-001" on page 103
6		NAMEPLATE 15MM GE LOGO Included with "FRU Top Cover Assembly, PN 2039939-001" on page 103
7		KEYPAD Refer to "Keypads" on page 107.
8	2061574–001	MAC800 V2 FRU LCD ASSEMBLY
9		PRINTER DOOR included with "FRU Printer Assembly, PN 2039941-001" on page 104
10		THERMAL PRINTER HEAD - MAC800 included with "FRU Printer Assembly, PN 2039941-001" on page 104
11		M2X6 MACHINE SCREW PHILIPS PAN Included with: • "FRU Printer Assembly, PN 2039941-001" on page 104 • "FRU Kits, PN 2039945-001" on page 108
12		PRINTER HOLDER included with "FRU Bottom Cover Assembly, PN 2039943-001" on page 105
13		PCB MAC800 MAINBOARD included with "FRU Mainboard Assembly, PN 2061575–001" on page 104
14		REAR PANEL included with "FRU Mainboard Assembly, PN 2061575–001" on page 104
15		ACQ COVER1 included with "FRU Mainboard Assembly, PN 2061575–001" on page 104
16		ACQ COVER2 included with "FRU Mainboard Assembly, PN 2061575–001" on page 104
17		PATIENT CABLE CONNECTOR HOLDER included with "FRU Mainboard Assembly, PN 2061575–001" on page 104

Upper Level Assembly (cont'd.)

Item	Part Number	Item Description
18		AN00388 4-40x3/8 SCREW NI included with: • "FRU Mainboard Assembly, PN 2061575–001" on page 104 • "FRU Kits, PN 2039945-001" on page 108
19		SD CARD HOUSE included with "FRU Mainboard Assembly, PN 2061575–001" on page 104
20		60W 12V OUTPUT AC-DC MODULE BIG HEATSINK included with "FRU Power Supply Assembly, PN 2040052-001" on page 104
21		FLAT SCREW M3X12 included with: • "FRU Bottom Cover Assembly, PN 2039943-001" on page 105 • "FRU Kits, PN 2039945-001" on page 108
22		CRIMP RING .217 included with: • "FRU Bottom Cover Assembly, PN 2039943-001" on page 105 • "FRU Kits, PN 2039945-001" on page 108
24		M4X16 MACHINE SCREW PHILIPS PAN NI included with: • "FRU Bottom Cover Assembly, PN 2039943-001" on page 105 • "FRU Kits, PN 2039945-001" on page 108
25	2039946-001	FUSE 2.0A QUI-BLO 250V 5X20MM Available as an independent FRU. Also included with "FRU Bottom Cover Assembly, PN 2039943-001" on page 105.
26		HEXAGON SCREW1 included with: • "FRU Bottom Cover Assembly, PN 2039943-001" on page 105 • "FRU Kits, PN 2039945-001" on page 108
27		HEXAGON SCREW2 included with: • "FRU Bottom Cover Assembly, PN 2039943-001" on page 105 • "FRU Kits, PN 2039945-001" on page 108

Upper Level Assembly (cont'd.)

Item	Part Number	Item Description
28		SHIELD PLATE included with "FRU Bottom Cover Assembly, PN 2039943-001" on page 105
30		CABLE FOR MAINBOARD included with: • "FRU Power Supply Assembly, PN 2040052-001" on page 104 • "FRU Kits, PN 2039945-001" on page 108
31		CABLE FOR BATTERY included with: • "FRU Bottom Cover Assembly, PN 2039943-001" on page 105 • "FRU Kits, PN 2039945-001" on page 108
32		PRINTER MOUNTING BASE included with "FRU Bottom Cover Assembly, PN 2039943-001" on page 105
33		PRINTER GROUND POLE included with "FRU Bottom Cover Assembly, PN 2039943-001" on page 105
34		PAPER TRAY SHEET included with: • "FRU Bottom Cover Assembly, PN 2039943-001" on page 105 • "FRU Kits, PN 2039945-001" on page 108
35		PAPER LIFTING TAPE included with: • "FRU Bottom Cover Assembly, PN 2039943-001" on page 105 • "FRU Kits, PN 2039945-001" on page 108
37		FOOTPAD1 included with: • "FRU Bottom Cover Assembly, PN 2039943-001" on page 105 • "FRU Kits, PN 2039945-001" on page 108
38		FOOTPAD2 included with: • "FRU Bottom Cover Assembly, PN 2039943-001" on page 105 • "FRU Kits, PN 2039945-001" on page 108

Upper Level Assembly (cont'd.)

Item	Part Number	Item Description
39		FOOTPAD3 included with: • "FRU Bottom Cover Assembly, PN 2039943-001" on page 105 • "FRU Kits, PN 2039945-001" on page 108
43		HINGE LEFT included with "FRU Bottom Cover Assembly, PN 2039943-001" on page 105
44		HINGE RIGHT included with "FRU Bottom Cover Assembly, PN 2039943-001" on page 105
45		ST2 9X9.5 SELF TAPPING SCREW NI included with: • "FRU Bottom Cover Assembly, PN 2039943-001" on page 105 • "FRU Kits, PN 2039945-001" on page 108
46		BOTTOM COVER included with "FRU Bottom Cover Assembly, PN 2039943-001" on page 105
47		HANDLE BOTTOM included with "FRU Bottom Cover Assembly, PN 2039943-001" on page 105
48		HANDLE TOP included with "FRU Bottom Cover Assembly, PN 2039943-001" on page 105
49		M3X10 MACHINE SCREW PHILIPS PAN NI included with: • "FRU Bottom Cover Assembly, PN 2039943-001" on page 105 • "FRU Kits, PN 2039945-001" on page 108
50		AC INLET MODULE included with "FRU Bottom Cover Assembly, PN 2039943-001" on page 105
52		AC INLET HOUSE MODULE included with "FRU Bottom Cover Assembly, PN 2039943-001" on page 105
53		PCB MAC800 BATTERY INTERFACE BD included with "FRU Bottom Cover Assembly, PN 2039943-001" on page 105
54	2039944-001	MAC800 FRU BATTERY ASSEMBLY
55	2039947-001	MAC800 FRU INTERNAL MODEM (OPTION)

Upper Level Assembly (cont'd.)

Item	Part Number	Item Description
57	2027268-005	CARD SECURE DIGITAL 2GB
58	2061820-001	MAC800 V2 FRU CD MANUAL
59	2061821-005	MAC800 V2 FRU PROGRAMMED SD CARD-SW 2.0.8
60		CR2032(H) COIN BATTERY, 3.0V Included with "FRU CLOCK BATTERY, PN 2040761-001" on page 107

FRU Top Cover Assembly, PN 2039939-001

The following table summarizes the items in the FRU Top Cover Assembly. Item numbers correspond to the item numbers in the "Upper Level Assembly Diagrams" on page 95.

FRU Top Cover Assembly, PN 2039939-001

Item	Description	Qty
2	LCD POLY FOAM	1
3	LCD LENS	1
4	PRINTER BUTTON	1
5	TOP COVER	1
6	NAMEPLATE 15MM GE LOGO	1

FRU Printer Assembly, PN 2039941-001

The following table summarizes the items in the FRU Printer Assembly. Item numbers correspond to the item numbers in the "Upper Level Assembly Diagrams" on page 95.

FRU Printer Assembly, PN 2039941-001

Item	Description	Qty
9	PRINTER DOOR	1
10	THERMAL PRINTER HEAD-MAC800	1
11	M2X6 MACHINE SCREW PHILIPS PAN	3

FRU Mainboard Assembly, PN 2061575–001

The following table summarizes the items in the FRU Mainboard Assembly. Item numbers correspond to the item numbers in the "Upper Level Assembly Diagrams" on page 95.

FRU Mainboard Assembly, PN 2061575–001

Item	Description	Qty
1	M3X8 MACHINE SCREW PHILIPS PAN NI	7
13	PWA MAC800 V2 MAINBOARD	1
14	REAR PANEL	1
15	ACQ COVER1	1
16	ACQ COVER2	1
17	PATIENT CABLE CONNECTOR HOLDER	1
18	AN00388 4-40x3/8 SCREW NI	2
19	SD CARD HOUSE	1

FRU Power Supply Assembly, PN 2040052-001

The following table summarizes the items in the FRU Power Supply Assembly. Item numbers correspond to the item numbers in the "Upper Level Assembly Diagrams" on page 95.

FRU Power Supply Assembly, PN 2040052-001

Item	Description	Qty
20	60W 12V OUTPUT AC-DC MODULE BIG HEATSINK	1
30	CABLE FOR MAIN BOARD	1

FRU Bottom Cover Assembly, PN 2039943-001

The following table summarizes the items in the FRU Bottom Cover Assembly. Item numbers correspond to the item numbers in the "Upper Level Assembly Diagrams" on page 95.

FRU Bottom Cover Assembly, PN 2039943-001

Item	Description	Qty
1	M3X8 MACHINE SCREW PHILIPS PAN NI	16
12	PRINTER HOLDER	1
21	FLAT SCREW M3X12	2
22	CRIMP RING .217	2
24	M4X16 MACHINE SCREW PHILIPS PAN NI	6
25	FUSE 2.0A QUI-BLO 250V 5X20MM	2
26	HEXAGON SCREW1	4
27	HEXAGON SCREW2	4
28	SHIELD PLATE	1
31	CABLE FOR BATTERY	1
32	PRINTER MOUNTING BASE	1
33	PRINTER GROUND POLE	1
34	PAPER TRAY SHEET	1
35	PAPER LIFTING TAPE	1
37	FOOTPAD1	2
38	FOOTPAD2	1
39	FOOTPAD3	1
43	HINGE LEFT	1
44	HINGE RIGHT	1
45	ST2.9X9.5 SELF TAPPING SCREW NI	6
46	BOTTOM COVER	1
47	HANDLE BOTTOM	1
48	HANDLE TOP	1
49	M3X10 MACHINE SCREW PHILIPS PAN NI	2
50	AC INLET MODULE	1
52	AC INLET HOUSE MODULE	1
53	PCB MAC800 BATTERY INTERFACE BD	1

Model Data Matrix Barcode Scanner Kits

MAC 800 Data Matrix Barcode Scanner Kits

Part Number	Description
2040758-001	USB BARCODE SCANNER ENG
2040758-002	USB BARCODE SCANNER GER
2040758-003	USB BARCODE SCANNER FRE
2040758-004	USB BARCODE SCANNER SPA
2040758-005	USB BARCODE SCANNER SWE
2040758-006	USB BARCODE SCANNER ITA
2040758-008	USB BARCODE SCANNER DUT
2040758-009	USB BARCODE SCANNER NOR
2040758-010	USB BARCODE SCANNER DAN
2040758-011	USB BARCODE SCANNER CZE
2040758-014	USB BARCODE SCANNER HUN
2040758-016	USB BARCODE SCANNER RUS
2040758-017	USB BARCODE SCANNER SLO
2040758-018	USB BARCODE SCANNER POR
2040758-020	USB BARCODE SCANNER FIN

Keypads

MAC 800 Keypad Assemblies

Part Number	Description
2040049-001	MAC800 FRU KEYPAD ASSEMBLY ENGLISH
2040049-002	MAC800 FRU KEYPAD ASSEMBLY RUSSIAN

NOTE:
The Russian Keypad (2040049-002) is used only in Russia; all other countries use the English Keypad (2040049-001).

