

# Voluson E-Series BT15

## Service Manual

English (English)

- Voluson E6 / Voluson E8 / Voluson E10 with Software version EC300, 15.x.x (BT15)



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# Chapter 1

## Introduction

*This chapter describes important issues related to safely servicing the Voluson E-Series (Voluson E6, Voluson E8 and/or Voluson E10) ultrasound system. The service provider must read and understand all the information presented in this manual before installing or servicing this system.*

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### Note

*Under consideration of general maintenance requirements a minimum lifetime of 7 years for the equipment and 5 years for the probes may be expected. To maintain the safety and performance of the ultrasound system, a regular check (once per year) by authorized personnel is recommended.*

## 1.1 Important Precautions

### Translation Policy

**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.

**AVERTISSEMENT**  
(FR)

CE MANUEL DE MAINTENANCE N'EST DISPONIBLE QU'EN ANGLAIS.

- CE MANUEL DE MAINTENANCE N'EST DISPONIBLE QU'EN ANGLAIS. •SI LE TECHNICIEN DU CLIENT A BESOIN DE CE MANUEL DANS UNE AUTRE LANGUE QUE L'ANGLAIS, C'EST AU CLIENT QU'IL INCOMBE DE LE FAIRE TRADUIRE.
- NE PAS TENTER D'INTERVENTION SUR LES ÉQUIPEMENTS TANT QUE LE MANUEL SERVICE N'A PAS ÉTÉ CONSULTÉ ET COMPRIS.
- LE NON-RESPECT DE CET AVERTISSEMENT PEUT ENTRAÎNER CHEZ LE TECHNICIEN, L'OPÉRATEUR OU LE PATIENT DES BLESSURES DUES À DES DANGERS ÉLECTRIQUES, MÉCANIQUES OU AUTRES.

**WARNUNG**  
(DE)

DIESES KUNDENDIENST-HANDBUCH EXISTIERT NUR IN ENGLISCHER SPRACHE.

- FALLS EIN FREMDER KUNDENDIENST EINE ANDERE SPRACHE BENÖTIGT, IST ES AUFGABE DES KUNDEN FÜR EINE ENTSPRECHENDE ÜBERSETZUNG ZU SORGEN.
- VERSUCHEN SIE NICHT, DAS GERÄT ZU REPARIEREN, BEVOR DIESES KUNDENDIENST-HANDBUCH NICHT ZU RATE GEZOGEN UND VERSTANDEN WURDE.
- WIRD DIESE WARNUNG NICHT BEACHTET, SO KANN ES ZU VERLETZUNGEN DES KUNDENDIENSTTECHNIKERS, DES BEDIENERS ODER DES PATIENTEN DURCH ELEKTRISCHE SCHLÄGE, MECHANISCHE ODER SONSTIGE GEFAHREN KOMMEN.

**AVISO**  
(ES)

ESTE MANUAL DE SERVICIO SÓLO EXISTE EN INGLÉS.

- SI ALGÚN PROVEEDOR DE SERVICIOS AJENO A GEHC SOLICITA UN IDIOMA QUE NO SEA EL INGLÉS, ES RESPONSABILIDAD DEL CLIENTE OFRECER UN SERVICIO DE TRADUCCIÓN.
- 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.

**ATENÇÃO**  
(PT-Br)

ESTE MANUAL DE ASSISTÊNCIA TÉCNICA SÓ SE ENCONTRA DISPONÍVEL EM INGLÊS.

- SE QUALQUER OUTRO SERVIÇO DE ASSISTÊNCIA TÉCNICA, QUE NÃO A GEHC, SOLICITAR ESTES MANUAIS NOUTRO IDIOMA, É DA RESPONSABILIDADE DO CLIENTE FORNECER OS SERVIÇOS DE TRADUÇÃO.
- NÃO TENHA TENTAR REPARAR O EQUIPAMENTO SEM TER CONSULTADO E COMPREENDIDO ESTE MANUAL DE ASSISTÊNCIA TÉCNICA.
- O NÃO CUMPRIMENTO DESTA AVISO PODE POR EM PERIGO A SEGURANÇA DO TÉCNICO, OPERADOR OU PACIENTE DEVIDO A CHOQUES ELÉTRICOS, MECÂNICOS OU OUTROS.

**AVISO**  
(PT-pt)

ESTE MANUAL DE ASSISTÊNCIA ESTÁ DISPONÍVEL APENAS EM INGLÊS.

- SE QUALQUER OUTRO SERVIÇO DE ASSISTÊNCIA TÉCNICA, QUE NÃO A GEHC, SOLICITAR ESTES MANUAIS NOUTRO IDIOMA, É DA RESPONSABILIDADE DO CLIENTE FORNECER OS SERVIÇOS DE TRADUÇÃO.
- NÃO TENHA EFECTUAR REPARAÇÕES NO EQUIPAMENTO SEM TER CONSULTADO E COMPREENDIDO PREVIAMENTE ESTE MANUAL.
- A INOBSERVÂNCIA DESTA AVISO PODE RESULTAR EM FERIMENTOS NO TÉCNICO DE ASSISTÊNCIA, OPERADOR OU PACIENTE EM CONSEQUÊNCIA DE CHOQUE ELÉCTRICO, PERIGOS DE ORIGEM MECÂNICA, BEM COMO DE OUTROS TIPOS.

**AVVERTENZA**  
(IT)

IL PRESENTE MANUALE DI MANUTENZIONE È DISPONIBILE SOLTANTO IN INGLESE.

- SE UN ADDETTO ALLA MANUTENZIONE ESTERNO ALLA GEHC 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.
- NON TENERE CONTO 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.

**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 ELEKTRILÕÕGI, MEHAANILISE VÕI MUU OHU TAGAJÄRJEL.

**VAROITUS**  
(FI)

TÄMÄ HUOLTO-OHJE ON SAATAVILLA VAIN ENGLANNIKSI.

- JOS ASIAKKAAN PALVELUNTARJOAJA 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 PALVELUNTARJOAJAN, LAITTEISTON KÄYTTÄJÄN TAI POTILAAN VAHINGOITTUMINEN SÄHKÖISKUN, MEKAANISEN VIAN TAI MUUN VAARATILANTEEN VUOKSI.

**ΠΡΟΕΙΔΟΠΟΙΗΣΗ**  
(EL)

ΤΟ ΠΑΡΟΝ ΕΓΧΕΙΡΙΔΙΟ ΣΕΡΒΙΣ ΔΙΑΤΙΘΕΤΑΙ ΣΤΑ ΑΓΓΛΙΚΑ ΜΟΝΟ.

- ΕΑΝ ΤΟ ΑΤΟΜΟ ΠΑΡΟΧΗΣ ΣΕΡΒΙΣ ΕΝΟΣ ΠΕΛΑΤΗ ΑΠΑΙΤΕΙ ΤΟ ΠΑΡΟΝ ΕΓΧΕΙΡΙΔΙΟ ΣΕ ΓΛΩΣΣΑ ΕΚΤΟΣ ΤΩΝ ΑΓΓΛΙΚΩΝ, ΑΠΟΤΕΛΕΙ ΕΥΘΥΝΗ ΤΟΥ ΠΕΛΑΤΗ ΝΑ ΠΑΡΕΧΕΙ ΥΠΗΡΕΣΙΕΣ ΜΕΤΑΦΡΑΣΗΣ.
- ΜΗΝ ΕΠΙΧΕΙΡΗΣΕΤΕ ΤΗΝ ΕΚΤΕΛΕΣΗ ΕΡΓΑΣΙΩΝ ΣΕΡΒΙΣ ΣΤΟΝ ΕΞΟΠΛΙΣΜΟ ΕΚΤΟΣ ΕΑΝ ΕΧΕΤΕ ΣΥΜΒΟΥΛΕΥΤΕΙ ΚΑΙ ΕΧΕΤΕ ΚΑΤΑΝΟΗΣΕΙ ΤΟ ΠΑΡΟΝ ΕΓΧΕΙΡΙΔΙΟ ΣΕΡΒΙΣ.
- ΕΑΝ ΔΕ ΛΑΒΕΤΕ ΥΠΟΨΗ ΤΗΝ ΠΡΟΕΙΔΟΠΟΙΗΣΗ ΑΥΤΗ, ΕΝΔΕΧΕΤΑΙ ΝΑ ΠΡΟΚΛΗΘΕΙ ΤΡΑΥΜΑΤΙΣΜΟΣ ΣΤΟ ΑΤΟΜΟ ΠΑΡΟΧΗΣ ΣΕΡΒΙΣ, ΣΤΟ ΧΕΙΡΙΣΤΗ Ή ΣΤΟΝ ΑΣΘΕΝΗ ΑΠΟ ΗΛΕΚΤΡΟΠΛΗΞΙΑ, ΜΗΧΑΝΙΚΟΥΣ Ή ΑΛΛΟΥΣ ΚΙΝΔΥΝΟΥΣ.

**FIGYELMEZTETÉS**  
(HU)

EZEN KARBANTARTÁSI KÉZIKÖNYV KIZÁRÓLAG ANGOL NYELVEN ÉRHETŐ EL.

- HA A VEVŐ SZOLGÁLTATÓJA ANGOLTÓL ELTÉRŐ NYELVRE TART IGÉNYT, AKKOR A VEVŐ FELELŐSSÉGE A FORDÍTÁS ELKÉSZÍTÉSÉRE.
- NE PRÓBÁLJA ELKEZDENI HASZNÁLNI A BERENDEZÉST, AMÍG A KARBANTARTÁSI KÉZIKÖNYVBEN LEÍRTAKAT NEM ÉRTELMEZTÉK.
- EZEN FIGYELMEZTETÉS FIGYELMEN KÍVÜL HAGYÁSA A SZOLGÁLTATÓ, MŰKÖDTETŐ VAGY A BETEG ÁRAMÚTÉS, MECHANIKAI VAGY EGYÉB VESZÉLYHELYZET MIATTI SÉRÜLÉSÉT EREDMÉNYEZHETI.

**VIÐVÖRUN**  
(IS)

ÞESSI ÞJÓNUSTUHANDBÓK ER EINGÖNGU FÁANLEG Á ENSKU.

- EF ÞJÓNUSTUAÐILI VIÐSKIPTAMANNS ÞARFNAST ANNARS TUNGUMÁLS EN ENSKU, ER ÞAÐ Á ÁBYRGÐ VIÐSKIPTAMANNS AÐ ÚTVEGA ÞÝÐINGU.
- REYNIÐ EKKI AÐ ÞJÓNUSTA TÆKIÐ NEMA EFTIR AÐ HAFA SKOÐAÐ OG SKILIÐ ÞESSA ÞJÓNUSTUHANDBÓK.
- EF EKKI ER FARIÐ AÐ ÞESSARI VIÐVÖRUN GETUR ÞAÐ VALDIÐ MEIÐSLUM ÞJÓNUSTUVEITANDA, STJÓRNANDA EÐA SJÚKLINGS VEGNA RAFLOSTS, VÉLRÆNNAR EÐA ANNARRAR HÆTTU.

**VÝSTRAHA**  
(CS)

TENTO SERVISNÍ NÁVOD EXISTUJE POUZE VANGLICKÉM JAZYCE.

- VPŘÍPADĚ, ŽE POSKYTOVATEL SLUŽEB ZÁKAZNÍKŮM POTŘEBUJE NÁVOD V JINÉM JAZYCE, JE ZAJIŠTĚNÍ PŘEKLADU DO ODPOVÍDAJÍCÍHO JAZYKA ÚKOLEM ZÁKAZNÍKA.
- NEPROVÁDĚJTE ÚDRŽBU TOHOTO ZAŘÍZENÍ, ANIŽ BYSTE SI PŘEČETLI TENTO SERVISNÍ NÁVOD A POCHOPILI JEHO OBSAH.
- VPŘÍPADĚ NEDODRŽOVÁNÍ TÉTO VÝSTRAHY MŮŽE DOJÍT ÚRAZU ELEKTRICKÁM PROUDEM PRACOVNÍKA POSKYTOVATELE SLUŽEB, OBSLUŽNÉHO PERSONÁLU NEBO PACIENTŮ V LIVEM ELEKTRICKÉHO Proudu, RESPEKTIVE V LIVEM K RIZIKU MECHANICKÉHO POŠKOZENÍ NEBO JINÉMU RIZIKU.

**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 MEDMINDREDENNE SERVICEMANUAL ER BLEVET LÆST OG 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 ONDERHOUDSHANDLEIDING IS ENKEL IN HET ENGELS VERKRIJGBAAR.

- ALS HET ONDERHOUDSPERSONEEL EEN ANDERE TAAL VEREIST, DAN IS DE KLANT VERANTWOORDELIJK VOOR DE VERTALING ERVAN.
- PROBEER DE APPARATUUR NIET TE ONDERHOUDEN VOORDAT DEZE ONDERHOUDSHANDLEIDING WERD GERAADPLEEGD EN BEGREPEN IS.
- INDIEN DEZE WAARSCHUWING NIET WORDT OPGEVOLGD, ZOU HET ONDERHOUDSPERSONEEL, DE OPERATOR OF EEN PATIËNT GEWOND KUNNEN RAKEN ALS GEVOLG VAN EEN ELEKTRISCHE SCHOK MECHANISCHE OF ANDERE GEVAREN.

**BRĪDINĀJUMS  
(LV)**

ŠĪ APKALPES ROKASGRĀMATA IR PIEEJAMA TIKAI ANĢĻU VALODĀ.

- JA KLIENTA APKALPES SNIEDZĒJAM NEPIECIEŠAMA INFORMĀCIJA CITĀ VALODĀ, NEVIS ANĢĻU, KLIENTA PIENĀKUMS IR NODROŠINĀT TULKOŠANU.
- NEVEICIET APRĪKOJUMA APKALPI BEZ APKALPES ROKASGRĀMATAS IZLASĪŠANAS UN SAPRAŠANAS.
- ŠĪ BRĪDINĀJUMA NEIEVĒROŠANA VAR RADĪT ELEKTRISKĀS STRĀVAS TRIECIENA, MEHĀNISKU VAI CITU RISKU IZRAISĪTU TRAUMU APKALPES SNIEDZĒJAM, OPERATORAM VAI PACIENTAM.

**ĮSPĖJIMAS  
(LT)**

ŠIS EKSPLOATAVIMO VADOVAS YRA IŠLEISTAS TIK ANGLŲ KALBA.

- JEI KLIENTO PASLAUGŲ TEIKĖJUI REIKIA VADOVO KITA KALBA – NE ANGLŲ, VERTIMU PASIRŪPINTI TURI KLIENTAS.
- NEMĖGINKITE ATLIKTI ĮRANGOS TECHNINĖS PRIEŽIŪROS DARBŲ, NEBENT VADOVAUTUMĖTĖS ŠIUO EKSPLOATAVIMO VADOVU IR JĮ SUPRASTUMĖTE
- NEPAISANT ŠIO PERSPĖJIMO, PASLAUGŲ TEIKĖJAS, OPERATORIUS AR PACIENTAS GALI BŪTI SUŽEISTAS DĖL ELEKTROS SMŪGIO, MECHANINIŲ AR KITŲ PAVOJŲ.

**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 JEDYNIJE WJĘZYKU ANGIELSKIM.

- JEŚLI FIRMA ŚWIADCZĄCA KLIENTOWI USŁUGI SERWISOWE WYMAGA UDOSTĘPNIENIA PODRĘCZNIKA W JĘZYKU INNYM NIŻ ANGIELSKI, OBOWIĄZEK ZAPEWNIENIA STOSOWNEGO TŁUMACZENIA SPOCZYWA NA KLIENCIE.
- NIE PRÓBOWAĆ SERWISOWAĆ NINIEJSZEGO SPRZĘTU BEZ UPZEDNIEGO ZAPOZNANIA SIĘ Z PODRĘCZNIKIEM SERWISOWYM.
- NIEZASTOSOWANIE SIĘ DO TEGO OSTRZEŻENIA MOŻE GROZIĆ OBRAŻENIAMI CIAŁA SERWISANTA, OPERATORA LUB PACJENTA W WYNIKU PORAŻENIA PRĄDEM, URAZU MECHANICZNEGO LUB INNEGO RODZAJU ZAGROŻEŃ.

**ATENȚIE  
(RO)**

ACEST MANUAL DE SERVICE ESTE DISPONIBIL NUMAI ÎN LIMBA ENGLEZĂ.

- DACĂ UN FURNIZOR DE SERVICII PENTRU CLIEȚII NECESITĂ O ALTĂ LIMBĂ DECÂT CEA ENGLEZĂ, ESTE DE DATORIA CLIENTULUI SĂ FURNIZEZE O TRADUCERE.
- NU ÎNCERCAȚI SĂ REPARAȚI ECHIPAMENTUL DECÂT ULTERIOR CONSULTĂRII ȘI 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.

**ОСТОРОЖНО!**  
(RU)

ДАННОЕ РУКОВОДСТВО ПО ОБСЛУЖИВАНИЮ ПРЕДОСТАВЛЯЕТСЯ ТОЛЬКО НА АНГЛИЙСКОМ ЯЗЫКЕ.

- ЕСЛИ СЕРВИСНОМУ ПЕРСОНАЛУ КЛИЕНТА НЕОБХОДИМО РУКОВОДСТВО НЕ НА АНГЛИЙСКОМ ЯЗЫКЕ, КЛИЕНТУ СЛЕДУЕТ САМОСТОЯТЕЛЬНО ОБЕСПЕЧИТЬ ПЕРЕВОД.
- ПЕРЕД ОБСЛУЖИВАНИЕМ ОБОРУДОВАНИЯ ОБЯЗАТЕЛЬНО ОБРАТИТЕСЬ К ДАННОМУ РУКОВОДСТВУ И ПОЙМИТЕ ИЗЛОЖЕННЫЕ В НЕМ СВЕДЕНИЯ.
- НЕСОБЛЮДЕНИЕ УКАЗАННЫХ ТРЕБОВАНИЙ МОЖЕТ ПРИВЕСТИ К ТОМУ, ЧТО СПЕЦИАЛИСТ ПО ТЕХОБСЛУЖИВАНИЮ, ОПЕРАТОР ИЛИ ПАЦИЕНТ ПОЛУЧАТ УДАР ЭЛЕКТРИЧЕСКИМ ТОКОМ, МЕХАНИЧЕСКУЮ ТРАВМУ ИЛИ ДРУГОЕ ПОВРЕЖДЕНИЕ.

**ПРЕДУПРЕЖДЕНИЕ**  
(BG)

ТОВА СЕРВИЗНО РЪКОВОДСТВО Е НАЛИЧНО САМО НА АНГЛИЙСКИ ЕЗИК.

- АКО ДОСТАВЧИКЪТ НА СЕРВИЗНИ УСЛУГИ НА КЛИЕНТ СЕ НУЖДАЕ ОТ ЕЗИК, РАЗЛИЧЕН ОТ АНГЛИЙСКИ, ЗАДЪЛЖЕНИЕ НА КЛИЕНТА Е ДА ПРЕДОСТАВИ ПРЕВОДАЧЕСКА УСЛУГА.
- НЕ СЕ ОПИТВАЙТЕ ДА ИЗВЪРШВАТЕ СЕРВИЗНО ОБСЛУЖВАНЕ НА ТОВА ОБОРУДВАНЕ, ОСВЕН ВСЛУЧАЙ, ЧЕ СЕРВИЗНОТО РЪКОВОДСТВО Е ПРОЧЕТЕНО И СЕ РАЗБИРА.
- НЕСПАЗВАНЕТО НА ТОВА ПРЕДУПРЕЖДЕНИЕ МОЖЕ ДА ДОВЕДЕ ДО НАРАНЯВАНЕ НА ДОСТАВЧИКА НА СЕРВИЗНИ УСЛУГИ, НА ОПЕРАТОРА ИЛИ ПАЦИЕНТА ВСЛЕДСТВИЕНА ТОКОВ УДАР, МЕХАНИЧНИ ИЛИ ДРУГИ РИСКОВЕ.

**UPOZORENJE**  
(SR)

OVAJ PRIRUČNIK ZA SERVISIRANJE DOSTUPAN JE SAMO NA ENGLJESKOM JEZIKU.

- АКО КЛИЈЕНТОВ СЕРВИСЕР ЗАХТЕВА ЈЕЗИК КОЈИ НИЈЕ ЕНГЛЕСКИ, ОДГОВОРНОСТ ЈЕ НА КЛИЈЕНТУ ДА ПРУЖИ УСЛУГЕ ПРЕВОЂЕНЈА.
- НЕМОЈТЕ ПОКУШАВАТИ ДА СЕРВИСИРАТЕ ОПРЕМУ АКО НИСТЕ ПРОЉИТАЛИ И РАЗУМЕЛИ ПРИРУЉНИК ЗА СЕРВИСИРАЊЕ.
- АКО НЕ ПОШТУЈЕТЕ ОВО УПОЗОРЕЊЕ, МОЖЕ ДОЉИ ДО ПОВРЕЂИВАЊА СЕРВИСЕРА, ОПЕРАТЕРА ИЛИ ПАЦИЈЕНТА УЗРОКОВАНОГ ЕЛЕКТРИЉНИМ УДАРОМ, МЕХАНИЉКИМ И ДРУГИМ ОПАСНОСТИМА.

**OPOZORILO**  
(SL)

ТА СЕРВИСНИ ПРИРОЉНИК ЈЕ НА ВОЛЈО САМО В АНГЛЕШЉИНИ.

- ЉЕ ПОНУДНИК СЕРВИСНИХ СТОРИТЕВ ЗА СТРАНКО ПОТРЕБУЈЕ НАВОДИЛА В ДРУГЕМ ЈЕЗИКУ, ЈЕ ЗА ПРЕВОД ОДГОВОРНА СТРАНКА САМА.
- НЕ ПОСКУШАЈТЕ СЕРВИСИРАТИ ОПРЕМЕ, НЕ ДА БИ ПРЕЈ ПРЕБРАЛИ И РАЗУМЕЛИ СЕРВИСНИ ПРИРОЉНИК.
- ЉЕ ТЕГА ОПОЗОРИЛА НЕ УПОШТЕВАТЕ, ОБСТАЈА НЕВАРНОСТ ЕЛЕКТРИЉНЕГА УДАРА, МЕХАНСКИХ АЛИ ДРУГИХ НЕВАРНОСТИ И ПОСЛЕДИЉНИХ ПОШКОДБ ПОНУДНИКА СЕРВИСНИХ СТОРИТЕВ, УПОРАБНИКА ОПРЕМЕ АЛИ ПАЦИЕНТА.

**UPOZORENJE**  
(HR)

OVAJ SERVISNI PRIRUČNIK DOSTUPAN JE SAMO NA ENGLJESKOM JEZIKU.

- АКО КЛИЈЕНТОВ СЕРВИСЕР ЗАХТИЈЕВА ЈЕЗИК КОЈИ НИЈЕ ЕНГЛЕСКИ, ОДГОВОРНОСТ КЛИЈЕНТА ЈЕ ПРУЖИТИ УСЛУГЕ ПРЕВОЂЕНЈА.
- НЕМОЈТЕ ПОКУШАВАТИ СЕРВИСИРАТИ ОПРЕМУ АКО НИСТЕ ПРОЉИТАЛИ И РАЗУМЈЕЛИ СЕРВИСНИ ПРИРУЉНИК.
- АКО НЕ ПОШТУЈЕТЕ ОВО УПОЗОРЕЊЕ, МОЖЕ ДОЉИ ДО ОЗЛЈЕДЕ СЕРВИСЕРА, ОПЕРАТЕРА ИЛИ ПАЦИЈЕНТА ПРОУЗРОЉЕНЕ СТРУЈНИМ УДАРОМ, МЕХАНИЉКИМ И ДРУГИМ ОПАСНОСТИМА.

**UPOZORNENIE**  
(SK)

TÁTO SERVISNÁ PRÍRUČKA JE K DISPOZÍCIИ LEN V ANGLIЉTINE.

- АК ЗАКАЗЊИКОВ ПОСКЫТОВАТЕЉ СЛУЖИЕВ ВЪЖАДУЈЕ ИЊÝ ЈАЗЫК АКО АНГЛИЉТИЊУ, ПОСКЫТЊУТИЕ ПРЕКЛАДАТЕЉСЉЫХ СЛУЖИЕВ ЈЕ ЗОДПОВЕДНОСЉОУ ЗАКАЗЊИКА.
- НЕПОКЉШАЈТЕ СА ВЫКОНÁВАЉ СЕРВИС ЗАРИАДЕНА СКЉР, АКО СИ НЕПРЕЉИТАТЕ СЕРВИСЊУ ПРИРУЉКУ А НЕПОРОЗУМИЕТЕ ЈЕЈ.
- ЗАНЕДБАЊЕ ТОНТО УПОЗОРЊЕНА МОЖЕ ВЫЉСТИЉ ДО ЗРАНЕНА ПОСКЫТОВАТЕЉА СЛУЖИЕВ, ОБСЛУНУЈЉУЉЕЈ ОСОБЫ АЛЕБО ПАЦИЕНТА ЕЛЕКТРИЉЫМ ПРЉДОМ, ПРИПАДНЕ ДО МЕХАНИЉКЉЕНО АЛЕБО ИЊЕНО НЕБЕЗПЕЉЕНСТВА.

**VARNING**  
(SV)

DEN HÁR SERVICEHANDBOKEN FINNS BARA TILLGÁNGLIG PÁ ENGELSKA.

- ОМ ЕН КУЊДС СЕРВИСЕТЕКНИКЕР HAR BEHOV AV ETT ANNAT SPRÁK ÁN ENGELSKA ANSVARAR KUNDEN FÖR ATT TILLHANDAHÁLLA ÖVERSÁTTNINGSTJÁNSTER.
- FÖRSÖK INTE UTFÖRA SERVICE PÁ UTRUSTNINGEN OM DU INTE HAR LÁST OCH FÖRSTÁR DEN HÁR SERVICEHANDBOKEN.
- ОМ DU INTE TAR HÁNSYN TILL DEN HÁR VARNINGEN KAN DET RESULTERA I SKADOR PÁ SERVICETEKNIKERN, OPERATÖREN ELLER PATIENTEN TILL FÖLJD AV ELEKTRISKA STÖTAR, MEKANISKA FAROR ELLER ANDRA FAROR.

**DİKKAT**  
(TR)

BU SERVİS KILAVUZU YALNIZCA İNGİLİZCE OLARAK SAĞLANMIŞTIR.

- EĞER MÜŞTERİ TEKNİSYENİ KILAVUZUN İNGİLİZCE DIŞINDAKİ BİR DİLDE OLMASINI İSTERSE, KILAVUZU TERCÜME ETTİRMEK MÜŞTERİNİN SORUMLULUĞUNDADIR.
- SERVİS KILAVUZUNU OKUYUP ANLAMADAN EKİPMANLARA MÜDAHALE ETMEYİNİZ.
- BU UYARININ GÖZ ARDI EDİLMESİ, ELEKTRİK ÇARILMASI YA DA MEKANİK VEYA DİĞER TÜRDE KAZALAR SONUCUNDA TEKNİSYENİN, OPERATÖRÜN YA DA HASTANIN YARALANMASINA YOL AÇABİLİR.

**警告**  
(JA)

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**警告**  
(繁體中文)  
Traditional Chinese

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(ZH-CN)

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**경고**  
(KO)

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All packages should be closely examined at time of delivery. If damage is apparent write "Damage In Shipment" on ALL copies of the freight or express bill BEFORE delivery is accepted or "signed for" by a GE representative or hospital receiving agent. Whether noted or concealed, damage MUST be reported to the carrier immediately upon discovery, or in any event, within 14 days after receipt, and the contents and containers held for inspection by the carrier. A transportation company will not pay a claim for damage if an inspection is not requested within this 14 day period.

**Certified electrical contractor statement - For USA only**

All electrical Installations that are preliminary to positioning of the equipment at the site prepared for the equipment shall be performed by licensed electrical contractors. Other connections between pieces of electrical equipment, calibrations and testing shall be performed by qualified GE personnel. In performing all electrical work on these products, GE will use its own specially trained field engineers. All of GE's electrical work on these products will comply with the requirements of the applicable electrical codes.

The purchaser of GE equipment shall only utilize qualified personnel (i.e., GE's field engineers, personnel of third-party service companies with equivalent training, or licensed electricians) to perform electrical servicing on the equipment.

## Omissions & errors

If there are any omissions, errors or suggestions for improving this documentation, please contact the GE Healthcare Austria GmbH & Co OG Service Documentation group with specific information listing the system type, manual title, part number, revision number, page number and suggestion details.

Mail the information to: GE Healthcare Austria GmbH & Co OG  
Tiefenbach 15  
A-4871 Zipf Austria - Europe  
Attn.: " Service Documentation"

GE employees should use TrackWise to report service documentation issues. These issues will then be in the internal problem reporting tool and communicated to the writer.

## Service safety considerations



### Danger

**Dangerous voltages, capable of causing death are present in this system. Use extreme caution when handling, testing and adjusting.**

---



### Warning

Use all Personal Protection Equipment (PPE) such as gloves, safety shoes, safety glasses, and kneeling pad, to reduce the risk of injury.

---

## 1.2 Legal Notes

The contents of this publication may not be copied or duplicated in any form, in whole or in part, without prior written permission of General Electric.

GE Healthcare Austria GmbH & Co OG may revise this publication from time to time without written notice.

### Trademarks

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## 1.3 Purpose of this Service Manual

This Service Manual is valid for Voluson E-Series (Voluson E6, Voluson E8 and/or Voluson E10) ultrasound systems.

**Note** *The Voluson E6 is a "feature-reduced" version of the Voluson E8 ultrasound system. That means not all options are available on the Voluson E6 (marked with an asterisk \* in sections of this manual).*

The service manual is divided into 10 chapters. In the beginning of the manual, before chapter 1, you will find the revision overview and the Table of Contents (TOC).

The language policy for GE's service documentation, the omission & errors and the legal information are included in the beginning of this chapter (chapter 1).

Table 1-1 Contents in this service manual

Chapter Number and Title	Description
<i>Chapter 1 – Introduction</i>	Contains a content summary and warnings.
<i>Chapter 2 – Site Preparation</i>	Contains pre-installation requirements.
<i>Chapter 3 – Setup Instructions</i>	Contains setup and installation procedures.
<i>Chapter 4 – Functional Checks</i>	Contains functional checks that are recommended as part of the installation, or as required during servicing and periodic maintenance.
<i>Chapter 5 – Components and Functions (Theory)</i>	Contains block diagrams and functional explanations of the electronics.
<i>Chapter 6 – Service Adjustments</i>	Contains instructions on how to make available adjustments.
<i>Chapter 7 – Diagnostics/Troubleshooting</i>	Provides procedures for running diagnostic or related routines.
<i>Chapter 8 – Replacement Procedures</i>	Provides disassembly procedures and reassembly procedures for all Field Replaceable Units (FRU) and Customer Replaceable Units (CRU).
<i>Chapter 9 – Renewal Parts</i>	Contains a complete list of field replaceable parts.
<i>Chapter 10 – Care &amp; Maintenance</i>	Provides periodic maintenance procedures.

### 1.3.1 Typical Users of the "Basic" Service Manual

- GE service personnel (setup, maintenance, etc.)
- Hospital's service personnel
- Architectural planners/installation planners (Some parts of Chapter 2 - Site Preparation)



## 1.3.2 Models covered by this Manual

Table 1-2 Voluson E6 - model designations

Part Number	Description	BT version
H48691RL	Voluson E6	BT15
H48691XH	Voluson E6 incl. CW	BT15

Table 1-3 Voluson E8 - model designations

Part Number	Description	BT version
H48691RM	Voluson E8	BT15
H48691XJ	Voluson E8 incl. CW	BT15

Table 1-4 Voluson E10 - model designations

Part Number	Description	BT version
H48691RN	Voluson E10	BT15
H48691XK	Voluson E10 incl. CW	BT15

## 1.3.3 System History - Hardware and Software Versions

This manual applies to:

- Voluson E6 systems with Serial Number E00001 - (BT15)
- Voluson E6 systems with Software version EC300, Ext.x, 15.x.x (BT15)
- Voluson E8 systems with Serial Number E30001 - (BT15)
- Voluson E8 systems with Software version EC300, Ext.x, 15.x.x (BT15)
- Voluson E10 systems with Serial Number E60001 - (BT15)
- Voluson E10 systems with Software version EC300, Ext.x, 15.x.x (BT15)

### 1.3.3.1 How to identify the Systems

Housing, Console and Monitor are the same. Logos on the Console and on the Monitor screen identify the 3 models Voluson E6, Voluson E8 or Voluson E10.

## 1.3.4 Purpose of Operator Manual(s)

The operator manuals should be fully read and understood before operating the Voluson E-Series system and also kept near the system for quick reference.

The online versions of the operator manual is available via the Help function (**F1** key) on Voluson E-Series control console.

The translated online user manuals are available on a CD ROM delivered with the system. They are also available on the Common Documentation Library (CDL) for downloading.

## 1.4 Important Conventions

### 1.4.1 Conventions used in this Manual

#### **MODEL DESIGNATIONS**

This manual covers the Voluson E-Series ultrasound units listed in *Models covered by this Manual*.

#### **ICONS**

Pictures, or icons, are used wherever they reinforce the printed message. The icons, labels and conventions used on the product and in the service information are described in this chapter.

#### **SAFETY PRECAUTION MESSAGES**

Various levels of safety precaution messages may be found on the equipment and in the service information. The different levels of concern are identified by a flag word that precedes the precautionary message. Known or potential hazards to personnel are labeled in one of following ways:

- **Danger**
- **Warning**
- **Caution**

### 1.4.2 Standard Hazard Icons

Important information will usually be preceded by the exclamation point (!) contained within a triangle, as seen throughout this chapter. In addition to text, several different graphical icons (symbols) may be used to make you aware of specific types of hazards that could cause harm. Even if a symbol isn't used in this manual, it is included for your reference.



#### **Danger**

Indicates the presence of a hazard that will cause severe personal injury or death if the instructions are ignored.

---



#### **Warning**

Indicates the presence of a hazard that can cause severe personal injury and property damage if instructions are ignored.

---



#### **Caution**

Indicates the presence of a hazard that will or can cause minor personal injury and property damage if instructions are ignored. Equipment damage possible.

---



#### **Electric Hazard**

Indicates the risk of injury from electric hazards.

---



#### **Bio Hazard**

Indicates the risk of disease transmission or infections.

---



#### **Explosion Hazard**

Indicates the risk of injury from explosion hazards.

---



#### **Moving Hazard**

Indicates the risk of injury from moving or tipping hazards.

---



#### **Mechanical Hazard**

Indicates the risk of injury from mechanical/pinch hazards.

---



#### **Acoustic Output Hazard**

Indicates the risk of injury from acoustic output hazards.

---



**Laser Radiation Hazard**  
Indicates the risk of injury from laser radiation.



**Non-ionizing Hazard**  
Indicates the risk of injury from non-ionizing radiation.

**Operating LED**  
Indicates the risk of injury from light beams entering the eye. Do not stare into the light beam of the LED.



**Electrostatic Discharge (ESD) Hazard**  
Describes precautions necessary to avoid static electricity that will or can damage integrated circuits.



This icon is used when options or features are specific for BT-Software versions.



This icon is used for special hints, or tips that may facilitate servicing a Voluson E-Series system.

#### Note

*Notes are used to provide important information about an item or a procedure.  
Be sure to read the notes; the information contained in a note can often save you time or effort.*

#### Standard icons that indicate that a special procedure is to be used

Other icons make you aware of specific procedures that should be followed.

Table 1-5 Standard icons that indicates that a special procedure is to be used

Avoid Static Electricity	Tag and Lock Out	Wear Eye Protection	Wear Hand Protection	Wear Foot Protection

### 1.4.3 Product Labels and Icons












The following table describes the purpose and location of labels, safety icons and other important information provided on the equipment.













#### Note

*For description of all symbols and labels used in combination with this Voluson E-Series ultrasound system, refer to Chapter 2 in the Basic User Manual.*

Table 1-6 Product Labels and Icons

LABEL/SYMBOL	PURPOSE/MEANING	LOCATION
Identification and Rating Plate	Manufacturer's name and address Model and Serial numbers Electrical ratings	rear side of the system on plug of each probe
	Manufacturer's name and address	Identification and Rating Plate (rear side of the system / on plug of each probe)
	Date of manufacture	Identification and Rating Plate (rear side of the system / on plug of each probe)

LABEL/SYMBOL	PURPOSE/MEANING	LOCATION
	Serial number	Identification and Rating Plate (rear side of the system / on plug of each probe)
	Catalog or model number	Identification and Rating Plate (rear side of the system / on plug of each probe)
Device Listing / Certification Labels	Laboratory logo or labels denoting conformance with industry safety standards such as UL or IEC.	rear side of the system
	CE Conformity mark according to Medical Device Directive 93/42/EEC. <b>0123</b> : Identification number of notified body TÜV Süd Product Service.	Identification and Rating Plate (rear side of the system / on plug of each probe)
	“Tested and production monitored by TÜV Product Service NRTL with respect to ELECTRICAL SHOCK, FIRE and MECHANICAL HAZARDS only in accordance with UL2601-1 and CAN/CSA C22.2 NO.601.1.”	Identification and Rating Plate (rear side of the system)
Type/Class Label	Used to indicate the degree of safety or protection.	
IP Code (IPX 0) IP Code (IPX 1) IP Code (IPX 7)	degree of protection provided by enclosure per IEC 60529: IPX 0 - no protection against ingress of water IPX 1 - protected against dripping water IPX 7 - protected against the effects of immersion	various
	Equipment Type BF (man in box, symbol IEC 60878-5333) indicates B Type equipment having even more electrical isolation than standard Type B equipment because it is intended for intimate patient contact.	Identification and Rating Plate (rear side of the system / on plug of each probe)
	Defibrillator-proof Type CF equipment (heart in box with “electrodes”, symbol IEC 60878-5336) identifies a defibrillation-proof type CF applied part complying with IEC 60601-1.	front side of the ECG-preamplifier
"DANGER - Risk of explosion used in ..."	The system is not designed for use with flammable anesthetic gases.	Indicated in the Service Manual.
	This precaution is intended to prevent injury that may result if one person attempt to move the system considerable distances or on an incline due to the weight of the system.	Used in the Service and User Manual which should be adjacent to equipment at all times for quick reference.
	Pushing prohibited. Do not lean on the system. Tipping danger. Take special care when moving the system.	various
	Loading prohibited. Do not put any items on this shelf. Danger of breaking. Also items might be crushed when lowering the user interface.	at top cover of the system
	“ATTENTION” - Read and understand all instructions for use” This symbol advises the reader to consult the accompanying documents (operator manual or other instructions).	rear side of the system
	Waste Electrical and Electronic Equipment (WEEE) Disposal. This symbol indicates that waste electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of your equipment.	Identification and Rating Plate (rear side of the system / on plug of each probe)

LABEL/SYMBOL	PURPOSE/MEANING	LOCATION
	This product consists of devices that may contain mercury, which must be recycled or disposed of in accordance with local, state, or country laws. (Within this system, the backlight lamps in the monitor and the Touch Panel display, contain mercury.)	Identification and Rating Plate (rear side of the system) not visible: - below the cover on read side of Monitor - on rear side of the Touch Panel
	This symbol indicates that in the United States of America, federal law restricts this device to sale by or on the order of a physician.	Identification and Rating Plate (rear side of the system)
	GOST-R label (Russia Regulatory Country Clearance)	Identification and Rating Plate (rear side of the system)
	"CAUTION - Consult accompanying documents" This symbol is used to advise the reader to consult the accompanying documents for important safety-related information such as warnings and pre-cautions that cannot be presented on the device itself.	various
	"CAUTION - Dangerous electric voltage" (lightning flash with arrowhead) is used to indicate electric shock hazards. Unplug the main plug before opening the system!	various
	"Mains OFF" Indicates the power off position of the mains power switch.	rear of system at mains switch (on power supply RSP)
	"On/Off" or "Standby" <b>CAUTION: System shutdown using this button DOES NOT disconnect the Voluson E-Series from mains voltage!</b>	<b>ON/OFF</b> Standby button on control console
	"Mains ON" Indicates the power on position of the mains power switch.	rear of system at mains switch (on power supply RSP)
	"Protective Earth" Indicates the protective earth (grounding) terminal.	rear of system at mains switch (on power supply RSP)
	"Equipotential" Indicates the terminal to be used for connecting equipotential conductors when interconnecting (grounding) with other equipment.	rear of system at mains switch (on power supply RSP)
	This symbol indicates that the device is equipped with hardware for using Continuous Wave Doppler.	rear side of the system
	These symbols indicate that at least one of the six hazardous substances of the China RoHS Labeling Standard is above the RoHS limitation. The number inside the circle is referred to as the Environmental Friendly Use Period (EFUP). It indicates the number of years that the product, under normal use, will remain harmless to health of humans or the environment. EFUP = 10 for Short Use Products EFUP = 20 for Medium Use Products	rear side of the system on the plug of each probe

## 1.5 Safety Considerations

### 1.5.1 Introduction

The following safety precautions must be observed during all phases of operation, service and repair of this equipment. Failure to comply with these precautions or with specific warnings elsewhere in this manual, violates safety standards of design, manufacture and intended use of the equipment.