FRU CLOCK BATTERY, PN 2040761-001

MAC800 V2 FRU Clock Battery

Part Number	Description
2040761–001	MAC800 V2 FRU CLOCK BATTERY

USB Wireless Dongle

MAC800 FRU USB Wireless Dongle

Part Number	Description
2064357-001	MAC800 V2 FRU USB WIRELESS DONGLE CHANNEL11
2064357-002	MAC800 V2 FRU USB WIRELESS DONGLE CHANNEL13

USB Wireless Dongle Upgrade Kit

WIFI MODULE CHANNEL11 MAC800 V2 UPD (2065567-002)

Part Number	Description
2061297-001	WIFI MODULE CHANNEL11 MAC800 V2

WIFI MODULE CHANNEL13 MAC800 V2 UPD (2065567-003)

Part Number	Description
2061469-001	WIFI MODULE CHANNEL13 MAC800 V2

Silex Wireless Bridge

MAC 800 Silex Wireless Bridge

Part Number	Description
2039939-002	MAC 800 SILEX WIRELESS BRIDGE KIT FOR USA AND CANADA
2039939-003	MAC 800 SILEX WIRELESS BRIDGE KIT FOR WORLDWIDE EXCEPT USA AND CANADA

Silex Wireless Bridge Upgrade Kit

MAC 800 Silex WIFI BRIDGE CHANNEL 11 – UPGRADE (2065567-005)

Part Number	Description
2095170-001	SILEX WI-FI BRIDGE KIT MAC 2000 US

MAC 800 Silex WIFI BRIDGE CHANNEL 13 – UPGRADE (2065567-006)

Part Number	Description
2098761-001	MAC 2000 SILEX WIRELESS BRIDGE KIT- GLOBAL VERSION

FRU Kits, PN 2039945-001

FRU Kits, PN 2039945-001

Item	Description	Qty
1	M3X8 MACHINE SCREW PHILIPS PAN NI	20
11	M2X6 MACHINE SCREW PHILIPS PAN	5
18	AN00388 4-40X3/8 SCREW NI	2
21	FLAT SCREW M3X12	2
22	CRIMP RING .217	2
24	M4X16 MACHINE SCREW PHILIPS PAN NI	6
26	HEXAGON SCREW1	4
27	HEXAGON SCREW2	4
30	CABLE FOR MAIN BOARD	1

FRU Kits, PN 2039945-001 (cont'd.)

Item	Description	Qty
31	CABLE FOR BATTERY	1
34	PAPER TRAY SHEET	1
35	PAPER LIFTING TAPE	1
37	FOOTPAD1	2
38	FOOTPAD2	1
39	FOOTPAD3	1
45	ST2.9X9.5 SELF TAPPING SCREW NI	6
49	M3X10 MACHINE SCREW PHILIPS PAN NI	2

7

System Configuration

System Configuration provides access to functions that allow you to customize the system settings and to utilities to help manage those settings. This chapter describes the settings managed by each function and the process followed by each utility.

CAUTION:

POTENTIAL DATA LOSS — Configuration changes can cause data loss.

After making configuration changes, you MUST return to the ***Main Menu*** to ensure the changes are saved.

Setup Functions

Setup functions fall into the following categories:

- Basic system settings
- Resting ECG settings
- Arrhythmia settings
- Communication settings
- Country settings
- Patient settings
- User settings
- Options
- Service settings
- Date and time
- Order manager settings

Depending on which options were activated, some of these functions may not be available on your system.

Basic Setup

The Basic Setup function allows you to define the following information:

- Institutional identification
- Default physicians
- System settings

- Printer settings
- PDF Naming settings
- System security
- Time servers

NOTE:
You must add physicians in ***User Setup*** before they can be picked as default physicians. For more information, see "User Setup" on page 136.

To access ***Basic Setup*** from the device ***Main Menu***, press **F4** (***System Configuration***) > **F1** (***Basic Setup***).

The following tables describe each setting available on ***Basic Setup***.

Field	Comment
Page 1	
Name	The name of the institution.
Street	The street address of the institution.
City	The city where the institution is located.
Ordering Physician	The physician who ordered the ECG. Defaults on any patient records created on the system.
Referring Physician	The physician who referred the patient. Defaults on any patient records created on the system.
Attending Physician	The physician who supervised the ECG. Defaults on any patient records created on the system.
Technician	The technician who conducted the ECG. Defaults on any patient records created on the system.
Location	Location ID where the device is located. Defaults on any patient records created on the system.
Site #	Site number where the device is located. (Defaults on any patient records created on the system). This field is required to store ECG reports on a cardiology information system such as the MUSE system.
Cart #	Unique cart number of the device. Defaults on any patient records created on the system.

Field	Comment
Test Patient (temporary)	Enables/disables simulated ECGs. When enabled, simulated waveforms are generated in the resting, arrhythmia, or RR Analysis ECG functions. This is useful for demonstration, training, or testing purposes. **NOTE:** This setting clears when the system is reset.
Page 2	
Power up mode	Determines which screen is displayed when the system is powered on. Available options are: • ***Resting ECG*** • ***Arrhythmia*** • ***Main Menu*** ***Resting ECG*** is the default value.
Display Colors	Determines the appearance of the ECG display. Select a color combination that is legible for you.
ECG Grid on Display	Determines whether a grid is displayed behind the waveforms. A grid may make reading the ECG easier. The default is ***on***.
Anti-Aliasing of ECG Waveforms	Determines whether anti-aliasing is applied to waveforms to reduce distortion caused by the video display. The default is ***on***.
Auto Standby	Determines whether the device automatically enters ***standby*** mode if it is inactive for a predefined time limit. This helps reduce power consumption and increases the life of the device. See also ***Auto Standby Time***.
Auto Standby Time (1–255 min)	Identifies the amount of time, in minutes, that the device can remain inactive before it enters ***standby*** mode. ***Auto Standby*** uses this field.
Page 3	

Laser Printer	Printer Type:
	• USB Printer
	• Network Printer
	  • IP Address
	  • Port Number
	NOTE:
	IP Address and ***Port Number*** are available only when ***Network Printer*** is chosen.

Field	Comment
PDF Naming	***On/Off*** PDF ***Automatic Naming*** Rule. • ***Patient ID*** • ***Last Name*** • ***First Name*** • ***Date of Birth*** • ***Procedure*** • ***Date of Test*** • ***Export Date***
Page 4	
High Security Mode	Enables/disables high security mode. You can activate it only if at least one user with ***Edit Users*** and ***Edit Setup*** privileges is configured with a password. When ***High Security Mode*** is enabled, users are prompted to enter an ID and password when logging on to the system. You must add each user in ***User Setup***.
Audit Trail	Determines whether the system creates an audit trail of activity. This is available only if ***High Security Mode*** is enabled and the ***CFRA*** audit tail option is activated. For information on activating the CFRA option, refer to "Options Setup" on page 138.
Auto Logoff	Determines whether the system automatically logs the user off after a predefined period of inactivity. See also ***Auto Logoff Time***. This is available only if ***High Security Mode*** is enabled.
Auto Logoff Time (1–255 min)	Determines the length of inactivity, in minutes, before the system logs off the user. This is available only if ***High Security Mode*** is enabled.
Automatically synchronize with Time Server	Enables/disables automatic synchronization with an external time server either on the institution's network or the Internet. You must activate a LAN option to set this option.
Time Server Name	Identifies the server with which the device synchronizes its time. This can be a server on the institution's network or on the Internet. Contact your server administrator for this information.
Last synchronization at	Display-only field that identifies when the last synchronization occurred.
Last synchronized from Time Server	Display-only field that identifies where the last synchronization occurred.

Resting ECG Setup

The Resting ECG Setup option allows you to define:

- Waveform parameters
- Lead usage
- Analysis options
- Lead sequence
- Report options
- Storage options (if the internal storage option is activated)
- Transmission options (if a communications option is activated)

To access the ***Resting ECG Setup*** from the device ***Main Menu***, press **F4** (***System Configuration***) > **F2** (***Resting ECG Setup***).

The following tables describe each setting available on ***Resting ECG Setup***.

Field	Comment
Page 1	
Gain	Sets the amplitude of the ECG signal. Measurement is in millimeters per millivolt and includes the following options: • 2.5 mm/mV • 5 mm/mV • 10 mm/mV • 20 mm/mV • 40 mm/mV • Automatic The larger the selected measurement, the larger the waveform. Only the representation of the waveform changes; signal strength is not affected. **NOTE:** If ***Automatic*** is selected, the system calculates the best gain based on the peak-to-peak amplitudes of all displayed leads and the selected display format.
Sweep Speed	Changes the speed of rhythm printing and the wiper bar movement across the display. Measurement is in millimeters per second (mm/s) and includes the following options: • 5 mm/s (rhythm) / 12.5 mm/s (display) • 25 mm/s • 50 mm/s

Field	Comment
Low Pass Filter	Sets the maximum frequency to include in the waveform. Restricting frequencies can help eliminate noise in the waveform. Frequencies are measured in Hertz (Hz) and include the following options: • 20 Hz • 40 Hz • 100 Hz • 150 Hz Selecting a frequency eliminates signals above that frequency. For example, if you select 40, only signals that have a frequency of 40 Hz or lower are included in the waveform.
High Pass Filter	Sets the minimum frequency to include in the waveform. Restricting frequencies can help eliminate noise in the waveform. Frequencies are measured in Hertz (Hz) and include the following options. • 0.04 Hz • 0.08 Hz • 0.16 Hz • 0.31 Hz Selecting a frequency eliminates signals that fall below that frequency. For example, if you select 0.16, only signals that have a frequency of 0.16 Hz or higher are included in the waveform.
ADS	Toggles the anti-drift system (***ADS***) on and off. ***ADS*** helps reduce baseline drift.
Line Filter	Enables/disables the line filter defined in ***Country Setup***.
6 leads: 1x6	Enables/disables a display option that shows one six-waveform column.
6 leads: 2x3	Enables/disables a display option that shows two three-waveform columns.
12 leads: 2x6	Enables/disables a display option that shows two six-waveform columns. Available only if the ***R12L system*** option is enabled.
12 leads: 4x3	Enables/disables a display option that shows four three-waveform columns. Available only if the ***R12L system*** option is enabled.
Display Format	Selects the display format of the resting ECG. The default value is ***3 leads: 1x3***. Other values depend on which of the previous four fields are set.
Display Lead Group	Determines which group of leads is displayed. The available values depends on which ***Display Format*** is selected. For example, if ***3 Leads: 1x3*** is selected, the available values are: • 3 rhythm leads • 1st group • 2nd group • 3rd group • 4th group If either of the 12–lead display formats is selected, this field is not available, since all 12 leads are displayed.

Field	Comment
Page 2	
Printer Leads	Identifies the default set of leads to use for printing. The values are: • First 6 • Second 6 • Rhythm 6
Start rhythm report on new page	Determines whether the rhythm report prints on a separate page.
Pace Enhancement	Increases the readability of pacemaker ECG either by augmenting small pace pulses or by truncating large pace pulses. If enabled, pace enhancement is done in two steps: 1. Add a marker (1.5 mV amplitude, 6 ms duration) to the electrode signal. 2. Limit the sum to 0.5 mV in the lead signal.
Hookup Advisor	Enables/disables the ***Hookup Advisor*** option, which visually indicates the quality of lead signals.
Preview before Analysis	Determines waveform preview options. Values include: • ***No*** Waveforms are never previewed. • ***Always*** Waveforms are always previewed. • ***Yellow electrodes*** Waveforms are previewed when the ***Hookup Advisor*** indicator shows a yellow or red electrode. • ***Red electrodes*** Waveforms are previewed when the ***Hookup Advisor*** indicator shows a red electrode. For additional information, see "" on page .
ECG Acquisition	Determines the ECG acquisition mode. Values include: • ***Pre-Acquisition*** Uses the last 10 seconds of ECG data already stored in the system. • ***Post Acquisition*** Acquires 10 new seconds of ECG data after you press **ECG** key.

Field	Comment
Reanalysis	Enables/disables the reanalysis feature, which allows you to adjust the following ECG measurements: • ***P Duration*** • ***PR Interval*** • ***QRS Duration*** • ***QT Interval*** Available only if ***Audit Trail*** is disabled and either the ME12 or MI12 option is activated. For more information on activating options, see "Options Setup" on page 138. For more information on the reanalysis feature, see "" on page .
QTC Calculation	Determines which formula is used to correct QT calculations. Options are: • Bazett QTc = QT √HR/60 • Framingham QTc = QT + 154 (1 — 60/HR) • Fridericia QTc = QT ^{3}√HR/60 In all formulas, HR = Heart Rate. Available only if the ME12 or MI12 option is activated.
Screening Criteria	Enables/disables the inclusion of the screen criteria. This setting is available only if the ***MI12*** option is activated. It is disabled by default.
Suppress normal statement	Enables/disables the inclusion of the normal statement. This setting is available only if the ***MI12*** option is activated.
Suppress abnormal/ borderline	Enables/disables the inclusion of the abnormal/borderline statements. This setting is available only if the ***MI12*** option is activated.
Suppress all statements	Enables/disables the inclusion of all statements. This setting is available only if the ***MI12*** option is activated.
Suppress reason statement	Enables/disables the inclusion of reason statements. This setting is available only if the ***Screening Criteria*** field is enabled. It is enabled by default. **NOTE:** Reason statements are not yet available for all languages.

Field	Comment
ACI-TIPI	Enables/disables the inclusion of the ***ACI-TIPI (Acute Cardiac Ischemia Time Insensitive Predictive Instrument)*** statement and enables the ***Chest Pain*** field on the ***Patient Information*** window. To include ACI-TIPI statements, the following conditions must be met: • ***MI12*** or ***ME12*** system option is activated • ***TIPI*** system option is activated • ***ACI-TIPI*** is enabled • ***10s ECG Report Format*** is enabled • ***Print interpretation***is enabled • Patient data must include: gender, date of birth, and chest pain indication. • Patient cannot be a pediatric patient (15 years or younger), as calculated from the date of birth. For additional information, refer to the *ACI-TIPI Physician's Guide*.
Sample Rate	Determines the report frequency. Options are ***500 Hz*** or ***1000 Hz***. 1000 HZ is supported only for XML output.
Page 3	
Lead Sequence	Determines the lead sequence to use. Values are: • ***Standard*** • ***Cabrera*** • ***NEHB*** • ***SEQ4*** ***SEQ4*** allows you to configure a custom 12-lead sequence using the following fields. If either ***12SL*** option (***ME12*** or ***MI12***) is activated, you must select leads I (-I), II (-II), V1, V2, V3, V4, V5, and V6 for a correct 12SL analysis.
Sequence Name	Set the display name for a custom lead sequence. Available only if ***SEQ4*** is selected for the ***Lead Sequence***.
1–12 Lead	Twelve fields that allow you to define the sequence in which the leads are displayed. Available only if ***SEQ4*** is selected for the ***Lead Sequence***.
1–12 Label	Twelve fields that allow you to define the labels that are displayed/printed for the corresponding leads. Available only if ***SEQ4*** is selected for the ***Lead Sequence***.
1–6 Rhythm Leads	Six fields that allow you to define the rhythm leads and their sequence. You can select the rhythm leads for all four lead sequences.
Page 4	
10s ECG Report Format	Determines how the 10s ECG report will print on the internal writer. If no format is selected, the report will not print.
Detailed Results Report Format	Determines how the ***Detailed Results*** report prints. If no format is selected, the report prints without the median report page.
Report Copies	Determines how many copies of the selected report print.

Field	Comment
Print Interpretation	Determines whether ECG interpretation will print on the report. Available only if the MI12 option is activated. For more information, refer to "Options Setup" on page 138.
Auto Store ECG	Determines whether the ECG will automatically be stored on the internal storage. Available only if the M100 or M300 internal storage option is activated. For more information, refer to "Options Setup" on page 138.
File Manager Sort By	Determines the field by which the ***File Manager*** will sort records in internal storage. Available only if the M100 or M300 internal storage option is activated.
Auto Transmit ECG	Determines whether the ECG is transmitted automatically to an external device. Available only if one of the communications options is activated. For more information, see "Options Setup" on page 138.
Delete after Transmission	Determines whether the ECG is deleted from internal storage after it is transmitted to an external device. Available only if one of the communications options is activated. For more information, see "Options Setup" on page 138.
Print Transmission Log	Determines whether the transmission log prints after an ECG is transmitted from ***File Manager*** to an external device. Available only if one of the communications options is activated. For more information, see "Options Setup" on page 138.
Auto-Export ECG	Exports the ECG record automatically. The values are: • ***<blank>*** (do not export) • ***Hilltop*** • ***Hilltop/XML*** • ***PDF*** Available only if LANC or WIFC options are activated.
Export Location	The location of auto-export ECG records. The values are: • ***Shared Directory*** • ***FTP Server*** Available only if LANC or WIFC option is activated.
Page 5	
Laser Printer Settings	

Field	Comment
10s ECG Report Format	Determines how the 10s ECG report prints on an external laser printer. The options are: • 4x2.5x3_25 • 4x2.5x3_25_R1 • 4x2.5x3_25_R3 • MUSE1 (Not available in Chinese Version) • MUSE2 (Not available in Chinese Version) • 1x10x12_25 • 2x5x6_25 • 2x5x6_25_Syn
Report Copies	Determines how many copies of the 10s ECG report prints on an external laster printer. Valid values range from 0 to 5.
Paper Size	Determines the page size of the report when it prints on a laser printer. Valid values are ***A4*** and ***Letter***.
Print Grids	Determines whether the grid prints on the report when printed on a laser printer.
Baseline Auto Adjust	On/Off **NOTE:** The system automatically adjusts the gain to a proper value before adjusting baseline. Available only when the ***1x10x12_25*** of ***10s ECG Report Format*** option is selected.
PDF Export Setting	
10s ECG Report Format	Determines how the 10s ECG report prints to a PDF file. The options are: • 4x2.5x3_25 • 4x2.5x3_25_R1 • 4x2.5x3_25_R3 • MUSE1 (Not available in Chinese Version) • MUSE2 (Not available in Chinese Version) • 1x10x12_25 • 2x5x6_25 • 2x5x6_25_Syn
Baseline Auto Adjust	On/Off Available only when the ***1x10x12_25*** of ***10s ECG Report Format*** option is selected.

Arrhythmia Setup

The ***Arrhythmia Setup*** function allows you to define:

- Waveform parameters
- Lead usage
- Analysis options
- Report options

To access ***Arrhythmia Setup*** from the device ***Main Menu***, press **F4** (***System Configuration***) > **F3** (***Arrhythmia Setup***).