### 1.5.2 Human Safety

- Operating personnel must not remove the system covers.
- Servicing should be performed by authorized personnel only.

Only personnel who have participated a Voluson E-Series training are authorized to service the equipment.



**Danger**  
Dangerous voltages, capable of causing death are present in this system. Use extreme caution when handling, testing and adjusting.

---



**Warning**  
Do not operate the system in an explosive atmosphere. Operation of any electrical equipment in such an environment constitutes a definite safety hazard.

---



**Warning**  
Because of the limited access to cabinets and equipment in the field, placing people in awkward positions, GE has limited the lifting weight for one person in the field to 16 KG (35 LBS). Anything over 16 KG (35 LBS) requires 2 people.

---



**Warning**  
If the covers are removed from an operating Voluson E-Series, some metal surfaces may be warm enough to pose a potential heat hazard if touched, even while in shutdown mode.

---



**Warning**  
Do not substitute parts or modify the system. Because of the danger of introducing additional hazards, ONLY install GE Healthcare Austria GmbH & Co OG approved parts. DO NOT perform any unauthorized modification of the system.

---



**Warning:** Risk of electrical shock

Beware that the main power supply, extended power shutdown and BackEnd processor may be energized even if the power is turned off when the cord is still plugged into the AC outlet.

- Ensure that the system is turned off and disconnected from power source.
  - Wait for at least 20 seconds for capacitors to discharge as there are no test points to verify isolation. The amber light on the control console **ON/OFF** button will turn off.
- 



**Warning**  
Use extreme caution as long as the Voluson E-Series is un-stable, not resting on all four caster wheels.

---



**Warning**  
Use all Personal Protection Equipment (PPE) such as gloves, safety shoes, safety glasses, and kneeling pad, to reduce the risk of injury.

---



**Warning**  
Beware of possible sharp edges on all mechanical parts. If sharp edges are encountered, the appropriate PPE should be used to reduce the risk of injury.

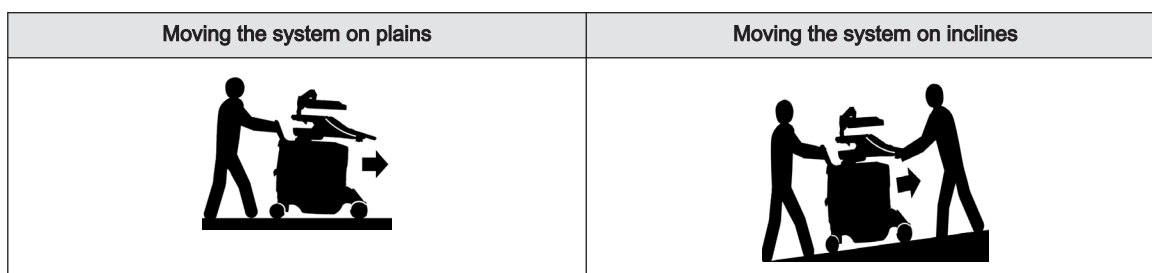
---



**Warning**  
Wear all PPE including gloves as indicated in the chemical Material Safety Data Sheet (MSDS).

---

### 1.5.3 Mechanical Safety



#### Caution

The Voluson E-Series systems weighs 150 kg or more, depending on installed peripherals, (330 lbs., or more) when ready for use.

Be careful when moving the system. Two people are required when moving the Voluson E-Series on inclines or lifting more than 16 kg (35 lbs).

- Always lower and center the control console (UI) to its minimum height and lock it in its parking (locked) position.
- Secure the monitor for transport: Lock the monitor arm and flap down the LCD monitor.
- Use the rear handle to move the system.
- Remove all obstacles.
- Move the system slowly and carefully.
- Avoid collisions with walls or door frames.
- Always place the system on horizontal ground and engage the caster brakes.
- Do not move the system when the brakes are engaged.
- Move the system forward or backward when going up or down inclines. Do not move the system sideways or diagonally.

Failure to follow the precautions could result in injury, uncontrolled motion and costly damage.



#### Warning

Ultrasound systems and probes are highly sensitive medical instruments that can easily be damaged by improper handling. Use care when handling and protect from damage also when not in use. Do not use a damaged or defective ultrasound system or probe. Failure to follow these precautions can result in serious injury and system damage.



#### Warning

Never use a probe that has fallen to the floor. Even if it looks OK, it may be damaged.



#### Note

*Special care should be taken when transporting the unit in a vehicle:*

- *Eject any DVD/CD from the drive.*
- *Place the probes in their carrying cases.*
- *DO NOT use the control console as an anchor point.*
- *Secure the system with straps in an upright position and lock the caster wheels (brake).*
- *Ensure that the Voluson E-Series system is firmly secured while inside the vehicle.*
- *Drive cautiously to prevent vibration damage.*

## 1.5.4 Electrical Safety

### 1.5.4.1 Safe Practices

Follow these guidelines to minimize electrical shock hazards whenever using the system:

- To minimize electrical shock hazard, the equipment chassis must be connected to an electrical ground.
- The system is equipped with a three-conductor AC power cable. This must be plugged into an approved electrical outlet with safety ground.
- The power outlet used for this equipment should not be shared with other types of equipment.
- Both the system power cable and the power connector must meet international electrical standards.



#### Warning

Connecting a Voluson E-Series system to the wrong voltage level will most likely destroy it.

---

### 1.5.4.2 Probes

All probes for Voluson E-Series systems are designed and manufactured to provide trouble-free, reliable service. To ensure this, correct handling of probes is important and the following points should be noted:

- Do not drop a probe or strike it against a hard surface, as this may damage the probe elements, acoustic lens, or housing.
- Inspect the probe prior to each use for damage or degradation to the housing, cable strain relief, lens, seal, connector pins and locking mechanism.
- Do not use a cracked or damaged probe. In this event, call your field service representative immediately to obtain a replacement.
- Avoid pulling, pinching or kinking the probe cable, since a damaged cable may compromise the electrical safety of the probe.
- Never immerse the probe connector or adapter into any liquid.
- The system has more than one type of probe port. Use the appropriate probe port designed for the probe you are connecting.

#### Note

*For detailed information on handling probes, refer to the Voluson E-Series Basic User Manual and the care card supplied with the probe.*

## 1.5.5 Auxiliary Devices Safety



#### Caution

Power supplies for additional equipment **MUST** comply with IEC 60601-1.

---



#### Caution

Do not attempt to use different peripherals and accessories (brand and model; connected via USB port) other than approved and provided by GE Healthcare Austria GmbH & Co OG! The Voluson E-Series ultrasound system is an extremely sensitive and complex medical system. Any unauthorized peripherals may cause system failure or damage.

---

Voluson E-Series systems are equipped with an isolation transformer to provide the required separation from mains for both, the system and the auxiliary devices. One AC mains power outlet is located at the power supply. It is used for connecting the threefold/fourfold splitter whose outlets are led to the shelves, intend for auxiliary devices (e.g., printers).

The IEC60601-1-1 standard provides a guideline for safely interconnecting medical devices in systems. "Equipment connected to the analog or digital interface must comply with the respective IEC/UL standards (e.g. IEC60950 / UL 60950 for data processing equipment and IEC60601-1 / UL60601-1 for medical equipment).

Everybody who connects additional equipment to the signal input portion or signal output portion configures a medical system, and is therefore responsible that the system complies with the requirements of the system standard IEC60601-1-1.

Special care has to be taken, if the device is connected to computer network (e.g., Ethernet), because other devices could be connected without any control. There could be a potential difference between the protective earth and any line of the computer network including the shield.



In this case the only way to operate the system safely is to use an isolated signal link with minimum 4mm creepage distance, 2.5mm air clearance of the isolation device. For computer networks there are media converters available which convert the electrical to optical signals. Please consider that this converter has to comply with IEC xxx standards\* and is battery operated or connected to the isolation mains output of the Voluson E-Series ultrasound system.

\* IEC xxx stands for standards such as:

- IEC60601 for medical devices
- IEC60950 for information technology equipment etc.

**Note** *The system integrator (any person connecting the medical device to other devices) is responsible that connections are safe. If in doubt, consult the technical service department or your local representative.*

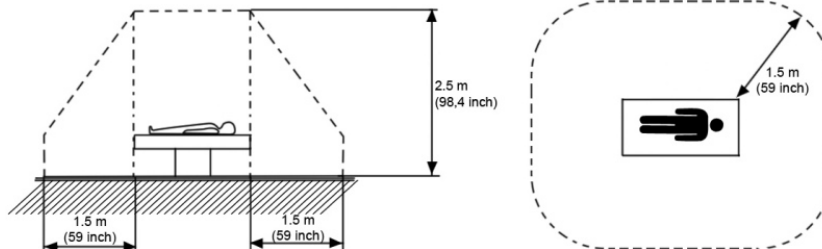


**Caution**

The leakage current of the entire system including any / all auxiliary equipment must not exceed the limit values as per EN60601-1-1 (IEC60601-1-1) respectively other valid national or international standards. All equipment must comply with UL, CSA, IEC or other relevant requirements.

**Caution**

Please observe that some printers may not be medical devices! If the Bluetooth Printer and/or Line Printers are no medical devices, they have to be located outside of the typical patient environment. Examples for typical patient environments can be found in standard IEC 60601 (see illustrations below).



**Caution**

Auxiliary equipment must only be connected with the special main outlet provided for the electrical safety of the system.



**Caution**

Auxiliary equipment with direct main connection requires galvanic separation of the signal and/or control leads.

**Note** *Always observe the instructions given in the manual of the peripheral/auxiliary device.*

For hardware installation procedures see: [Chapter 3 – Setup Instructions](#)



**Warning**

After each installation, the leakage currents have to be measured according to IEC 60601-1, UL 60601-1, IEC 62353 or other relevant standard.

**Note** *All peripherals mounted on the Voluson E-Series system chassis must be firmly secured in position.*

## 1.5.6 Labels Locations

The Voluson E-Series ultrasound system comes equipped with product labels and icons. These labels and icons represent pertinent information regarding the operation of the system.

**Note** For description of all symbols and labels used in combination with this Voluson E-Series ultrasound system, refer to [Section 1.4.3 on page 1-11](#) and [Chapter 2 in the Basic User Manual of your system](#).

### 1.5.6.1 Identification and Rating Plate

The Identification and Rating Plate is located on the rear of the Voluson E-Series system.

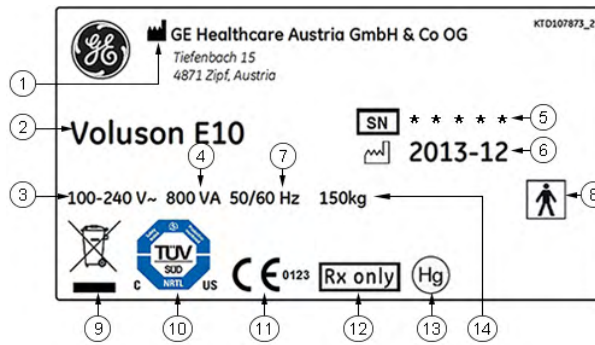


Figure 1-1 Identification and Rating Plate: Examples

1	Manufacturer	6	Manufacturing date	11	CE Conformity mark
2	Model Type	7	Frequency	12	FDA Guidance
3	System Voltage range	8	Safety type: Type BF	13	Hg label
4	Power Consumption nominal	9	WEEE Disposal Icon	14	approx. weight of the system
5	System Serial Number	10	TUEV NRTL Certification mark		

## 1.5.7 Dangerous Procedure Warnings

Warnings, such as the examples below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.



### Danger

**Dangerous voltages, capable of causing death are present in this system. Use extreme caution when handling, testing and adjusting.**



### Warning

If the covers are removed from an operating Voluson E-Series, some metal surfaces may be warm enough to pose a potential heat hazard if touched, even while in shutdown mode.



### Warning

Do not operate the system in an explosive atmosphere. Operation of any electrical equipment in such an environment constitutes a definite safety hazard.



### Warning

Do not substitute parts or modify the system. Because of the danger of introducing additional hazards, **ONLY** install GE Healthcare Austria GmbH & Co OG approved parts. **DO NOT** perform any unauthorized modification of the system.

## 1.5.8 Lockout/Tagout (LOTO) Requirements

Follow OSHA Lockout/Tagout requirements (USA) or local Lockout/Tagout requirements by ensuring you are in total control of the AC power plug at all times during the service process.

To apply Lockout/Tagout (LOTO):

1. Plan and prepare for shutdown.
2. Shutdown the equipment.
3. Isolate the equipment.
4. Apply Lockout/Tagout Devices.
5. Control all stored and residual energy.
6. Verify isolation.

All potentially hazardous stored or residual energy is relieved.

### Warning

Energy Control and Power Lockout for Voluson E-Series:



When servicing parts of the system where there is exposure to voltage greater than 30 Volts:

1. Follow LOTO (Lockout/Tagout) procedures.
2. Turn off the breaker.
3. Unplug the system.
4. Maintain control of the system power plug.
5. Wait for at least 30 seconds for capacitors to discharge as there are no test points to verify isolation.

System components may be energized.

## 1.5.9 Returning/Shipping System, Probes and Repair Parts

When returning or shipping the Voluson E-Series system in the original packaging:

- system must be lowered to its minimum height with monitor flapped down
- the control console has to be centered and locked in “unextended” position

**Note** For control console positioning see [Section 6.3 on page 6-4](#).

Equipment being returned must be clean and free of blood and other infectious substances.

GE policy states that body fluids must be properly removed from any part or equipment prior to shipment. GE employees, as well as customers, are responsible for ensuring that parts/equipment have been properly decontaminated prior to shipment. Under no circumstance should a part or equipment with visible body fluids be taken or shipped from a clinic or site (for example, body coils or and ultrasound probe).

The purpose of the regulation is to protect employees in the transportation industry, as well as the people who will receive or open this package.

**Note** *The US Department of Transportation (DOT) has ruled that “items what were saturated and/or dripping with human blood that are now caked with dried blood; or which were used or intended for use in patient care” are “regulated medical waste” for transportation purpose and must be transported as a hazardous material.*

**Note** *The user/service staff should dispose of all the waste properly, per federal, state, and local waste disposal regulations.*

The Voluson E-Series system is not meant to be used for long-term storage of patient data or images. The user is responsible for the data on the system and a regular backup is highly recommended.

If the system is sent for repair, please ensure that any patient information is backed up and erased from the system before shipping. It is always possible during system failure and repair to lose patient data. GE is not responsible for the loss of this data.

If PHI (Patient Healthcare Information) data needs to be sent to GE employees for service purposes, GE will ascertain agreement from the customer. Patient information shall only be transferred by approved service processes, tools and devices restricting access, protecting or encrypting data where required, and providing traceability in the form of paper or electronic documents at each stage of the procedure while maintaining compliance with cross-border restrictions of patient information transfers.

## 1.6 EMC, EMI and ESD

### 1.6.1 What is EMC?

Electromagnetic compatibility describes a level of performance of a device within its electromagnetic environment. This environment consists of the device itself and its surroundings including other equipment, power sources and persons with which the device must interface. Inadequate compatibility results when a susceptible device fails to perform as intended due interference from its environment or when the device produces unacceptable levels of emission to its environment. This interference is often referred to as radio-frequency or electromagnetic interference (RFI/EMI) and can be radiated through space or conducted over interconnecting power or signal cables. In addition to electromagnetic energy, EMC also includes possible effects from electrical fields, magnetic fields, electrostatic discharge and disturbances in the electrical power supply.

For applicable standards please refer to Chapter 2 in the Basic User Manual of the Voluson E-Series ultrasound system.

### 1.6.2 Compliance

The Voluson E-Series system conforms to all applicable conducted and radiated emission limits and to immunity from electrostatic discharge, radiated and conducted RF fields, magnetic fields and power line transient requirements as mentioned in IEC60601-1-2.

**Note** *For CE Compliance, it is critical that all covers, screws, shielding, gaskets, mesh, clamps, are in good condition, installed tightly without skew or stress. Proper installation following all comments noted in this service manual is required in order to achieve full EMC performance.*

### 1.6.3 Electrostatic Discharge (ESD) Prevention

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**Warning:** DO NOT touch any boards with integrated circuits prior to taking necessary ESD precautions.



1. When installing boards, ESD may cause damage to a board. ALWAYS connect yourself, via an arm-wrist strap, to the advised ESD connection point located on the rear of the system (to the right of the power connector).
2. Follow general guidelines for handling of electrostatic sensitive equipment.

---

**Warning:** Risk of electrical shock! System must be turned off.



Avoid all contact with electrical contacts, conductors and components.

Always use non-conductive handles designed for the removal and replacement of ESD sensitive parts. All parts that have the potential for storing energy must be discharged or isolated before making contact.

---

## 1.7 Customer Assistance

### 1.7.1 Contact Information

If the system does not work as indicated in this service manual or in the Basic User Manual, or if you require additional assistance, please contact the local distributor or appropriate support resource, as listed below.

**Note** *Prepare vital system information (see: [Section 7.1 on page 7-2](#)) before you call:*

- System Type
- System Serial number (also visible on label on back of the system)
- Application Software version
- Backup version
- additional information about installed software

Table 1-7 phone numbers for customer assistance

Location	Phone Number	
USA GE Medical Systems Ultrasound Service Engineering 9900 Innovation Drive (RP-2123) Wauwatosa, WI 53226, USA	Service On-site Service: Parts Applications support	1-800-437-1171 1-800-558-2040 1-800-682-5327 or 1-262-524-5698
Canada		1-800-668-0732
Latin America	Service Applications support	1-800-321-7937 1-262-524-5698
Europe GE Ultraschall Deutschland GmbH Beethovenstraße 239 Postfach 11 05 60, D-42655 Solingen Germany	OLC - EMEA Phone: +49 (0) 212 2802 - 652 Fax: +49 (0) 212 2802 - 431 OLC - EAGM Phone: +33 1 3083 1300 (English/German all segments incl. training)	
Online Services Ultrasound Asia	Australia China India Japan Korea Singapore	+(61) 1-800-647-855 +(86) 800-810-8188 +(91) 1800-425-8025 +(81) 42-648-2940 +(82) 2620-13585 +(95) 6277-3444

### 1.7.2 System Manufacturer

Table 1-8 system manufacturer

Manufacturer	Telephone	FAX
GE Healthcare Austria GmbH & Co OG Austria GmbH & Co OG Tiefenbach 15 A-4871 Zipf Austria - Europe	+43 (0) 7682-3800-0	+43 (0) 7682-3800-47

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# Chapter 2

## Site Preparation

*This chapter provides the information required to plan and prepare for the installation of a Voluson E-Series system. Included are descriptions of the facility and electrical needs to be met by the purchaser.*

### Content in this chapter

<i>2.1 General Requirements</i> .....	<i>2-2</i>
<i>2.2 Facility Needs</i> .....	<i>2-6</i>

## 2.1 General Requirements

### 2.1.1 Environmental requirements

Table 2-1 environmental requirements

Operating Temperature	Operating Humidity	Heat Dissipation	Storage Temperature	Storage Humidity
10 to 30°C (50 to 86°F)	30 to 80% rH non-condensing	2730 BTU/hour	-10 to 40°C (14 to 104°F)	< 90% rH non- condensing



**Caution**

If the system has been in storage, has been transported or is very cold or hot, do not turn on its power until it has had a chance to acclimate to its operating environment. (see: [Section 3.1.2 "Installation Warnings" on page 3-2](#)).

#### 2.1.1.1 Cooling

The cooling requirement for a Voluson E-Series system is 2730 BTU/hour. This figure does not include cooling needed for lights, people, or other equipment in the room.

**Note** *Each person in the room places an additional 300 BTU/hr demand on the cooling system.*

#### 2.1.1.2 Lighting

Bright light is needed for system installation, updates and repairs. However, operator and patient comfort may be optimized if the room light is subdued and indirect. Therefore a combination lighting system (dim/bright) is recommended. Keep in mind that lighting controls and dimmers can be a source of EMI which could degrade image quality. These controls should be selected to minimize possible interference.

### 2.1.2 Electrical Requirements

**Note** *GE Healthcare Austria GmbH & Co OG requires a dedicated power and ground for the proper operation of its Ultrasound equipment. This dedicated power shall originate at the last distribution panel before the system.*

*The Ultrasound will function on voltages from 100-240 Volts and 50 or 60 Hz. However, if using 220 volt power in North America, then a center tapped power source is required.*

*Sites with a mains power system with defined Neutral and Live:*

*The dedicated line shall consist of one phase, a neutral (not shared with any other circuit), and a full size ground wire from the distribution panel to the ultrasound outlet.*

*Sites with a mains power system without a defined Neutral:*

*The dedicated line shall consist of one phase (two lines), not shared with any other circuit, and a full size ground wire from the distribution panel to the ultrasound outlet.*

**Note** *Please note that image artifacts can occur, if at any time within the facility, the ground from the main facility's incoming power source to the ultrasound system is only a conduit.*

#### 2.1.2.1 Voluson Power Requirements Voluson E-Series

Table 2-2 electrical specifications for Voluson E-Series

Voltage	Tolerances	Power Consumption	Frequency
100 - 240 VAC	±10%	800 VA	50, 60 Hz (±2%)

AC mains power outlets (AUX) for auxiliary devices and peripherals are co-switched by the systems mains switch. Output voltage for AUX: 115V



**Caution**

The maximum power consumption of equipment (inclusive color LCD monitor) connected to these outlets must not exceed 200VA!



### 2.1.2.2 Inrush Current

Inrush current is not a factor to consider due to the inrush current limiting properties of the power supplies.

### 2.1.2.3 Site Circuit Breaker

It is recommended that the branch circuit breaker for the system be readily accessible.



Caution: Power outage may occur.

Voluson E-Series requires a dedicated single branch circuit. To avoid circuit overload and possible loss of critical care equipment, make sure you DO NOT have any other equipment operating on the same circuit.

---

### 2.1.2.4 Site Power Outlets

A dedicated AC power outlet must be within reach of the system without extension cords. Other outlets adequate for the external peripherals, medical and test equipment needed to support this system must also be present within 1 m (3.2 ft.) of the system. Electrical installation must meet all current local, state, and national electrical codes.

### 2.1.2.5 System Power Plug

If the Voluson E-Series arrives without a power plug, or with the wrong plug, you must contact your GE dealer or the installation engineer must supply what is locally required.

## 2.1.3 EMI Limitations

Ultrasound systems are susceptible to Electromagnetic Interference (EMI) from radio frequencies, magnetic fields, and transients in the air or wiring. They also generate EMI. The Voluson E-Series system complies with limits as stated on the EMC label. However, there is no guarantee that interference will not occur in a particular installation.

**Note** *Possible EMI sources should be identified before the system is installed.*

Electrical and electronic equipment may produce EMI unintentionally as the result of a defect. Sources of EMI include the following:

- medical lasers
- scanners
- cauterizing guns
- computers
- monitors
- fans
- gel warmers
- microwave oven
- light dimmers
- mobile phones
- in-house wireless phones (DECT phones)
- wireless computer keyboard and mouse
- air conditioning system
- High Frequency (HF) surgery equipment
- general AC/DC adapters

The presence of a broadcast station or broadcast van may also cause interference.

Table 2-3 EMI prevention/abatement

EMI Rule	Details
Be aware of Radio Frequency sources.	Keep the system at least 5 meters (15 feet) away from other EMI sources. Special shielding may be required to eliminate interference problems caused by high frequency, high powered radio or video broadcast signals.
Ground the system.	Poor grounding is the most likely reason a system will have noisy images. Check grounding of the power cord and power outlet.
Replace all screws, Radio Frequency gaskets, covers and cores.	After you finish repairing or updating the system, replace all covers and tighten all screws. Any cable with an external connection requires a magnet wrap at each end. Install all covers. Loose or missing covers or Radio Frequency gaskets allow radio frequencies to interfere with the ultrasound signals.
Replace broken Radio Frequency gaskets.	If more than 20% or a pair of the fingers on an Radio Frequency gasket are broken, replace the gasket. Do not turn ON the system until any loose metallic part is removed.
Do not place labels where Radio Frequency gaskets touch metal.	Never place a label where Radio Frequency gaskets meet the system. Otherwise, the gap created will permit Radio Frequency leakage. In case a label has been found in such a position, move it.
Use GE- specified harnesses and peripherals.	The interconnect cables are grounded and require ferrite beads and other shielding. Also, cable length, material, and routing are all important; do not change from what is specified.
Take care with cellular phones.	Cellular phones may transmit a 5 V/m signal; that could causes image artifacts.
Properly route peripheral cables.	Do not allow cables to lie across the top of the card rack or hang out of the peripheral bays. Loop the excess length for peripheral cables inside the peripheral bays. Attach the monitor cables to the frame.

### 2.1.4 Environmental Requirements for Probes

Probes can be used in clinical environment.

Ensure that the probe face temperature does not exceed the normal operation temperature range.

Probes must be operated, stored, or transported within the parameters outlined below.

	Operational	Storage	Transport
Temperature	+18° to +30° C (+64.4°F to +86°F)	-10° to +50° C (+14°F to +122°F)	-10° to +50° C (+14°F to +122°F)
Humidity	30% to 75% RH non-condensing	10% to 85% RH non-condensing	10% to 85% RH non-condensing
Pressure	700hPa (3000m) to 1060hPa	700hPa (3000m) to 1060hPa	700hPa (3000m) to 1060hPa

### 2.1.5 Time and Manpower Requirements

Site preparation takes time. Begin site preparation checks as soon as possible. If possible, six weeks before delivery, to allow enough time to make any changes.



**Warning**

Have two people available to deliver and unpack the Voluson E-Series ultrasound system.

Attempts to move the system considerable distances (or on an incline) by one person alone, could result in personal injury and/or damage to the system.

## 2.1.6 System Specifications

### 2.1.6.1 Physical Dimensions of Voluson E-Series

Physical dimensions and weight (without peripherals) of the Voluson E-Series system are summarized in [Table 2-4](#).

**Note** *Physical dimensions (especially height and depth) depend on control console and monitor positioning. For more details see [Section 5.10.3 "Control Console Positioning" on page 5-34](#).*

Table 2-4 physical dimensions and weight (without monitor and peripherals)

Height	Width	Depth	Weight
1533 mm / 60.4 inch *	582 mm / 22.9 inch	1168 mm / 46.0 inch *	150 kg / 330 lbs.
1333 mm / 52.5 inch **		968 mm / 38.1 inch **	

\* maximum at "normal" monitor position (control console is elevated and moved forwards to the maximum)

\*\* minimum at "normal" monitor position (no control console elevation or forwards movement)

### 2.1.6.2 Acoustic Noise Output

max. 60 dB(A)

### 2.1.6.3 Electrical Specifications

Refer to: [Section 2.1.2.1 "Voluson Power Requirements Voluson E-Series" on page 2-2](#).

## 2.2 Facility Needs

### 2.2.1 Purchaser Responsibilities

The work and materials needed to prepare the site is the responsibility of the purchaser. Delay, confusion, and waste of manpower can be avoided by completing pre-installation work before delivery.

Use the Pre-installation checklist (provided in [Table 2-5](#)) to verify that all needed steps have been taken.

Table 2-5 Voluson E-Series pre-installation checklist

Action	Yes	No
Schedule at least 3 hours for installation of the system.		
Notify installation team of the existence of any variances from the basic installation.		
Make sure system and probes have been subject to acclimation period.		
Environmental cooling is sufficient.		
Lighting is adjustable to adapt to varying operational conditions of the system.		
Electrical facilities meet system requirements.		
EMI precautions have been taken and all possible sources of interference have been removed.		
Mandatory site requirements have been met.		
If a network is used, IP address has been set for the system and a dedicated network outlet is available.		

Purchaser responsibility includes:

- Procuring the materials required.
- Completing the preparations before delivery of the ultrasound system.
- Paying the costs for any alterations and modifications not specifically provided in the sales contract.

**Note**

*All electrical installations that are preliminary to the positioning of the equipment at the site prepared for the equipment must be performed by licensed electrical contractors. Other connections between pieces of electrical equipment, calibrations, and testing must also be performed by qualified personnel. The products involved (and the accompanying electrical installations) are highly sophisticated and special engineering competence is required. All electrical work on these products must comply with the requirements of applicable electrical codes. The purchaser of GE equipment must only utilize qualified personnel to perform electrical servicing on the equipment.*

The desire to use a non-listed or customer provided product or to place an approved product further from the system than the interface kit allows presents challenges to the installation team. To avoid delays during installation, such variances should be made known to the individuals or group performing the installation at the earliest possible date (preferably prior to the purchase).

The ultrasound suite must be clean prior to delivery of the machine. Carpet is not recommended because it collects dust and creates static. Potential sources of EMI (electromagnetic interference) should also be investigated before delivery. Dirt, static, and EMI can negatively impact system reliability.

## 2.2.2 Required Facility Needs

- dedicated single branch power outlet of adequate amperage (see: [Table 2-2 on page 2-2](#)), meeting all local and national codes, which is located less than 2.5 m (8 ft.) from the system's proposed location.; see [Section 2.1.2 "Electrical Requirements" on page 2-2](#).
- door opening is at least 76 cm (30 in) wide
- proposed location for the system is at least 0.5 m (1.6 ft.) from the wall for cooling
- power outlet and place for any external peripheral are within 2 m (6.5 ft.) of each other with peripheral within 1 m of the system to connect cables.
- power outlets for other medical equipment
- power outlets for test equipment within 1 m (3.2 ft.) of system
- clean and protected space to store probes (in their cases or on a rack)
- material to safely clean probes (done with a plastic container, never metal)

**Note** *The Voluson E-Series has four outlets inside. One for the monitor and three for on board peripherals.*

In case of network option:

- An active network outlet in the vicinity of the ultrasound system.
- A network cable of appropriate length (regular Pin-to-Pin network cable).
- An IT administrator who will assist in configuring the system to work with your local network. A fixed IP address is required. Refer to the form provided in [Figure 3-58](#) for network details that are required.

**Note** *All relevant preliminary network port installations at the prepared site must be performed by authorized contractors. The purchaser of GE equipment must utilize only qualified personnel to perform servicing on the equipment.*

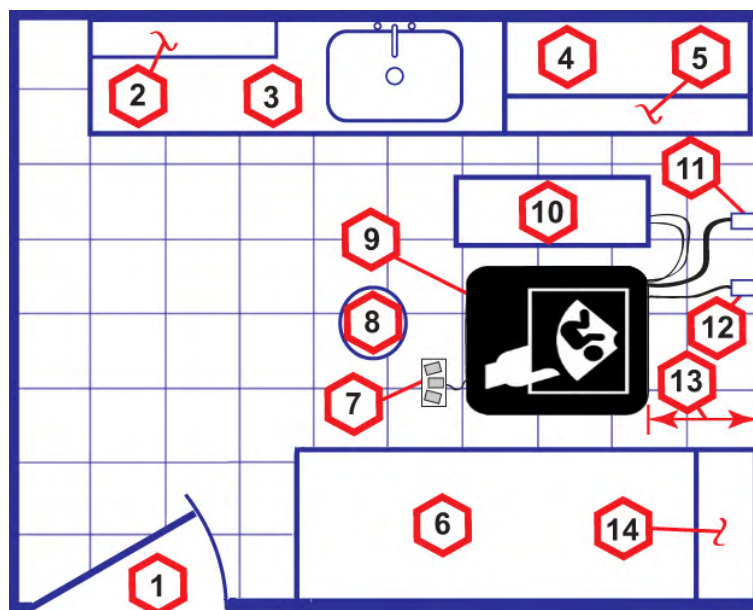


Figure 2-1 recommended Floor Plan 4.3 m x 5.2 m (14 by 17 foot)

1 door – at least 76 cm (30 inches)	8 stool
2 film viewer	9 ultrasound system
3 counter top, sink with hot and cold water, supplies storage	10 external peripherals
4 linen supply	11 dedicated power outlet - circuit breaker protected and easily accessible
5 probes/supplies	12 network interface
6 examination table	13 distance from wall or objects
7 footswitch	14 cabinet for software and manuals

### 2.2.3 Desirable Features

- door is at least 92 cm (3 ft.) wide
- circuit breaker for dedicated power outlet is easily accessible
- sink with hot and cold water
- receptacle for bio-hazardous waste, like used probe sheaths
- emergency oxygen supply
- storage for linens and equipment
- nearby waiting room, lavatory, and dressing room
- dual level lighting (bright and dim)
- lockable cabinet for software and manuals

### 2.2.4 Network Setup Requirements

#### 2.2.4.1 Stand-alone System (without Network Connection)

None

#### 2.2.4.2 System connected to Hospital's Network

Supported networks:

- Ethernet network connection
- Wireless LAN (option)

#### 2.2.4.3 Purpose of the DICOM Network Function

DICOM<sup>1</sup> (Digital Imaging and Communications in Medicine) services provide the operator with clinically useful features for moving images and patient information over a hospital network. Examples of DICOM services include the transfer of images to workstations for viewing or transferring images to remote printers. As an added benefit, transferring images in this manner frees up the on-board monitor and peripherals, enabling viewing to be done while scanning continues. With DICOM, images can be archived, stored, and retrieved faster, easier, and at a lower cost.

#### 2.2.4.4 DICOM Option Pre-installation Requirements

To configure the Voluson E-Series ultrasound system to work with other network connections, the network administrator must provide some necessary information.

Use the [Figure 3-57 on page 3-67](#) to record required information that must include:

- Voluson E-Series Details: DICOM network details for the Voluson E-Series system, including the host name, local port, IP address, AE title and net mask.
- Routing Information: IP addresses for default gateway and other routers in use at site.
- DICOM Application Information: Details of DICOM devices in use at the site, including the DICOM host name, AE title, DICOM port number and IP addresses.

**Note** *For further details refer to the Voluson E-Series Basic User Manual.*

---

<sup>1</sup> DICOM is the registered trademark of the National Electrical Manufacturers Association for its standards publications relating to digital communications of medical information.

# Chapter 3

## Setup Instructions

*This chapter contains information needed to setup the Voluson E-Series ultrasound system. Included are procedures to receive, unpack and configure the equipment. A worksheet is provided (see: [Section 3.14 on page 3-67](#)) to help ensure that all the required information is available, prior to setup the system.*

### Content in this chapter

<i>3.1 Setup Reminders</i>	<i>3-2</i>
<i>3.2 Receiving and Unpacking the System</i>	<i>3-5</i>
<i>3.3 Preparing for Setup</i>	<i>3-7</i>
<i>3.4 Connection of Auxiliary Devices</i>	<i>3-9</i>
<i>3.5 Completing the Setup</i>	<i>3-26</i>
<i>3.6 Printer Installation</i>	<i>3-31</i>
<i>3.7 System Configuration</i>	<i>3-40</i>
<i>3.8 On-board optional Peripherals</i>	<i>3-44</i>
<i>3.9 External I/O Connectors</i>	<i>3-45</i>
<i>3.10 Available Probes</i>	<i>3-48</i>
<i>3.11 Software/Option Configuration</i>	<i>3-48</i>
<i>3.12 Connectivity Setup</i>	<i>3-49</i>
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<i>3.14 Connectivity Setup Worksheet</i>	<i>3-67</i>
<i>3.15 Paperwork</i>	<i>3-69</i>

## 3.1 Setup Reminders

### 3.1.1 Average Installation Time

Once the site has been prepared, the average installation time required is shown in Table 3-1 below.

Table 3-1 average installation time

Description	Average Installation Time	Comments
Unpacking the system	0.5 hours	
Installing the system / options / printers	0.5 to 1.5 hours	depends on required configuration
DICOM Option (connectivity)	0.5 to 1.5 hours	depends on configuration amount
Install InSite	0.5 hours	

### 3.1.2 Installation Warnings



**Caution**

Since the Voluson E-Series weighs approximately 150 kg (330 lbs.) without peripherals, two people are required to unpack it.



**Warning**

There are no operator serviceable components. To prevent shock, do not remove any covers or panels. Should problems or malfunctions occur, unplug the power cord.

**Only** qualified service personnel should carry out servicing and troubleshooting.

#### 3.1.2.1 Moving/Lifting the System

**Note** For important safety considerations see [Section 1.5.3 "Mechanical Safety" on page 1-15](#).

How to lift the system:

1 Preparation

- Disconnect all probes and transport them separately.
- Disconnect the ECG cable (if applicable) and transport it separately.
- Ensure all peripheral devices (printer, ...) are firmly fixed within the system.

2 Remove the footrest/wheel axis cover on the front side of the system: Turn the 4 quick release devices below the footrest 90° (see: [Figure 8-22 on page 8-17](#)).

3 Pass a strap through the openings in the metal sheet.

4 Lift the system by the straps and the rear handle.



**Caution**

- Do not pull or lift the system with the front handle of the user interface (control console).
- Always use a strap to lift the system. Do not grasp the metal sheet with your hands.
- Move the system forward or backward when going up or down inclines. Do not move the system sideways or diagonally.



### 3.1.2.2 System Acclimation Time

After being transported, the Voluson E-Series system may be very cold or hot. It requires one hour for each 2.5°C increment if its temperature is below 10°C or above 40°C.



**Caution**

Equipment damage possibility. Turning the system on without acclimation after arriving at site may cause the system to be damaged.