Most of the fields on the ***Arrhythmia Setup*** windows are the same as those on ***Resting ECG Setup***. The following tables list the arrhythmia settings that are unique or differ from resting ECG. For all other fields, see "Resting ECG Setup" on page 115.

Field	Comment
Page 2	
Rhythm Printing	Determines whether the rhythm report starts automatically when recording starts.
Arrhythmia Event Printing	Selects which arrhythmia events print. Options are: • All events • Unequal events • No event printing
Episodes Printout in Summary Report	Determines how arrhythmia events print. Options are: • Chronological order • Priority order • Only episodes with ventricular events • No episodes
Page 3	
Lead Sequence	Determines the lead sequence to use. ***Arrhythmia Setup*** includes the following options in addition to the four options available in the ***Resting ECG Setup***: • ***STD_C*** • ***STD_RED*** • ***STD_LI*** • ***CABR_LI*** • ***NEHB_6*** • ***HIGH_C***

Communication Setup

The ***Communication Setup*** function allows you to define the following settings:

- Basic communication settings
- Shared directory settings (if LAN and/or WiFi options are activated)
- FTP server settings (if LAN and/or WiFi options are activated)
- Destination location settings
- Modem settings (if a modem option is activated)
- WLAN Settings (if a WiFi option is activated)
- LAN settings (if a LAN option is activated)
- DCP Settings (if LAN and/or WiFi options are activated)

To access the ***Communication Setup*** from the device ***Main Menu***, press **F4** (***System Configuration***) > **F6** (***More***) > **F1** (***Communication Setup***).

The following tables describe the settings on ***Communication Setup***.

Field	Comment
Page 1	
Default Location	Determines which of the four available communication locations is the default. The locations are defined on Page 2 of this *Communication Setup Fields* table.
Export XML	Determines whether ECG records are transmitted as XML. If this field is set, ECG records exported to an SD card are stored in both XML and Hilltop formats. If this field is not set, ECG records exported to an SD card are stored only in Hilltop format.
Serial Baud Rate	Determines the speed at which data is transmitted across the serial communications port.
Allow Export Using Shared Directory	Determines whether ECG records can be exported to a shared network drive. Available only if the ***LAN Communications to CardioSoft*** option (***LANC***) or ***WiFi Communications to CardioSoft*** option (***WIFC***) has been activated. If this field is checked, the following five fields become available (***Share Name***, ***Username***, ***Password***, ***Confirm***, and ***Domain***).
Share Name	Identifies the name of the shared network drive. It must be the share drive's name; IP addresses are not supported. This field allows a maximum of 256 characters. This field is available only if the ***Allow Export Using Shared Directory*** field is checked.

Field	Comment
Username	Identifies the user name that the system uses to log on to the shared directory. The user must be set up on the domain with the appropriate permissions to access the shared directory. This field allows a maximum of 30 characters. This field is available only if the ***Allow Export Using Shared Directory*** field is checked.
Password	Identifies the password that the system will use to log on to the shared directory. The password should contain only numeric, uppercase, and lowercase letters. This field allows a maximum of 30 characters. Available only if the ***Allow Export Using Shared Directory*** field is checked.
Confirm	Re-enter the password in this field to confirm that the password was entered correctly. This field is available only if the ***Allow Export Using Shared Directory*** field is checked.
Domain	Identifies the user's domain. This field allows a maximum of 30 characters. This field is available only if the ***Allow Export Using Shared Directory*** field is checked.
Page 2	
Allow Export Using FTP Server	Determines whether ECG records can be exported to a FTP Server. Available only if the ***LAN Communications to CardioSoft*** option (***LANC***) or ***WiFi Communications to CardioSoft*** option (***WIFC***) has been activated. If this field is checked, the following three fields become available.
Secured FTP	Determines whether to set the FTP as a secured FTP. This field is available only if the ***Allow Export Using FTP*** field is checked.
FTP Server	Identifies the FTP server and path. This field allows a maximum of 256 characters. The format is `ftp://ftp server/path`. This field is available only if the ***Allow Export Using FTP*** field is checked.
Port	Identifies the port for incoming IP connections. The port values range from 1 to 65535. This field is available only if the ***Allow Export Using FTP*** field is checked.

Field	Comment
Username	Identifies the user name the system uses to log on to the FTP server. The user must have write permission to the specific path of the FTP server. This field allows a maximum of 30 characters. This field is available only if the ***Allow Export Using FTP*** field is checked.
Password	Identifies the password the system uses to log on to the FTP server. The password should contain only numeric, uppercase, and lowercase letters. This field allows a maximum of 30 characters. This field is available only if the ***Allow Export Using FTP*** field is checked. If the FTP server supports anonymous login, both the ***username*** and ***password*** could be blank.
Test Connection	Press to test whether the system is connected to the FTP server. This field is available only if ***FTP*** is activated.
Page 3	
Location	Identifies the name of a communication location that receives the transmission from the system. You can define up to four locations.
Device	Identifies the type of device to use to transmit data to the location. Options are: • Serial • Modem • LAN Modem and LAN are available only if the corresponding option was activated. This field becomes active only after a corresponding location is entered.
Phone Number	Identifies the location's phone number. This field is available only if the selected device is ***Modem***.
Protocol	Determines the protocol to use to communicate with the device. Options are: • A5 • CSI • DCP Select CSI or DCP for MUSE connections and A5 for CardioSoft connections.
Page 4	

Field	Comment
Dialing Method	Determines whether the system uses a tone or pulse to dial.
PIN Dialing	Identifies whether a personal identification number (PIN) is required to dial out. If this field is checked, you must complete the following three fields (***Delay***, ***Service Provider Number***, and ***PIN Number***).
Delay	Determines how long, in seconds, the system should pause between dialing the ***Service Provider Number*** and the ***PIN Number*** and between dialing the ***PIN Number*** and the ***Outside Line***.
Service Provider Number	Identifies the service provider's access telephone number.
PIN Number	Identifies the personal identification number to enter.
Outside Line	Identifies any access numbers that must be dialed to reach an outside line.
Manual Dialing	Determines whether the system automatically dials. If this field is checked, the connection must be made manually. If this field is cleared, the system automatically dials and you must complete the following fields: • ***Dialing Method*** • ***Dialtone Required*** • ***PIN Dialing***
Page 5 — This page is available only if the LAN option is activated.	
Cardiograph Device Name	Identifies the name of the device on the network. By default, the value is set to ***GE_<serial number>***. A valid network device name contains between 1 and 20 alphanumeric and underscore characters. The first character must be a letter. This field is available only if a ***LAN*** option was activated.
Serial/IP Redirector Listen Port	Identifies the port where the device should listen for incoming serial/IP connections. These communications must match the values defined on the transmitting MUSE system.

Field	Comment
Obtain an IP address automatically (DHCP)	Determines whether the device automatically receives an IP address from the network. If this box is checked and LAN communication to a MUSE system is enabled, you must configure the DHCP server to reserve a static IP address for the device. Contact your network administrator for assistance. If this field is checked, the ***IP Address***, ***Netmask***, and ***Gateway*** fields are display only. If this field is cleared, you must complete those fields.
IP Address	Identifies the IP address of the device. If the ***Obtain an IP address automatically (DHCP)*** field is cleared, you must define a unique IP address.
Netmask	Identifies the netmask of the device. If the ***Obtain an IP address automatically (DHCP)*** field is cleared, you must define a netmask.
Gateway	Identifies the IP address of the gateway for the device to use. If the ***Obtain an IP address automatically (DHCP)*** field is cleared, you must enter the gateway's IP address.
Obtain DNS service address automatically (DHCP)	Determines whether the device automatically obtains a DNS (Domain Name Server) IP address. If this field is checked, the following four fields are display-only. If this field is cleared, you must define the IP address of the DNS servers to use.
Preferred DNS Server	Identifies the IP address of the primary DNS server used to resolve Internet domain names.
Alternate DNS Server	Identifies the IP address of the secondary DNS server used to resolve Internet domain names.
Preferred WINS Server	Identifies the IP address of the primary WINS server used to resolve Windows host names. You must have the correct WINS address configured if you are using a shared folder for communication.
Alternate WINS Server	Identifies the IP address of the secondary WINS server used to resolve Windows host names. You must have the correct WINS address configured if you are using a shared folder for communication.
Page 6 — This page is available only if the WiFi option is activated.	

Field	Comment
Cardiograph Device Name	Identifies the name of the device on the network. By default, the value is set to ***GE_<serial number>***. A valid network device name contains between 1 and 20 alphanumeric and underscore characters. The first character must be a letter. This field is unavailable when the LAN option is activated.
Serial/IP Redirector Listen Port	Identifies the port where the device should listen for incoming serial/IP connections. These communications must match the values defined on the transmitting MUSE system. This field is only available when the WiFi option is activated. This field is unavailable when the LAN option is activated.
Obtain an IP address automatically (DHCP)	Determines whether the device automatically receives an IP address from the network. If this box is checked and WiFi communication to a MUSE system is enabled, you must configure the DHCP server to reserve a static IP address for the MACxxxx. Contact your network administrator for assistance. If this field is checked, the ***IP Address***, ***Netmask***, and ***Gateway*** fields are display only. If this field is cleared, you must complete those fields.
IP Address	Identifies the IP address of the device. If the ***Obtain an IP address automatically (DHCP)*** field is cleared, you must define a unique IP address.
Netmask	Identifies the netmask of the device. If the ***Obtain an IP address automatically (DHCP)*** field is cleared, you must define a netmask.
Gateway	Identifies the IP address of the gateway for the device to use. If the ***Obtain an IP address automatically (DHCP)*** field is cleared, you must enter the gateway's IP address.
Obtain DNS service address automatically (DHCP)	Determines whether the MAC device automatically obtains a DNS (Domain Name Server) IP address. If this field is checked, the following four fields are display-only: ***Preferred DNS Server***, ***Alternate DNS Server***, ***Preferred WINS Server*** and ***Alternate WINS Server***. If this field is cleared, you must define the IP address of the DNS servers to use.

Field	Comment
Preferred DNS Server	Identifies the IP address of the primary DNS server used to resolve Internet domain names.
Alternate DNS Server	Identifies the IP address of the secondary DNS server used to resolve Internet domain names.
Preferred WINS Server	Identifies the IP address of the primary WINS server used to resolve Windows host names. You must have the correct WINS address configured if you are using a shared folder for communication.
Alternate WINS Server	Identifies the IP address of the secondary WINS server used to resolve Windows host names. You must have the correct WINS address configured if you are using a shared folder for communication.
Page 7 — This page is available only if the WiFi option is activated.	
Active WiFi	On/Off WiFi **NOTE:** In order to connect to WiFi, please insert the USB WiFi device after the device status indicates it is working. Otherwise, WiFi is not connected correctly.
Network name	Specifies the name of the wireless local area network (WLAN). This field allows a maximum of 30 characters. **NOTE:** When the Network name is empty, the system connects to any available network. The system uses Infrastructure Mode (Wireless access point) to provide the connection with Enterprise network or internet.
Authentication type	Specifies the authentication protocol. Options include: • Open authentication • Shared authentication • WiFi Protected Access with pre-shared key (WPA-PSK) • WiFi Protected Access 2 with pre-shared key (WPA2-PSK)

Field	Comment
Encryption type	The user net configuration determines the encryption type. Options include: • ***No*** - Select this option to use 802.1X certification without WEP Key. This option is available when the user configures access point association in Open mode or Share mode. This is a typical setting for wireless hotspots. • ***WEP*** - Select this option for data encryption through WEP Key. You may use this option in open mode association and share mode association. • ***TKIP*** - Select this option for temporal key integrity protocol. Select this option if the access point needs WPA or WPA2 association, and is configured for TKIP data encryption. • ***AES*** - Select this option to use advanced encryption standard protocol. Select this option if the access point needs WPA or WPA2 association, and is configured for AES data encryption.
Key Index	This field is only available when the encryption type is WEP. Valid values are 1–4. This field depends on the user's network configuration.
Key	ASCII or Hexadecimal characters (0-9, A-F) for encryption. This field depends on the user's network configuration.
Page 8 — This page is available only if DCP and LAN/WiFi options are both activated.	
Searching DCP Server...	Opens the ***DCP Server List*** window. The DCP servers search results will display a maximum of five records in the window. The list displayed includes: • Total DCP Servers • DCP Server name, model, and address

Field	Comment
DCP Server Address	Enter or select, the correct server address from the DCP server list. The format required is: `HTTP://IP Address:Port number/Server string`
Testing Server Connection	Tests whether the device can connect to the DCP server. One of the following test results will display: • ***Connect Successfully*** • ***Connect Failed*** **NOTE:** In order to test the DCP connection, the device must be connected to a LAN or WiFi.

Country Setup

The ***Country Setup*** function allows you to define the following:

- System language
- Date and time formats
- Measurement units
- Line filter
- Lead label

To access the ***Country Setup*** from the ***Main Menu***, press **F4** (***System Configuration***) > **F6** (***More***) > **F2** (***Country Setup***).

The following table identifies the settings on ***Country Setup***.

Field	Comments
Language	Determines the language the interface and reports use.
Date Format	Determines the format in which dates are displayed. Options are: • DD.MM.YYYY • MM/DD/YYYY • YYYY-MM-DD
Time Format	Determines whether the system uses a 12–hour or a 24–hour format.
Height/Weight Unit	Determines whether the system uses metric measurements (cm, kg) or American measurements (in, lb) for patient weight and height.

Field	Comments
Blood Pressure Unit	Determines whether blood pressure is measured in millimeters of mercury (mmHg) or kilopascals (kPa).
Line Filter	Determines the frequency of the line filter. Options are 50 Hz and 60 Hz.
Lead Label	Determines whether the system labels leads using the standards of the International Electrotechnical Commission (IEC) or the American Heart Association (AHA).

Patient Setup

The ***Patient Setup*** function allows you to define the following information:

- Available and required patient information
- Available test information
- Available clinical trial information
  This is available only if the ***CTDG CT Data Guard*** option is activated.
- Magnetic card reader
  For complete information, refer to "" on page .
- Barcode reader settings
  This is available only if the ***BCRD USB Barcode Reader*** option is activated

To access ***Patient Setup*** from the MAC system ***Main Menu***, press **F4** (***System Configuration***) > **F6** (***More***) > **F4** (***Patient Setup***).

The following tables identify the settings on ***Patient Setup***.

Field	Comment
Patient Information Setup Window	
Patient ID	Determines whether the patient ID is required. On reports, it is labelled ***ID***.
Secondary ID	Determines whether a secondary patient ID is available when entering patient data and whether it is required. It can only be required if it is first enabled. On reports, it is labelled ***ID 2***.
Last Name	Determines whether the patient's last name field is available when entering patient data and whether it is required. It can only be required if it is first enabled.
First Name	Determines whether the patient's first name field is available when entering patient data and whether it is required. It can only be required if it is first enabled.
Kanji Name	Determines whether the Kanji name field is available when entering patient data.

Field	Comment
Date of Birth	Determines whether the date of birth field is available when entering patient data.
Age	Determines whether the age field is available when entering patient data.
Height	Determines whether the height field is available when entering patient data.
Weight	Determines whether the weight field is available when entering patient data.
Gender	Determines whether the gender field is available when entering patient data.
Race	Determines whether the race field is available when entering patient data.
Phone Number	Determines whether the phone number field is available when entering patient data.
Pacemaker	Determines whether the pacemaker field is available when entering patient data.
Enable Patient ID Check	Determines whether additional checks are performed to ensure that the patient ID meets the requirements of the national patient ID used in Scandinavian countries. If this field is set, you must select the appropriate ***Patient ID Type***.
Patient ID Type	This field is available only if the ***Enable Patient ID Check*** field is set. This field determines which type of ID is used and, therefore, which checks to perform. Options are: • Swedish Patient ID • Danish Patient ID • Norwegian Patient ID When a patient ID is entered, the system verifies its format, extracts the patient's gender and date of birth, and populates those fields if they are enabled.
Patient ID Length (3-30)	Defines the maximum length of the patient ID within the range of 3 to 30 characters. This field is available only if the ***Enable Patient ID Check*** field is cleared.

Field	Comment
Leading "0"	Enable/Disable ***Leading "0"***. When the patient ID consists of numbers, the system automatically adds the Arabic numeral "0" before the IDs that do not meet the set length (the range is 3-30 according to the user). For example, the set length of the patient ID is nine numbers, but the input patient ID is 123, then the system automatically adjusts the patient ID to 000000123.
Sort Patient List by	Determines the field by which the patient list is sorted. Options are: • Patient ID • Secondary ID • Patient Name
Test Information Window	
Systolic BP	Determines whether the systolic blood pressure field is available when entering test information.
Diastolic BP	Determines whether the diastolic blood pressure field is available when entering test information.
Location	Determines whether the location field is available when entering test information.
Room	Determines whether the room field is available when entering test information.
Order Number	Determines whether the order number field is available when entering test information.
Indication	Determines whether the indication field is available when entering test information.
Ordering Physician	Determines whether the ordering physician field is available when entering test information.
Referring Physician	Determines whether the referring physician field is available when entering test information.
Attending Physician	Determines whether the attending physician field is available when entering test information.
Technician	Determines whether the technician field is available when entering test information and whether it is required. It is required only if it is enabled.
Medications (0-3)	Determines the number of medications that you can enter into the test information window.

Field	Comment
Extra Questions...	Opens the ***Extra Questions*** window, which allows you to define up to four custom fields. Each field consists of a ***Prompt*** and a ***Type***. The ***Prompt*** can be up to 10 characters. The ***Type*** can be any of the following: • Alphanumeric • Numeric • Yes/No/Unknown
Clinical Trial Setup Window	
Visit Number	Determines whether the visit number field is available when entering clinical trial information.
Visit Type	Determines whether the visit type field is available when entering clinical trial information.
Dose Type	Determines whether the Dose Type field is available when entering clinical trial information. If this field is set, use ***Dose List...*** to define the types of doses that are available when entering clinical trial information.
Investigator ID	Determines whether the investigator ID field is available when entering clinical trial information.
Extra Questions...	Opens the ***Extra Questions*** window, which allows you to define up to five custom clinical test fields. Each field consists of a ***Prompt*** and a ***Type***. The ***Prompt*** can be up to 10 characters. The ***Type*** can be any of the following: • Alphanumeric • Numeric • Yes/No/Unknown
Dose List...	Opens the ***Dose List...*** window, which allows you to define the dose types that are available when entering clinical trial information. Doses are plain text up to 32 alphanumeric characters.
Project Code and Trial ID...	Opens the ***Project Code and Trial ID...*** window. You can only input up to five groups of ***Project Code*** and ***Trial ID*** in this window.
Barcode Scanner or Magnetic Card Reader Setup	
Peripheral Device Selection	Determines whether the MAC device is connected to a magnetic card reader, an optional barcode scanner, or no peripheral device at all.

Field	Comment
Auto Configure	Automatically configures the barcode reader. When you click this link, you are prompted to scan a configuration barcode created by the site's IT department. This field is available only when the ***Barcode Scanner*** is selected in the ***Peripheral Device Selection***.
Total number of bytes	Identifies the total number of bytes on the barcode or magnetic strip.
Offset	Identifies the position of the initial character of the corresponding field.
Length	Identifies the number of characters for the corresponding field.

User Setup

The ***User Setup*** function allows you to define the following:

- User names
- User identification
- User roles
- User privileges

Users entered in setup can be selected for system defaults and patient information. If ***High Security Mode*** is enabled, anyone who uses the system must be set up as a user with a user ID, a password, and privileges to log on to the system. For more information on setting system defaults and enabling ***High Security Mode***, see "Basic Setup" on page 111.

To access ***User Setup*** from the ***Main Menu***, press **F4** (***System Configuration***) > **F6** (***More***) > **F5** (***User Setup***).

When you run ***User Setup***, the ***Edit User Lists*** window opens to offer four choices:

- Ordering Physicians
- Referring Physicians
- Attending Physicians
- Technicians

When you select one of these roles, a list of existing users with that role opens. You can now add, edit, and delete users.

The following table identifies the settings on ***User Setup***.