Table 3-2 Acclimation Time

°C	60	55	50	45	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40
°F	140	131	122	113	104	96	86	77	68	59	50	41	32	23	14	5	-4	-13	-22	-31	-40
hrs	8	6	4	2	0	0	0	0	0	0	0	2	4	6	8	10	12	14	16	18	20

### 3.1.2.3 Control Console Positioning

If weight is placed on the control console (UI) in its extended position the system could tip over.



**Caution**

The system should not be moved with the control console (UI) extended. Move the control console to its centered and locked position for transport.



**Caution**

Monitor mounting mechanism may break if not properly supported (e.g., with packing foam) during transportation.

### 3.1.2.4 Brake Pedal Operation



**Caution**

If the wheel brakes are engaged, release brake pedals (brakes on wheels under the foot rest) to disengage the lock, for transportation.

### 3.1.3 Safety Reminders



**Danger**

When using any test instrument that is capable of opening the AC ground line (i.e., meter's ground switch is OPEN), DO NOT touch the system!



**Caution**

To prevent electrical shock, connect the system to a properly grounded power outlet. DO NOT use a three to two prong adapter. This defeats safety grounding.



**Caution: The Voluson E-Series requires all covers!**

Do not operate this system unless all board covers and frame panels are securely in place, to ensure optimal system performance and cooling. (When covers are removed, EMI may be present).



**Caution**

Two people should unpack the system because of its weight. Two people are required whenever a part weighing 16kg (35 lb.) or more must be lifted.



**Caution:**

Do not wear the ESD wrist strap when you work on live circuits and more than 30 V peak is present.



**Caution**

If the system is very cold or hot, do NOT turn on its power until it has had sufficient time to acclimate to its operating environment.



**Caution: Operator Manual(s)**

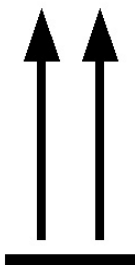
The User Manual(s) should be fully read and understood before operating the Voluson E-Series. Keep manuals near the system for reference.



**Caution: Acoustic Output hazard**

Although the ultrasound energy transmitted from the Voluson E-Series ultrasound system is within FDA limitations, avoid unnecessary exposure. Ultrasound energy can produce heat and mechanical damage.

Table 3-3 Environmental Labels



10 VERUG J.A. KITZLER, 1011 Wien, Österreich, Tel.: 0177 33 34, Fax: 0177 57 84 85



12 VERUG J.A. KITZLER, 1011 Wien, Österreich, Tel.: 0177 33 34, Fax: 0177 57 84 85



<p><b>ENVIRONMENTAL STORAGE AND SHIPPING CONDITIONS</b></p> <p><b>-10°C to +40°C</b>  <b>+14°F to +104°F</b></p> <p><b>max. 90% RH no condensation</b></p> <p><b>700 to 1060 hPa</b></p> <p style="text-align: right; font-size: small;">H2011610</p>
---

## 3.2 Receiving and Unpacking the System

**Note** Please read this section carefully before unpacking the Voluson E-Series ultrasound system and its (optional) peripherals.

The Voluson E-Series ultrasound system, together with peripherals, probes and accessories are shipped from the factory in a single durable shipping cardboard which is mounted on a raised wooden platform base.



### Caution

Transport only with forklift or stacker truck. During transport pay attention to the point of gravity ("tilt and drop" indicator)!



### Warning

Have two people available to deliver and unpack the Voluson E-Series ultrasound system.

Attempts to move the system considerable distances (or on an incline) by one person alone, could result in personal injury and/or damage to the system.

Table 3-4 shipping cardboard -dimensions and weight

Description	Height	Width	Depth	Weight*
Voluson E-Series incl. peripherals and accessories	1369 mm / 54 inch	780 mm / 30.7 inch	1086 mm / 42.8 inch	190 kg / 419 lbs.

\* Weight is approximate and will vary depending upon the supplied peripherals

### Before unpacking the system

- Inspect the cardboard for visible damage.
- Inspect the drop and tilt indicator (1) for evidence of accidental shock or tilting during transit. The tilt indicator must not turn *red*.
- Verify delivery address and remove the packing slip and invoice from the envelope (2) that is located on the front panel of the cardboard.
- Remove the unpacking instruction (3) that is located on the side panel of the cardboard.



Figure 3-1 shipping cardboard

**Note**      ***The device must only be transported in the original packaging cardboard!***

*It is recommended to keep and store the shipping cardboard and all other packing materials (including the support foams, anti-static plastic cover, etc.), in case the system has to be moved to a different location. Unpack the system such a way that packaging can be reused. For warranty purposes, storage of the above is required for one year from date of purchase.*

**Note**      *If the shipping cardboard is damaged, please inform the GE Healthcare Austria GmbH & Co OG sales representative immediately.*

### **Unpacking procedure**

Unpack the Voluson E-Series ultrasound system and its (optional) peripherals and accessories according to the provided unpacking instruction.

## 3.3 Preparing for Setup

### 3.3.1 Verify Customer Order

1. After unpacking, it is important to verify that all items ordered by the customer have been received. Compare all items listed on the packing slip (delivery note) with those received.

**Note** *It is recommended to keep and store the shipping cardboard and all other packing materials (including the support foams, anti-static plastic cover, etc.), in case the system has to be moved to a different location. Unpack the system such a way that packaging can be reused. For warranty purposes, storage of the above is required for one year from date of purchase.*

2. Visually inspect the system components using the following checklist.

Table 3-5 Damage Inspection Checklist - Voluson E-Series system

✓	Step	Item	Recommended Procedure
	1	Rating Plate	Enter Serial Number: _____ (printed on rating plate, see: <a href="#">Figure 1-1 on page 1-18</a> )
	2	System	Verify that the Voluson E-Series system is switched OFF and unplugged. Clean the system.
	3	Control Console	Physically inspect the control console for missing or damaged items. After switching on the system, verify the proper illumination of all the control console buttons.
	4	Probes	Check all probes for wear and tear on the lens, cable, and connector. Look for bent or damaged pins on the connector and in the connector socket on the system. Verify that the EMI fingers around the probe connector socket housing are intact. Check the probe locking mechanism and probe switch.
	5	LCD Display	Clean the LCD display by gently wiping with a dry, soft, lint-free non-abrasive folded cloth. Inspect the monitor for scratches and raster burn.
	6	Fans	Verify that the system's cooling fans and peripheral fans are operating.
	7	Rear Panel	Check the rear panel connectors for bent pins, loose connections and loose or missing hardware. Screw all the cable connectors tightly to the connector sockets on the panel. Verify that the labeling is in good condition.
	8	Covers	Check that all screws are tightly secured in place, that there are no dents or scratches and that no internal parts are exposed.
	9	Peripherals	Check and clean the peripherals in accordance with the manufacturer's directions. To prevent EMI or system overheating, dress the peripheral cables inside the peripheral cover.
	10	Power Cord	Check the power cord for cuts, loose hardware, tire marks, exposed insulation, or any deterioration. Verify continuity. Replace the power cord, as required.

**Note** *Report any items that are missing, back-ordered, or damaged, to your GE Healthcare Austria GmbH & Co OG sales representative. The contact address is shown in "Contact Information" on page 1-21 .*

### 3.3.2 EMI Protection

This system has been designed to minimize the effects of Electro-Magnetic Interference (EMI). Many of the covers, shields, and screws are provided primarily to protect the system from image artifacts caused by this interference. For this reason, it is imperative that all covers and hardware are installed and secured before the system is put into operation.

Ensure that the system is protected from electromagnetic interference (EMI), as follows:

- Operate the system at least 15 feet away from equipment that emits strong electromagnetic radiation.
- Operate the system in an area enclosed by walls, floors and ceilings comprised of wood, plaster or concrete, which help prevent EMI.
- Shield the system when operating it in the vicinity of radio broadcast equipment, if necessary.
- Do not operate mobile phones or other EMI emitting devices in the ultrasound room.
- Verify that all EMI rules listed are followed.

The Voluson E-Series system is approved for use in hospitals, clinics and other environmentally qualified facilities, in terms of the prevention of radio wave interference. Operation of the ultrasound system in an inappropriate environment can cause electronic interference to radios and television sets situated near the medical equipment.

For further details and EMI Prevention/Abatement refer to [Section 2.1.3 "EMI Limitations" on page 2-3](#).

## 3.4 Connection of Auxiliary Devices

### Content in this section

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3.4.2 Connecting the Black & White Printer	3-11
3.4.3 Connecting the Color Printer	3-13
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**Note** Always observe the instructions given in the manual of the peripheral/auxiliary device.

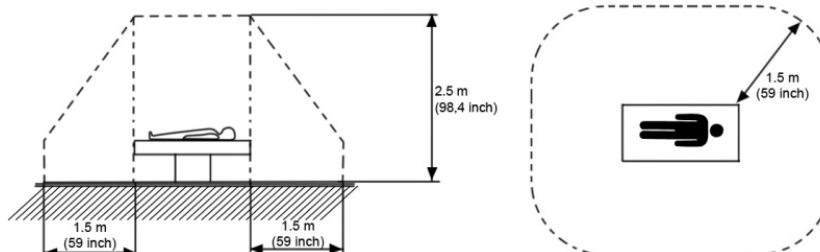


### Warning

After each installation, the leakage currents have to be measured according to IEC 60601-1, UL 60601-1, IEC 62353 or other relevant standard.

### Caution

Please observe that some printers may not be medical devices! If the Bluetooth Printer and/or Line Printers are no medical devices, they have to be located outside of the typical patient environment. Examples for typical patient environments can be found in standard IEC 60601 (see illustrations below).



**Note** For more detailed Safety Considerations when connecting auxiliary devices to the Voluson E-Series system, please review: [Section 1.5.5 "Auxiliary Devices Safety" on page 1-16](#).

### 3.4.1 Connecting the LCD Monitor

**Note**      *The LCD Monitor comes pre-installed with the system.*

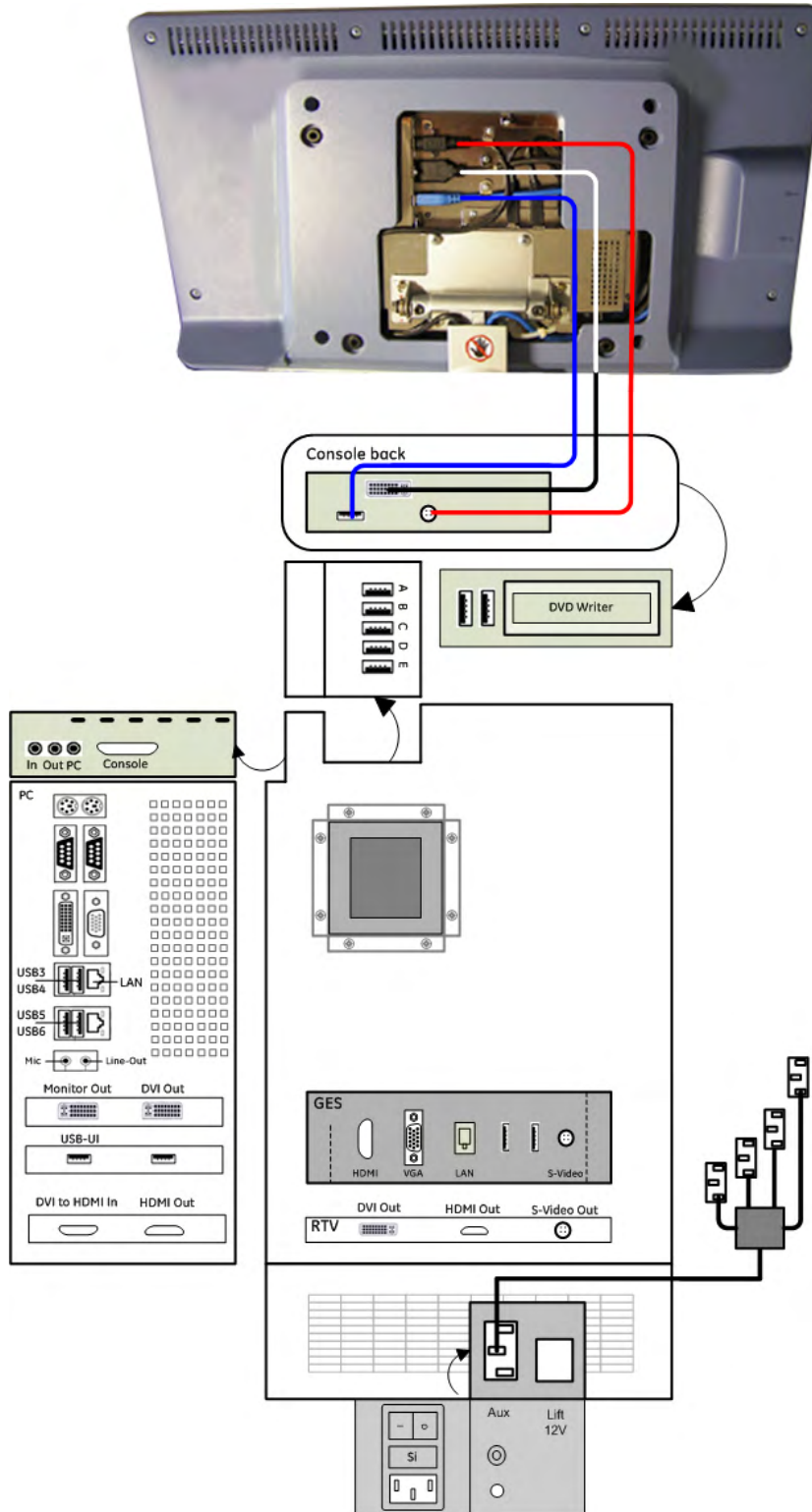


Figure 3-2 Connection Scheme - LCD Monitor



### 3.4.2 Connecting the Black & White Printer

1. Power Off/Shutdown the system as described in [Section 4.2.2 on page 4-4](#).
2. Connect the Black & White printer according to connection scheme, see: [Figure 3-3 on page 3-12](#).
3. When all cables are connected, press the Power ON switch on the printer.
4. Power ON/Boot up the Voluson E-Series system as described in [Section 3.5.1 on page 3-26](#).  
All software drivers are pre-installed for the designated printer only.
5. After physical connection to the Voluson E-Series system, assign the printer to a remote key (**P1, P2, P3, P4, P5** and/or **P6**) as described in [Section 3.6.6 "Remote Control Selection" on page 3-39](#).
6. Verify correct printer settings; see [Section 3.6.5 "Adjustment of Printer Settings" on page 3-33](#).

**Note**

*The B&W printer should be connected to **USB port C** on the RTB Distribution Board Bottom.*

**Warning**

After each installation, the leakage currents have to be measured according to IEC 60601-1, UL 60601-1, IEC 62353 or other relevant standard.

### 3.4.2.1 Connection Scheme: B&W Printer

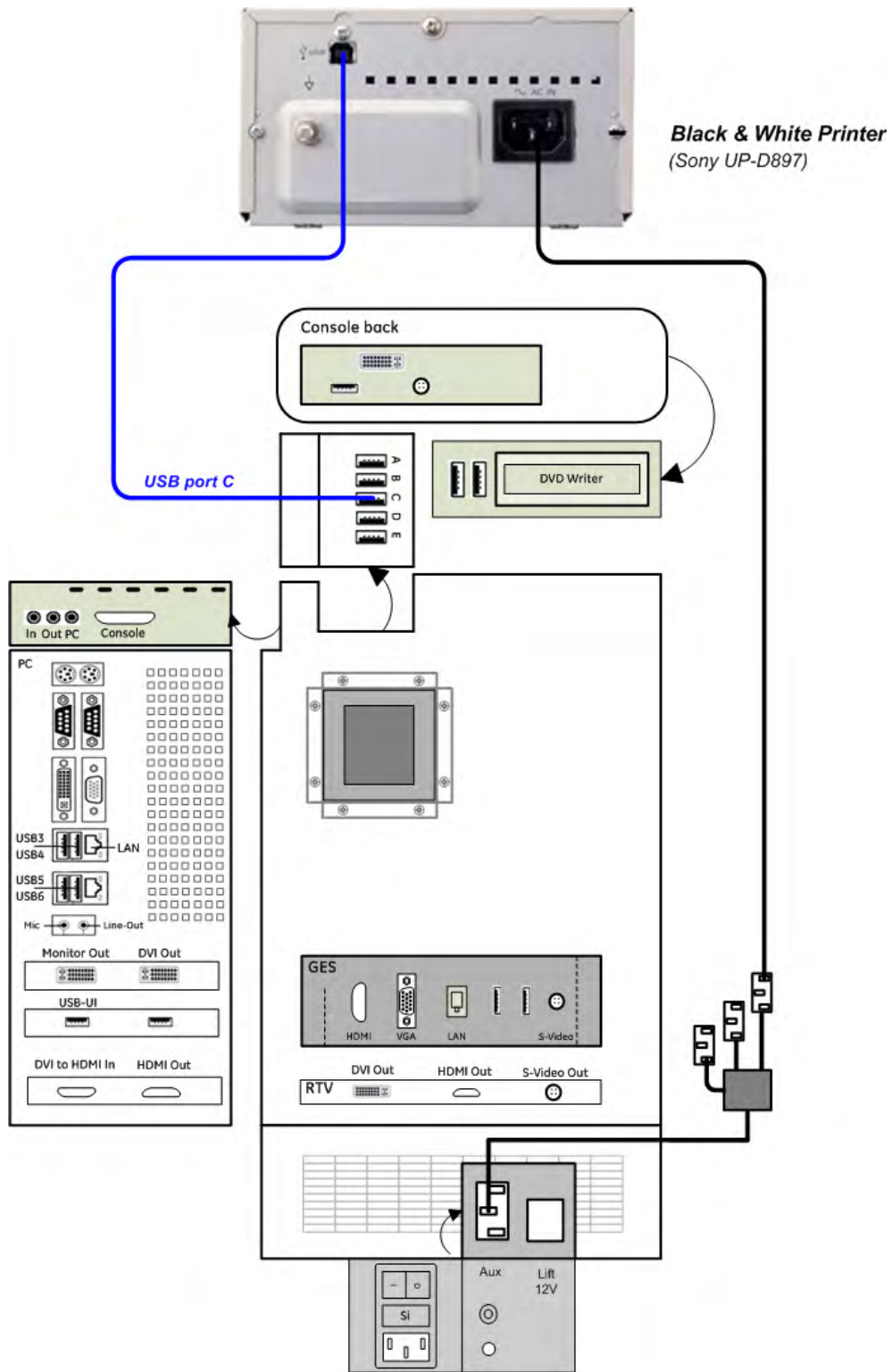


Figure 3-3 B&W Printer connection

### 3.4.3 Connecting the Color Printer

1. Power Off/Shutdown the system as described in [Section 4.2.2 on page 4-4](#).
2. Connect the Color printer according to connection scheme, see: [Figure 3-4 on page 3-14](#).
3. When all cables are connected, press the Power ON switch on the printer.
4. Power ON/Boot up the Voluson E-Series system as described in [Section 3.5.1 on page 3-26](#).  
All software drivers are pre-installed for the designated printer only.
5. After physical connection to the Voluson E-Series system, assign the printer to a remote key (**P1, P2, P3, P4, P5** and/or **P6**) as described in [Section 3.6.6 "Remote Control Selection" on page 3-39](#).
6. Verify correct printer settings; see [Section 3.6.5 "Adjustment of Printer Settings" on page 3-33](#).

**Note**

*The Color printer should be connected to **USB port D** on the RTB Distribution Board Bottom.*

**Warning**

After each installation, the leakage currents have to be measured according to IEC 60601-1, UL 60601-1, IEC 62353 or other relevant standard.

### 3.4.3.1 Connection Scheme: Color Printer

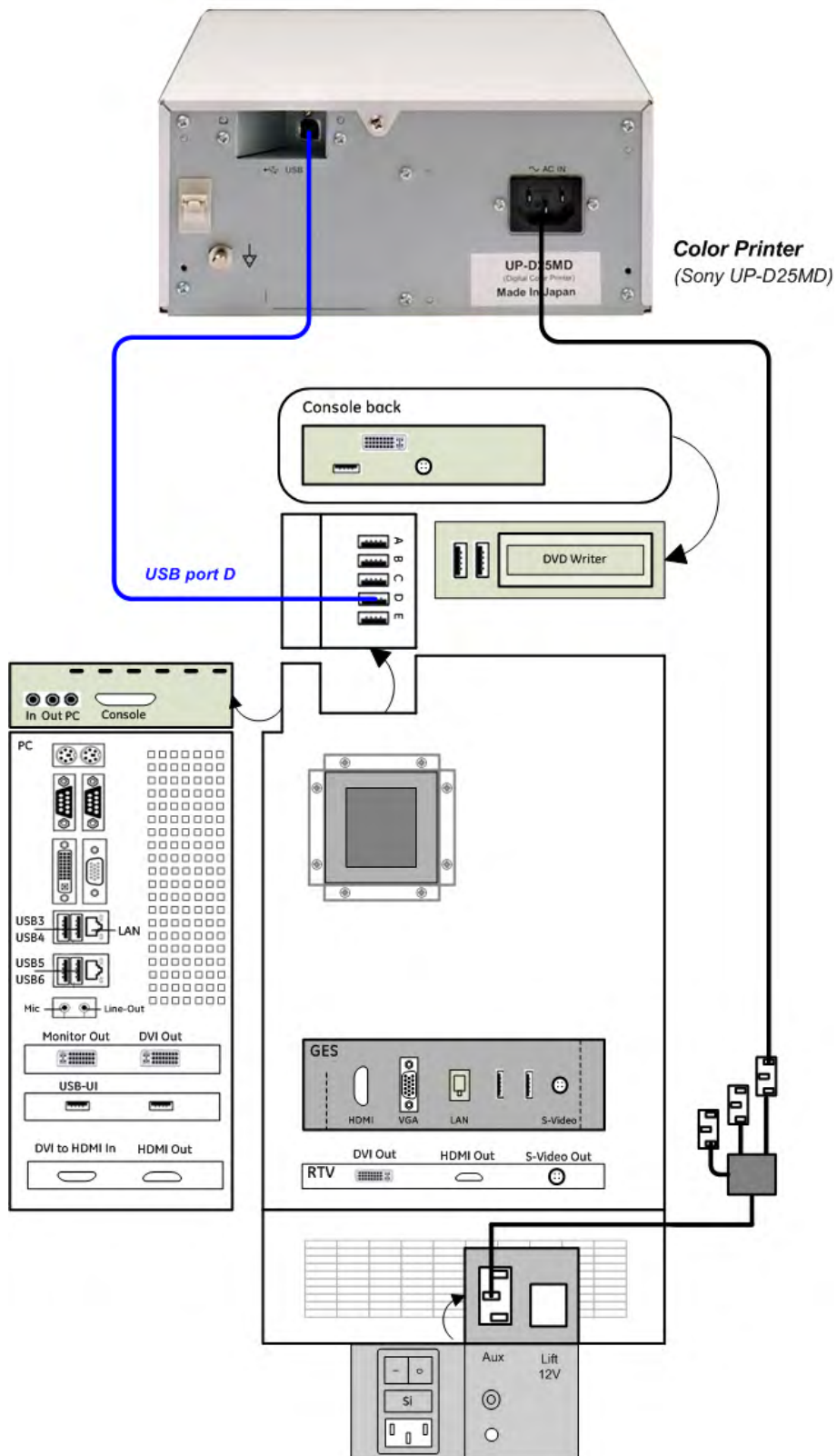


Figure 3-4 Color Printer connection

### 3.4.4 Connecting the DeskJet Color Printer



#### Caution

Please observe that the complete Bluetooth Printer Assembly has to be located outside of the patient environment (according to IEC 60601-1 / UL 60601-1).



#### Caution

The printer being used may not be a medical device. The Bluetooth Printer Set and the Power Supply of the Bluetooth Printer Adapter is also not a medical device. The equipment meets the requirements of the EN 60950 Standard.

#### Connection via Bluetooth Adapter

The DeskJet Color Printer can be connected to an external, non-isolated power source. The Bluetooth Adapter should be directly connected to any accessible USB port.

#### Note

Please use the proper Bluetooth Printer Connection set; see: [Section 9.10.1 "Printers" on page 9-28](#).

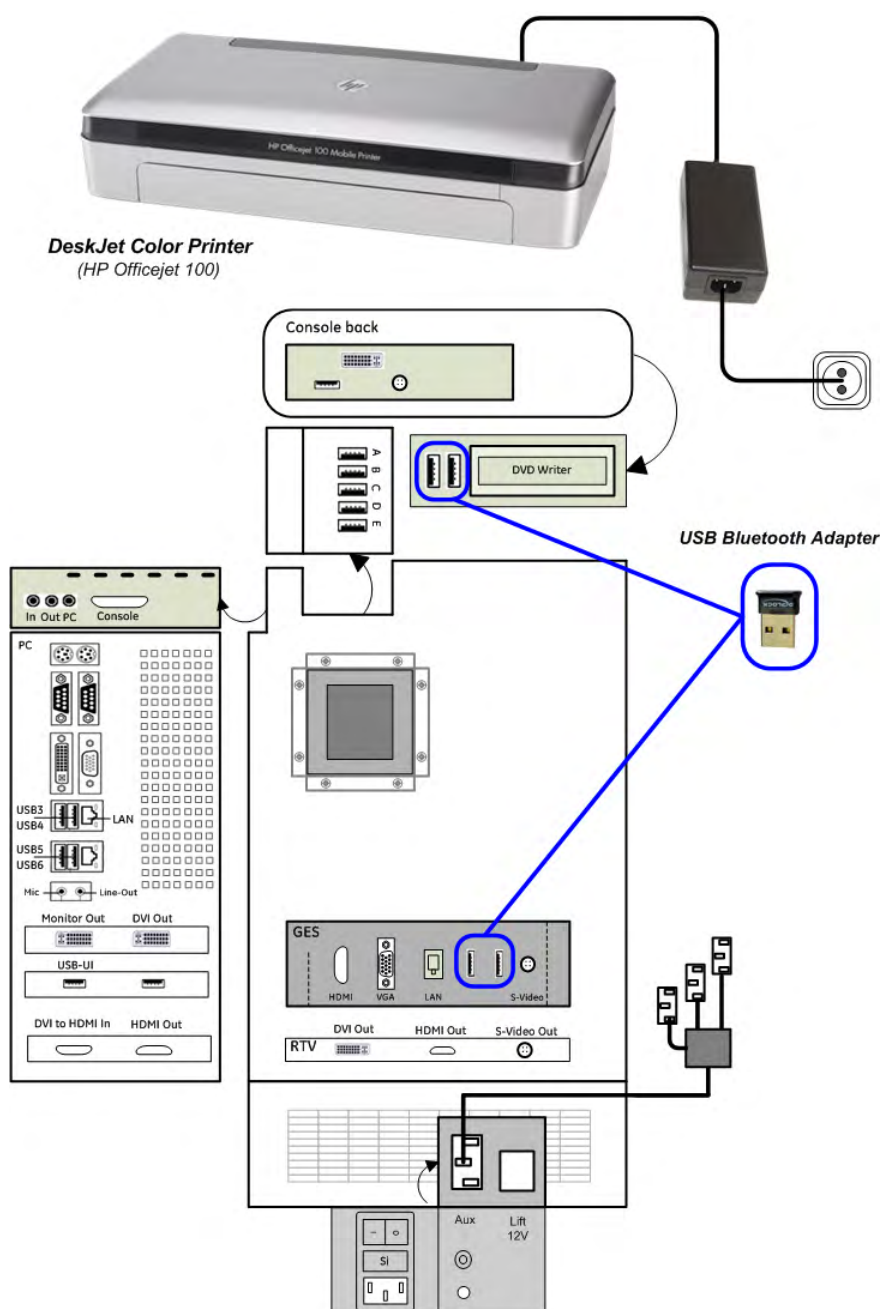


Figure 3-5 DeskJet Color Printer connection (via Bluetooth Adapter)

### Connection directly to the Voluson E-Series

The DeskJet Color Printer can be directly connected to any accessible USB port or the indicated USB port E on the RTB Distribution Board Bottom via an USB cable.

**Note**

*If a DeskJet printer (e.g., HP Officejet 100) is connected directly via an USB-cable, use the AC mains power outlet provided by the Voluson E-Series system (auxiliary output). This ensures medical grade separation from AC mains.*

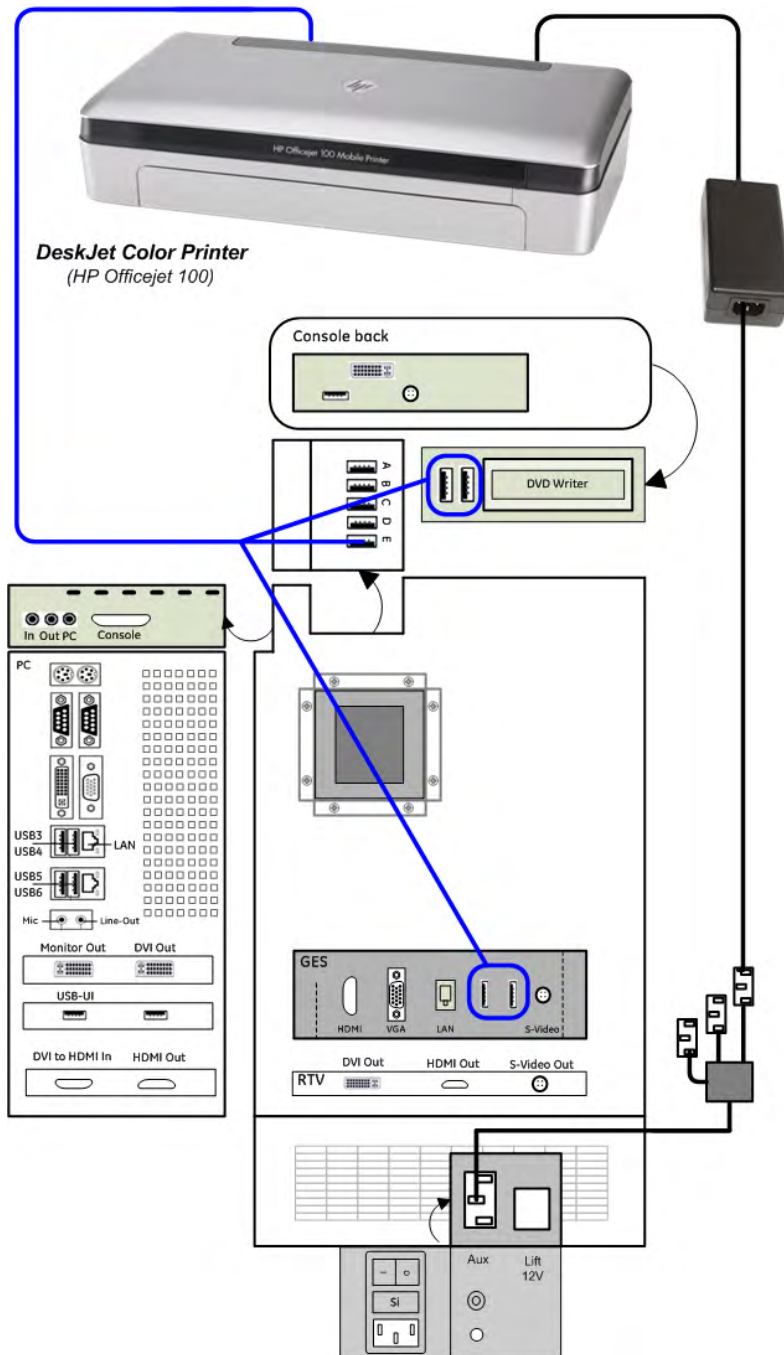


Figure 3-6 DeskJet Color Printer connection (directly via USB cable)

### 3.4.5 Connecting the Cellular Modem

1. Power Off/Shutdown the system as described in [Section 4.2.2 on page 4-4](#).
2. Insert a Standard SIM card from your local provider.

**SIM card requirements:**

- Data capable
- Standard size
- prepaid or post paid

**Note**

*Since the Voluson E-Series does not enable browser access, the service provider needs to enable the Internet access on the SIM card before installation in the Cellular Modem. Please ensure from the service provider, that there is no browser registration necessary when using the SIM card.*

3. Connect the Cellular Modem according to connection scheme, see: [Figure 3-7 on page 3-18](#).
4. Power ON/Boot up the Voluson E-Series system as described in [Section 3.5.1 on page 3-26](#).
5. After physical connection of the Cellular Modem to the Voluson E-Series system, perform Modem Configuration as described in [Section 3.13.3 "How to Setup the Cellular Modem" on page 3-58](#).
6. Click the signal strength icon in the status bar and select **Connect** for connection to the service provider.
7. If it is desired to send E-mails, perform configuration as described in [Section 3.13.4 on page 3-60](#).
8. If it is desired to use also MMS, adjust settings as described in [Section 3.13.5 on page 3-61](#).
9. Assign the Modem to a remote key (**P1, P2, P3, P4, P5** and/or **P6**) as described in [Section 3.6.6 "Remote Control Selection" on page 3-39](#) and adjust the Email settings.
10. Individually enter Patient's Email address and Phone number in the PID screen and adjust Email and/or MMS options as described in [Section 3.13.6 on page 3-62](#).

**Note**

*The Cellular Modem should be connected to the **USB port B** on the RTB Distribution Board Bottom.*



**Warning**

After each installation, the leakage currents have to be measured according to IEC 60601-1, UL 60601-1, IEC 62353 or other relevant standard.

### 3.4.5.1 Connection Scheme: Cellular Modem

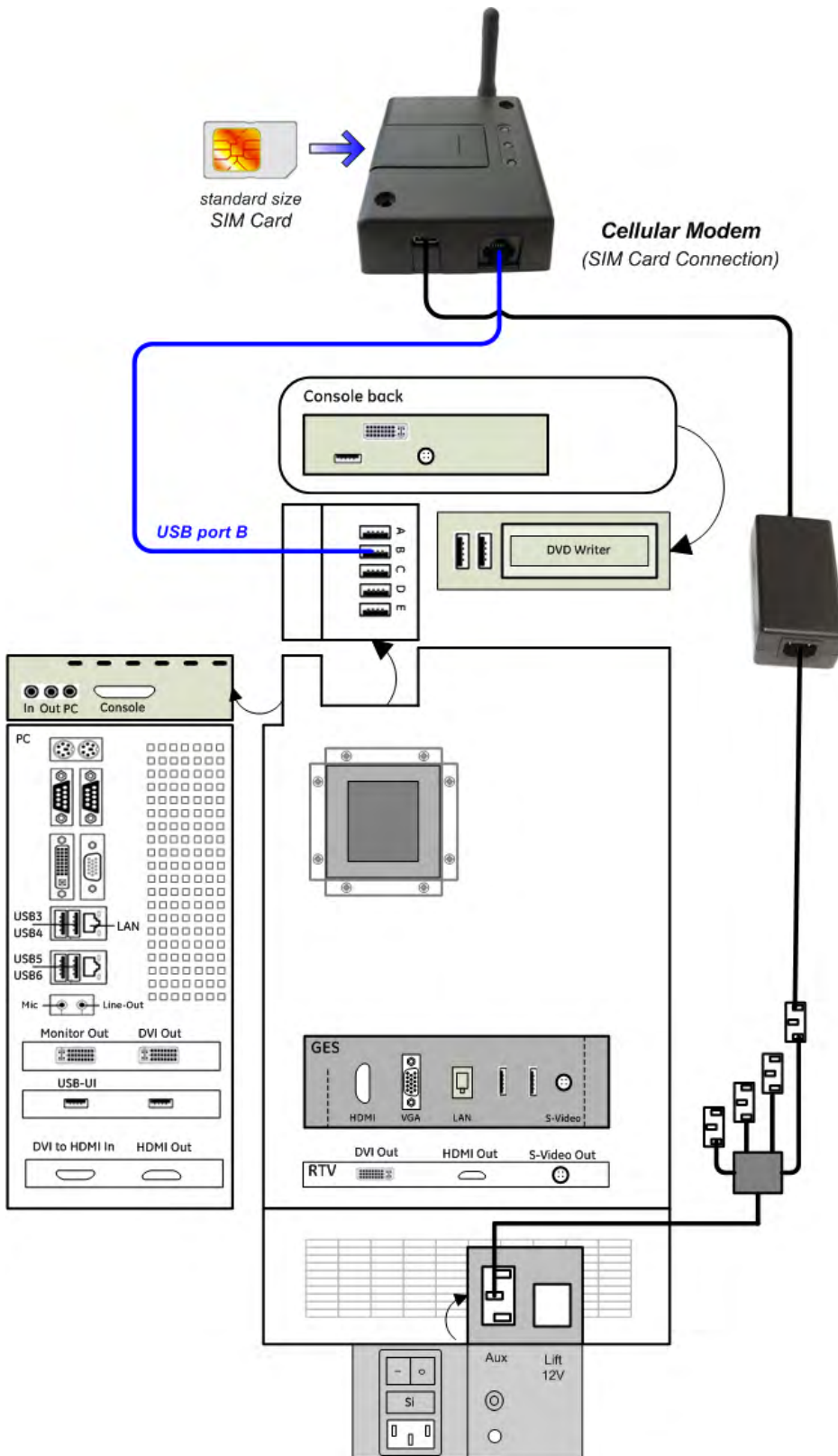


Figure 3-7 Connection Scheme - Cellular Modem

**Note** Connection is always the same (no differences between PC-Motherboard version of the Voluson E-Series system).



### 3.4.6 Connecting the Wireless Network Adapter

1. Turn ON the power of the system and wait till the system has booted.
2. Plug the Wireless Network adapter into an accessible USB port of the Voluson E-Series. All software drivers are pre-installed for the designated Wireless Network adapter only.

The Wireless Network Adapter can be connected to any accessible USB port.