Field	Comment
Last Name	Identifies the user's surname. This field is required and allows a maximum of 30 alphanumeric characters.
First Name	Identifies the user's given name. This field is optional, but if used, allows a maximum of 20 alphanumeric characters.
User ID	Defines a unique ID for the user. If ***High Security Mode*** is enabled, the user needs to enter this ID to log on to the system. This field is required and allows a maximum of 30 alphanumeric characters.
MUSE ID	Defines the ID with which the user logs on to the MUSE system. This field is used if reports from this system are transmitted to a MUSE system.
Ordering	Determines whether the user fills the role of ordering physician. If this is the role that was selected on the ***Edit User List*** window, this field is checked by default. You may select multiple roles, but you must select at least one role.
Referring	Determines whether the user fills the role of referring physician. If this is the role that was selected on the ***Edit User List*** window, this field is checked by default. You may select multiple roles, but you must select at least one role.
Attending	Determines whether the user fills the role of attending physician. If this is the role that was selected on the ***Edit User List*** window, this field is checked by default. You may select multiple roles, but you must select at least one role.
Technician	Determines whether the user fills the role of technician. If this is the role that was selected on the ***Edit User List*** window, this field is checked by default. You may select multiple roles, but you must select at least one role.
Password	Defines the password the user must enter along with the ***User ID*** to log on to the system if ***High Security Mode*** is enabled. This field must be between 6 and 30 alphanumeric characters.
Retype Password	Confirms the password was entered correctly.
Edit Setup	Enables/disables the user's ability to edit system setup information.

Field	Comment
Edit Date and Time	Enables/disables the user's ability to edit system date and time.
Edit Users	Enables/disables the user's ability to edit user information.
Edit Record	Enables/disables the user's ability to edit ECG records.
Delete Record	Enables/disables the user's ability to delete ECG records.
Transmit Records	Enables/disables the user's ability to transmit ECG records.

Options Setup

The ***Options Setup*** function allows you to activate options by entering ***Option Codes***, which are generated for a specific serial number and can only activate options on the device with that serial number.

All purchased options are activated when the system ships. If you purchase a new option or re-activate an option, use the following instructions:

1. From the ***Main Menu***, press **F4** (***System Configuration***) > **F6** (***More***) > **F6** (***More***) > **F4** (***Options Setup***).
2. Press the center key on the **trimpad** to enter.

   You can find activation codes for purchased options on the ***Active Code Summary Sheet*** provided with the system or with additional purchased options.
3. Press **Enter**.

   The ***Option Activated*** message is displayed at the bottom of the window.
4. Repeat step 2 through step 3 for any additional options you want to activate.
5. Press ***Save*** to save the configuration options.

The following table identifies the available options. You are given an activation code for each purchased option.

Code	Item Number	Name
CTDG	2037986–001	CT Data Guard
R12L	2037986–002	12–Lead display for Resting ECG. This is always active.
ME12	2037986–003	12SL Measurement
MI12	2037986–004	12SL Measurement and Interpretation
M100	2037986–005	Storage for 100 ECGs
M300	2037986–015	Storage for 300 ECGs
LANC	2037986–006	LAN Communication to the CardioSoft system
LANM	2037986–007	LAN Communication to the MUSE system
WIFC	2037986–024	WiFi Communication to CardioSoft

Code	Item Number	Name
WIFM	2037986–025	WiFi Communication to MUSE
MODC	2037986–008	Modem or serial communication to the CardioSoft system
MODM	2037986–009	Modem or serial communication to the MUSE system
CFRA	2037986–010	21 CFR Part 11 Audit Trail
BCRD	2037986–011	USB Barcode Reader
TIPI	2037986–012	ACI-TIPI
RRAN	2037986–013	RR Analysis
PDFC	2037986–014	PDF Export
LPRT	2037986–023	Laser Print

Service Setup

The ***Service Setup*** option allows service personnel to configure the following:

- ***Device settings***
- ***Event log***
- ***System diagnostics***

Refer to the *MAC 800 Service Manual* for details.

Date/Time Setup

The ***Date/Time Setup*** function allows you to configure the system's date and time settings.

To access ***Date/Time Setup*** from the ***Main Menu***, press **F4** (***System Configuration***) > **F6** (***More***) > **F6** (***More***) > **F6** (***More***) > **F1** (***Date/Time Setup***).

The following table identifies the settings on ***Date/Time Setup***.

Field	Comment
Date	Sets the current system date. The format of the fields depends on the date format selected on ***Country Setup***. For more information, see "Country Setup" on page 131.
Time	Sets the current system time. If the ***Automatically Synchronize with Time Server*** field is set on ***Basic Setup***, any changes made to the time are overwritten during the next synchronization. For more information, see "Basic Setup" on page 111.

Field	Comment
Time Zone	Identifies the time zone in which the device is located. This field is available only if ***Automatically synchronize with Time Server*** is enabled in ***Basic Setup***. See "Basic Setup" on page 111.
Adjust clock for daylight savings time	Determines whether the system automatically adjusts the system time for daylight savings time. This field is available only if ***Automatically synchronize with Time Server*** is enabled in ***Basic Setup***. For more information, see "Basic Setup" on page 111.

Order Manager Setup

To configure the system's ***Order Manager***, from Main Menu, press **F4** (***System Configuration***) > **F6** (***More***) > **F6** (***More***) > **F6** (***More***) > **F2** (***Order Manager Setup***), and complete the fields described in the following table.

Field	Comment
Initial sort value	Determines how the ***Order Manager*** initially sorts the ECGs. Select one of the following values: • ***Patient name*** • ***Patient ID*** • ***Location*** • ***Time*** • ***Stat***
Auto order delete	Determines whether the system will automatically delete orders under the following conditions: • the orders have been successfully transmitted to a receiving device, and • the associated ECGs have been transmitted and deleted. This field is NOT dependent on the ***Delete after transmit*** field on the ***Basic Setup*** window. Both fields operate independently.
Default order locations	Identifies the locations displayed on the prompt when downloading orders. This will typically be the device's location (see "Basic Setup" on page 111). If the device is used in multiple locations, enter multiple locations and separate them with commas: 1,3,10, and so on.

Setup Utilities

The setup utilities available in ***System Configuration*** allow you to print, switch, export, and import system settings and export the audit trail.

Print Setup Report

The ***Print Setup Report*** utility prints a report of individual settings or the complete system settings. You may use the report to verify that all of your devices are configured identically or as a reference if you need to re-configure a device.

Use the following instructions to print a setup report:

1. From the ***Main Menu***, press **F5** (***System Configuration***) > **F6** (***More***) > **F3** (***Print Setup Report***).
2. On the ***Print Setup Report*** window, select the report you want to print.
   - ***Basic Setup***
   - ***Resting Setup***
   - ***RR Analysis Setup***
   - ***Arrhythmia Setup***
   - ***Communication Setup***
   - ***Country Setup***
   - ***Patient Setup***
   - ***User Setup***
   - ***Options Setup***
   - ***Order Manager Setup***
   - ***Complete Setup***
3. When you are done, press **F6** (***Return***) to return to the ***System Configuration***.

Select Setup

The ***Select Setup*** utility allows you to save up to five system configurations and switch between them. This is useful if the system is shared by departments or used in multiple clinical trials.

Use the following instructions to save and load configuration files:

1. From the ***Main Menu***, press **F4** (***System Configuration***) > **F6** (***More***) > **F6** (***More***) > **F1** (***Select Setup***).

   The ***Select Setup*** window opens. The name of the setup the system is using currently is displayed in the ***Loaded Setup*** field.
2. To save a copy of the current setup, do the following:
   a. Press **F3** (Save As).

      The ***Setup Name*** window opens.

   b. Type a name for the configuration and press **F6** (***Save***).

      The configuration is saved, and the ***Setup Name*** window closes.

3. To load a different setup, do the following:
   a. Select the setup you want to load.
   b. Press **F1** (***Load Setup***).
   c. Restart the system.

      You must power the device off and then on for all setup changes to take effect, especially if the new setup includes a change to the language setting; the language does not change until the system restarts.
4. To delete a setup file, do the following:
   a. Select the file you want to delete.
   b. Press **F2** (***Delete***).

      You are prompted to confirm the deletion.
   c. Press **F6** (***Ok***).

      NOTE:
      You cannot delete a configuration that is currently loaded.
5. To change the name of a system setup file, do the following:
   a. Select the setup file you want to change.
   b. Press **F4** (***Edit Name***).

      The ***Setup Name*** window opens.
   c. Type the new name and press **F6** (***Save***).
6. To remove all custom settings, do the following:
   a. Select the setup file you want to reset.
   b. Press **F5** (***Factory Defaults***).
   c. When prompted to confirm, press **F6** (***Yes***).
7. When you are done, press **F6** (***Return***) to exit.

Export Setup

The ***Export Setup*** utility allows you to export saved settings from the device to an SD card. You can then use the SD card to import the settings to another device, greatly simplifying the installation and configuration of multiple devices.

1. Insert the SD card.
2. From the ***Main Menu***, press **F4** (***System Configuration***) > **F6** (***More***) > **F6** (***More***) > **F3** (***Export Setup***).

   The ***Select Setup for Export*** window opens. All saved settings on the device are listed in the left column. All saved settings on the SD card are listed in the right column.
3. In the left pane, select the setup file you want to export.
4. Press **F1** (***Export***).

   The selected file is copied to the SD card and is displayed in the right column.

5. Repeat step 3 through step 4 for each saved configuration file you want to export.
6. When you are done, press **F6** (***Return***).

Import Setup

The ***Import Setup*** utility allows you to import up to five system setup files from another device that were exported to an SD card. This feature is useful to sites with multiple systems that need to have the same or similar setups.

1. Insert the SD card with the saved setup file.
2. From the ***Main Menu***, press **F4** (***System Configuration***) > **F6** (***More***) > **F6** (***More***) > **F2** (***Import***).

   The ***Select Setup for Import*** window opens. All saved settings on the device are listed in the left column. All saved settings on the SD card are listed in the right column.
3. In the right pane, select the setup file you want to import.
4. Press **F1** (***Import***).