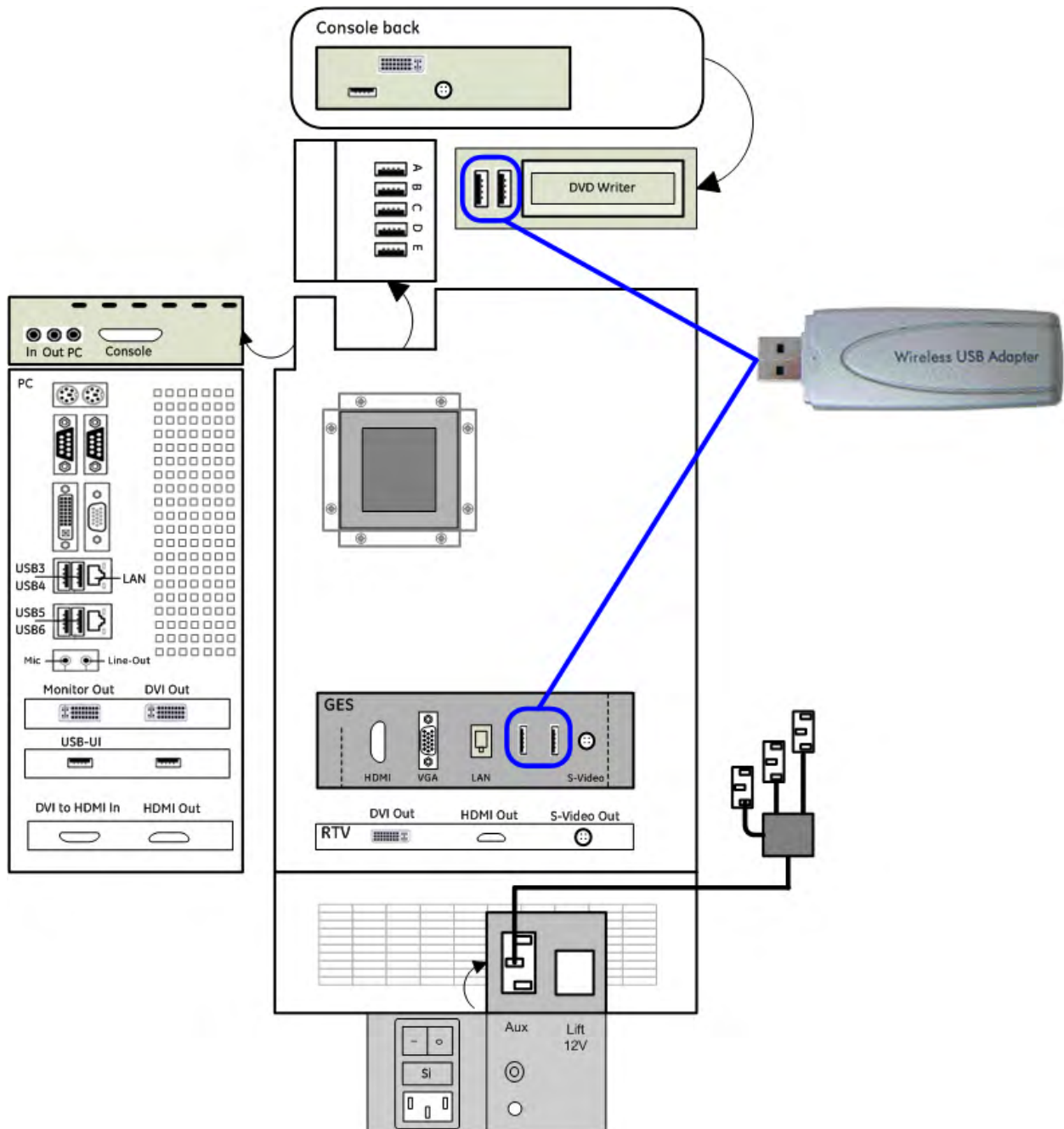


Figure 3-8 Connection Scheme - Wireless (USB) Network Adapter

**Note** Connection is always the same (no differences between PC-Motherboard version of the Voluson E-Series system).

**Note** After physical connection of the WLAN adapter to the Voluson E-Series system, follow the procedure described in Section 3.13.2 "Wireless Network Configuration" on page 3-53 .

### 3.4.7 Connecting a Secondary "Patient" Monitor

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**Caution**

A Secondary "Patient" Monitor **MUST NEVER** be connected to the Voluson E-Series systems mains supply directly! Always connect it to an appropriate Isolation Transformer (see [Section 9.10.3 on page 9-30](#)).

---



**Caution**

The secondary monitor is the only item to be connected to the isolation transformer.

---

**Note** *A Secondary Monitor is **NOT intended for diagnostic use**. It is an additional device used to allow the patient to watch the proceedings.*

**Note** *Take your time to think about the best position of the monitor in your facilities. Patients should be able to view the monitor easily and without having to bend or turn around.*

1. Power Off/Shutdown the system as described in [Section 4.2.2 on page 4-4](#) .
2. Connect the Secondary Monitor according to connection scheme, see: [Figure 3-9 on page 3-21](#) .
3. After physical connection to the Voluson E-Series system check, and if necessary change the Ext. Monitor Output setting, see: [Section 3.7.1.7 on page 3-43](#) .

**Note** *Connection is always the same (no differences between PC-Motherboard version of the Voluson E-Series system).*

### 3.4.7.1 Connection Scheme: Secondary "Patient" Monitor

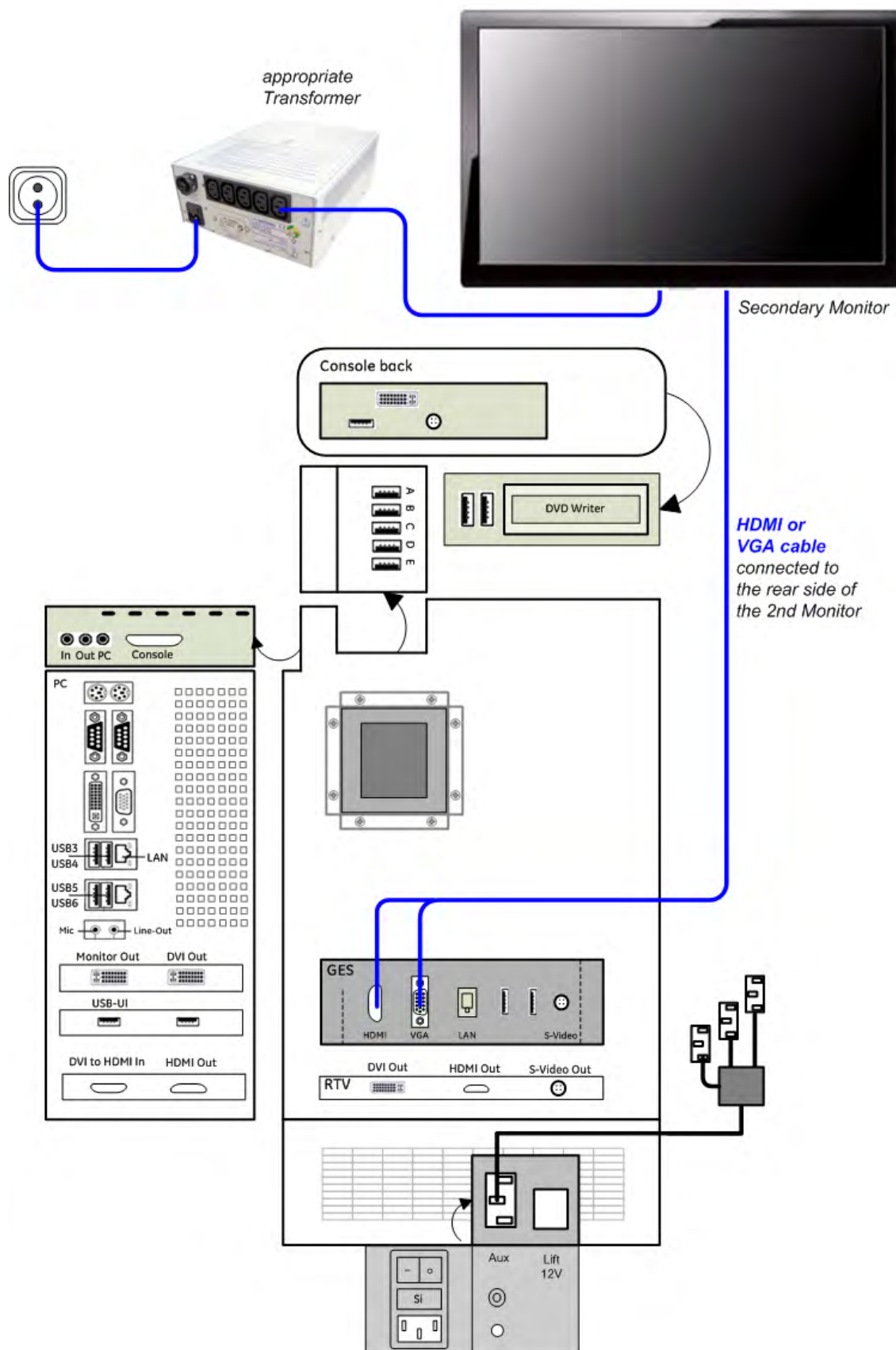


Figure 3-9 Secondary Monitor connection

### 3.4.8 Connecting the Footswitch

The Footswitch should be directly connected to any accessible USB-port on the Voluson E-Series (e.g., on rear of the system).

**Note** *Connection is always the same (no differences between PC-Motherboard version of the Voluson E-Series system).*

After physical connection, adjust the Footswitch as described in [Section 3.7.1.8 on page 3-43](#).

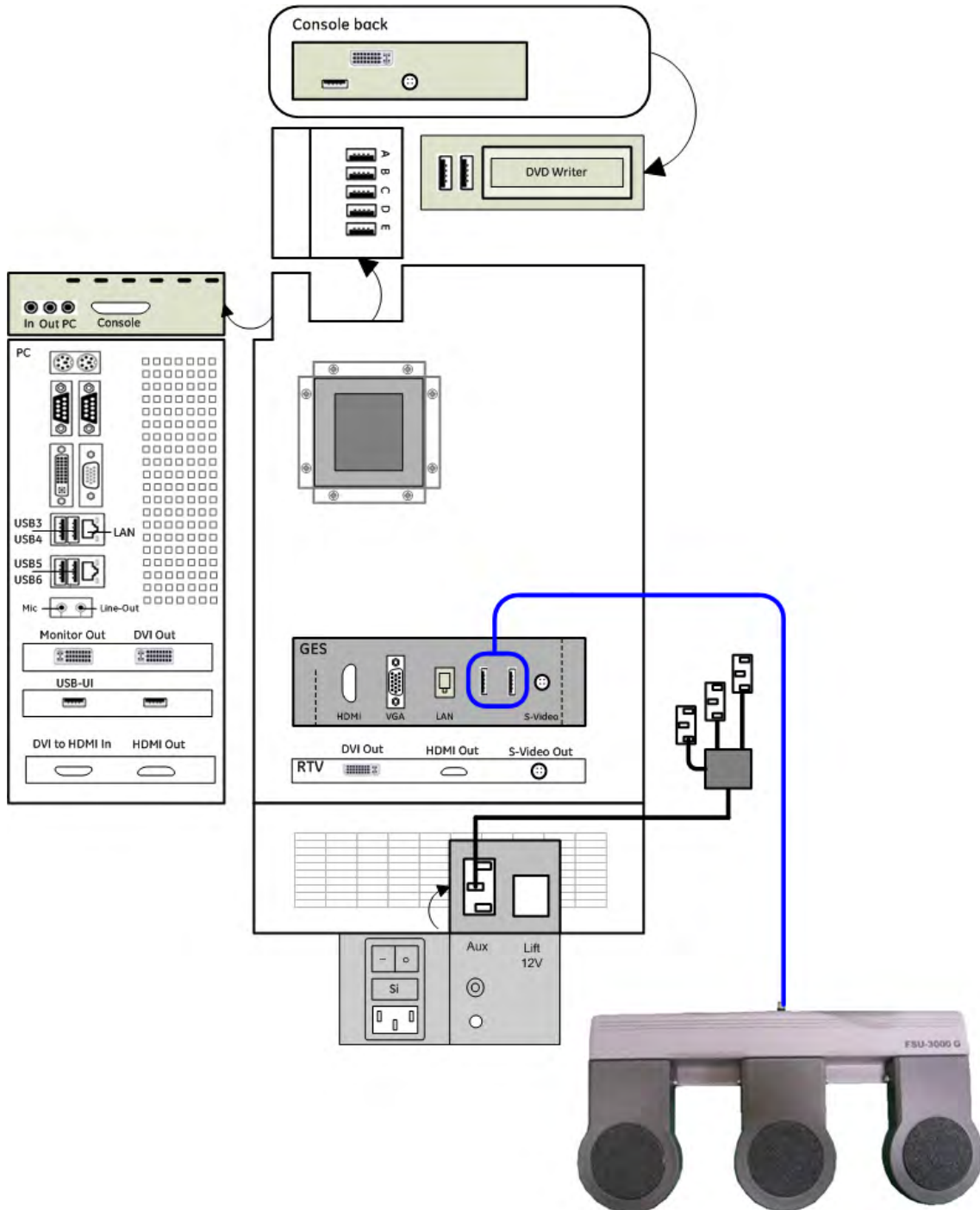


Figure 3-10 Connection Scheme - Footswitch

### 3.4.9 Connecting the ECG-preamplifier

**Note** Connection is always the same (no differences between PC-Motherboard version of the Voluson E-Series system).

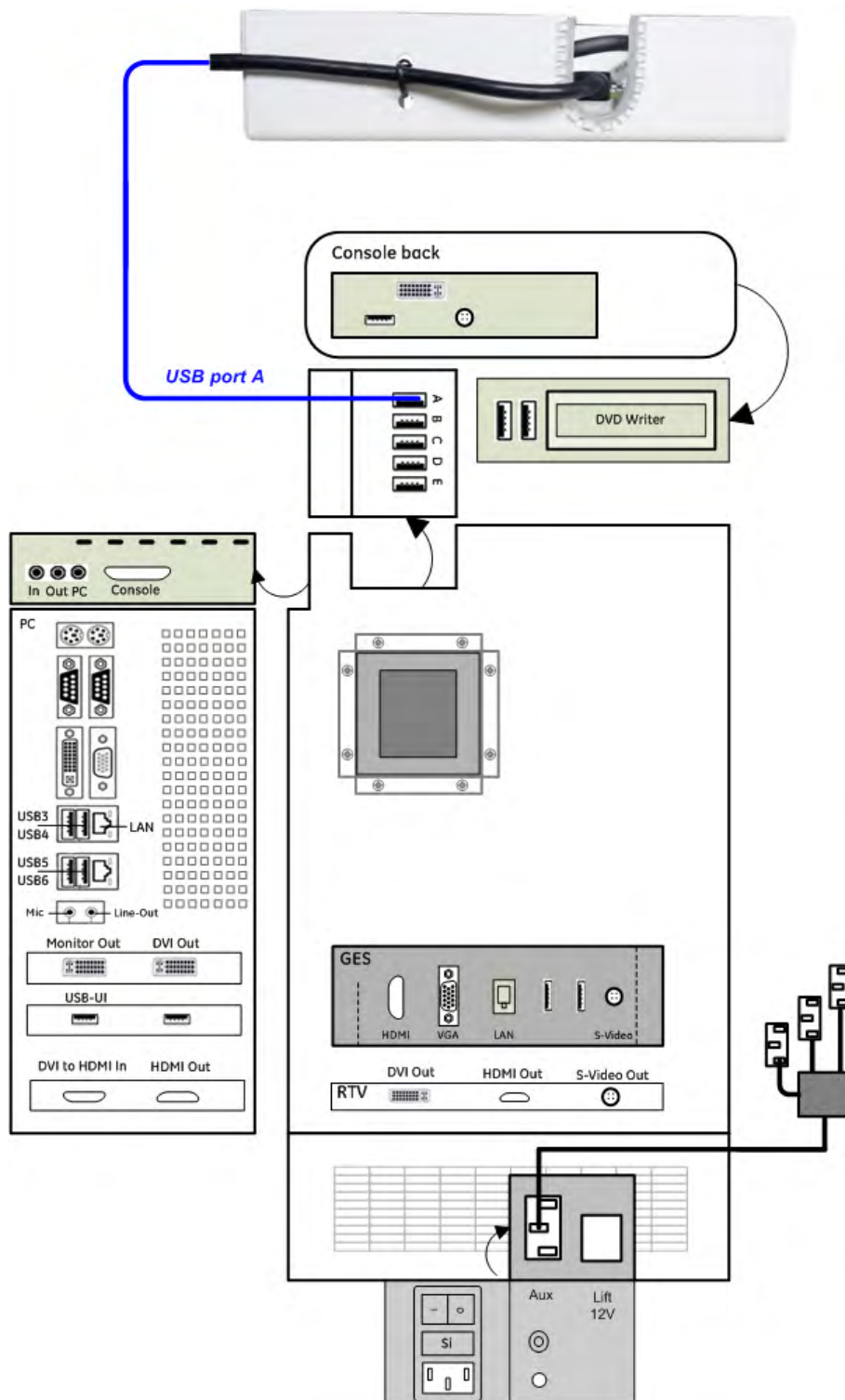


Figure 3-11 Connection Scheme - ECG-preamplifier

### 3.4.10 Connecting an USB Flash Memory Stick

**Note** *Before connecting an USB device, please read [Section 3.4.12 "General Remarks and Hints when using external USB-Devices"](#) on page 3-25 .*

An USB Flash Memory Stick may be connected to an accessible USB port of the Voluson E-Series system (e.g., on back of control console).

An external USB Flash Memory Stick can be connected once the system is powered ON, or after shutdown. The Voluson E-Series, Windows detects the device and automatically installs a driver. During this process several dialogs may pop up, starting with the „Found New Hardware” dialog.

**Note** *Memory drives or sticks may be sensitive to EMC interference. This may affect system performance and/or image quality.*

**Note** *Before disconnecting an external USB-device (e.g., USB Stick), the system has to be informed about the removal of the device! For this purpose press the **Eject** key on the keyboard.*

*For further details see [Section 3.4.12.2 "External USB-Devices - Disconnection"](#) on page 3-25 .*

### 3.4.11 Connecting an external USB Hard disk

**Note** *Before connecting an USB device, please read [Section 3.4.12 "General Remarks and Hints when using external USB-Devices"](#) on page 3-25 .*

An external HDD may be connected to an accessible USB port of the Voluson E-Series system (e.g., on back of control console).

An external USB Hard Disk Drive can be connected once the system is powered ON, or after shutdown. The Voluson E-Series, Windows detects the device and automatically installs a driver. During this process several dialogs may pop up, starting with the „Found New Hardware” dialog.

**Note** *Memory drives or sticks may be sensitive to EMC interference. This may affect system performance and/or image quality.*

**Note** *Before disconnecting an external USB-device (e.g., USB Stick), the system has to be informed about the removal of the device! For this purpose press the **Eject** key on the keyboard.*

*For further details see [Section 3.4.12.2 "External USB-Devices - Disconnection"](#) on page 3-25 .*

### 3.4.12 General Remarks and Hints when using external USB-Devices



#### Caution

Do not connect or disconnect any external USB-devices to or from the system while scanning a patient! The appearing dialogs could distract you from the scan!

#### 3.4.12.1 External USB-Devices - Connection

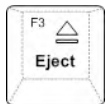
When an external USB-storage device (such as an USB-memory stick or an external hard disk) is connected to the Voluson E-Series, Windows detects the device and automatically installs a driver. During this process, several dialogs may pop up, starting with the "Found New Hardware" dialog.

The device is then accessible using the drive letter the system assigned to it.

**Note** *If an external drive was not recognized automatically after connecting it, click **Rescan Drive**.*

**Note** *When connecting external USB devices, be sure to execute Safety Directions found in the Voluson E-Series Basic User Manual.*

#### 3.4.12.2 External USB-Devices - Disconnection



Before an external USB-device (e.g., USB-memory stick) can be disconnected, the system has to be informed about the removal of the device! For this purpose press the **Eject** key on the keyboard.



#### Caution

Unplugging or ejecting USB devices without first stopping them can cause the system to crash and possibly result in loss of valuable data.

By pressing the **Eject** key on the keyboard, a dialog window (see: [Figure 3-12 below](#)) is displayed. The "Connect USB and Network Drives" window shows all USB and Network drives connected to the system. Using this dialog, the USB-devices can be stopped before they are physically disconnected.

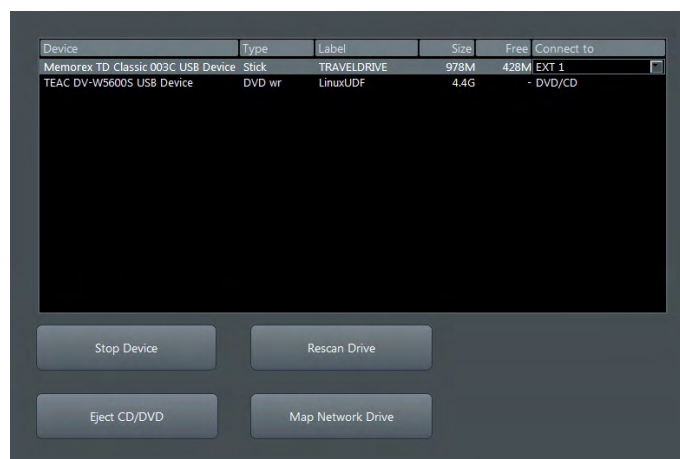


Figure 3-12 Connect USB and Network Drives

To stop the external device, select it and then click the **Stop Device** button.

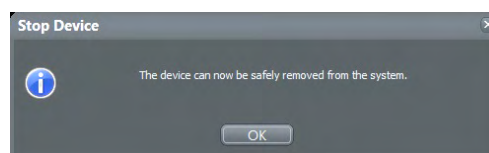


Figure 3-13 Device can now be safely removed

Confirm the "Stop Device" dialog with **OK** and **Close** the "Connect USB and Network Drives" window.

## 3.5 Completing the Setup

### Connecting the System to a Power Source



**Caution**

Prior to connect the Voluson E-Series system to a power source, verify compliance with all electrical and safety requirements. Check the power cord to verify that it is intact and of hospital-grade. Products equipped with a power source (wall outlet) plug should be connected to the fixed power socket that has a protective grounding conductor. Never use an adapter or converter to connect with a power source plug (for example, a three-prong to two-prong converter).



**Warning**

The system's power must be supplied from a separate, properly rated outlet to avoid risk of fire. Refer to [Section 2.1.2.1 "Voluson Power Requirements Voluson E-Series" on page 2-2](#) for rating information. The power cord should not, under any circumstances, be altered to a configuration rated less than that specified for the current.

**Note**

*Use only the power cords, cables and plugs provided by or designated by GE Healthcare Austria GmbH & Co OG to connect the system to the power source.*



**Caution**

Whenever disconnecting the Voluson E-Series system from the electrical outlet, always observe the safety precautions. First unplug the main power cable from the wall outlet socket, then from the system itself. Remove by pulling on the cable connector - Do not pull on the cable.



**Caution: The Voluson E-Series requires all covers!**

Do not operate this system unless all board covers and frame panels are securely in place, to ensure optimal system performance and cooling. (When covers are removed, EMI may be present).

### 3.5.1 Power On / Boot Up

#### System Power On / BackEnd Processor Boot Up

1. Connect the main power cable to the back of the system.
2. If not already done, screw on the pull-out protection of the mains power cable with the 2 screws.
3. Connect the main power cable to a hospital grade power outlet with the proper rated voltage. Never use an adapter that would defeat the safety ground.
4. Switch ON the circuit breaker at the rear of the system.



Figure 3-14 Circuit Breaker at rear of system

- 1 circuit breaker
- 2 fuses (2x T10A H/250V)
- 3 connector for main power cable

**Note**

*When AC power is applied to the system, the **ON/OFF** standby button on the control console illuminates amber, indicating that the system (including the Back-end Processor) is in standby mode.*



5. Hold down the **ON/OFF** standby button (see: [Figure 3-15 below](#)) on the control console for ~3 seconds.

**Note**

*The mains outlet of the system for peripheral auxiliary equipment are commonly switched with the **ON/OFF** standby button. The power switch of any attached printer(s) needs to be in ON position before starting the system. However, be aware some auxiliary equipment may switch itself to standby mode (e.g., Color video printer) and must therefore be switched on separately.*

When the **ON/OFF** standby button on the control console is pressed, the system (including the Back-end Processor) starts and the operating system is loaded which then leads to activate the application software.

The system automatically performs an initialization sequence which includes the following:

- Loading the operating system.
- Running a quick diagnostic check of the system.
- Detecting connected probes



Figure 3-15 ON/OFF standby button

As soon as the software has been loaded, the system enters 2D-Mode with the probe and application that were used before the system shutdown.

**Note**

*Total time used for start-up is about 2 minutes.*

6. Adjust height and position of the control console as described in [Section 6.3 "Control Console Positioning"](#) on page 6-4 .

### 3.5.1.1 During a normal boot, you may observe

1. Power is distributed to peripherals, control console, monitor, FrontEnd and BackEnd processor.
2. The BackEnd processor and rest of the system starts with the sequence listed in following steps:
  - a. First of all, the BIOS version is shown on the monitor.
  - b. Afterward the "Boot Screen" is displayed. (**Voluson** is highlighted).

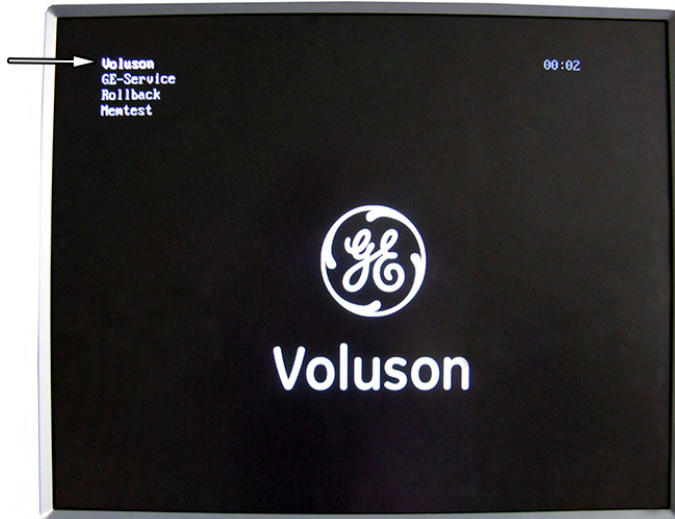


Figure 3-16 Boot screen

3. BackEnd processor is turned ON and starts to load the software.
4. The start screen is displayed on the monitor.
5. Start-up progress bars indicating software loading procedures, are displayed on the monitor.



Figure 3-17 start-up screen

6. The software initiates and sets up the FrontEnd electronics and the rest of the system (incl. clicking sound of relays on RTF board).
7. The keyboard back light is lit.
8. As soon as the software has been loaded, the 2D screen is displayed on the monitor.

### 3.5.2 Power Off / Shutdown

**Note** After turning off a system, wait at least 10 seconds before turning it on again. The system may not be able to boot if power is recycled too quickly.

1. If not already in read mode, freeze the image.
2. Press the **ON/OFF** Standby button on the control console. Following dialog appears.

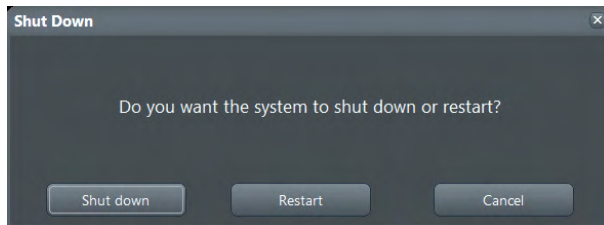


Figure 3-18 Shutdown dialog

3. Select **Shutdown**. The system performs an automatic full shutdown sequence.
4. Switch OFF the circuit breaker at the rear of the system.

**Note** A full shutdown is also performed when pressing the **ON/OFF** standby button on the control console twice.

**Note** The mains outlet of the system for peripheral auxiliary equipment are commonly switched with the **ON/OFF** standby button. So the auxiliary equipment need not to be switched ON/OFF separately.



#### Warning

Disconnection of the main power cable is necessary!

5. After complete power down, unscrew the 2 screws and remove the pull-out protection to disconnect the main power cable from the system or unplug it from the AC wall outlet socket.

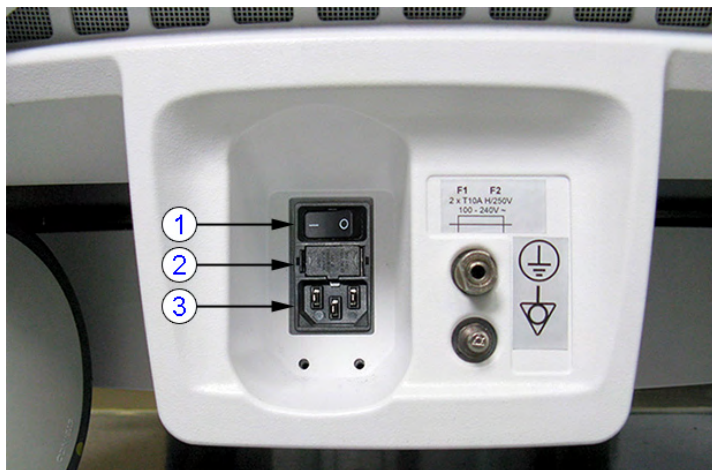


Figure 3-19 Circuit Breaker at rear of system

- 1 circuit breaker
- 2 fuses (2x T10A H/250V)
- 3 connector for main power cable

6. Press on the brakes to block the front caster wheels.
7. Disconnect probes. (Turn the probe locking handle counterclockwise and then pull the connector straight out of the probe port.)



#### Caution

Do not disconnect a probe while running (Live Scan "Write" mode)! A software error may occur. In this case switch the system OFF (perform a reset).

### 3.5.3 Probe Connection

**Note** *When the probe is connected, it is automatically activated. Once connected, probes can be selected for different applications.*

Connect a probe to one of the three rightmost probe receptacle as follows:

1. Inspect the probe and probe socket to verify that it is free of debris.
2. Ensure that the probe locking lever is at horizontal position.
3. Insert the connector on the receptacle guide pin until it touches the receptacle mating surface.
4. Twist the probe locking lever clockwise (to vertical position) to lock it in place.
5. Open the side door, lay the cable into the intended cable holder and close the door.
6. Carefully position the probe cord so that it is free to move and is not resting on the floor.

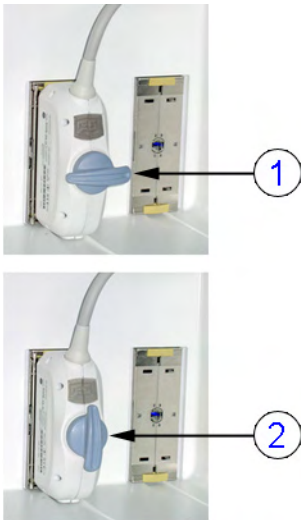


Figure 3-20 probe connection

- 
- 1 probe **unlocked** (locking lever is in horizontal position)
  - 2 probe **locked** (locking lever is in vertical position)
- 

#### Caution



- Do not bend the probe cable acutely. **Fault conditions can result in electric shock hazard.**
  - Do not touch the surface of probe connectors which are exposed when the probe is removed.
  - Do not touch the patient when connecting or disconnecting a probe.
- 

**Note** *Prior to connecting or disconnecting a probe, freeze the image. It is not necessary to turn OFF power to connect or disconnect a probe.*

## 3.6 Printer Installation

**Note** For connection schemes see *Section 3.4 "Connection of Auxiliary Devices" on page 3-9*.

### Content in this section

<i>3.6.1 Installing the Digital Black &amp; White Printer</i>	<i>3-31</i>
<i>3.6.2 Installing the Digital Color Printer</i>	<i>3-31</i>
<i>3.6.3 Installing the DeskJet Color Printer directly via an USB-cable</i>	<i>3-31</i>
<i>3.6.4 Printer Installation manually</i>	<i>3-32</i>
<i>3.6.5 Adjustment of Printer Settings</i>	<i>3-33</i>
<i>3.6.6 Remote Control Selection</i>	<i>3-39</i>

**Note** The Bluetooth printer connection set **MUST NOT** be installed by the user! For Bluetooth installation please contact your local distributor or GE service representative.

If a DeskJet printer (e.g., HP Officejet 100) is connected directly via an USB-cable, use the AC mains power outlet provided by the Voluson E-Series system (auxiliary output). This ensures medical grade separation from AC mains.



### Warning

After each installation, the leakage currents have to be measured according to IEC 60601-1, UL 60601-1, IEC 62353 or other relevant standard.

### 3.6.1 Installing the Digital Black & White Printer

1. Power Off/Shutdown the system as described in *Section 4.2.2 on page 4-4*.
2. Connect and install the printer as described in *Section 3.4.2 on page 3-11*.
3. Verify correct printer settings; see *Section 3.6.5 "Adjustment of Printer Settings" on page 3-33*.
4. Assign the printer to the remote keys **P1**, **P2**, **P3**, **P4**, **P5** and/or **P6**; see *Section 3.6.6 "Remote Control Selection" on page 3-39*.

### 3.6.2 Installing the Digital Color Printer

1. Power Off/Shutdown the system as described in *Section 4.2.2 on page 4-4*.
2. Connect and install the printer as described in *Section 3.4.3 on page 3-13*.
3. Verify correct printer settings; see *Section 3.6.5 "Adjustment of Printer Settings" on page 3-33*.
4. Assign the printer to the remote keys **P1**, **P2**, **P3**, **P4**, **P5** and/or **P6**; see *Section 3.6.6 "Remote Control Selection" on page 3-39*.

### 3.6.3 Installing the DeskJet Color Printer directly via an USB-cable

1. Power Off/Shutdown the system as described in *Section 4.2.2 on page 4-4*.
2. Connect the printer according to connection scheme *Figure 3-6 on page 3-16*.
3. When all cables are connected, press the Power ON switch on the printer.
4. Power ON/Boot up the Voluson E-Series system as described in *Section 3.5.1 on page 3-26*.  
All software drivers are pre-installed for the designated printer only.
5. After physical connection to the Voluson E-Series system, assign the printer to a remote key (**P1**, **P2**, **P3**, **P4**, **P5** and/or **P6**) as described in *Section 3.6.6 "Remote Control Selection" on page 3-39*.
6. Verify correct printer settings; see *Section 3.6.5 "Adjustment of Printer Settings" on page 3-33*.
7. Assign the printer as Report Printer, see *Section 3.6.6.1 "Report Printer Selection" on page 3-39*.

### 3.6.4 Printer Installation manually

1. Press the **Utilities** key on the control console.
2. In the “Utilities” menu touch the **Setup** button to invoke the setup desktop on the screen.
3. On the right side of the screen select **Connectivity** and then click the **Peripherals** tab.

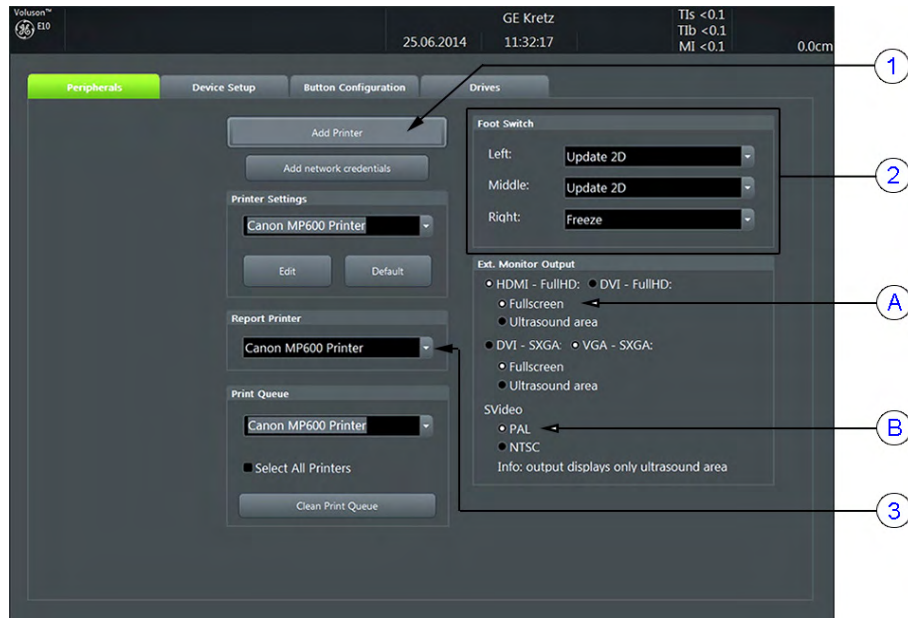


Figure 3-21 Setup - Connectivity - PERIPHERALS page

A	External Monitor Output selection	1	Add Printer button
B	Video Norm selection	2	Footswitch Remote Control
3	Report Printer selection		

4. Click the **Add Printer** button.  
Please read the displayed message carefully and click **Yes** if you have skills to do this.
5. Click the **Next** button to start the Add Printer Wizard.
6. After installation, close all open windows, select **Save & Exit** and restart the system (turn off and on the system).
7. Verify correct printer settings; see [Section 3.6.5 "Adjustment of Printer Settings" on page 3-33](#) .
8. Assign the printer to the remote keys **P1**, **P2**, **P3**, **P4**, **P5** and/or **P6**; see [Section 3.6.6 "Remote Control Selection" on page 3-39](#) .

### 3.6.5 Adjustment of Printer Settings

After system restart:

1. Press the **Utilities** key on the control console.
2. In the "Utilities" menu touch the **Setup** button to invoke the setup desktop on the screen.
3. On the right side of the screen select **Connectivity** and then click the **Peripherals** tab.
4. Select the desired printer from the Printer Settings pull-down menu and click the **Edit** button.

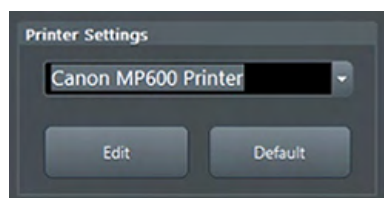


Figure 3-22 select desired printer

- "UP-D897 Printer - Settings" on page 3-33
- "P95D Printer - Settings" on page 3-34
- "CP30D Printer - Settings" on page 3-35
- "UP-D25MD Printer - Settings" on page 3-36
- "UP-D23MD Printer - Settings" on page 3-38



#### Warning

After each installation, the leakage currents have to be measured according to IEC 60601-1, UL 60601-1, IEC 62353 or other relevant standard.

#### 3.6.5.1 UP-D897 Printer - Settings

1. Call up the "Printer Preferences"; see [Section 3.6.5 "Adjustment of Printer Settings" on page 3-33](#).
2. Select the **Layout** page and select:
  - Paper: **960x1280**
  - Orientation: **Portrait**
  - Interpolation Method: **Bilinear**

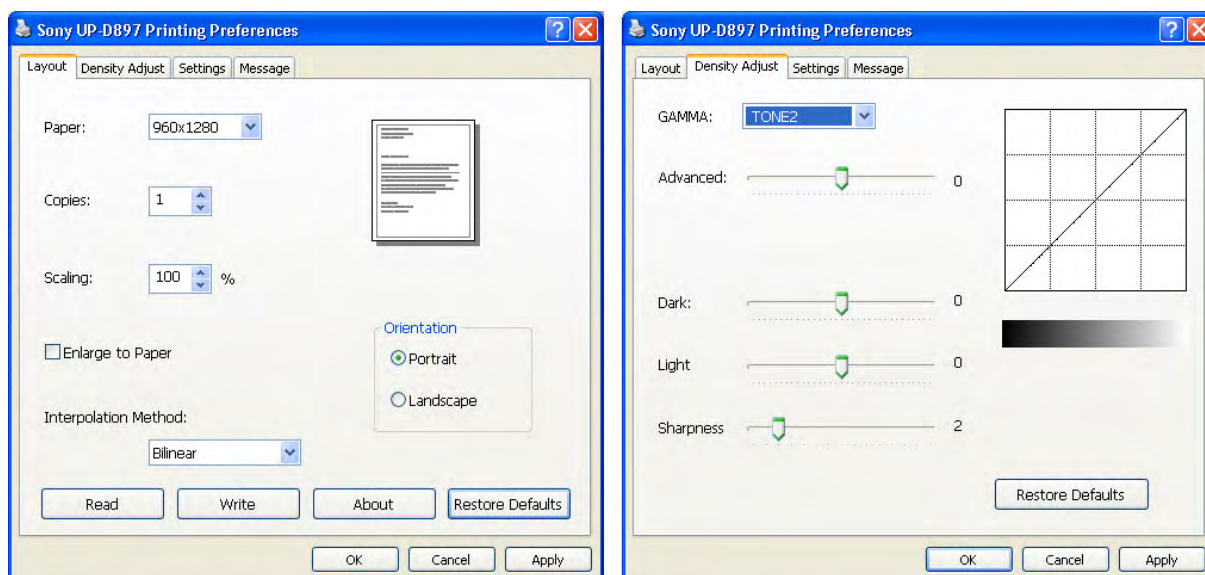


Figure 3-23 Layout / Density Adjust page

3. Select the **Density Adjust** page and select:
  - Gamma: **TONE2**
  - Sharpness = **0**, Dark = **0**, Light = **0**, Sharpness = **2**
4. Save the adjusted printer settings with **Apply** and **OK**. Close window and exit System Setup.
5. Assign the printer to the remote keys **P1**, **P2**, **P3**, **P4**, **P5** and/or **P6**; see [Section 3.6.6 "Remote Control Selection" on page 3-39](#).