   The selected file is copied to the device and is displayed in the left column.
5. Repeat step 3 through step 4 for each saved configuration file you want to import.
6. When you are done, press **F6** (***Return***).

Exporting Audit Trail

The ***Export Audit*** function copies the system audit trail in XML format to an SD card. The Audit Trail tracks the creation, transmission, and deletion of records, changes to the system setup, and tracks the ID of the users who made each change.

Audit trail log files are saved to the ***audittrail*** directory on the SD card. Their filenames are in the format `audittrail_x.log`, where x is a number. When a log file is saved to the SD card, the system determines whether the card already contains an audit trail log file and names the new file accordingly. For example, if the card does not contain a log file, the new file is named `audittrail_0.log`; subsequent files are increments of 1: `audittrail_1.log`, `audittrail_2.log`, `audittrail_3.log`, and so on.

After the log file is exported to the SD card, it is cleared from the MAC system.

GE Healthcare recommends exporting the audit trail weekly to long term storage to meet archive requirements. If the audit trail is not exported regularly, it consumes storage space and reduces the number of ECGs that you can store on the system.

To export an audit trail, the following conditions must be met:

- ***High Security Mode*** must be enabled.
  See "Basic Setup" on page 111.
- ***Audit Trail*** must be enabled.
  See "Basic Setup" on page 111.
- The user must have the ***Edit Setup*** and ***Delete Records*** permissions set.

See "User Setup" on page 136.

1. Insert an SD card into the device.
2. On the ***Main Menu***, press **F4** (***System Configuration***) > **F6** (***More***) > **F6** (***More***) > **F6** (***More***) > **F4**(***Export Audit***).

After the XML file is exported, you can review or print the audit trail as needed. For more information on how to parse the XML file for viewing or printing, refer to the ***GE Cardiology Open XML manual***.

A

Product Specifications

Specifications

Instrument Type

Microprocessor augmented automatic electrocardiograph; 10-leadwire, 12 lead simultaneous acquisition with programmable lead configuration.	
Processing	
ECG Interpretation	Marquette 12SL ECG Analysis Program
Computerized measurements	12-lead analysis
ECG analysis frequency	500 or 1000 samples/second (sps)
Digital sampling rate	1,000 samples/second (sps)
Acquisition mode	Pre-Acquisition or Post-Acquisition, provide 10 seconds of instantaneous ECG acquisition
Dynamic range	AC Differential ± 10 mV, DC offset ±300 mV
Resolution	4.88 µV/LSB
Frequency response	0.04 to 150 Hz
Common mode rejection	> 90 dB
Input impedance	> 10 MΩ @ 10 Hz, defibrillator protected
Patient leakage	< 10 µA
Pace detection	Pulsed with amplitude between +/-5 mV and +/-700 mV and duration between 0.1 ms and 2.2 ms duration shall be detected
Special acquisition functions	Hookup advisor, provides visual indication of signal quality
Heart rate meter	30 to 300 BPM ±10% or 5 BPM, whichever is greater. Heart rates outside this range will not be displayed.
Operating System	Microsoft Windows CE OS
Start up time	< 15 seconds

Software Standard

Resting ECG Mode	Records and prints 12 lead resting ECGs with 10 seconds duration as a standard feature
Arrhythmia Mode	Continuously monitors ECG and prints report when arrhythmia events of the user-selected class occur
Hookup Advisor	Provides visual indication of signal quality
Multi-language support	Support localized language requirements for 186 countries/regions

Software Options

Measurement	Supports Measurement with Marquette 12SL ECG Analysis Program
Interpretation and Measurement	Supports Measurement and Interpretation with Marquette 12SL ECG Analysis Program
ACI-TIPI	Provides numeric score of probability of acute cardiac ischemia
RR Analysis	Up to 5 minutes or 500 beats
Internal and External Storage	Provides File Manager menu to support 100 or 300 ECGs storage in internal memory, 100 or 200 ECGs in Secure Digital card
PDF output	Supports exported ECG in PDF format
12-lead display	Supports 12 leads resting waveform display
Clinical Trials Data Guard	Supports Clinical Trials data object which is used in Pharma
Order download from MUSE	Supports downloading the orders from MUSE system into MAC 800
21 CFR	Supports 21 CFR Part 11 audit documentation for pharmaceutical drug trials

Communication

MAC 800 to MUSE Cardiology Information System (Optional)	
Internal Modem	Inbound and Outbound
RS232 Port	Outbound
LAN Port	Inbound and Outbound
Secure Digital card	Outbound
Wireless LAN	Inbound and Outbound
MAC 800 to Cardiosoft (Optional)	
Modem	Outbound
RS232 Port	Outbound
LAN Port	Outbound
Secure Digital Card	Outbound
Wireless LAN	Outbound

Report Format

Thermal printer (Z-fold)	• 4x2.5x3_25 • 4x2.5x3_25_R1 • 4x2.5x3_50 • 4x2.5x3_50_R1 • 4x5x3_25 • 4x5x3_50 • 4x10x3_25 • 4x10x3_50 • 2x5x6_25 • 2x5x6_50 • 2x10x6_25 • 2x10x6_50 • 4x2.5x3_25_R2_P (with Pharma object) • 4x2.5x3_25_R3_P (with Pharma object) • Median_25 • Median_50
Laser printer (A4/Standard letter)	• 4x2.5x3_25 • 4x2.5x3_25_R1 • 4x2.5x3_25_R3 • MUSE1 (with Pharma object) • MUSE2 (with Pharma object) • 1x10x12_25 • 2x5x6_25 • 2x5x6_25_Syn

Display

Display type	7" color TFT
Display resolution	800 x 480 pixels
Display data	Heart rate, patient ID, clock, battery power indicator, waveforms, lead labels, speed, gain and filter settings, warning messages and prompts. 6 leads standard display. Optional 12 lead display.

Writer

Writer technology	Thermal dot-matrix
Writer speed	5, 25 and 50 mm/s
Number of traces	Up to 6 ECG traces
Writer sensitivity/gain	2.5, 5, 10, 20 and 40 mm/mV and automatic

Writer (cont'd.)

Speed accuracy	±5%
Amplitude accuracy	±5%
Writer resolution	1000 dots/in at 25 mm/sec horizontal, 200 dots/in vertical
Paper type	Thermal. Z-fold (140 mm×110 mm)

Keyboard

Type	T9 SMS style keyboard integrated with sealed rubber Membrane, withstand hospital grade cleaning agents, dedicated quick access function keys

External Peripherals

Keyboard	Standard USB Keyboard
Barcode Reader	IT4600G
Magnetic Carder Reader	ISO 7810, 7811-1, -2, -3, -4, -5
Laser Printer	Support HP laser printer that support HP PCL 5e or compatible
USB Wireless Module	Specific USB wireless module
Wireless Bridge	Silex Wireless Bridge GEH-BR-4600WAN2

Accessories

IEC/AHA lead wire and electrode adaptor sets (user selectable)
10-lead patient cable (user selectable replaceable leads or fixed leads cables)
NEHB patient cable (user selectable)
10-lead KISS patient cable (user selectable replaceable or fixed leads cables). To be powered by external KISS pump (purchased separately)
Electrodes (disposable or reusable, user selectable)
Country-specific power cords
Z-fold Paper
Electrode Cream 250ML/TUBE (Except US)

Safety and Regulatory

IEC 60601-1: 1988 +Amd-1: 1991, +Amd-2: 1995 General Requirements for Basic Safety and Essential Performance
UL 60601-1:2003(C 2006) Medical Electrical Equipment, part 1: General Requirements for Safety
CAN/USA C22.2 No.601.1-M90 (Update No.2, 11/2003)
GB 9706.1-2007 Medical electrical equipment - part 1: General requirements for safety
IEC 60601-1-1: 2000 Medical Electrical Equipment: General Requirements for Safety Collateral Standard: Safety Requirements for Medical Electrical Systems

Safety and Regulatory (cont'd.)

IEC 60601-1-4: 2000 General requirements for safety - Collateral Standard: Programmable electrical medical systems
IEC 60601-1-6: 2006 General Requirements for Safety and essential performance Collateral Standard - Usability
EN 62366:2008 (IEC 62366:2007): Medical devices – Application of usability engineering to medical
EN 62304:2006 (IEC 62304:2006): Medical device software - Software life-cycle processes
IEC 60601-2-25: 1993 +Amd-1: 1999 Safety of Electrocardiographs
IEC 60601-2-51: 2003 Safety and performance of ECG recorders
GB10793-2000 Medical electrical equipment - part 2: Particular requirements for the safety of electrocardiographs.
ANSI/AAMI EC11: 1991/ (R2007): Diagnostic Electrocardiographic Devices
ANSI/AAMI EC13 2002 (R 2007): Cardiac Monitors, Heart Rate Meters, and Alarms (On screen heart rate meter, clause 4.2.7 only)
ANSI/AAMI EC57: 1998/(R2008): Testing and Reporting Performance Results of Cardiac Rhythm and ST-segment Measurement Algorithms (All clauses except 4.3.3.2, 4.3.3.3 and 4.6)
YY1139-2000 Single and multichannel electrocardiograph
EN 1041:2008 Information supplied by manufacturer with medical devices
EN 980:2008 Symbols for use in the labeling of medical devices
80/181/EEC (Metric SI Units): Council Directive 80/181/EEC of 20 December 1979 on the approximation of the laws of the Member States relating to units of measurement and on the repeal of Directive 71/354/EEC
IEC 60601-1-2: 2007 General Requirements for Safety - Collateral Standard: Electromagnetic Compatibility- Requirements and Tests
EN 55011:2007/A2:2007 Industrial, scientific and medical (ISM) radio-frequency Equipment - Electromagnetic disturbance characteristics - Limits and methods of measurement
The device shall meet the requirements for group1, class B accordingto EN55011
WEEE Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment
GB 18455-2001: Packaging Recycling Mark

Electrical

Power Supply	Internal AC/DC or battery operation
AC/DC operation specifications	
Input voltage	100 to 240 VAC ±10 %
Power Input	80 VA
Input Frequency	50 to 60 Hz, +5%, -6%
Battery specifications	
Battery type	Replaceable and rechargeable, 7.2V@ 4.5 AH +/- 10%, rechargeable Lithium-Ion

Electrical (cont'd.)