### 3.6.5.2 P95D Printer - Settings

1. Printer Settings directly on the B&W printer:
  - a. Press the **BRT** button on the printer and adjust Brightness to **0** by using the turning knob.
  - b. Press the **CONT** button on the printer and adjust Contrast to **0** by using the turning knob.
  - c. Press the **SHARP** button on the printer and adjust Sharpness to **3** by using the turning knob.
  - d. Press the **FUNC** button on the printer and adjust Gamma to **r5** by using the turning knob.
  - e. Press the **BRT** button twice to save and exit.



Figure 3-24 P95D - Printer settings

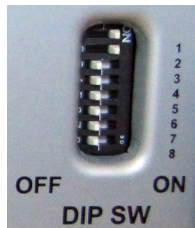
1	Brightness = 0	2	Contrast = 0
3	Sharpness = 3	4	Gamma = r5

2. Assign the printer to the remote keys **P1**, **P2**, **P3**, **P4**, **P5** and/or **P6**; see [Section 3.6.6 "Remote Control Selection" on page 3-39](#).
3. Activate USB serial number:
  - a. Turn the printer OFF and wait 5 seconds.
  - b. Press and hold the buttons **COPY + CONT** and power on the printer. When the Display changes to **S1** the buttons can be released.
  - c. Press the **FUNC** button -> the display changes to **U0**.
  - d. Adjust the value to **U2** via turning knob.
  - e. Press the **FUNC** button again -> the display changes to another value (normally **F0**).
  - f. Power OFF the printer.



### 3.6.5.3 CP30D Printer - Settings

1. Set Dip-switches on rear of the printer. **1 and 2 to ON**. 3, 4, 5, 6, 7 and 8 to OFF.



2. Call up the "Printer Preferences"; see [Section 3.6.5 "Adjustment of Printer Settings" on page 3-33](#).
3. Select the **Paper** page and select:
  - Paper Size: **L (large)**
  - Orientation: **Landscape** (recommended when using large paper size)

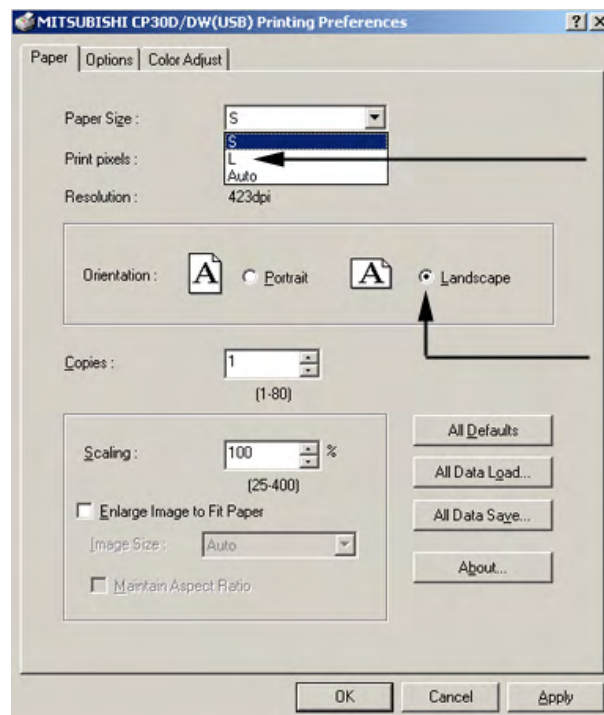


Figure 3-25 Paper page

4. Save the adjusted printer settings with **Apply** and **OK**. Close window and exit System Setup.
5. Assign the printer to the remote keys **P1, P2, P3, P4, P5** and/or **P6**; see [Section 3.6.6 "Remote Control Selection" on page 3-39](#).

### 3.6.5.4 UP-D25MD Printer - Settings

1. Call up the "Printer Preferences"; see *Section 3.6.5 "Adjustment of Printer Settings" on page 3-33*.
2. Select the **Paper** page and select:
  - Paper: **UPC-...L** (large) / UPC-...S (small)
  - Orientation: **Landscape** (recommended when using large paper size)
  - **High Speed** (check mark on)

**Note** *Settings for paper size **must** match with the used paper (large/small) and also the right color ink cartridge has to be used. Otherwise you will get an error message at printing.*

3. Select the **Graphics** page. From the "Color Adjust" pull-down menu select:
4. **Color Balance**: Cyan = 0, Magenta = 0, Yellow = 0

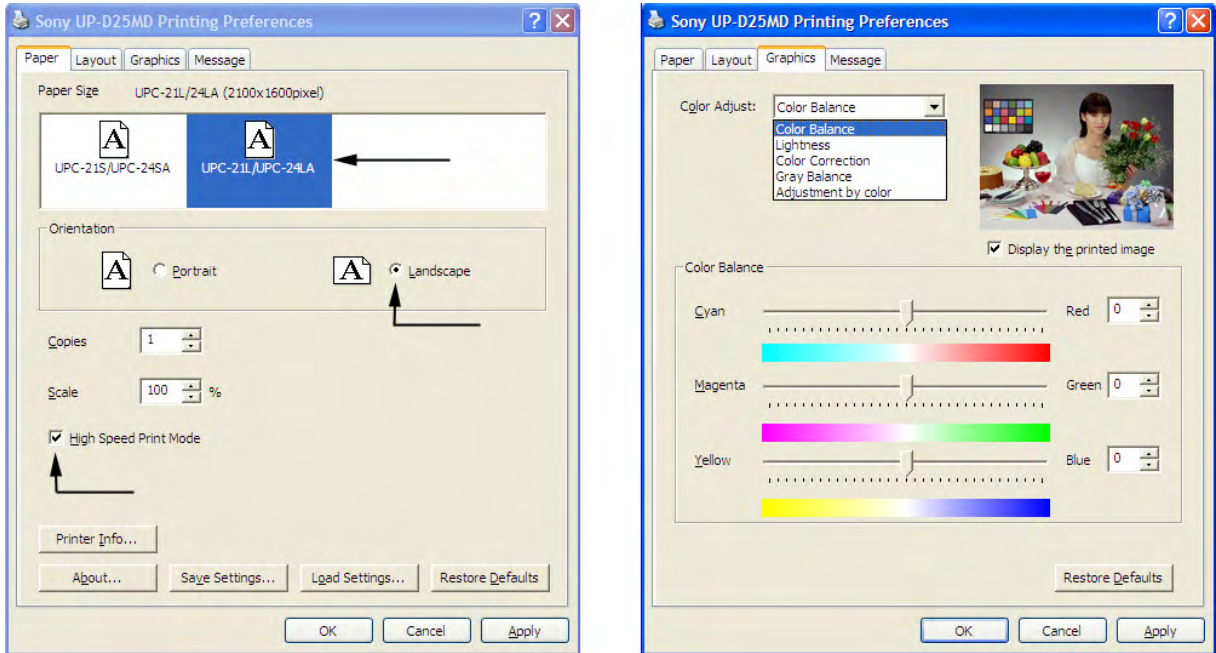


Figure 3-26 Paper / Graphics page

5. **Lightness:** Sharpness = 7, Dark = 0, Gamma = -6, Light = 2, Gamma Curve = Curve 1
6. **Color Correction:** check mark Printer Hardware Color Correction

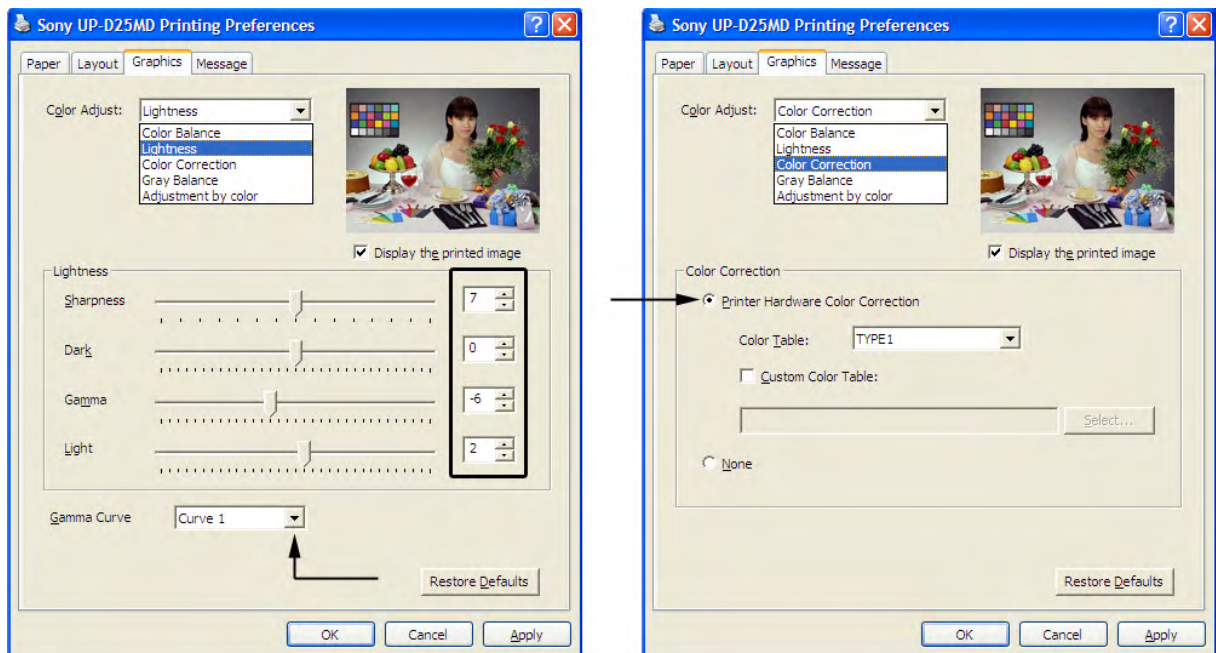


Figure 3-27 Graphic page (Lightness / Color Correction)

7. **Gray Balance:** X = 50, Y = 50
8. **Adjustment by Color:** Color (region) = Magenta Red

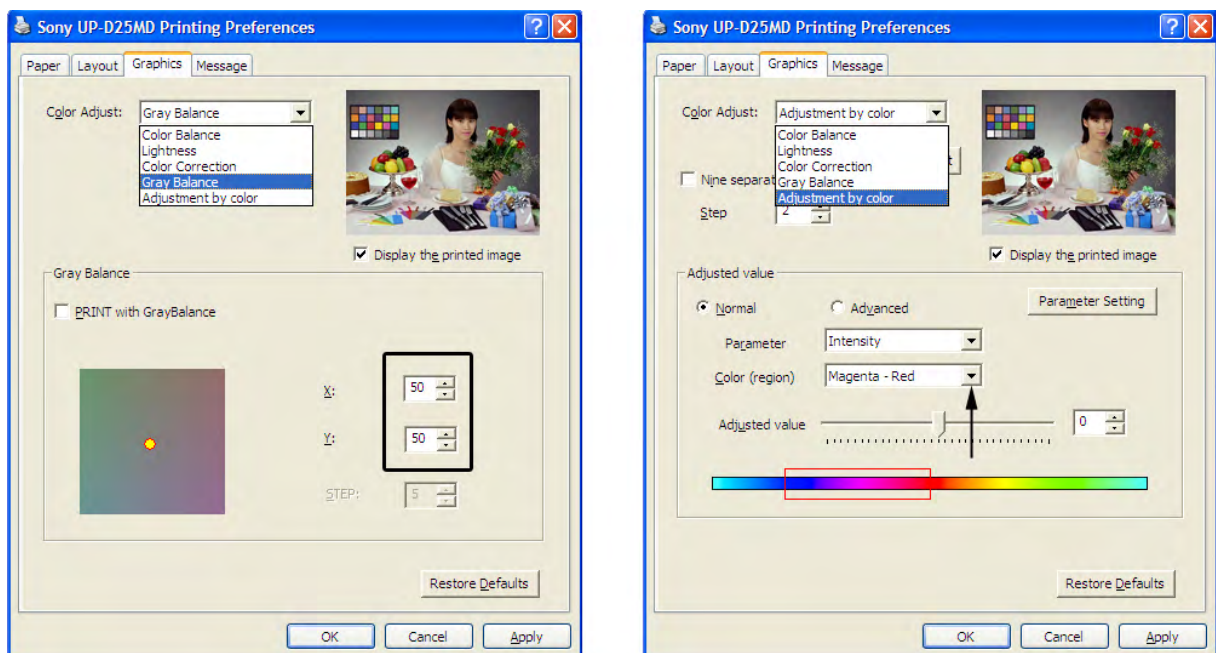


Figure 3-28 Graphic page (Gray Balance / Adjustment by Color)

9. Save the adjusted printer settings with **Apply** and **OK**. Close window and exit System Setup.
10. Assign the printer to the remote keys P1, P2, P3, P4, P5 and/or P6; see [Section 3.6.6 "Remote Control Selection" on page 3-39](#).

### 3.6.5.5 UP-D23MD Printer - Settings

1. Call up the "Printer Preferences"; see *Section 3.6.5 "Adjustment of Printer Settings" on page 3-33*.
2. Select the **Paper** page and set settings as shown in the left image at *Figure 3-26 on page 3-36*.
3. Select the **Graphics** page. From the "Color Adjust" pull-down menu select:
  - Color Balance: Cyan = 0, Magenta = 0, Yellow = 0
  - Gamma Select: **Gamma 1**

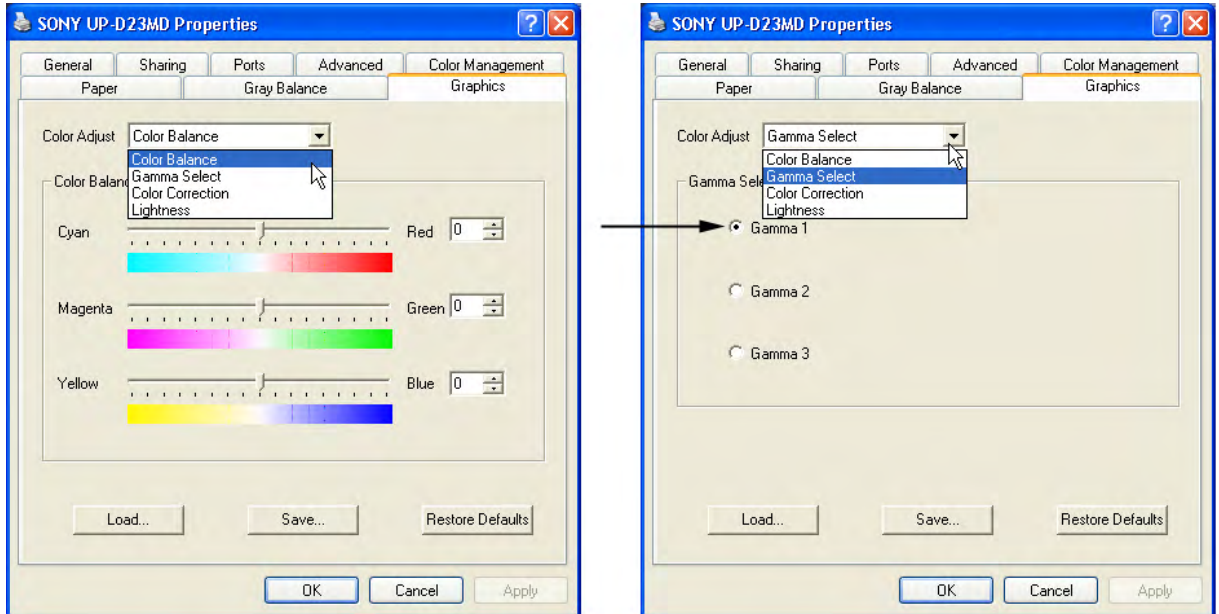


Figure 3-29 Graphics page (Color Balance + Gamma Select)

- Color Correction: set **Printer Hardware Color Correction**
- Lightness: Sharpness = **7** or **8**, Dark = **0**, Gamma = **-12**, Light = **8**

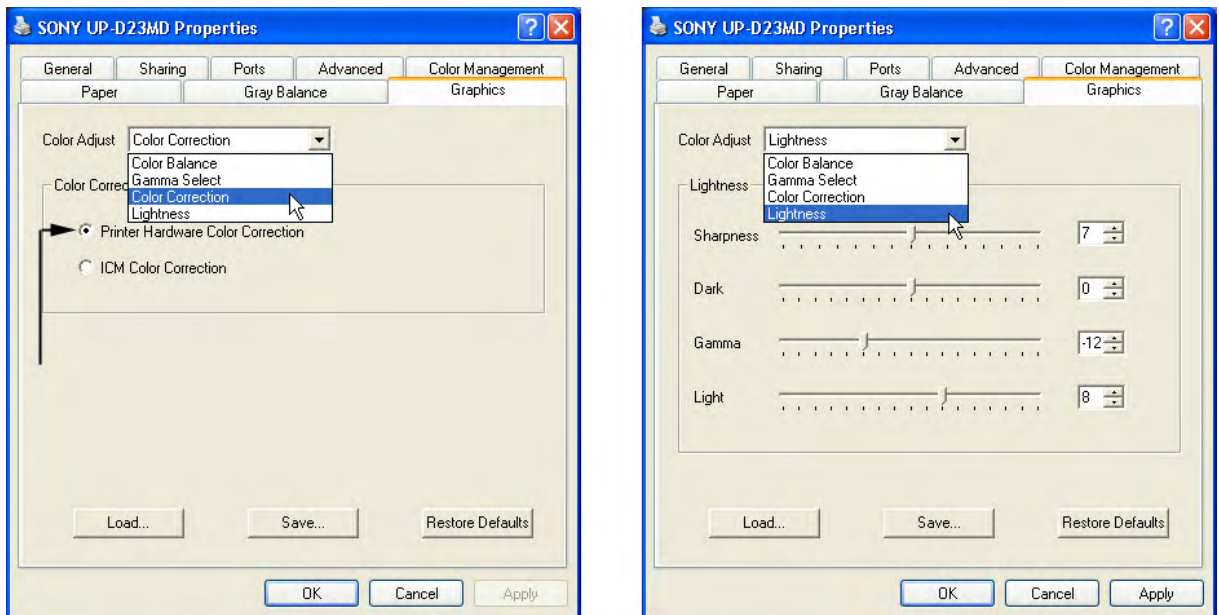


Figure 3-30 Graphic page (Color Correction / Lightness)

4. Save the adjusted printer settings with **Apply** and **OK**. Close window and exit System Setup.
5. Assign the printer to the remote keys **P1**, **P2**, **P3**, **P4**, **P5** and/or **P6**; see *Section 3.6.6 "Remote Control Selection" on page 3-39*.

### 3.6.6 Remote Control Selection

To assign an auxiliary device (e.g., printer) to the remote keys **P1**, **P2**, **P3**, **P4**, **P5** and/or **P6**:

1. Press the **Utilities** key on the control console.
2. In the "Utilities" menu touch the **Setup** button to invoke the setup desktop on the screen.
3. On the right side of the screen select **Connectivity** and then click the **Button Configuration** tab.

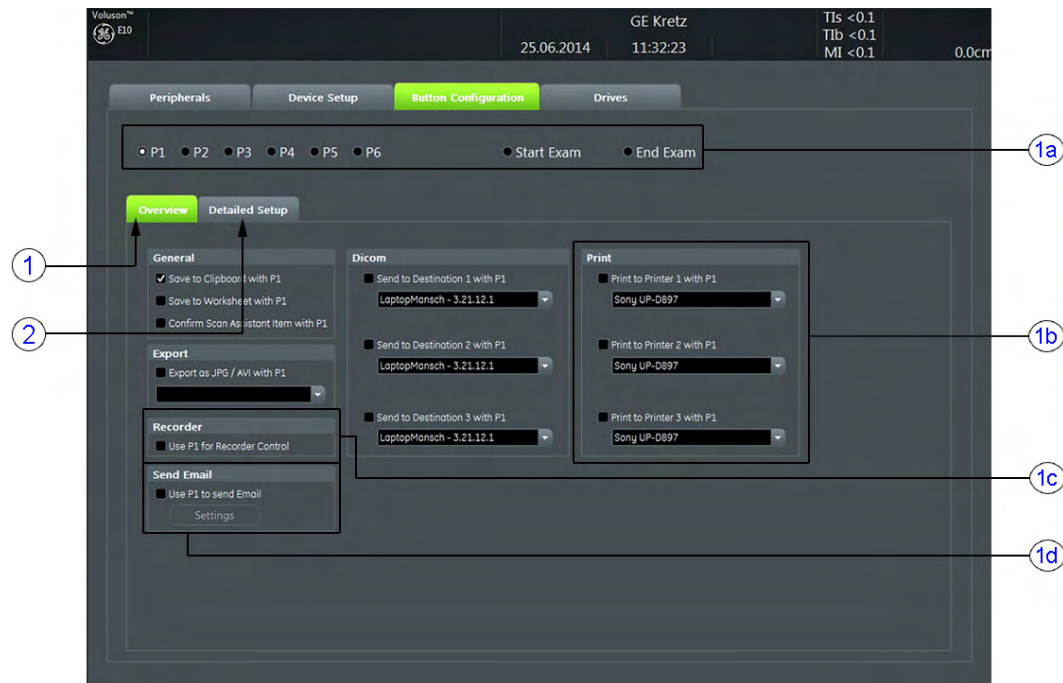


Figure 3-31 System Setup - Connectivity - BUTTON CONFIGURATION page (Overview)

1	Overview	2	Detailed Setup
1a	Configure buttons		
1b	Select Printer		
1c	Recorder Control		
1d	Select <b>P?</b> key to send Email		

1. **Overview** tab:
  - a. Configure "Remote" Buttons: Select the desired remote control button.
  - b. Select Printer: Check mark and select the desired Printer for the remote control button.
  - c. Recorder Control: Check mark this item to use the selected **P?** key for Recorder Control.
  - d. Check mark "Use **P?** key to send Email", and adjust **Settings**.

**Note** *Optionally the Printer Remote Control can be done by the Foot switch; see [Figure 3-21 on page 3-32](#).*

2. **Detailed Setup** tab:
  - a. If it is desired, check mark "Use Report Printer for Reports"

#### 3.6.6.1 Report Printer Selection

1. Click on the **Peripherals** tab; see [Figure 3-21 on page 3-32](#).
2. Select the desired Report Printer from the pull-down menu.

**Note** *The selected Report Printer is usually used for printing reports and images from the Archive.*

## 3.7 System Configuration

### 3.7.1 Setup

Modifications of system parameters and settings are supported by 4 major groups. Each major group contains diverse dialog pages and sub windows.

#### General Settings

- **General Settings:** Date, Time, Clinic Name, (EUM) Language, Screen saver, etc.
- **Annotation:** adjustment of different Annotation presets (e.g. Home position, etc.)
- **Clipboard:** adjustment of Clipboard display and functions
- **Patient Info Display:** Drop Down Management, Title Bar Settings, Capitalize Letter in Patient Names, etc.
- **Scan Assistant:** Scan Assistant List/Item Settings, etc.

#### Administration

- **Service:** enter the password to get access to the Service Tools functions
- **System Info:** shows which Software/Hardware version is installed in the system
- **Options:** shows which options are installed in the system. For information on configuring software options refer to: [Section 8.7 on page 8-15](#).

#### Connectivity

- **Peripherals:** Video Norm selection, Foot switch assignment, Add Printer, Edit Printer settings, etc.
- **Device Setup:** to set up all DICOM, Archive and Network configuration nodes (e.g. TCP/IP, WLAN, EMAIL, etc.)
- **Button Configuration:** adjust assignment of Remote keys **P1, P2, P3, ...** (e.g. Printer selection)
- **Drives:** USB and Network drives: stop devices, map network drive, erase CD

#### Backup

- **System Configuration:** Save/Load Scan Settings, Save/Load/Delete Full System Configuration
- **Image Archive:** Save/Load Image Archive

#### Imaging Presets

- **Presets:** to save User Folders/Presets and 3D/4D Presets, Logo display, etc.
- **Global Parameters:** adjustment of different parameters for specific or all applications

#### Biopsy

- Menu to program Biopsy Lines

#### Measure

- **Measure & Calc:** shows all settings, which are used for generic measurements as well as calculations in different applications
- **Application Parameters:** to adjust Status on Freeze for different modes, Manual Trace method, Calculation Ratio, etc.
- **Global Parameters:** to select cursor type and size, font size and color of measure results, position of results for different modes, etc.
- **Report:** adjustment and setup of Report display
- **Result Window:** adjustment of Result and OB Graph display
- **Measure Button:** adjust assignment of Measure buttons

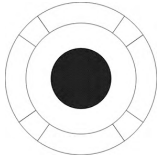
**Note** *For further details refer to the Voluson E-Series Basic User Manual.*

### 3.7.1.1 How to invoke Setup Procedure

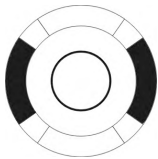


1. Press the **Utilities** key on the control console.
2. In the "Utilities" menu touch the **Setup** button to invoke the setup desktop on the screen.
3. Select the corresponding major group from the rightside of the screen and then click the desired tab.

**Note**      *In general operations are done with the trackball and the trackball keys (mouse emulation).*



**Trackball** (mouse position):  
positions the pointing device (arrow) on the desktop



**left / right trackball key** (left mouse button):  
sets, fixates markers and activates pages/buttons etc. marked by the pointing device



**upper / lower trackball key** (upper trackball key = right mouse button):  
no function in system desktop

### 3.7.1.2 How to enter Date and Time

1. Invoke System Setup as described in [Section 3.7.1.1 on page 3-41](#).
2. On the right side of the screen select **General Settings** and then click the **General Settings** tab.

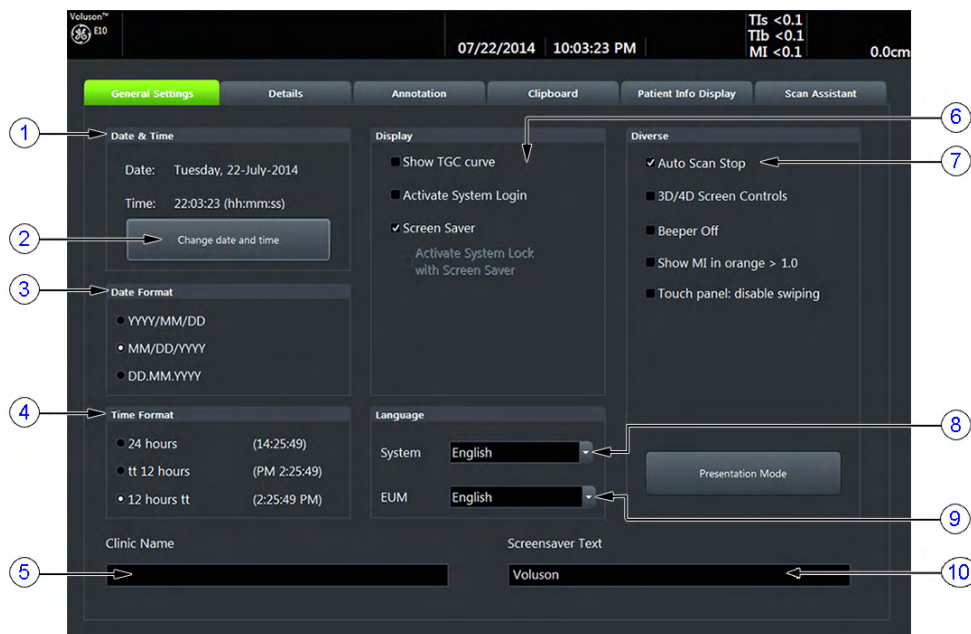


Figure 3-32 Setup - General- GENERAL SETTINGS page

1	Date and Time	6	Display options
2	change date and time	7	Diverse options
3	Date Format	8	change System Language
4	Time Format	9	change EUM Language
5	Clinic Name	10	Screensaver Text

3. Click the button to activate a sub dialog window to enter date, time and time zone.
4. Select the "Date Format" (only one can be active).
5. Close the Service page with **Save&Exit**.

### 3.7.1.3 How to enter Clinic Name

1. Invoke System Setup as described in [Section 3.7.1.1 on page 3-41](#).
2. On the right side of the screen select **General Settings** and then click the **General Settings** tab.
3. Select the text box to enter a new "Clinic Name" with the keyboard.
4. Close the Service page with **Save&Exit**.

The clinic name will be copied into the Clinic Name (ID) field of the information header.

### 3.7.1.4 How to change Language and/or EUM Language

1. Invoke System Setup as described in [Section 3.7.1.1 on page 3-41](#).
2. On the right side of the screen select **General Settings** and then click the **General Settings** tab.
3. Select the desired language from the pull-down menu.
4. Close the Service page with **Save&Exit** and restart the system.

**Note** After changing the language the Voluson E-Series has to reboot.



### 3.7.1.5 How to activate Screen Lock

1. Invoke System Setup as described in [Section 3.7.1.1 on page 3-41](#).
2. On the right side of the screen select **General Settings** and then click the **General Settings** tab.
3. Check mark "Screen Lock".
  - a. If no password previously entered, following dialog appears.

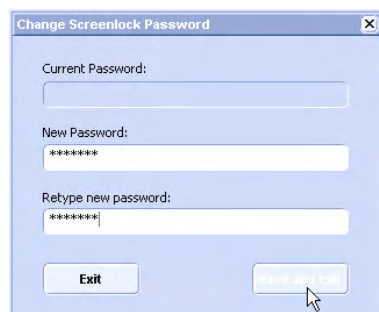


Figure 3-33 change password

- b. Enter "New Password".
  - c. "Retype new Password" and then click **Save&Exit** to save new screen lock password.
4. Close the Service page with **Save&Exit** and restart the system.

**Note** *A new screen lock password must be at least 6 characters long and has a maximum length of 80 characters. The password must contain at least 2 non-letter characters, 0...9 or !@#%\$%^\*().*

**Note** *If screen is locked you have to enter the password to get full system control. If password is unknown click **Emergency**. This enables standard - but limited - operation.*

**Note** *The Screen Lock password cannot be reset by the user! Please contact your GE service representative.*

### 3.7.1.6 How to change Video Norm

1. Invoke System Setup as described in [Section 3.7.1.1 on page 3-41](#).
2. On the right side of the screen select **Connectivity** and then click the **Peripherals** tab.
3. Click the proper field: PAL (50Hz) or NTSC (60Hz); see [Figure 3-21 on page 3-32](#).
4. Close the Service page with **Save&Exit** and restart the system.

### 3.7.1.7 How to change Ext. Monitor Output Settings

1. Invoke System Setup as described in [Section 3.7.1.1 on page 3-41](#).
2. On the right side of the screen select **Connectivity** and then click the **Peripherals** tab.
3. If not currently selected, click the proper field; see [Figure 3-21 on page 3-32](#).
4. Close the Service page with **Save&Exit** and restart the system.

### 3.7.1.8 How to adjust function of the Footswitch

1. Invoke System Setup as described in [Section 3.7.1.1 on page 3-41](#).
2. On the right side of the screen select **Connectivity** and then click the **Peripherals** tab.
3. Select desired function of the Footswitch. Refer to [Figure 3-21 on page 3-32](#).
4. Close the Service page with **Save&Exit** and restart the system.

### 3.7.1.9 How to change the Keyboard Layout

see [Section 6.4 "Modification of Keyboard Layout" on page 6-6](#)

### 3.7.1.10 How to configure InSite ExC

see [Section 3.13.8 "InSite ExC Configuration" on page 3-64](#)

## 3.8 On-board optional Peripherals

AC mains power outlets (AUX) for auxiliary devices and peripherals are co-switched by the systems mains switch. Output voltage for AUX: 115V



### Caution

The maximum power consumption of equipment (inclusive color LCD monitor) connected to these outlets must not exceed 200VA!

Table 3-6 Approved Peripherals

Device	Manufacturer	Model	Connection	Comment
Digital B/W Video Printer	SONY	UP-D897	USB-Port	<a href="#">Table 9-10</a>
Digital Color Printer	SONY	UP-D25MD	USB-Port	<a href="#">Table 9-10</a>
Color Deskjet Printer	Hewlett Packard (HP)	HP Officejet 100	USB-Port or Bluetooth	<a href="#">Table 9-10</a>
Bluetooth Adapter	Delock	Delock	USB-Port	<a href="#">Table 9-10</a>
ECG Preampfier	NORAV	MAN30	USB-Port	<a href="#">Table 9-11</a>
USB Flash Memory device	SanDisk	Cruzer Micro 512MB	USB-Port	<a href="#">Table 9-11</a>
Gigabit Network Isolator	Baaske Medical	MI 1005 Medical Isolator	USB-Port	<a href="#">Table 9-11</a>
Cellular Modem	CEP AG	HT910-G	USB-Port	<a href="#">Table 9-11</a>
Wireless Adapter (WLAN)	Netgear	WG111v3	USB-Port	<a href="#">Table 9-11</a>
Footswitch	Whanam	FSU3000G	USB-Port	<a href="#">Table 9-12</a>
Isolation Transformer	Noratel	IMED, 300WR 3 <sup>rd</sup> Edition		<a href="#">Table 9-12</a>
UPS (Uninterruptible Power Supply)	Tripp Lite	SMX1200XLHG <sup>2</sup>		<a href="#">Table 9-12</a>
32" Secondary Monitor	SONY	FWD-32EX650P/FWD-32B1	HDMI / VGA	



It might be possible that some probes, options or features are NOT available

- in some countries.
- at the time of release of this Service Manual.

<sup>2</sup> for 220-240V AC countries

### 3.9 External I/O Connectors

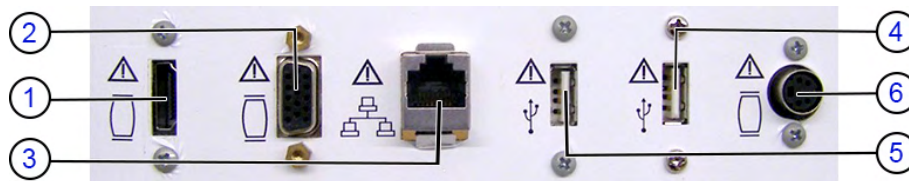


Figure 3-34 External I/O connectors - on rear of system (GES)

Item	Connector Name	Table Number	Description
1	HDMI OUT	<a href="#">Table 3-7</a>	Connector for external monitor
2	VGA OUT	<a href="#">Table 3-8</a>	Connector for external monitor
3	Network	<a href="#">Table 3-9</a>	DICOM input/output, twisted pair RJ-45 10/100 megabit/s
4	USB	<a href="#">Table 3-11</a>	USB 3.0 port
5	USB	<a href="#">Table 3-10</a>	USB 2.0 port
6	S-Video OUT	<a href="#">Table 3-12</a>	S-Video OUT connector



Figure 3-35 External I/O connectors - next to DVD drive

Item	Connector Name	Table Number	Description
1	USB	<a href="#">Table 3-10</a>	USB 2.0 port
2			

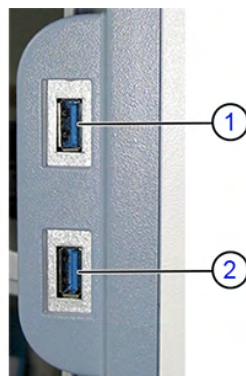


Figure 3-36 External I/O connectors - on the left side of the Monitor

Item	Connector Name	Table Number	Description
1	USB	<a href="#">Table 3-11</a>	USB 3.0 port
2			

### 3.9.1 External I/O Pin Outs

Table 3-7 HDMI OUT connector

Pin No	Signal	Pin No	Signal
1	TDMS Data2+	11	TMDS Clock Shield
2	TDMS Data2 Shield	12	TMDS Clock-
3	TDMS Data2-	13	CEC
4	TDMS Data1+	14	Reserved/HEC Data-
5	TDMS Data1 Shield	15	SCL (Serial Clock for DDC)
6	TMDS Data1-	16	SDA (Serial Data Line for DDC)
7	TMDS Data0+	17	DDC/HEC/CEC Ground
8	TMDS Data0 Shield	18	+5V Power
9	TDMS Data0-	19	Hot Plug Detect/HEC Data+
10	TMDS Clock+		

Table 3-8 VGA OUT connector, Sub-D (15 pin)

Pin No	Output Signal	Description
1	VGA OUT1 R	Red
2	VGA OUT1 G	Green
3	VGA OUT1 B	Blue
4, 9, 11, 12, 15	N/C	N/C
5, 6, 7, 8, 10	GND	GND
13	VGA OUT1 HS	H Sync
14	VGA OUT1 VS	V Sync

Table 3-9 Network connector, RJ45 Modular (8 pin)

Pin No	Output Signal	Description
1	ETHER TD	Ethernet RD +
2	ETHER TD	Ethernet RD -
3	ETHER RD	Ethernet TD +
6	ETHER RD	Ethernet TD -
others	NC	no connection

Table 3-10 USB 2.0 connectors

Pin No	Output Signal	Description
1	VCC	USB Power Supply
2	- Data	USB Data (-)
3	+ Data	USB Data (+)
4	GND	USB Power Ground

Table 3-11 USB 3.0 connectors

Pin No	Output Signal	Description
1	VBus	+5V Power
2	USB D-	USB 2.0 Data (-)
3	USB D+	USB 2.0 Data (+)
4	GND	Ground for power return
5	StdA_SSRX-	SuperSpeed receiver
6	StdA_SSRX+	SuperSpeed receiver
7	GND_DRAIN	Ground for signal return
8	StdA_SSTX-	SuperSpeed transmitter
9	StdA_SSTX+	SuperSpeed transmitter

Table 3-12 S-Video OUT connector (4 pin)

Pin No	Output Signal	Description
1	SVIDEO OUT/IN YG	Y (Luma) GND
2	SVIDEO OUT/IN CG	C (Chroma) GND
3	SVIDEO OUT/IN Y	Y (Luma) Signal
4	SVIDEO OUT/IN C	C (Chroma) Signal

Table 3-13 Monitor Power connector ( 16 pin)

Pin No	Description
2, 3, 7, 10, 15	12V
1, 5, 8, 9, 11, 16	GND
6 / 14	USB 1- / USB 1+
4, 12, 13	NC (no connection)

Table 3-14 DVI OUT connector

Pin No	Description	Pin No	Description
1	TDMS data 2-	13	TDMS data 3+
2	TDMS data 2+	14	+5 Volt
3	TDMS data 2, 4 shielding	15	ground for +5 Volt
4	TDMS data 4-	16	Hotplug-Detect
5	TDMS data 4+	17	TDMS data 0-
6	DDC clock	18	TDMS data 0+
7	DDC data	19	TDMS data 0, 5 shielding
8	Analog: V-Sync	20	TDMS data 5-
9	TDMS data 1-	21	TDMS data 5+
10	TDMS data 1+	22	TDMS meter shielding
11	TDMS data 1, 3 shielding	23	TDMS clock +
12	TDMS data 3-	24	TDMS clock -

### 3.9.2 Video Specification

Video specifications may be needed to be able to connect laser cameras or other devices to the Voluson E-Series system.

DVI-D/VGA-connector:

- visible resolution ... 1280 x 1024
- screen refresh rate ... 60Hz

S-Video connector:

- Type: separate Video (Y/C)
- Video modes: PAL (50Hz), NTSC (60Hz)

### 3.9.3 External Cables - Maximum Lengths

Table below shows maximum permitted cable length of external cables, according to IEC60601-1-2.

Table 3-15 maximum cable lengths

Description	Maximum Cable Length	Type
Probe cable	2.5 m	shielded
USB cable	5 m	shielded; USB2.0 or higher
LAN cable	80 m	shielded; Cat5e or higher
VGA cable	15 m	shielded
S-Video cable	5 m	shielded
HDMI cable	10 m	shielded
ECG cable	4 m	unshielded
Power cable	4 m	unshielded
PE cable	10 m	unshielded

### 3.10 Available Probes

See [Section 9.12 "Probes" on page 9-33](#), for part numbers to be used when ordering new or replacement service probes.

### 3.11 Software/Option Configuration

For description refer to:

- [Section 3.7.1 "Setup" on page 3-40](#)

**Note** For further details refer to the *Voluson E-Series Basic User Manual*.

## 3.12 Connectivity Setup

The Voluson E-Series ultrasound system can be connected to various connectivity devices. The following sections describe how to connect the system to a remote archive/work station or a DICOM service, using a TCP/IP connection.

### 3.12.1 Connectivity Introduction

This section describes communication and connection options between the Voluson E-Series ultrasound system and other devices in the hospital information system.

The following scenarios are covered:

- stand-alone Voluson E-Series system; see [Section 3.12.1.3 on page 3-51](#).
- Voluson E-Series and one or several PC workstations - with Software 4D View installed - within a "Sneaker Net" environment. ("Sneaker Net" means that you use a DVD/CD to move data because no network is available); see [Section 3.12.1.4 on page 3-51](#).
- Voluson E-Series and DICOM server in a network; see [Section 3.12.1.5 on page 3-51](#).

#### 3.12.1.1 Dataflow Concept

Communication between the Voluson E-Series ultrasound system and other information providers on the network takes the form of data flows. Each dataflow defines the transfer of patient information from either an input source to the system, or from the system to an output source (see examples in [Section 3.12.1.2 on page 3-50](#)).

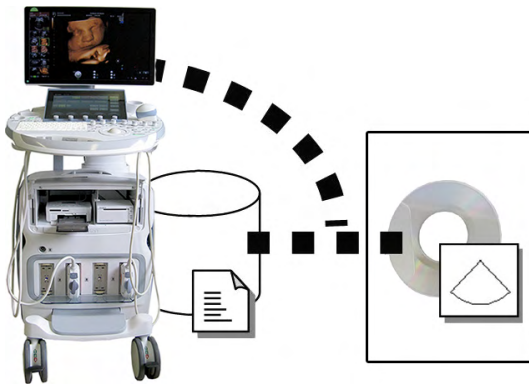
Patient information can include demographic data and images, as well as reports and Measurement and Analysis (M&A) data. A dataflow is a set of pre-configured services. Selecting a dataflow will automatically customize the ultrasound system to work according to the services associated with this dataflow.

By utilizing data flows, the user can configure the Voluson E-Series ultrasound system to optimally meet the needs of the facility, while keeping the user interface unchanged. Once the dataflow is selected, the actual location of the database is entirely transparent.

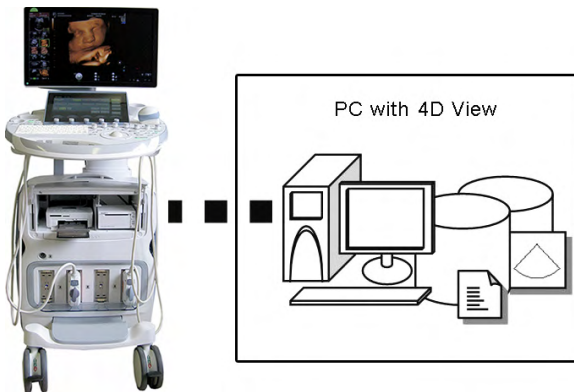
### 3.12.1.2 Dataflow Examples



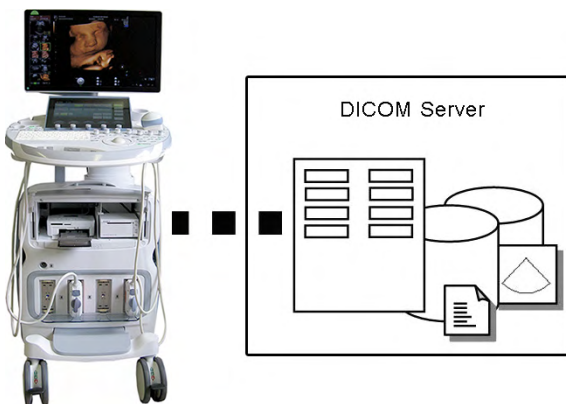
The local database is used for patient archiving. Images are stored to internal hard drive.



The local database is used for patient archiving. Afterwards images are stored to a DVD/CD or external USB device, etc.



A remote database is used for patient archiving. Images are also stored to a remote archive.



Search in the DICOM Modality Worklist, the patient found is copied into local database. The patient information and the examination results are stored to the local database. Images are stored to a DICOM server and to an image network volume on the local hard drive.



### 3.12.1.3 Stand-alone Voluson E-Series

If digital images or 3D/4D data sets are stored, they should be saved in the Archive (Image Management System software).

**Note** *For further details refer to the Voluson E-Series Basic User Manual.*

**Note** *To avoid loss of essential data, it is highly recommended to **export/backup patient data** as well as measurements **at least once a month**.*

Physical Connection:

No network connection needed.

### 3.12.1.4 Voluson E-Series + PC (with 4D View Software) within a "Sneaker Net"

A PC (one or several with 4D View software installed) is used for review and work on studies acquired on one or more Voluson E-Series system without being connected in a network.

The images are first stored on the Voluson E-Series system's hard drive (Archive) and then exported from the system's hard drive to a sneaker device (e.g., DVD/CD), and finally imported from the sneaker device to the "4D View" PC's internal hard drive.

**Note** *For further details refer to the Voluson E-Series Basic User Manual.*

**Note** *To avoid loss of essential data, it is highly recommended to **export/backup patient data** as well as measurements **at least once a month**.*

Physical Connection:

No network connection needed.

### 3.12.1.5 Connection between Voluson E-Series and DICOM Server

In this configuration, the Voluson E-Series is configured to work with a DICOM server in a network environment. Usually, this will be the hospital network. Images are first saved on the local image buffer on the system. At the end of the examination, the images are sent to the DICOM server via a DICOM spooler. This scenario requires that the system is configured to be connected to the DICOM server.

Physical Connection:

You will need one network cable.

1. Connect one end of the cable to the Ethernet connector on the Voluson E-Series.
2. Connect the other end of the cable to the wall outlet.

**Note** *If a Peer-to-Peer Network is connected to the hospital's network, you may connect the Voluson E-Series to the Peer-to-Peer Network.*

**Note** *For further details refer to the Voluson E-Series Basic User Manual.*

## 3.13 Network Configuration

### Content in this section

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<a href="#">3.13.2 Wireless Network Configuration</a>	3-53
<a href="#">3.13.3 How to Setup the Cellular Modem</a>	3-58
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<a href="#">3.13.5 How to Setup E-mail to MMS Service</a>	3-61
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### 3.13.1 TCP/IP Configuration

**Note** *Following information must be provided by the customer or hospital engineer before you can start: Station name, AE Title, IP address and Port Number for the Voluson E-Series. The IP addresses for the default gateway and other routers at the site for ROUTING INFORMATION. Only if necessary (e.g. for Internet access).*

1. Press the **Utilities** key on the control console.
2. In the "Utilities" menu touch the **Setup** button to invoke the setup desktop on the screen.
3. On the right side of the screen select **Connectivity** and then click the **Device Setup** tab.
4. Click the button, read the message and confirm with **Yes**.

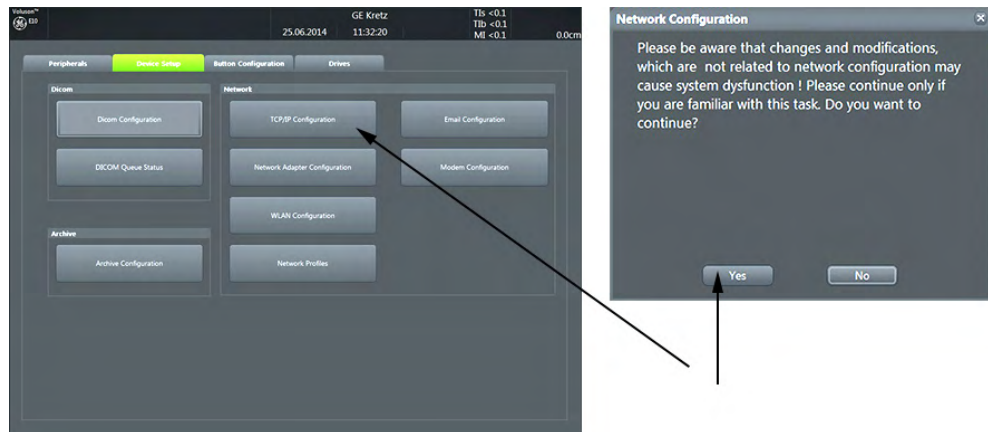


Figure 3-37 Configuration

5. The "Internet Protocol (TCP/IP) Properties" dialog page appears.

**Note** *This example shows fictional numbers!*

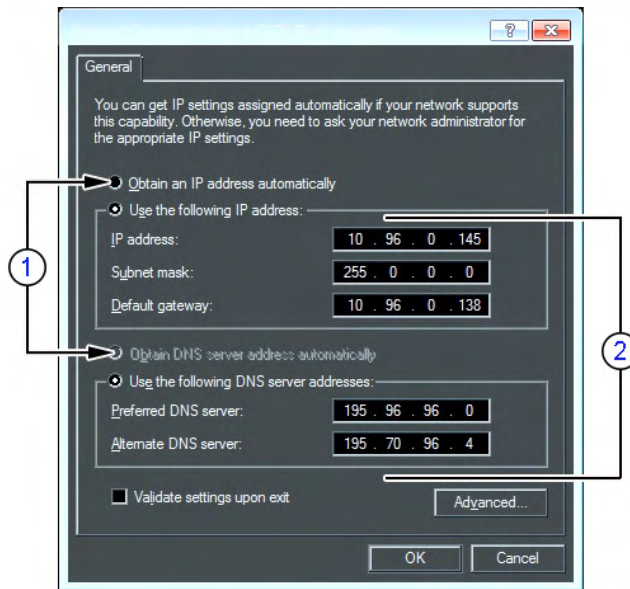


Figure 3-38 Internet Protocol (TCP/IP)

- 1 You can get IP and DNS settings assigned automatically, if your network supports this capability.
- 2 If fixed IP address is required, ask your network administrator for the appropriate settings.

Type in:

- IP address
- Subnet mask
- Default gateway
- DNS server

**Note** *For further details refer to the Voluson E-Series Basic User Manual.*

## 3.13.2 Wireless Network Configuration

**Note** To configure the Voluson E-Series system to work with WLAN, the *hospital's network administrator has to provide the required information.*

### Content in this section

<a href="#">3.13.2.1 Connecting to the WLAN</a>	3-53
<a href="#">3.13.2.2 Disconnecting from the WLAN</a>	3-53
<a href="#">3.13.2.3 Adding a WLAN Profile</a>	3-54
<a href="#">3.13.2.4 Refreshing a WLAN Network</a>	3-54
<a href="#">3.13.2.5 Setting a WLAN Network as Non-Preferable</a>	3-54
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### 3.13.2.1 Connecting to the WLAN

1. Connect the Wireless Network adapter as described in [Section 3.4.6 on page 3-19](#).
2. Press the **Utilities** key on the control console.
3. In the "Utilities" menu touch the **Setup** button to invoke the setup desktop on the screen.
4. On the right side of the screen select **Connectivity** and then click the **Device Setup** tab.
5. Click the **WLAN Configuration** button; see [Figure 3-37 on page 3-52](#).
6. The Wireless Network Configuration tool with available Wireless Networks appear.

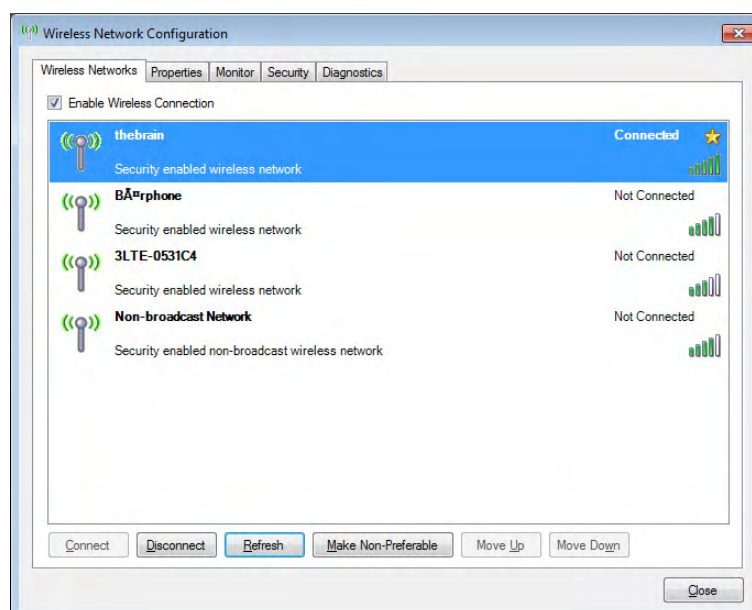


Figure 3-39 Wireless Networks - Connect

7. Check box "Enable Wireless Connection".
8. Highlight the wireless network you want to use and then click **Connect**.

**Note** *If the WLAN fails to connect, review and/or recreate the Wireless connection in the **Security** tab.*

### 3.13.2.2 Disconnecting from the WLAN

1. Press the **Utilities** key on the control console.
2. On the right side of the screen select **Connectivity** and then click the **Device Setup** tab.
3. Click the **WLAN Configuration** button; see [Figure 3-37 on page 3-52](#).
4. The Wireless Network Configuration tool with available Wireless Networks appear.
5. Select the WLAN you are connected to and then click **Disconnect**.

### 3.13.2.3 Adding a WLAN Profile

1. Press the **Utilities** key on the control console.
2. On the right side of the screen select **Connectivity** and then click the **Device Setup** tab.
3. Click the **WLAN Configuration** button; see [Figure 3-37 on page 3-52](#).
4. The Wireless Network Configuration tool with available Wireless Networks appear.
5. Select the **Security** tab and then click **Add**.

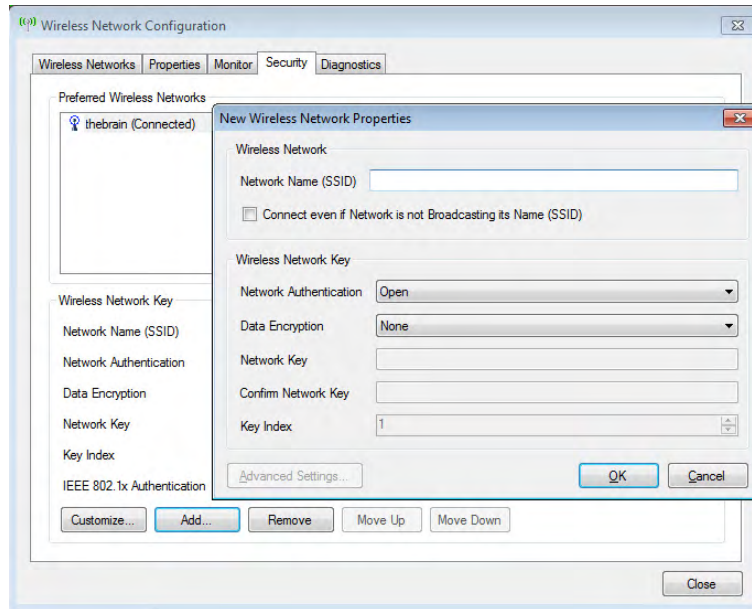


Figure 3-40 Security - Add

6. Add the following information to the Wireless Network Properties page:
  - Network Name (SSID)
  - Check box "Connect even if Network is not Broadcasting its Name (SSID)"
  - Network Authentication (Open, Shared Key, WPA PSK or WPA2 PSK)
  - Data Encryption
  - Network Key
  - Key Index
7. After you have filled in all the required information, click **OK**.

### 3.13.2.4 Refreshing a WLAN Network

1. Press the **Utilities** key on the control console.
2. On the right side of the screen select **Connectivity** and then click the **Device Setup** tab.
3. Click the **WLAN Configuration** button; see [Figure 3-37 on page 3-52](#).
4. The Wireless Network Configuration tool with available Wireless Networks appear.
5. Click **Refresh**.

### 3.13.2.5 Setting a WLAN Network as Non-Preferable

When you make a WLAN non-preferable, you disconnect the network from the system and delete all connection settings from the system. Afterwards the system WILL NOT try to reconnect to this WLAN automatically. And if you want to reconnect, you will need to re-add this WLAN.

1. Press the **Utilities** key on the control console.
2. On the right side of the screen select **Connectivity** and then click the **Device Setup** tab.
3. Click the **WLAN Configuration** button; see [Figure 3-37 on page 3-52](#).
4. The Wireless Network Configuration tool with available Wireless Networks appear.
5. Highlight the wireless network you want to set as non-preferred.
6. Click **Make Non-Preferable** and confirm the message box.

### 3.13.2.6 Removing a WLAN Profile

1. Press the **Utilities** key on the control console.
2. On the right side of the screen select **Connectivity** and then click the **Device Setup** tab.
3. Click the **WLAN Configuration** button; see [Figure 3-37 on page 3-52](#).
4. The Wireless Network Configuration tool with available Wireless Networks appear.
5. Select the **Security** tab and then click **Remove**.

### 3.13.2.7 Customizing an existing WLAN Profile

1. Press the **Utilities** key on the control console.
2. On the right side of the screen select **Connectivity** and then click the **Device Setup** tab.
3. Click the **WLAN Configuration** button; see [Figure 3-37 on page 3-52](#).
4. The Wireless Network Configuration tool with available Wireless Networks appear.
5. Select the **Security** tab and then click **Customize**.

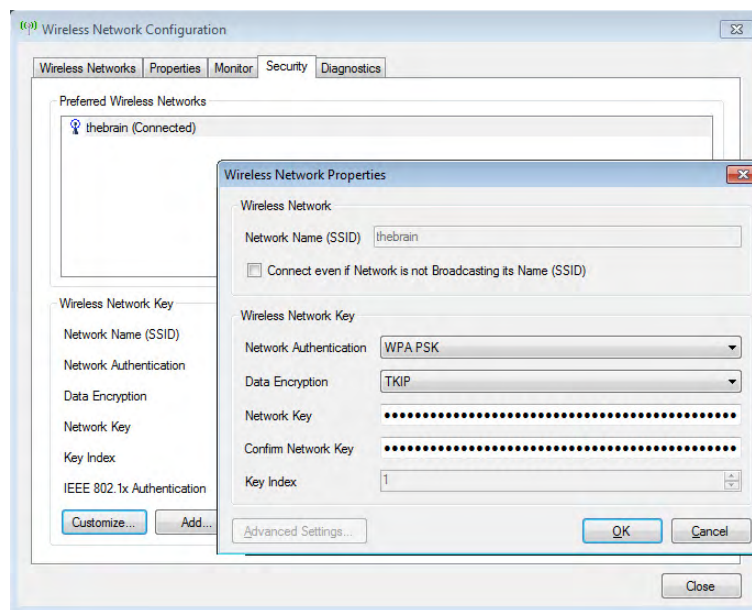


Figure 3-41 Security - Customize

6. Customize the following information:
  - Network Name (SSID)
  - Check box "Connect even if Network is not Broadcasting its Name (SSID)"
  - Network Authentication (Open, Shared Key, WPA PSK or WPA2 PSK)
  - Data Encryption
  - Network Key
  - Key Index
7. After you have filled in all the required information, click **OK**.

### 3.13.2.8 Available WLAN Channels

The available WLAN channels show availability of wireless connect point that the system can talk to. Each channel supports a finite number of users and has limited signal strength. This may effect the ability to connect, the throughput and the connection dropping out.

1. Press the **Utilities** key on the control console.
2. On the right side of the screen select **Connectivity** and then click the **Device Setup** tab.
3. Click the **WLAN Configuration** button; see [Figure 3-37 on page 3-52](#).
4. The Wireless Network Configuration tool with available Wireless Networks appear.
5. Select the **Properties** tab.

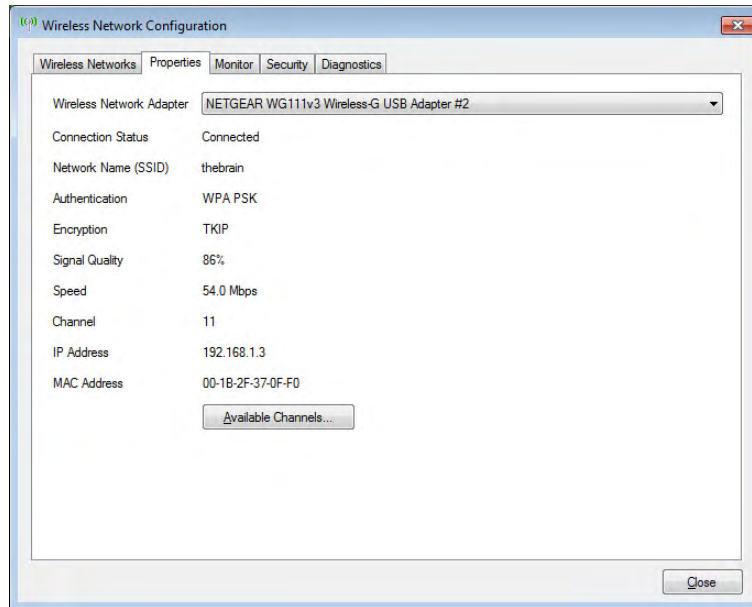


Figure 3-42 Properties

6. Click **Available Channels**.

### 3.13.2.9 Monitoring the WLAN

If there are wireless network communication issues, you can monitor the wireless connection to see if it is dropping out and recovering periodically. This can effect throughput.

1. Press the **Utilities** key on the control console.
2. On the right side of the screen select **Connectivity** and then click the **Device Setup** tab.
3. Click the **WLAN Configuration** button; see [Figure 3-37 on page 3-52](#).
4. The Wireless Network Configuration tool with available Wireless Networks appear.
5. Select the **Monitor** tab.

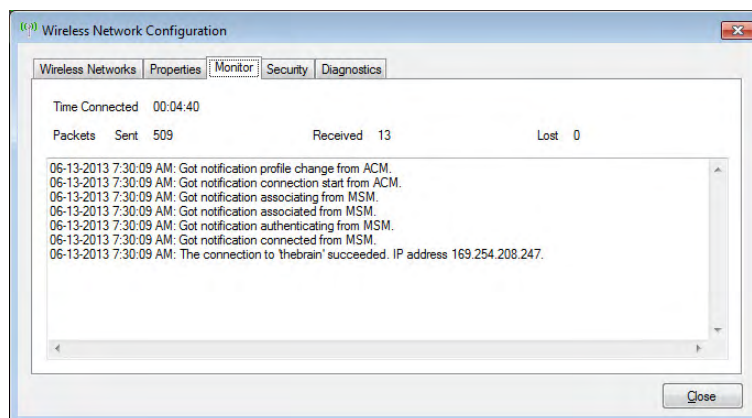


Figure 3-43 Monitor

### 3.13.2.10 WLAN Diagnostic

Running diagnostics is good if you think the adapter might be bad. Diagnostics also tell you if the connection is behaving properly. Sometimes the system connects by accident to the DVR or another internal device which uses the TCP/IP protocol. The diagnostics would show if there are errors when performing the full two-way communication. For example, if the IP address starts with 197 or 169 (loopback addresses), then something is wrong.

1. Press the **Utilities** key on the control console.
2. On the right side of the screen select **Connectivity** and then click the **Device Setup** tab.
3. Click the **WLAN Configuration** button; see [Figure 3-37 on page 3-52](#).
4. The Wireless Network Configuration tool with available Wireless Networks appear.
5. Select the **Diagnostics** tab and then click **Run Diagnostics**.

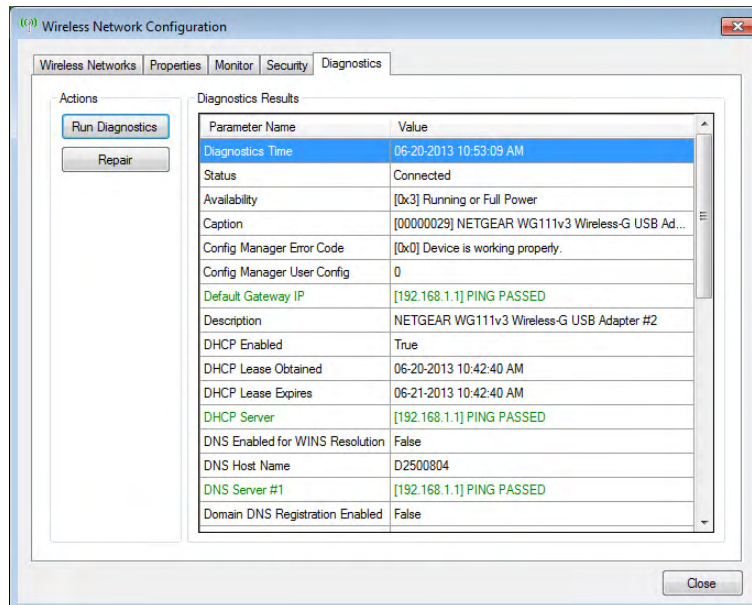


Figure 3-44 Run Diagnostics

### 3.13.2.11 Repairing the WLAN

Occasionally you may need to repair a WLAN that has lost its connection to the Voluson E-Series.

1. Press the **Utilities** key on the control console.
2. On the right side of the screen select **Connectivity** and then click the **Device Setup** tab.
3. Click the **WLAN Configuration** button; see [Figure 3-37 on page 3-52](#).
4. The Wireless Network Configuration tool with available Wireless Networks appear.
5. Select the **Diagnostics** tab and then click **Repair**.

**Note** *DO NOT cancel the Repair operation after you have selected to repair the Wireless LAN connection.*

### 3.13.3 How to Setup the Cellular Modem

By means of the Cellular Modem, it is possible to connect the Voluson E-Series to the Internet by using a SIM card.

#### When to use the Cellular Modem

The Cellular Modem is useful if no Internet connection is available via LAN or WIFI. Connecting the Voluson E-Series to the Internet allows the user to send images via e-mail and/or MMS to patients or physicians.

**Note** *MMS are sent by e-mail to a 3rd party provider (e.g. SMSglobal). This service needs to be ordered by a 3rd party provider.*

**Note** *Please check with a Smartphone located near the Voluson E-Series, if network coverage is available. Used SIM card in the Smartphone should use same provider as SIM card for Cellular Modem.*

**Hardware Setup:** To use the feature the peripheral Cellular Modem needs to be installed and a SIM card from your local service provider needs to be ordered.

- SIM card requirements:**
- Data capable
  - Standard size
  - prepaid or post paid

**Note** *Since the Voluson E-Series does not enable browser access, the service provider needs to enable the Internet access on the SIM card before installation in the Cellular Modem. Please ensure from the service provider, that there is no browser registration necessary when using the SIM card.*

#### Necessary SIM card information provided by the SIM card provider

APN (Access Point Name)	e.g., a1.net
User Name for APN	e.g., ppp@A1plus.a
Password for APN	***
SIM card Pin	****
Dial in Phone Number	e.g., *99# - if not explicitly stated by the provider, use *99#



Please ensure that the SIM card information is available before setting up the Voluson E-Series.

---



## Modem Configuration

1. Power Off/Shutdown the system as described in [Section 4.2.2 on page 4-4](#).
  2. Insert the SIM card into the Cellular Modem.
  3. Connect the Cellular Modem as described in [Section 3.4.5 on page 3-17](#).
  4. Press the **Utilities** key on the control console.
  5. In the "Utilities" menu touch the **Setup** button to invoke the setup desktop on the screen.
  6. On the right side of the screen select **Connectivity** and then click the **Device Setup** tab.
  7. Click the **Modem Configuration** button; see [Figure 3-37 on page 3-52](#).
- The Modem Configuration screen appear.

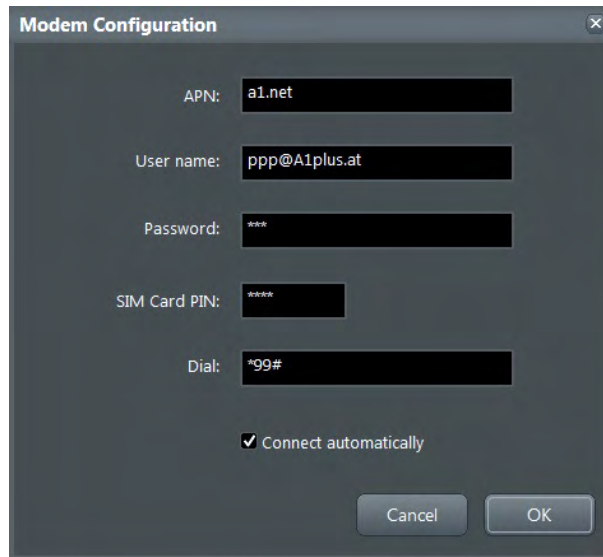


Figure 3-45 Modem Configuration

8. Enter all the required information.

### Note

*Please keep the Dial information as \*99#. Only in seldom cases different Dial information is needed.*

9. Check box "Connect automatically".
10. Click **OK**.
11. Click the signal strength icon in the status bar.  
Select **Connect** for connection to the service provider.
12. Please wait while busy symbol is on screen.  
 If the connection is established: Tooltip of the status icon provides signal strength in percentage.  
 If the connection is not established: Tooltip of the status icon provides an error message.
13. Depending on the region and/or provider it might be possible that you need one time registration of your SIM card, therefore:
  - a. Open *Windows Start Menu - All Programs - Internet Explorer*.
  - b. Internet connection OK: close all open windows.
  - c. Internet connection fail: enter registration key or voucher code, then close all open windows.
14. If it is desired to send E-mails, perform configuration as described in [Section 3.13.4 on page 3-60](#).
15. If it is desired to use also MMS, adjust settings as described in [Section 3.13.5 on page 3-61](#).
16. Assign the Modem to a remote key (**P1**, **P2**, **P3**, **P4**, **P5** and/or **P6**) as described in [Section 3.6.6 "Remote Control Selection" on page 3-39](#) and adjust the Email settings.
17. Individually enter Patient's Email address and Phone number in the PID screen and adjust Email and/or MMS options as described in [Section 3.13.6 on page 3-62](#).

### 3.13.4 How to Setup E-mail

If Internet access is available via LAN, Wi-Fi or Cellular modem, it is possible to send images/cines via E-Mail to patients or physicians.

#### Necessary information provided by the E-mail provider (SMTP settings)

To enable E-mail, the SMTP (Simple Mail Transfer Protocol) settings from your provider are needed.

**Note** *The Voluson E-Series is only supporting E-mail send; no e-mail receive is possible. To receive reply E-mails, the same E-mail account needs to be installed on an Office-PC.*

SMTP server name (Outgoing Messages)	e.g., smtp.gmail.com
SMTP authentication (Outgoing Messages)	e.g., SSL
SMTP port (Outgoing Messages)	e.g., 465

**Note** *Maybe the information above needs to be searched in the Internet from your e-mail provider and is the same for all e-mail users.*

#### Email Configuration

1. Press the **Utilities** key on the control console.
2. In the "Utilities" menu touch the **Setup** button to invoke the setup desktop on the screen.
3. On the right side of the screen select **Connectivity** and then click the **Device Setup** tab.
4. Click the **Email Configuration** button; see [Figure 3-37 on page 3-52](#).

The Email Configuration screen appear.

The screenshot shows the 'Email Configuration' dialog box with the following fields and settings:

- Identity:**
  - Your Name: Max Mustermann
  - Email Address: max.mustermann@gmail.com
  - Reply-to Address: (empty)
  - Signature text:  Use HTML (e.g. <b>bold</b>)
- SMTP Server Settings:**
  - Server Name: smtp@gmail.com
  - Port: 465 (Default: 587)
  - Connection security: SSL/TLS
  - Authentication method: Encrypted password
  - User Name: username@gmail.com
  - Password: (masked)
- Default Subject / Message:**
  - Subject: Your US image
  - Message: Find enclosed the image of your last Ultrasound examination.
  - Best regards,
- Options:**
  - Max. Email Size: 6 MB
  - Keep sent Emails in Mail Queue
- MMS Options:**
  - Use Email To MMS Service

Buttons: Send Test Email, Cancel, OK.

Figure 3-46 Email Configuration

5. Enter *Your name* and *Email Address* in the Identity group. As an option you can enter a different *Reply to Address* and a *Signature Text*.
6. To verify E-mail configuration click on **Send Test Email**. An E-mail is sent to the entered E-mail address followed by a message box where either a success message or an error message is shown.
7. Store your configuration with click on **OK**.
8. If it is desired to use also MMS, adjust settings as described in [Section 3.13.5 on page 3-61](#).
9. Individually enter Patient's Email address and Phone number in the PID screen and adjust Email and/or MMS options as described in [Section 3.13.6 on page 3-62](#).

### 3.13.5 How to Setup E-mail to MMS Service

If the Voluson E-Series is connected to the Internet (via LAN, Wi-Fi or Cellular modem) and E-mail service is configured properly, it is possible to send images as an MMS.

**Note** *MMS are sent by e-mail to a 3rd party provider (e.g. SMSglobal). This service needs to be ordered by a 3rd party provider.*

#### Registration of MMS Service

To use the MMS feature you need to contract with a 3rd party provider which offers E-mail to MMS service (e.g. SMSglobal). Please contact the service provider!

#### How this feature works

Voluson E-Series sends an E-mail with an attached image to the E-mail to MMS service. The MMS phone number is encapsulated in the recipient E-mail address

#### MMS Options

1. Press the **Utilities** key on the control console.
2. In the "Utilities" menu touch the **Setup** button to invoke the setup desktop on the screen.
3. On the right side of the screen select **Connectivity** and then click the **Device Setup** tab.
4. Click the **Email Configuration** button; see [Figure 3-37 on page 3-52](#).
5. In the Email Configuration screen check box "Use Email to MMS Service" and then click on **Settings**.

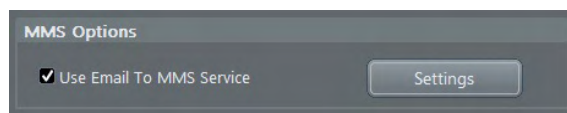


Figure 3-47 check box

The Email to MMS Service Settings window appear.

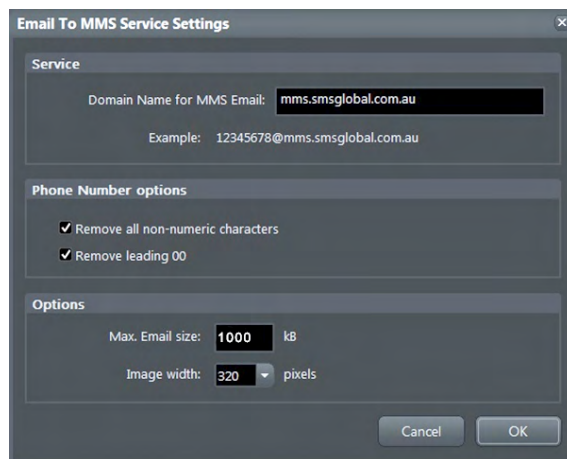


Figure 3-48 Email to MMS Service Settings

**Note** *The configuration above works with SMSglobal.*

6. Enter the Domain Name from 3rd party E-mail to MMS service.  
**Note:** An E-mail to **phone number@Domain Name for MMS Email** is sent!
7. Store your configuration with click on **OK**.
8. Individually enter Patient's Email address and Phone number in the PID screen and adjust Email and/or MMS options as described in [Section 3.13.6 on page 3-62](#).

### 3.13.6 How to enter Patient's Email address and Phone number in the PID screen

1. Enter the "Patient ID" screen by pressing the **Patient ID** key on the control console.
  2. Click the **@** icon (1).
- The Patient's Email address and Phone number window appear.

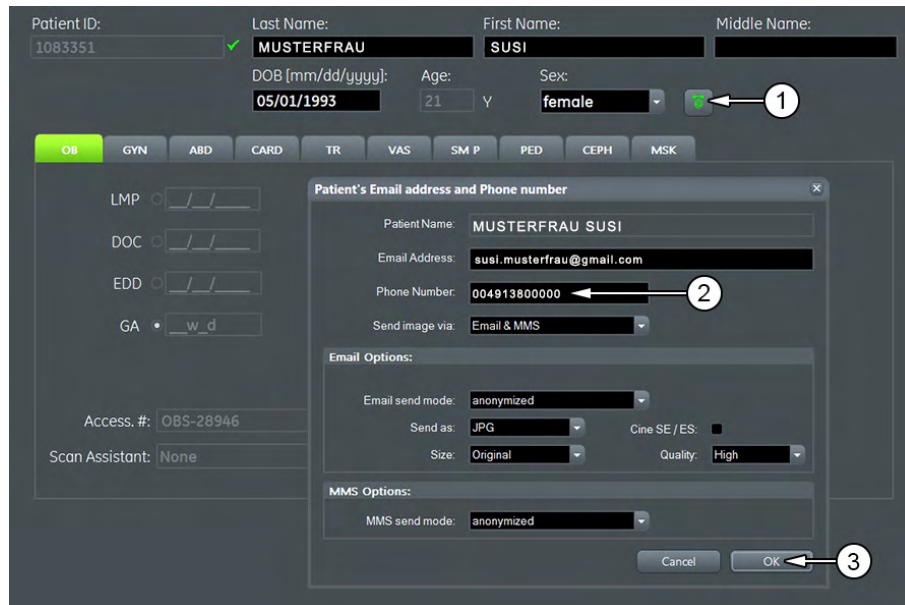


Figure 3-49 Patient ID screen

3. Enter patient's information and adjust Email/MMS Options (2).
4. Store your configuration with click on **OK**(3).

**Note**

Since the E-mail to MMS service provider is maybe not located in the same area as your MMS receptions, you need to add the area code (e.g. +49 or 0049 for Germany) to the used phone numbers in the Patient's E-mail address and Phone number dialog.