Battery capacity	1000 single page reports or 2 Hours continuous display (without printing), at a minimum
Battery charge time	Approximately 4 hours from total discharge (standby mode)

Physical Specification

Height	120 mm
Width	330 mm
Depth	280 mm
Weight	3.0 kg including battery, without paper

Environmental Specification

Temperature	
Operating	+5ºC to +40ºC
Transport/storage	-30ºC to +60ºC
Humidity	
Operating	25% to 95% (non-condensing)
Transport/storage	10% to 95% (non-condensing)
Pressure	
Operating	700 to 1060 hPA
Transport/storage	500 to 1060 hPA

Silex Wireless Bridge

Manufacturer/Model	GEH-BR-4600WAN2-01-XX
Physical Requirements	• Dimension: 110.5 × 79.0 × 27.6 (mm) • Weight: 130 (g)
Interface Requirements	• Ethernet Port: 10M/100 Mbps BASE-T, support Auto MDIX • Power Connector: 5.5 (outer)/2.1 (Inner) mm Diameter • Indication: LED indication for Power, Wireless connection, Data communication
Power Requirements	• Nominal Input Power: 5V • Input Current: 750 mA

Wireless Requirements	• Wireless LAN Protocol: IEEE 802.11a/b/g/n • Wireless LAN Channel: IEEE 802.11b/g: Ch1~CH13 • Encryption: WEP (64/128), WPA-PSK (TKIP/AES), WPA2-PSK (AES) • IEEE802.1X enterprise authentication: EAP-PEAP, EAP-TLS, EAP-TTLS, EAP-FAST, EAP-LEAP
Frequency Band	• 2.4 GHz • 5 GHz
Environmental Requirements	• Operating Temperature: 0 ~ 40 °C • Operating Relative humidity: 20 ~ 80% • Operating barometric pressures: 700 ~ 1060 hPa (Altitude range: 3010.9 to -381.9 meters) • Non-Operating Temperature: -10 ~ +50 °C • Non-Operating Relative humidity: 20% ~ 90% • Non-Operating barometric pressures: 500 ~ 1060 hPa (Altitude range: 5570 to -380 meters)
Accessories	• LAN Cable: Length 250 mm, RJ45 *2 connector • USB Power Cable: Length 260 mm, Type A Plug, Right angle USB connector, Right angle DC connector, Wire size 24 AWG
Certification Requirements	• CE certification • FCC/IC cetification • This product complies with the following Regulatory requirements for Australia, New Zealand, and Singapore. • EMC Directive: EN55032 Class B, EN55024, EN301489-1/-17 v1.8.1 • RE Directive: EN 300-328 v2.1.1, EN 301-893 v1.8.5 (EN 301-893 v1.8.1 (Adaptivity), EN 301-893 v2.1.0 (Receiver Blocking)), EN 60950-1, EN 62311, EN301-489-1 v2.1.1, EN301-489-17 v3.1.1 • This product is compliant with the EU's RoHS directive (2011/65/EU or newer) • This product is compliant with the EU's WEEE directive (2002/96/EC)

B

WiFi Country List

Countries apply their own regulations to both the allowable channels, allowed users and maximum power levels within these frequency ranges.

American		Europe		Asia/Middle East	
Country	**Channel #**	**Country**	**Channel #**	**Country**	**Channel #**
Canada	11	Austria	13	China	13
USA	11	UK	13	India	13
Brazil	11	Germany	13	Thailand	13
Argentina	13	Czech	13	UAE	13
Chile	11	Poland	13	Indonesia	13
Mexico	11	Belgium	13	Korea	13
Panama	11	Denmark	13	Kuwait	13
		Finland	13	Singapore	13
		France	13	Vietnam	13
		Greece	13	Japan	1–13 for b/g 14 for b
		Ireland	13	Malaysia	
		Italy	13		
		Luxembourg	13	**Oceania**	
		Netherlands	13	Australia	13
		Portugal	13	New Zealand	13
		Spain	13		
		Sweden	13	**Africa**	
		Cyprus	13	South Africa	13
		Estonia	13		
		Hungary	13	**Asia**	
		Latvia	13	Taiwan	11
		Lithuania	13		

		Malta	13		
		Slovakia	13		
		Slovenia	13		
		Russia	13		
		Belarus	13		
		Romania	13		
		Switzerland	13		
		Liechtenstein	13		
		Turkey	13		
		Iceland	13		
		Norway	13		

C

Electromagnetic Compatibility (EMC)

The information in this section is based on current OEM information at the time of publication. GE Healthcare is not responsible for changes to information by OEM.

Changes or modifications to this system not expressly approved by GE Healthcare could cause EMC issues with this or other equipment. This system is designed and tested to comply with applicable regulations regarding EMC, and must be installed and put into service according to the EMC information stated in this section.

WARNING:

EQUIPMENT MALFUNCTION Use of portable phones or other radio frequency (RF) emitting equipment near the system may cause unexpected or adverse operation.

Do not use portable phones or other electronic equipment that may emit radio frequency (RF) near this system.

WARNING:

EQUIPMENT MALFUNCTION Do not use the equipment or system adjacent to, or stacked with, other equipment.

If adjacent or stacked use is necessary, test the equipment or system to verify normal operation in the configuration in which you are using it.

Guidance and Manufacturer's Declaration—Electromagnetic Emissions

The system described in this manual is intended for use in the following specified electromagnetic environment. It is the responsibility of the customer or user to ensure that this system is used in such an environment.

EMC Emissions Test

Emissions Test	Compliance	Electromagnetic Environment–Guidance
RF emissions (Radiated)	Group 1	This device uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions (Conducted)	Class B	Class B equipment is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class B	
Voltage fluctuations/ Flicker emissions	Complies	

Guidance and Manufacturer's Declaration—Electromagnetic Immunity

The system described in this manual is intended for use in the following specified electromagnetic environment. It is the responsibility of the customer or user to ensure that this system is used in such an environment.

EMC Immunity Test

Immunity Test	Compliance	Electromagnetic Environment–Guidance
Electrostatic discharge (ESD) IEC 61000-4-2	• ± 6 kV contact • ± 8 kV air	Floors should be wood, concrete, or ceramic tile. If the floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical Fast Transient/burst (EFT) IEC 61000-4-4	± 2 kV for power supply lines	Mains power should be that of a typical commercial or hospital environment.
Fast Transient Surge (FTS) IEC 61000-4-5	• ± 1 kV differential mode • ± 2 kV common mode	Mains power should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions, and voltage variations on power supply input lines IEC 61000-4-11	• <5% Ut (>95% dip in Ut) for 0.5 cycles • 40% Ut (60% dip in Ut) for 5 cycles • 70% Ut (30% dip in Ut) for 25 cycles • <5% Ut (>95% dip in Ut) for 5 sec	Mains power should be that of a typical commercial or hospital environment. If the user requires continued system operation during power mains interruptions, it is recommended that the system is powered from an applicably rated uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field EC 61000-4-8	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE U_t is the AC mains voltage prior to application of the test level.		

Guidance and Manufacturer's Declaration—Electromagnetic Immunity

The system described in this manual is intended for use in the following specified electromagnetic environment. It is the responsibility of the customer or user to ensure that this system is used in such an environment.

EMC Immunity Test

Immunity Test	Compliance Test Level	Compliance Level	Electromagnetic Environment–Guidance
			Do not use portable or mobile RF communications equipment closer to any part of the system, including the cables, than the recommended separation distance calculated for the equation applicable to the frequency of the transmitter.
Conducted RF IEC 61000-4-6	3 Vrms 150 KHz to 80 MHz	3 Vrms	Recommended separation distance: d (meters) = 3.5/V1 x √P

EMC Immunity Test (cont'd.)

Immunity Test	Compliance Test Level	Compliance Level	Electromagnetic Environment–Guidance
Radiated RF IEC 61000-4-3	3 Vrms 80 MHz to 2.5 GHz	3 Vrms	Recommended separation distance: $d = 3.5/E1 \times \sqrt{P}$ for 80 MHz to 800 MHz $d = 7/E1 \times \sqrt{P}$ for 800 MHz to 2.5 GHz where *P* is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer, and *d* is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey: [a]should be less than the compliance level in each frequency range [b]Interference may occur in the vicinity of equipment marked with the following symbol: 

NOTE:

- At 80 MHz and 800 MHz, the higher frequency range applies.
- These guidelines may not apply in all situations. Electromagnetic propagation is affected by the reflection from structures, objects, and people.
- [a]Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radio, AM and FM radio broadcast, and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, consider conducting an electromagnetic site survey. If the measured field strength in the location in which the system is used exceeds the applicable RF compliance level listed in this table, observe the system to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the system.
- Over the frequency range 150 KHz to 80 MHz, field strengths should be less than 3 V/m.

Recommended Separation Distances

The following table provides the recommended separation distances (in meters) between portable and mobile RF communication equipment and the system described in this manual.

The system is intended for use in the electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the system can help prevent electromagnetic interference by maintaining the following recommended minimum distance between portable and mobile RF communications equipment (transmitters) and the system, according to the maximum output power of the communications equipment.

Recommended Separation Distances

Rated maximum output power of transmitter W	Separation distance (meters) according to frequency of transmitter					
	150 kHz to 80 MHz d (meters) = 3.5/V1 x √P d (meters) for V1 = 3 Vrms		80 MHz to 800 MHz d = 3.5/E1 x √P d for E1 = 3 V/m		800 MHz to 2.5 GHz d = 7/E1 x √P d for E1 = 3 V/m	
	meters	feet	meters	feet	meters	feet
0.01	0.117	0.383	0.117	0.383	0.233	0.766
0.1	0.369	1.210	0.369	1.210	0.738	2.421
1	1.167	3.828	1.167	3.828	2.333	7.655
10	3.689	12.104	3.689	12.104	7.379	24.208
100	11.667	38.276	11.667	38.276	23.333	76.552

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in metres (m) can be determined using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

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