Example: local phone number 069913800000 is **+49** 69913800000 or **0049** 69913800000 for Germany

### 3.13.7 Map Network Drive

1. Press the **Utilities** key on the control console.
2. In the “Utilities” menu touch the **Setup** button to invoke the setup desktop on the screen.
3. On the right side of the screen select **Connectivity** and then click the **Drives** tab.

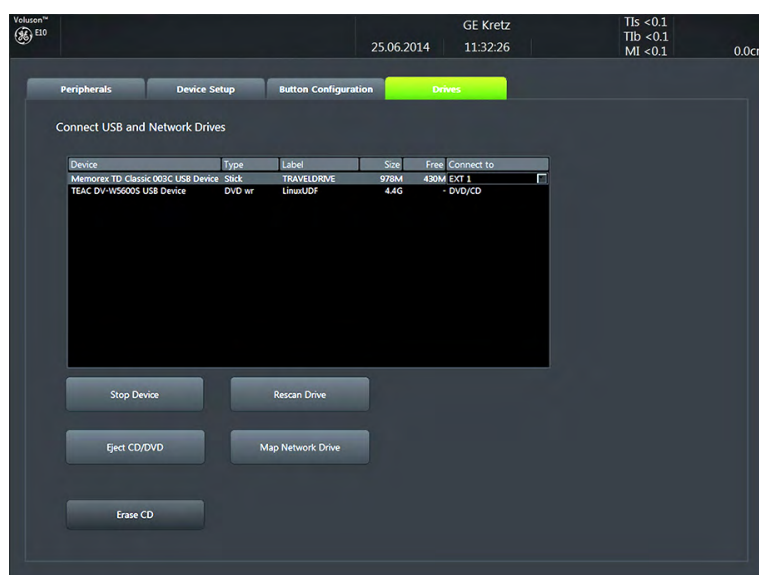


Figure 3-50 Setup - Connectivity - DRIVES page

4. Click the **Map Network Drive** button to open a dialog where the system can be connected to a shared network drive of another server.

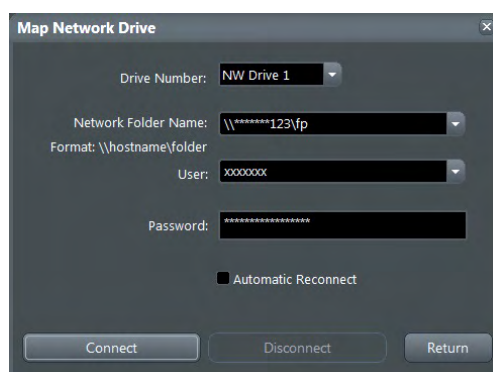


Figure 3-51 Map Network Drive

5. Enter the name of the shared network folder in the „Network Folder Name” field.
6. Supply a valid user name and a password for this folder.

**Note** *If you check the „Automatic Reconnect” box, the system tries to establish the connection again when starting up. Otherwise, the connection must be re-established manually after a shutdown or reboot.*

7. Select the **Connect** button to establish the connection to the remote system. If successful, the **Disconnect** button becomes active.

**Note** *The **Map Network Drive** button is also accessible in the “Connect USB and Network Drives” dialog window that appears when pressing the **Eject** key on the alphanumeric keyboard.*

**Note** *If there is an error during the connection, a warning message appears inside the dialog. In this case, please verify the data in the dialog.*

**Note** *If there already is a connection to the remote server, the **Connect** button is grayed. To change the existing connection, first click on **Disconnect** and then enter the new settings.*



#### Warning

Please make sure that the server you are connecting to is trustworthy and reliable. For details, contact your local system administrator.

If you backup archive data to this server, all the patients demographic data will be copied to this server!

### 3.13.8 InSite ExC Configuration

#### Prerequisites for InSite Setup

If not already available, collect the following information from the hospital network administrator:

1. Proxy Server, if necessary  
 \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_ and Port \_\_\_\_\_
2. Proxy Authentication, if necessary  
 User \_\_\_\_\_ and Password \_\_\_\_\_

#### Configuration Steps

1. Enter the Common Service Desktop (CSD).

**Note**

There are different possibilities to access the Common Service Desktop and its available features; see [Section 5.12.2 "Access / Security" on page 5-36](#).

2. Select the **Configuration** page, then double-click **InSite ExC Agent Configuration (A)**.

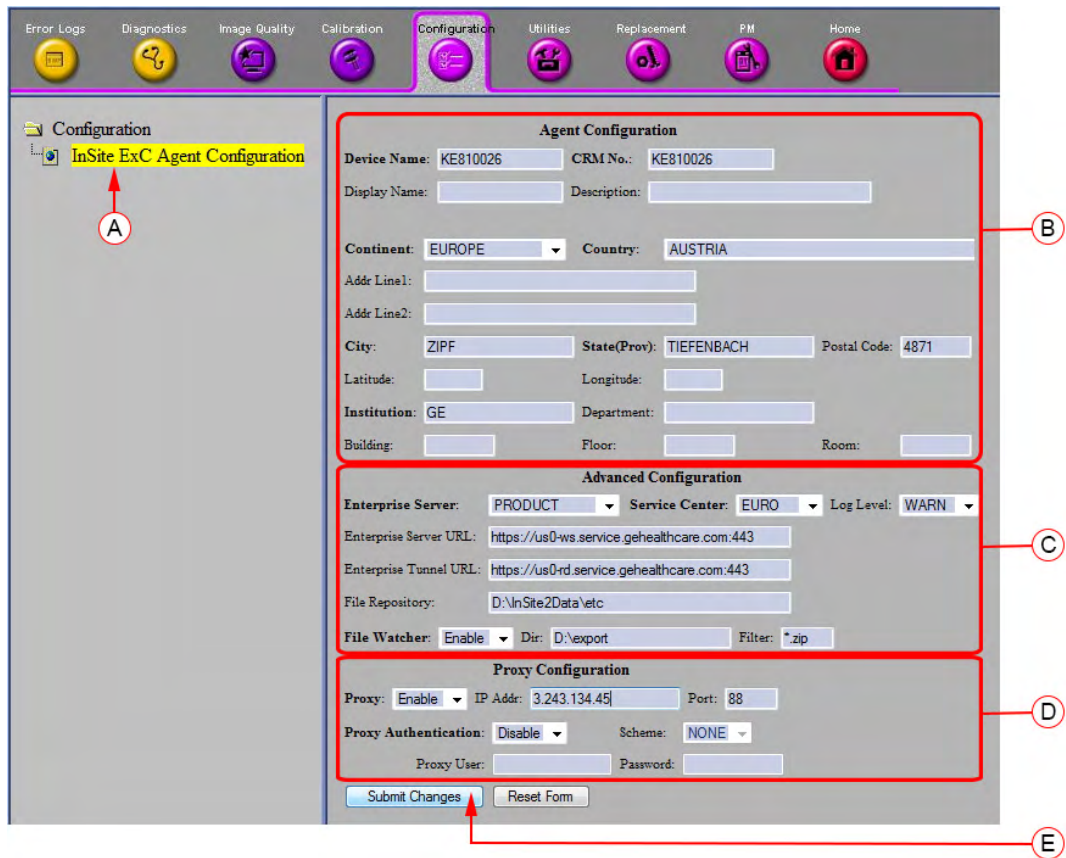


Figure 3-52 Common Service Desktop - Configuration

**Note**

This example shows fictional numbers!

3. Fill out **at least all bold stated mandatory** fields in the Agent Configuration section (B).
  - The **Device Name** (pre-populated) and the **CRM** field have to be prefix KE6 or KE8 + systems serial number without prefix letter; e.g. **KE810026**.
  - Select **Continent** and **Country** from the pull-down menu.
  - Enter **City**, **State**, **Postal Code** and **Institution** where the system resides.
4. Check settings in the Advanced Configuration section (C).
  - **Enterprise Server** - PRODUCT
  - **Service Center** - EURO
  - **Log Level** - WARN

Further fields should be pre-populated and should not be modified. However, please ensure correct setting.


- *Enterprise Server URL* - pre-populated URL
  - *Enterprise Tunnel URL* - pre-populated URL
  - *File Repository* - This path is set by engineering and must not be changed!
  - *File Watcher* - Should always be Enabled!
  - *Dir* - D:\export
  - *Filter* - ensure that this field has the entry "\*.zip"
5. Enter Proxy Configuration (D).
    - a. If the customer site does not require a Proxy server, select Disable from the Proxy pull-down menu and continue with step 7.
    - b. If a Proxy server is available, select Enable from the Proxy pull-down menu, enter a valid Proxy IP Address and Port number.

**Note** *The information MUST be properly entered, otherwise remote control does not work. There is no possibility to detect proxy server information automatically.*

6. Click the **Submit Changes** button (E) and then close the page.
7. Reboot.
8. Reenter the Common Service Desktop (CSD).
9. Confirm that Service Connectivity is "Configured" and "Checked Out" in the **Home** page.  
If the system indicates "Checked Out" you can be confident that the system has registered correctly. If required, verify further connectivity (e.g., remote connectivity using your account).
10. Close the page and check/create InSite permanent user setting; see [Section 3.13.8.1 on page 3-65](#).

### 3.13.8.1 How to create an InSite permanent User

An InSite permanent user is required for automatic system error reporting to the digital service network.

1.  Move the cursor to the InSite ExC link (GE icon) at the right bottom of the display screen and press the left trackball key (= left-click). The "Contact GE" form (see [Figure 1-1 below](#)) is displayed.
2. Ensure that Connection is "Checked Out" (1).

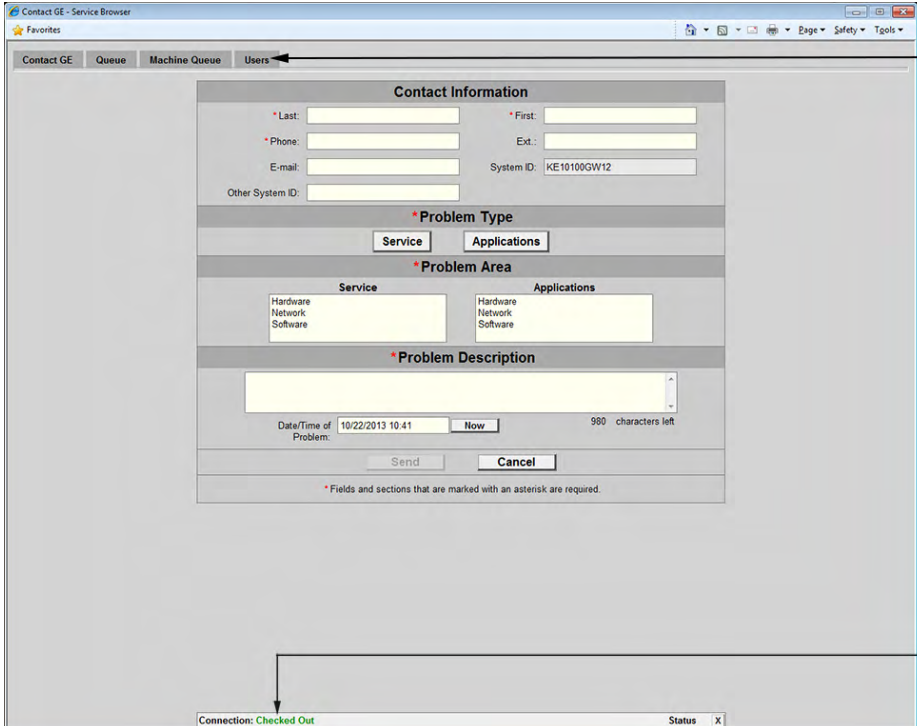


Figure 3-53 Contact GE

3. Select **Users** on the top menu (2).

- In the next screen click **Add User (3)**.

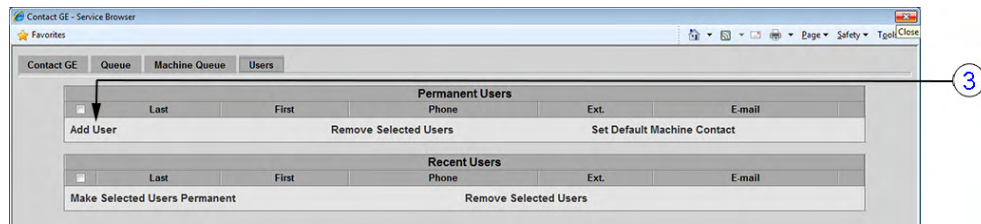


Figure 3-54 Add User

- Fill in the required information and confirm with **Add User (4)**.

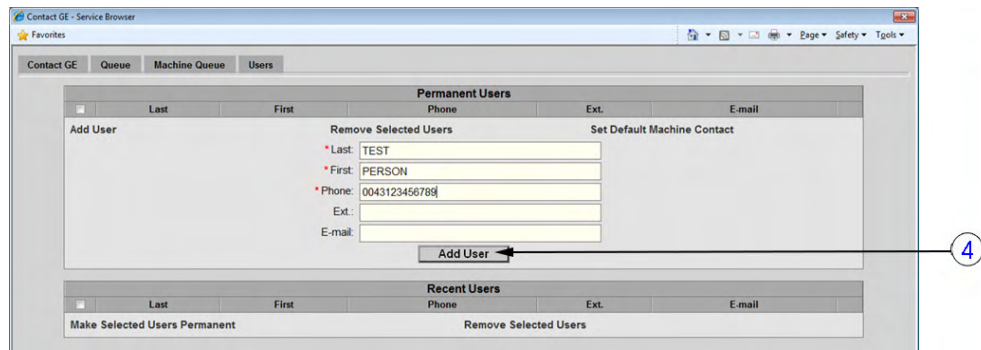


Figure 3-55 confirm with Add User

- Check mark the appropriate user and then click **Set Default Machine Contact (5)**.

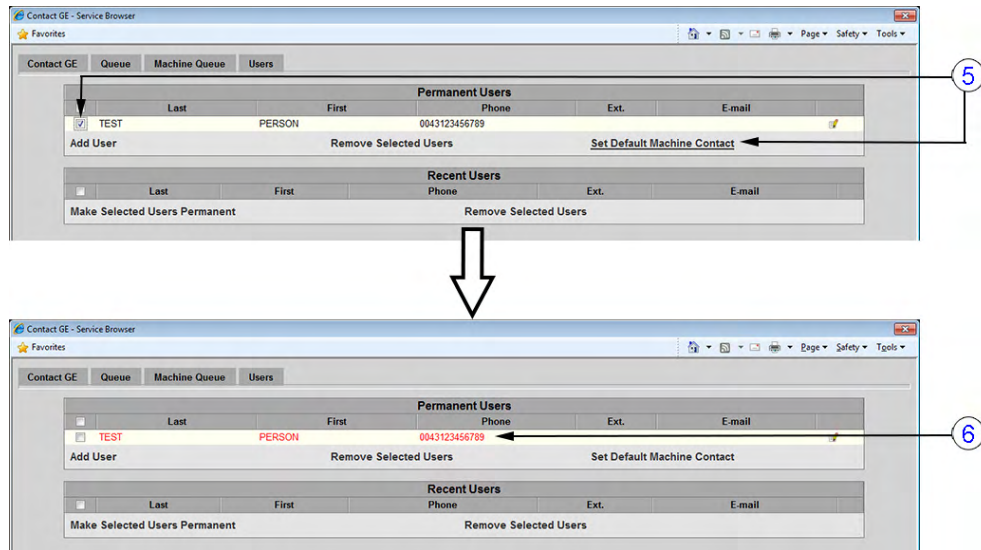


Figure 3-56 set User as Default

Color of the selected user turns from BLACK to RED (6). The permanent user is created.

- Close the window.



### 3.14 Connectivity Setup Worksheet

#### Site System Information

Site: 
 Floor: 
 Comments:

Dept: 
 Room:

Voluson E\_ 
 Type: 
 REV:

#### CONTACT INFORMATION

Name	Title	Phone	E-Mail Address

#### TCP/IP Settings

#### System IP Settings

Name - AE Title:

IP Address:

Subnet Mask:

Default Gateway:

#### Remote Archive Setup

Name - AE Title:

IP Address:

Subnet Mask:

Default Gateway:

Server Name:

Remote DB User Name:

#### Services (Destination Devices)

	Device Type	Manufacturer	Name	IP Address	Port	AE Title
1				<input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/>		
2				<input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/>		
3				<input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/>		
4				<input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/>		
5				<input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/>		
6				<input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/>		
7				<input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/>		
8				<input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/>		
9				<input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/>		
10				<input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/>		
11				<input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/>		
12				<input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/> <input style="width: 30px;" type="text"/>		

Figure 3-57 Site System Information

Voluson E__							
Host Name	<input style="width: 100%;" type="text"/>	Local Port	<input style="width: 100%;" type="text"/>	IP Address	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>
AE Title	<input style="width: 100%;" type="text"/>			Net Mask	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>
<b>ROUTING INFORMATION</b>				<b>GATEWAY IP Addresses</b>			
	<b>Destination IP Addresses</b>			<b>Default</b>			
ROUTER1	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>
ROUTER2	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>
ROUTER3	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>
<b>DICOM APPLICATION INFORMATION</b>							
	<b>NAME</b>	<b>MAKE/REVISION</b>	<b>AE TITLE</b>	<b>IP ADDRESSES</b>	<b>PORT</b>		
Store 1	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>
Store 2	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>
Store 3D_1	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>
Store 3D_2	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>
Print	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>
Worklist	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>
Structured Reporting	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>
Storage Commit	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>
MPPS	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>	<input style="width: 25%;" type="text"/>

Figure 3-58 Worksheet for DICOM Network Information

### 3.15 Paperwork

**Note** During and after installation, the documentation (i.e. User Manual, Installation Manual,...) for the peripherals must be kept as part of the original system documentation. This will ensure that all relevant safety and user information is available during the operation and service of the complete system.

#### 3.15.1 Product Locator Installation Card

**Note** The provided Product Locator Installation Card may not be the same as shown in the Figure below.


		GE Medical Systems Mailing Address Product Locator File P.O Box 414 Milwaukee, WI 53201-0414		GEMS-E Product Locator Administration BP 34 78533 Buc Cedex, FRANCE		Yokogawa Medical Systems Ltd. GEMSA Service Administration 4-7-127 Asahigaoka Hino-shi Tokyo 191, JAPAN	
DESCRIPTION	FDA	MODEL	KEY	SERIAL			
OCP		BS	ORD	EMPLOYEE NO.			
DISTRICT		CUSTOMER NO.		DATE (MO-DA-YR)			
<b>SHIPMENT</b>							
DESTINATION NAME AND ADDRESS							
ZIP CODE							
		GE Medical Systems Mailing Address Product Locator File P.O Box 414 Milwaukee, WI 53201-0414		GEMS-E Product Locator Administration BP 34 78533 Buc Cedex, FRANCE		Yokogawa Medical Systems Ltd. GEMSA Service Administration 4-7-127 Asahigaoka Hino-shi Tokyo 191, JAPAN	
DESCRIPTION	FDA	MODEL	KEY	SERIAL			
SYSTEM I.D.		OCP	BS	ORD	EMPLOYEE NO.		
DISTRICT		ROOM		DATE (MO-DA-YR)			
CUSTOMER NO.							
DESTINATION NAME AND ADDRESS							
ZIP CODE							
<b>INSTALLATION</b>							

Figure 3-59 Product Locator Installation Card

#### 3.15.2 User Manual(s)

Check that the correct User Manual(s) for the system and software revision, is included with the installation. Specific language versions of the User Manual may also be available. Check with your GE Sales Representative for availability.

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# Chapter 4

## Functional Checks

*This chapter provides procedures for quickly checking major functions of Voluson E-Series system diagnostics by using the built-in service software, and power supply adjustments.*

### Content in this chapter

<i>4.1 Required Equipments</i>	<i>4-2</i>
<i>4.2 General Procedure</i>	<i>4-2</i>
<i>4.3 Functional Checks</i>	<i>4-8</i>
<i>4.4 Backup and Restore Database, Preset Configurations and Images</i>	<i>4-11</i>
<i>4.5 Software Configuration Checks</i>	<i>4-24</i>
<i>4.6 Peripheral Checks</i>	<i>4-25</i>
<i>4.7 Mechanical Function Checks</i>	<i>4-26</i>
<i>4.8 Site Log</i>	<i>4-27</i>

### Note

*Most of the information pertaining to this Functional Checks chapter is found in the Voluson E-Series Basic User Manual; see: Section 9.11 "System Manuals" on page 9-32 .*

## 4.1 Required Equipments

- An empty (blank) DVD/CD+R/RW and/or external USB device (stick or hard disk drive).
- At least one probe; see [Section 9.12 "Probes" on page 9-33](#) for an overview. Usually you should check all the probes used on the system

## 4.2 General Procedure

---



### Caution

The system requires all covers. Operate the system only when all board covers and frame panels are securely in place. The covers are required for safe operation, good system performance and cooling purposes. When covers are removed, EMI may be present.

---



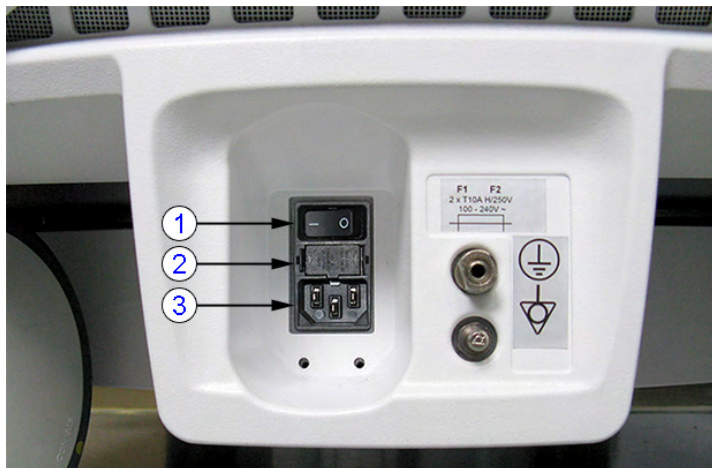
### Lockout/Tagout Requirements (For USA only).

Follow OSHA Lockout/Tagout requirements by ensuring you are in total control of the Power Cable on the system.

## 4.2.1 Power On / Boot Up

**Note** *After turning off a system, wait at least 10 seconds before turning it on again. The system may not be able to boot if power is recycled too quickly.*

1. Connect the main power cable to the back of the system.
2. If not already done, screw on the pull-out protection of the mains power cable with the 2 screws.
3. Connect the main power cable to a hospital grade power outlet with the proper rated voltage. Never use an adapter that would defeat the safety ground.
4. Switch ON the circuit breaker at the rear of the system.



- 1 circuit breaker
- 2 fuses (2x T10A H/250V)
- 3 connector for main power cable

Figure 4-1 Circuit Breaker at rear of system

**Note** *When AC power is applied to the system, the **ON/OFF** standby button on the control console illuminates amber, indicating that the system (including the Back-end Processor) is in standby mode.*

5. Hold down the **ON/OFF** standby button (see: [Figure 4-2 below](#)) on the control console for ~3 seconds.

**Note** *The mains outlet of the system for peripheral auxiliary equipment are commonly switched with the **ON/OFF** standby button. The power switch of any attached printer(s) needs to be in ON position before starting the system. However, be aware some auxiliary equipment may switch itself to standby mode (e.g., Color video printer) and must therefore be switched on separately.*



Figure 4-2 ON/OFF standby button

As soon as the software has been loaded, the system enters 2D-Mode with the probe and application that were used before the system shutdown. Total time used for start-up is about 2 minutes.

**Note** *The mains outlet of the system for peripheral auxiliary equipment are commonly switched with the **ON/OFF** standby button. So the auxiliary equipment need not to be switched ON/OFF separately.*

## 4.2.2 Power Off / Shutdown

**Note** After turning off a system, wait at least 10 seconds before turning it on again. The system may not be able to boot if power is recycled too quickly.

1. If not already in read mode, freeze the image.
2. Press the **ON/OFF** Standby button on the control console. Following dialog appears.

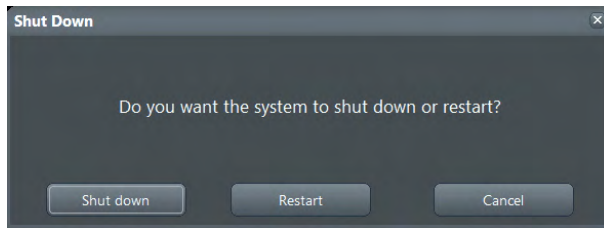


Figure 4-3 Shutdown dialog

3. Select **Shutdown**. The system performs an automatic full shutdown sequence.
4. Switch OFF the circuit breaker at the rear of the system.

**Note** A full shutdown is also performed when pressing the **ON/OFF** standby button on the control console twice.

**Note** The mains outlet of the system for peripheral auxiliary equipment are commonly switched with the **ON/OFF** standby button. So the auxiliary equipment need not to be switched ON/OFF separately.



### Warning

Disconnection of the main power cable is necessary!

5. After complete power down, unscrew the 2 screws and remove the pull-out protection to disconnect the main power cable from the system or unplug it from the AC wall outlet socket.

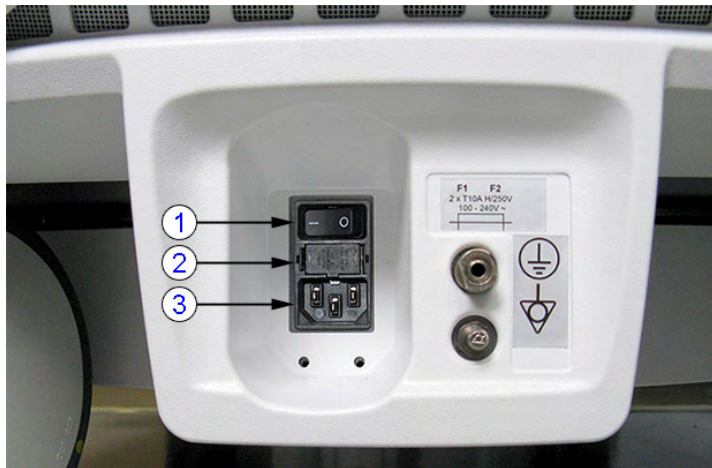


Figure 4-4 Circuit Breaker at rear of system

- 1 circuit breaker
- 2 fuses (2x T10A H/250V)
- 3 connector for main power cable

6. Press on the brakes to block the front caster wheels.
7. Disconnect probes. (Turn the probe locking handle counterclockwise and then pull the connector straight out of the probe port.)



### Caution

Do not disconnect a probe while running (Live Scan "Write" mode)! A software error may occur. In this case switch the system OFF (perform a reset).



## 4.2.3 System Features

### 4.2.3.1 Control Console



Figure 4-5 Control Console Tour

1	Touch Panel screen	8	Trackball and Trackball keys
2	Touch Panel rotary/push/flip controls	9	lamp on/off
3	Mode keys on/off (push), Gain (rotate) X,Y,Z rotary controls in 3D/4D Volume Mode	10	button for control console rotation
4	Foc.Depth (flip), B-Image Angle (rotate), Foc.Zones (push)	11	buttons for control console height adjustment
5	Zoom Box on/off (push), Zoom Size (rotate), B-Image Depth (flip)	12	Voluson Logo
6	Remote control P-keys (programmable)	13	keyboard and F1 key (to invoke EUM)
7	Freeze / Run key	14	ON/OFF Standby power button

### 4.2.3.2 Touch Panel

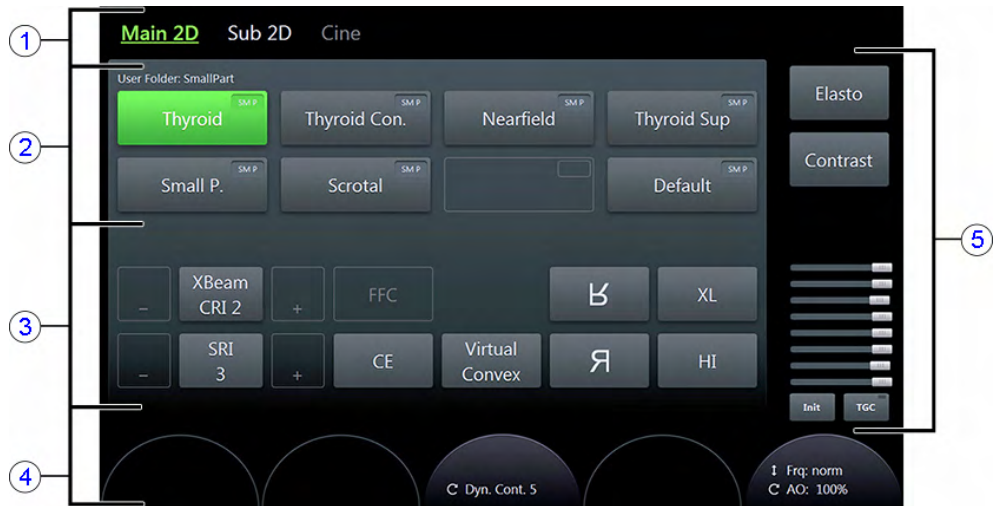


Figure 4-6 Touch Panel - Main Menu

- 1 Main, Sub and Cine menu of the selected mode.
- 2 Shows all presets for the active application; the active one is highlighted.
- 3 Functions and display options supported by the selected Mode.
- 4 Settings which can be adjusted by the combination rotary/push/flip controls adjacent to the Touch Panel.  
The functionality of these controls changes, depending upon the currently displayed menu.
- 5 Additional Operating Modes and applications such as TGC Sliders, etc.

**Note** *Different menus are displayed depending on which Touch Panel Menu and which Mode is selected.*

### 4.2.3.3 Monitor Display

## 4.3 Functional Checks

For basic functional checks of different modes, measurements, calculations etc. refer to the Voluson E-Series Basic User Manual.

---



It might be possible that some probes, options or features are NOT available

- in some countries.
  - at the time of release of this Service Manual.
- 

**Note** *Some software may be considered standard depending upon system configuration. If any Modes or Options are not part of the system configuration, the check can be omitted.*

**Note** *Different menus are displayed depending on which Touch Panel Menu and which Mode is selected.*

**Note** *Some function keys only appear on the Touch Panel if they are available for the selected probe.*

### 4.3.1 Patient Archive (Image Management)

The Voluson E-Series provides an Patient/Image Management System that allows fast and extremely easy patient, exam and image management.



#### Current Patient:

The entered patient data will be used in calculations, patient worksheets, DICOM settings and is displayed on the screen to identify images.

#### Archive:

The patient archive database is used for searching a particular exam and/or patient. Via the **Data Transfer** button, it is possible to send images over the DICOM network, print exams/images, export exams/images, import exams/images, etc.

#### Image History:

Image History gives you access to all the US pictures and exams of a particular patient.

#### Exam Review:

Exam Review allows you to view all exams of a particular patient. Additionally it is possible to view image properties, input comments and voice annotations, etc.

**Note** For further details refer to the *Voluson E-Series Basic User Manual*.

**Note** Images can also be backed up and restored by means of the **Image Archive** function in the System Setup. Operation see [Section 4.4.6 on page 4-21](#).

### 4.3.2 Erasing DVD/CD

1. Press the **Utilities** key on the control console.
2. In the “Utilities” menu touch the **Setup** button to invoke the setup desktop on the screen.
3. On the right side of the screen select **Connectivity** and then click the **Drives** tab.

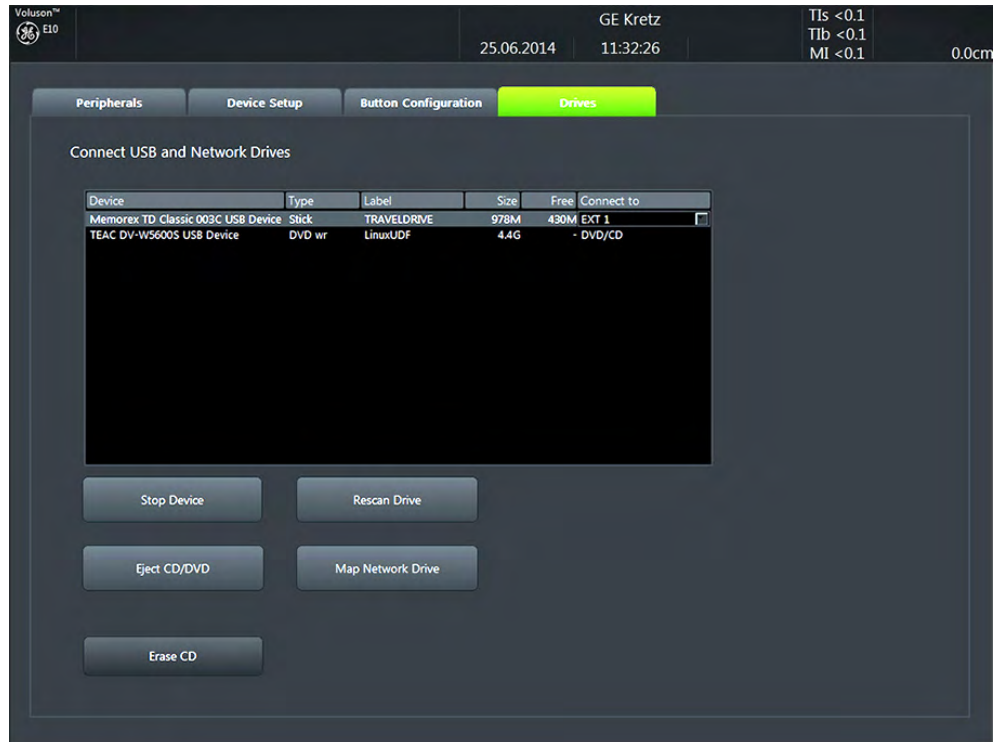


Figure 4-7 Setup - Connectivity - DRIVES page

4. Click the **Erase CD** button to displays the “Erase DVD/CD” window.

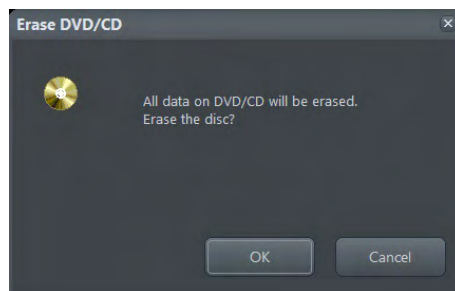


Figure 4-8 Erase DVD/CD Window

5. Click the **OK** button to start the process.
6. When erasing is finished, select **Exit** to return to scan mode.

## 4.4 Backup and Restore Database, Preset Configurations and Images

**Note** *It is highly recommended to Backup the Full System Configuration (Section 4.4.3 on page 4-16 ) and the Image Archive (Section 4.4.6 on page 4-21 ) once a week.*

1. Press the **Utilities** key on the control console.
2. In the "Utilities" menu touch the **Setup** button to invoke the setup desktop on the screen.
3. On the right side of the screen select **Backup** and then click the **System Configuration** tab.

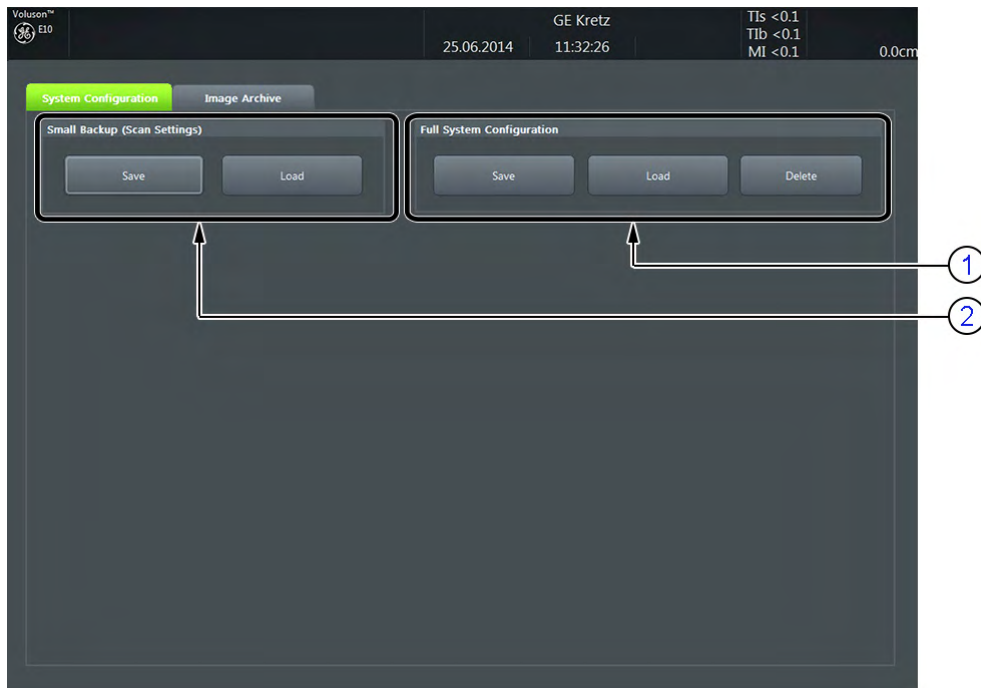


Figure 4-9 Setup - Backup - SYSTEM CONFIGURATION page

- 
- |   |                              |
|---|------------------------------|
| 1 | Full System Configuration    |
| 2 | Small Backup (Scan Settings) |
- 

The System Configuration page is subdivided in 2 main groups:

1. **Small Backup (Scan Settings)**
  - *"Save Small Backup (Scan Settings)" on page 4-12*
  - *"Load Small Backup (Scan Settings)" on page 4-13*
2. **Full System Configuration**
  - *"Save Full System Configuration (Full Backup)" on page 4-16*
  - *"Load Full System Configuration (Full Backup)" on page 4-18*
  - *"Delete Full System Configuration (Full Backup)" on page 4-20*

Settings and/or Full System Configuration can be saved to the following destinations:

- D: partition of internal hard disk
- DVD/CD+R/RW
- Mapped Network Drive, see: *Section 3.13.7 on page 3-63*.
- Any other drive connected to the system (e.g.; USB-Stick or external hard disk drive)

**Note:** This function is only available in the Full Backup utility. For further details review: *Section 3.4.12 "General Remarks and Hints when using external USB-Devices" on page 3-25*.

### 4.4.1 Save Small Backup (Scan Settings)

The Image/Scan Settings contain:

- Application Settings
  - 2D Factory and 2D User Presets
  - 3D/4D Factory and 3D/4D User Presets
  - Annotation Presets
  - Scan Assistant Configuration
  - Measure Configuration
  - Biopsy Lines
1. Insert a DVD/CD+R/RW into the drive or connect an external USB device.
  2. Press the **Utilities** key on the control console.
  3. In the "Utilities" menu touch the **Setup** button to invoke the setup desktop on the screen.
  4. On the right side of the screen select **Backup** and then click the **System Configuration** tab.
  5. Click the **Save** button (1) of the "Small Backup (Scan Settings)" group.

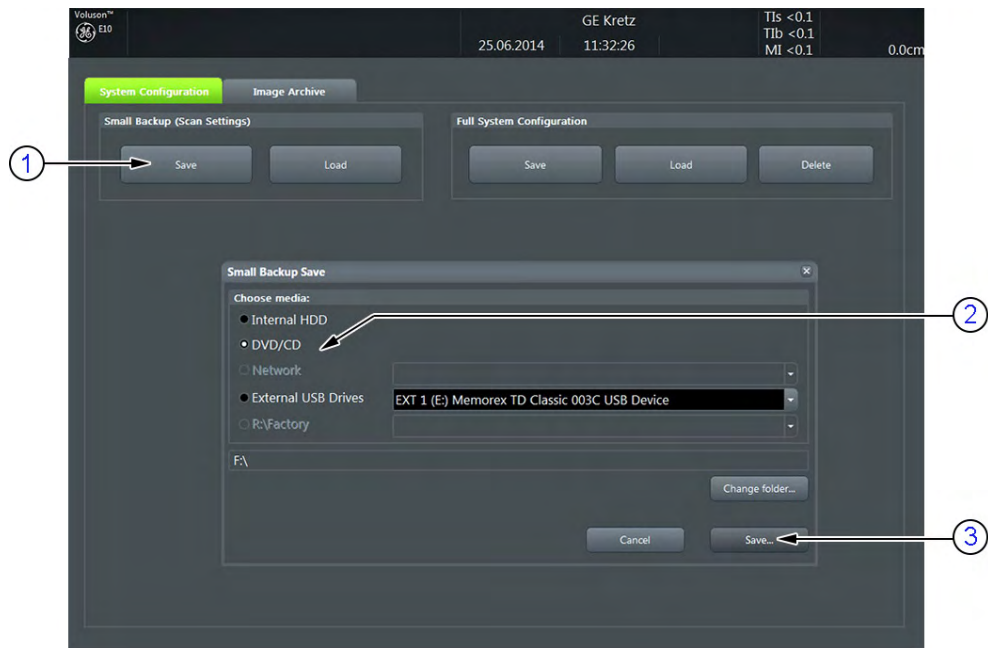


Figure 4-10 Save window

6. Choose the media (2) and click the **Save** button (3).
7. Select the **New File...** key and enter a file name (without extension).
8. Click the **OK** key to start the process. When the saving has been completed, click **OK**.



## 4.4.2 Load Small Backup (Scan Settings)



The loading procedure overwrites existing image/scan settings on the local hard drive.

Make sure to insert the correct System DVD. Additionally you can load the image settings from "D:\usersettings".

### 4.4.2.1 Preparations

1. Insert a DVD/CD+R/RW into the drive or connect an external USB device.
2. Press the **Utilities** key on the control console.
3. In the "Utilities" menu touch the **Setup** button to invoke the setup desktop on the screen.
4. On the right side of the screen select **Backup** and then click the **System Configuration** tab.
5. Click the **Load** button (1) of the "Small Backup (Scan Settings)" group.

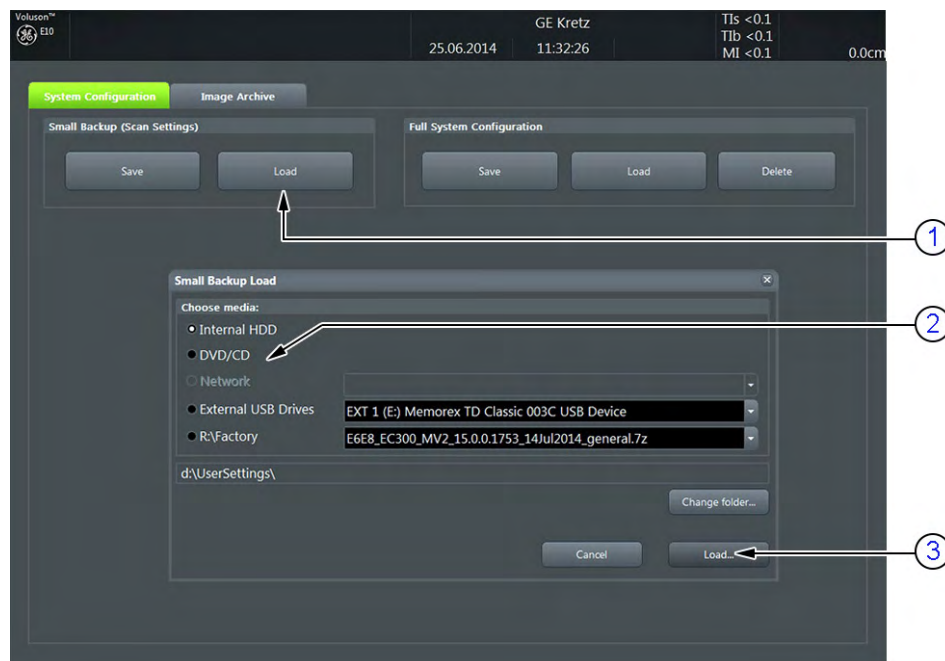


Figure 4-11 Load window

6. Choose the media (2) and click the **Load** button (3).

#### Note

If it is desired to load settings from media Internal HDD, click on the **Change folder** button, browse for the folder on "D:\usersettings" and then click the **Load** button.

7. Select the appropriate file and click **OK**.
8. Select the desired loading procedure:
  - "Load "Complete Backup"" on page 4-14
  - "Load only parts of the "Complete Backup"" on page 4-15

### 4.4.2.2 Load "Complete Backup"

**Note** The "Complete Backup" contains factory default settings that are adapted for the installed Application Software version.

1. Perform "Preparations" on page 4-13 .
2. Select the "Complete Backup" (1) (see figure below) and click the [>>] button (2) to copy it into the Load Data field.

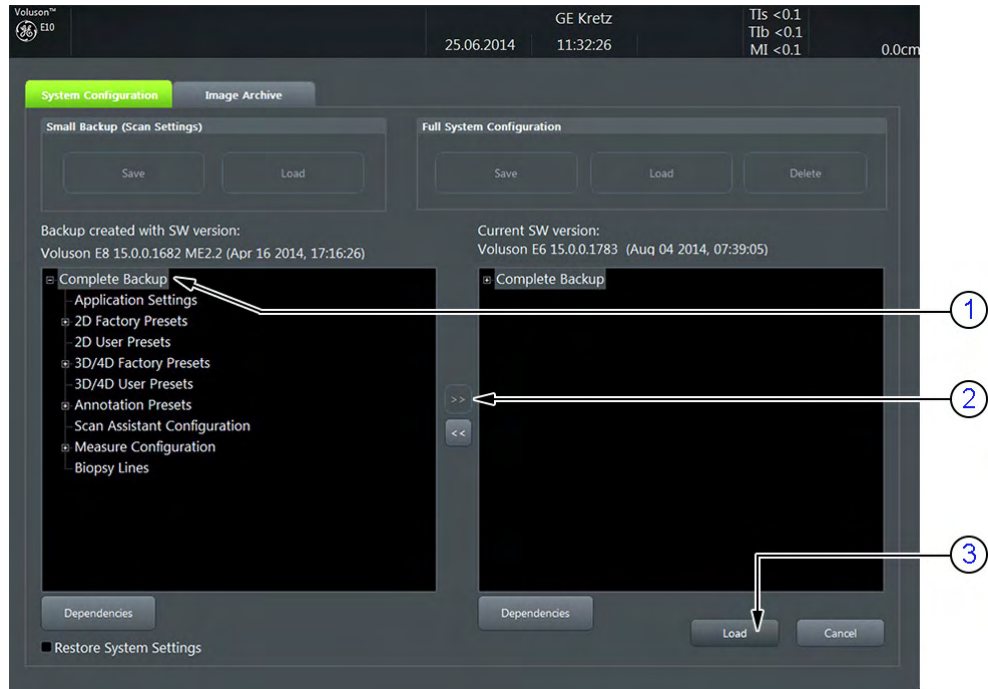


Figure 4-12 Load Backup Data

3. Click the **Load** button (3) to start the loading procedure of the complete backup into the system. The US Application Software restarts.

#### 4.4.2.3 Load only parts of the "Complete Backup"

**Note** *Following procedure should be used, if the user has saved own 2D/3D/4D Presets or Annotation entries, but new settings (presets) have to be added to match the installed Application Software version (e.g., 2D/3D/4D Factory Presets for new probe, etc.).*

1. Perform "*Preparations*" on page 4-13 .
2. Click the **[+]** sign next to "Complete Backup" (1) to open the content tree.

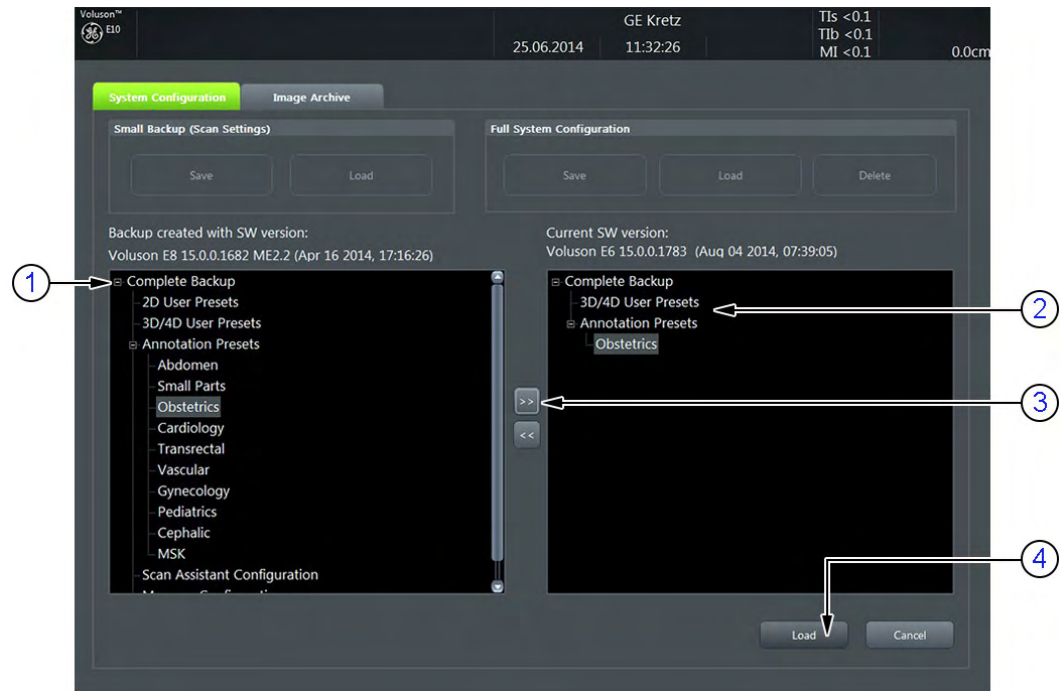


Figure 4-13 Load settings

3. For example: Click the **[+]** sign and copy the desired content by clicking the **[>>]** button; and so on ....

**Note** *To return selected items from the "Load Data" field to "Backup Data" field select the **[<<]** button.*

4. Confirm selection with the **Load** button (3).

Settings will be loaded and the US Application Software restarts.

### 4.4.3 Save Full System Configuration (Full Backup)

A backup of the Full System Configuration always contains the following data

- User Settings (databases and files containing User Programs, 2D/3D/4D Programs, Auto Text entries, gray curves and complete System settings such as language, time/date format, etc.)
- Measure Configuration (user specific measure setup settings)
- Patient Archive (database containing patient demographic data and measurements) - **no images**
- Options (Permanent Key that is specific for enabled software options and Demo Key)
- Image Transfer Configuration (DICOM settings e.g., DICOM servers, AE Title, Station Name, etc.)
- Network Configuration (network settings including the computer name)
- Service Platform (state of the Service Software)

**Note**

It is recommended to “Full Backup” system configuration data before upgrading the software and/or image settings (presets). This ensures that if settings need to be reloaded, will be the same ones the customer was using prior to service.

1. Press the **Utilities** key on the control console.
2. In the “Utilities” menu touch the **Setup** button to invoke the setup desktop on the screen.
3. On the right side of the screen select **Backup** and then click the **System Configuration** tab.
4. Click the **Save** button of the "Full System Configuration" group.
5. Choose the destination (1).

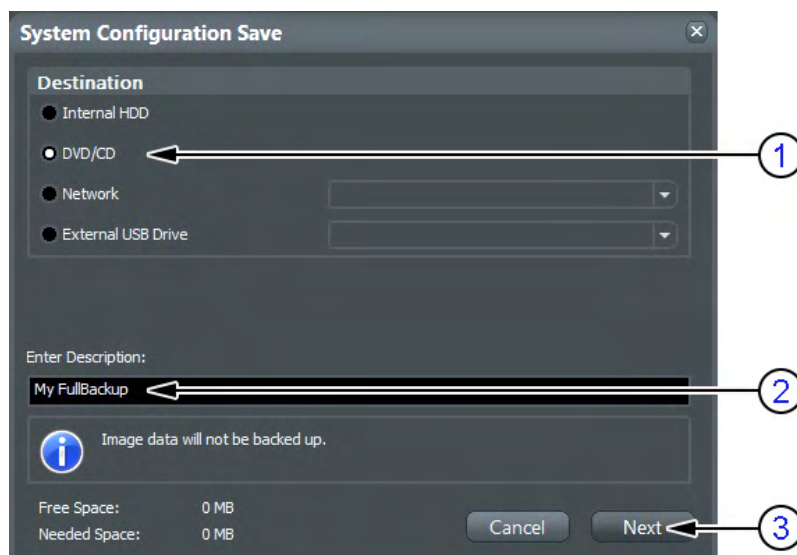


Figure 4-14 System Configuration Save

6. Enter the description of the Full Backup (2).

**Note**

Image data will not be backed up! To backup the Image Archive, refer to [Section 4.4.6 on page 4-21](#) .

7. Click the **Next** button (3).
8. To start the backup process click **Yes**.

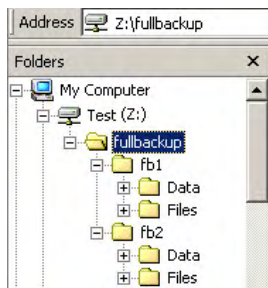
After copying the data, the Voluson E-Series reboots and the application starts again.

When the “Full Backup” is saved on a network drive it may be desirable to move the data (e.g., for backup or maintenance). To map a network drive see [Section 3.13.7 on page 3-63](#) .

The backups reside in sub folders of the main “fullbackup”-folder found at the root of the drive.

For Example: Backups on the mapped **Network Drive** are below path **Z:\fullbackup**.

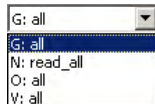
The directory structure of the full backup data is as follows:



The sub folders have the names fbX where X is a number (e.g., Z:\fullbackup\fb1).

The data resides within a directory structure within these sub folders. It is possible to move the fbX sub folders, even leaving gaps in the numeration sequence.

However, **NO** change **MUST** be made to the contents of the fbX folders itself, otherwise the backup data cannot be restored!



If the destination „Other drive“ is selected, the available drives (e.g., external USB-memory stick) can be chosen from the pull-down menu.

**Note**

*When the backup is saved to an external USB-device, the system has to be informed about the removal of the hardware. For this purpose every last dialog of "Full Backup Save" and "Full Backup Delete" has a **Stop USB Devices** button.*



Figure 4-15 Please stop USB Devices before unplugging!

For further details see [Section 3.4.12 "General Remarks and Hints when using external USB-Devices" on page 3-25](#).

### 4.4.4 Load Full System Configuration (Full Backup)



**Caution**

It is recommended to backup data before an upgrade; see [Section 4.4.3 on page 4-16](#).

The “Full Backup” loading procedure replaces (overwrites) **ALL** existing data (except Application Settings adapted for the used system software version) on the local hard drive of the Voluson E-Series system!

**Note**

*It is neither required nor advisable to reload a previously stored “Full Backup” after a software upgrade that was performed by means of the FMI from DVD button!*

**Note**

*There are circumstances where it is not possible to load (restore) all the data. The following rules specify these restrictions:*

1. Generally, **only** restoring data from an older to a newer software version is possible. Loading a backup into a system that has a lower software version than the system the backup was created on is prohibited.
2. Options can **only** be restored on the same Voluson E-Series system within the same major software version.
3. When loading a backup into a system with a software version that has a higher major number (4.x.x), the following items will not be restored:
  - Options
  - State of the Service Platform
4. The **user is only** allowed to restore data to a different system if and only if the software version on this system is the same as in the backup.
5. The **user is not** allowed to restore the following items to a different system:
  - Windows Network Settings
  - Options
  - DICOM AE Title and DICOM Station Name
  - State of the Service Platform

**Operation**

1. Press the **Utilities** key on the control console.
2. In the “Utilities” menu touch the **Setup** button to invoke the setup desktop on the screen.
3. On the right side of the screen select **Backup** and then click the **System Configuration** tab.
4. Click the **Load** button of the "Full System Configuration" group.
5. Choose the destination (1).

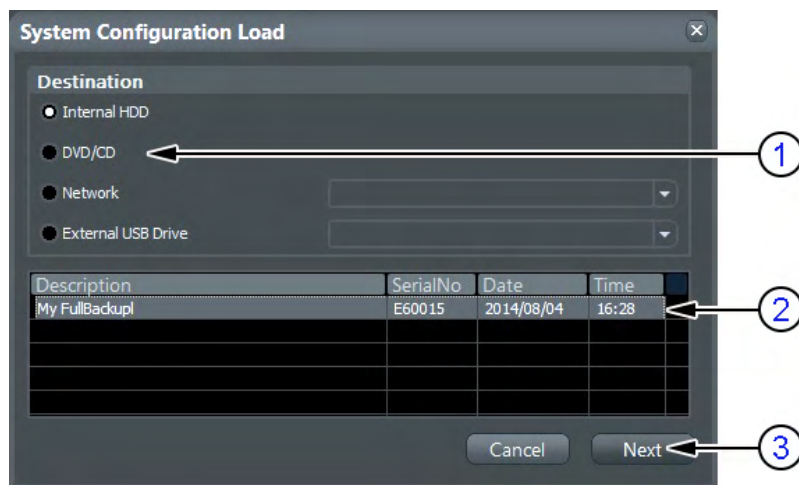


Figure 4-16 System Configuration Load

6. Click on the backup to be restored **(2)**. Additional information is displayed in the table.
7. Select the **Next** button **(3)**.  
The following window will be displayed.

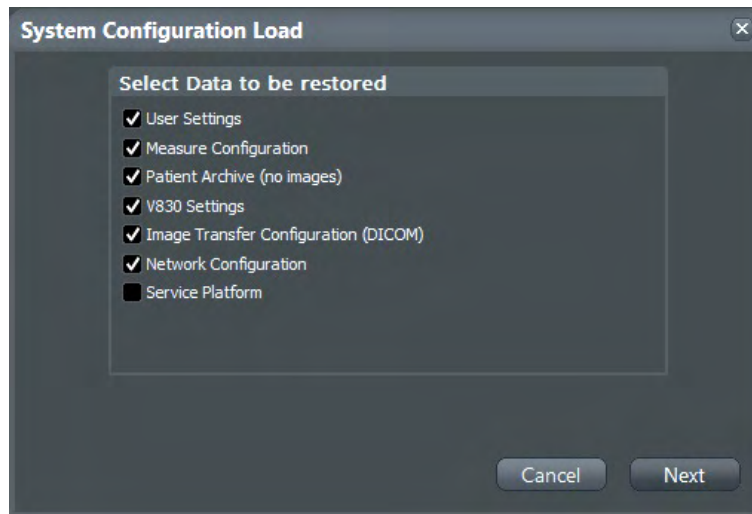


Figure 4-17 Select data to be restored

8. Select the data to be restored to the Voluson E-Series system.

**Note**

For description of the check box names see [Section 4.4.3 on page 4-16](#).

9. Click the **Next** button and then select **Yes** to start, or **No** to cancel the restore procedure.



**Caution**

When clicking **Yes**, the current data on the system will be permanently replaced by the data of the backup and can not be restored!

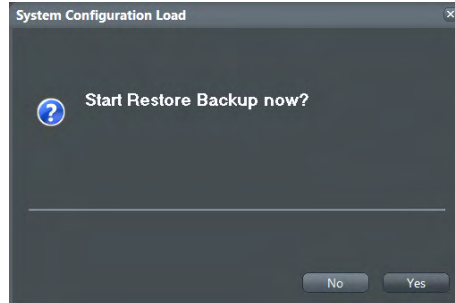


Figure 4-18 Start Restore Backup now?

After restoring the data, the Voluson E-Series reboots and the application starts again.

10. Confirm that the date and time are set correctly.

### 4.4.5 Delete Full System Configuration (Full Backup)

1. Press the **Utilities** key on the control console.
2. In the "Utilities" menu touch the **Setup** button to invoke the setup desktop on the screen.
3. On the right side of the screen select **Backup** and then click the **System Configuration** tab.
4. Click the **Delete** button of the "Full System Configuration" group.
5. Choose the destination (1).

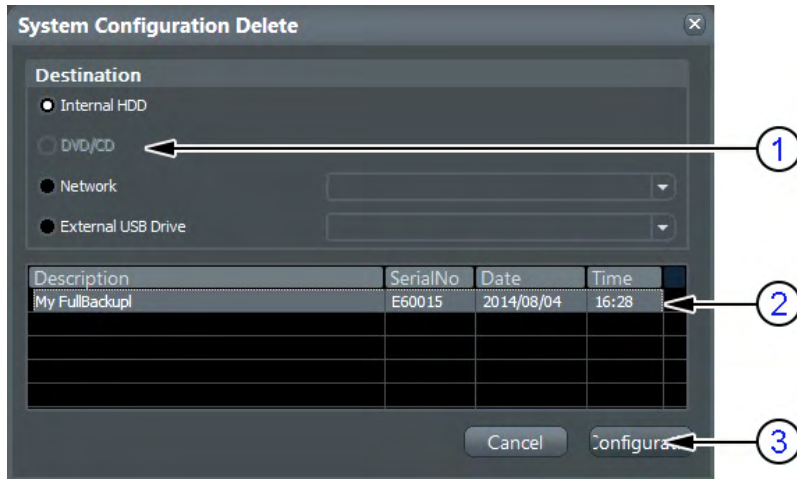


Figure 4-19 System Configuration Delete

6. Click on the backup to be deleted (2). Additional information is displayed in the table.
7. Select the **Delete** button (3).



Caution  
There is **no "Undo"** function for this action!!!



## 4.4.6 Archiving Images

**Note** *It is highly recommended to Backup the Full System Configuration (Section 4.4.3 on page 4-16 ) and the Image Archive (Section 4.4.6 on page 4-21 ) once a week.*

### 4.4.6.1 Save Image Archive

**Note** *A backup of the Image Archive always contains the Patient Archive (database containing patient demographic data and measurements) + **images** of the selected exams.*

1. Press the **Utilities** key on the control console.
2. In the “Utilities” menu touch the **Setup** button to invoke the setup desktop on the screen.
3. On the right side of the screen select **Backup** and then click the **Image Archive** tab.

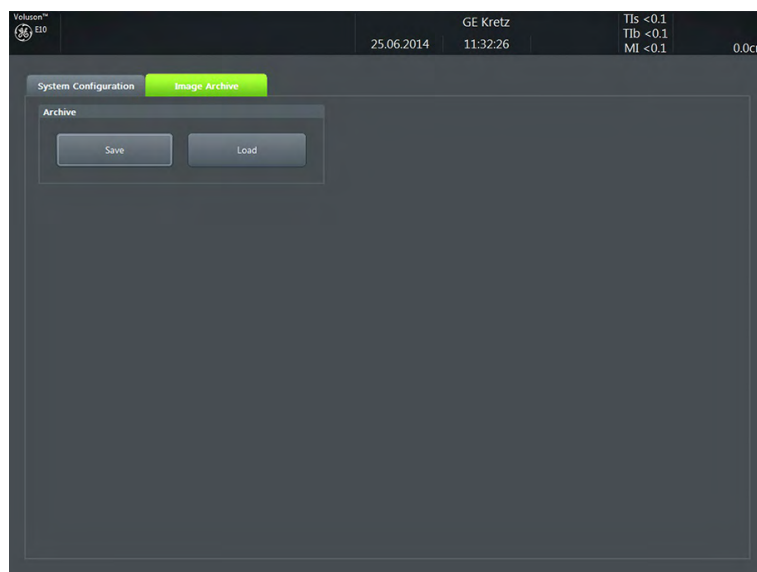


Figure 4-20 Setup - Backup - IMAGE ARCHIVE page

4. Click the **Save** button (2).

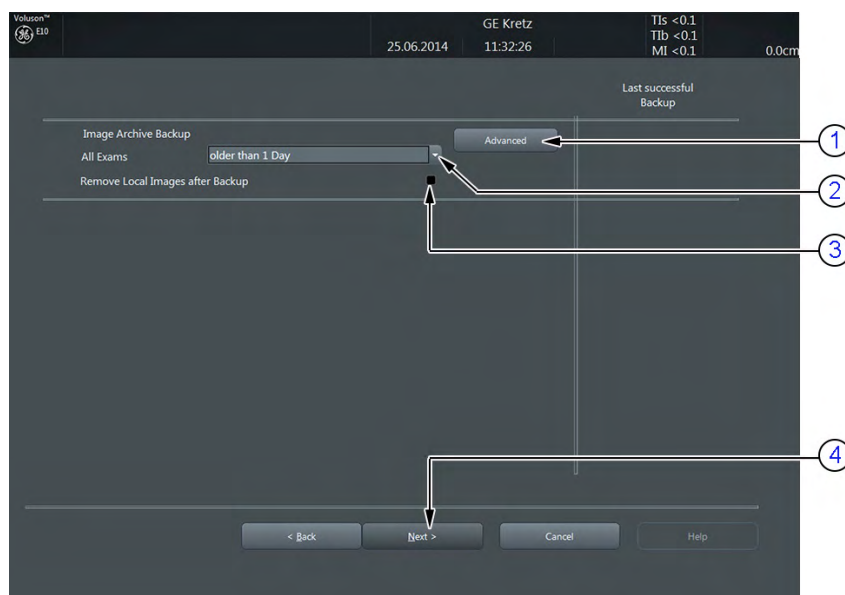


Figure 4-21 Image Archive Save - preparations

5. Choose archiving span time from the pull-down menu (2).

**Note** *If for example “All images older than” **1 Day** is chosen (see: Figure 4-21 on page 4-21 ), images of the current day will not be archived! However, if you click the [Advanced] button you can put this right.*

6. If desired, check mark “Remove Local Images after Backup” (3).
7. Click the **Advanced** button (1) if it is desired to adapt archive data.

8. Select the **Next** button (4).

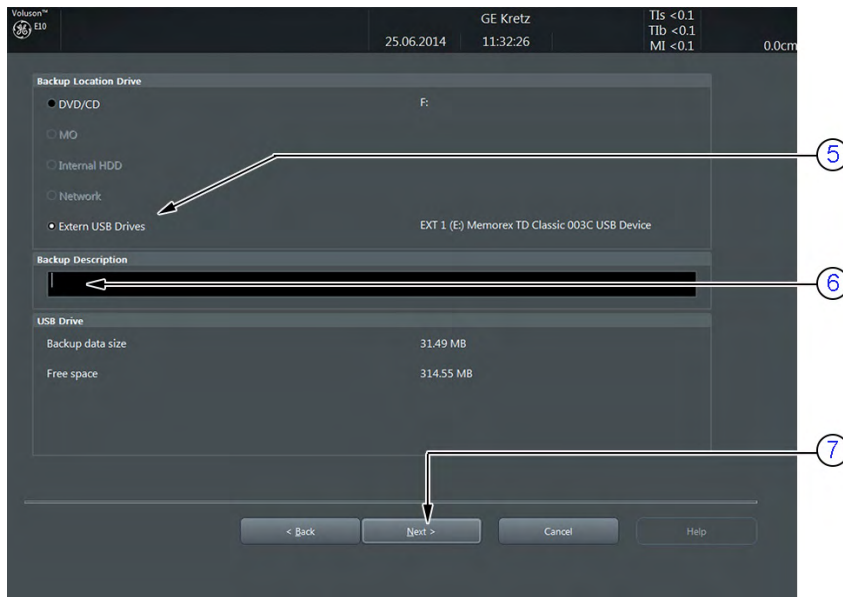


Figure 4-22 Image Archive Save - choose destination

9. Choose the destination (5).
10. Enter the description of the backup (6).

**Note**

*Voluson E-Series presets, configurations and image settings will not be backed up! To Backup the Full System Configuration see [Section 4.4.3 on page 4-16](#) .*

11. Select the **Next** button (7).
12. To start the backup process click **Yes**.

### 4.4.6.2 Load Image Archive

1. Press the **Utilities** key on the control console.
2. In the “Utilities” menu touch the **Setup** button to invoke the setup desktop on the screen.
3. On the right side of the screen select **Backup** and then click the **Image Archive** tab.
4. Click the **Load** button.

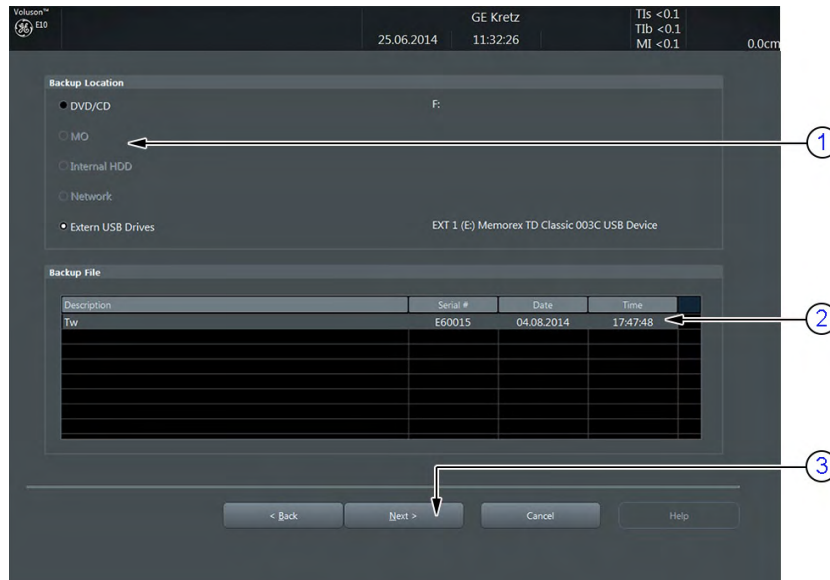


Figure 4-23 Image Archive Load - choose destination

5. Choose the destination (1).
6. Click on the backup to be restored (2). Additional information is displayed in the table.
7. Select the **Next** button (3). The following window will be displayed.

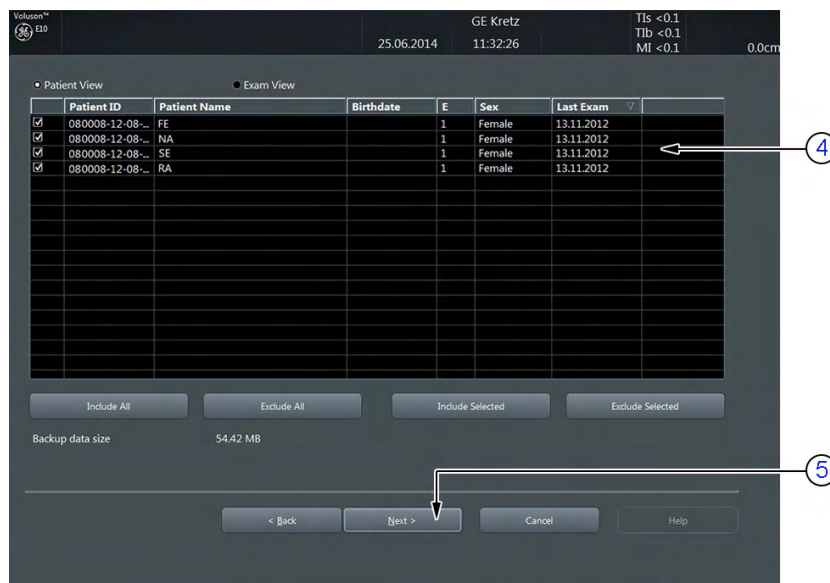


Figure 4-24 select image archive data to be restored

8. Select (check mark) the image archive data to be restored to the Voluson E-Series system (4).
9. Select the **Next** button (5) and then select **Yes** to start, or **No** to cancel the restore procedure.

## 4.5 Software Configuration Checks

### 4.5.1 System Setup

1. Press the **Utilities** key on the control console.
2. In the “Utilities” menu touch the **Setup** button to invoke the setup desktop on the screen.
3. On the right side of the screen select the desired major group.

Each major group contains different pages to check:

Table 4-1 System Setup Checks - GENERAL

Step	Page + Task	Expected Result(s)
1	General: Check Date and Time setting	Date and Time are correct
2	General: Check that Location (Clinic Name) is correct	Location name is correct
3	General: Check Language settings	desired Language is displayed
4	General: Check EUM Language settings	desired EUM Language is displayed
5	User Setting: Check all the User Settings	settings assigned as desired by the customer
6	Patient Info Display: Check all settings	settings assigned as desired by the customer
7	Scan Assistant: Check settings	settings assigned as desired by the customer

Table 4-2 System Setup Checks - ADMINISTRATION

Step	Page + Task	Expected Result(s)
1	Options: Check that all options are set up correct	D = Demo , I = Inactive , P = Permanent

Table 4-3 System Setup Checks - CONNECTIVITY

Step	Page + Task	Expected Result(s)
1	Peripherals: Check the Video Norm standard as described in <a href="#">Section 3.7.1.6 on page 3-43</a> .	settings assigned as required for the country
2	Peripherals: Check assignment of Report Printer	printer assigned as desired by the customer
3	Peripherals: Check assignment of Footswitch	Footswitch buttons assigned as desired by the customer
4	Device Setup: Check DICOM, Network and Archive configuration	setting assigned as desired and required by the customer
5	Button Configuration: Check assignment of remote keys <b>P1</b> , <b>P2</b> , <b>P3</b> and <b>P4</b> .	remote keys are assigned as desired by the customer
6	Button Configuration: Check assignment of <b>Start exam</b> and <b>End exam</b>	buttons are assigned as desired by the customer

## 4.6 Peripheral Checks

Check that peripherals work as described below:

Table 4-4 Peripheral Checks

Step	Page + Task	Expected Result(s)
1	Press the <b>Freeze</b> key.	Stop image acquisition.
2	Press the remote key ( <b>P1</b> , <b>P2</b> , <b>P3</b> or <b>P4</b> ), which is assigned to the BW printer.	The image displayed on the screen is printed on the Black & White printer.
3	Press the remote key ( <b>P1</b> , <b>P2</b> , <b>P3</b> or <b>P4</b> ), which is assigned to the color printer.	The image displayed on the screen is printed on the Color printer.
4	Press the remote key ( <b>P1</b> , <b>P2</b> , <b>P3</b> or <b>P4</b> ), which is assigned to recorder control.	Recording starts/stops.

### 4.6.1 ECG Check Out

Connect the ECG preamplifier and check:

Table 4-5 Peripheral Checks

Step	Page + Task	Expected Result(s)
1	Press the <b>Utilities</b> key on the control console and then touch the <b>ECG</b> button to display the "ECG" menu.	It will display a curve along the bottom edge of the image sector.

## 4.7 Mechanical Function Checks

### 4.7.1 Control Console Positioning


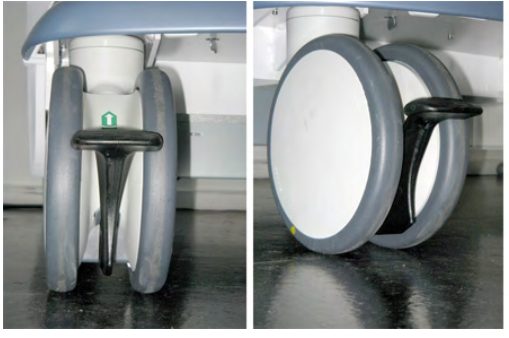

The control console can be rotated, translated and adjusted in height (**electronically** only).

**Note** For further details refer to [Section 5.10.3 on page 5-34](#) and/or [Section 6.3 on page 6-4](#).

### 4.7.2 Brakes and Direction (Swivel) Locks

Check the brakes and swivel locks function as described below.

Table 4-6 Brakes and Direction (Swivel) Lock

Step	Task	Expected Result(s)
1		swivel lock engaged
2		brakes and swivel lock released
3		brakes and swivel lock engaged (=full lock)



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# Chapter 5

## Components and Functions (Theory)

*This chapter explains Voluson E-Series system concepts, component arrangement, and subsystem function. It also describes the Power Distribution System (PDS) and probes.*

### Content in this chapter

<i>5.1 General information</i>	<i>5-2</i>
<i>5.2 FrontEnd Processor</i>	<i>5-20</i>
<i>5.3 BackEnd Processor</i>	<i>5-22</i>
<i>5.4 Internal I/O</i>	<i>5-24</i>
<i>5.5 Control Console (User Interface)</i>	<i>5-26</i>
<i>5.6 Monitor</i>	<i>5-28</i>
<i>5.7 External I/O</i>	<i>5-29</i>
<i>5.8 Peripherals</i>	<i>5-30</i>
<i>5.9 Power Distribution</i>	<i>5-32</i>
<i>5.10 Mechanical Descriptions</i>	<i>5-33</i>
<i>5.11 Air Flow Control</i>	<i>5-35</i>
<i>5.12 Service Platform</i>	<i>5-36</i>
<i>5.13 Common Service Desktop (CSD)</i>	<i>5-38</i>
<i>5.14 Service Page</i>	<i>5-39</i>
<i>5.15 Boot Screen Functions</i>	<i>5-42</i>

## 5.1 General information

Voluson E-Series is a digital beamforming curved-, linear- and phased array ultrasound imaging system. It has provisions for analog input sources like ECG and Phono. A CW-Doppler probe may also be connected and used.

The system can be used for:

- 2D Mode Imaging and additional Operating Modes (B-Flow, XTD-View, Contrast Imaging, etc.)
- Color Doppler Imaging (CFM, PD, TD and HD-Flow)
- M Mode + MCFM Imaging
- Doppler (PW, CW)
- 3D Mode and Real Time 4D Imaging
- Different combinations of the above modes



Figure 5-1 Voluson E-Series - Major Components

1 Monitor arm (fully adjustable)	8 12.1" Touch Panel display
2 DVD+(R)W drive	9 Control Console incl. Alphanumeric keyboard, Hardkeys and Encoders/Joycoders
3 ON/OFF Standby button	10 Control Console Movement buttons
4 holder for Endocavity probe	11 Front Handle
5 Probe cable holder	12 Place for peripherals (e.g., ECG, printer,...)
6 Probe connectors incl. CW and probe storage connector (left - not active for scanning)	13 Footrest
7 23" Widescreen LED Monitor	14 Front Caster wheels (lockable)

Among other significant features of the Voluson E-Series ultrasound system are the following:

- Integrated FrontEnd (uses advanced ASIC and FPGA technologies)
- Open connectivity using USB ports
- Bluetooth - wireless connectivity
- high-resolution 23" LCD Flat panel monitor with LED display
- Low profile, backlit Keyboard

Voluson E-Series has a digital beam forming system (incorporated in the FrontEnd) which can handle up to 256 element probes by use of multiplexing.

Signal flow from the Probe Connector Panel, to the FrontEnd (FE) Electronics, to the BackEnd Processor (BEP), and finally is displayed on the LCD monitor and peripherals.

Voluson E-Series internal electronics are divided into three:

- FrontEnd (FE)
- BackEnd Processor (BEP)
- Power Supply Unit

Interconnecting signals from FrontEnd, BackEnd, keyboard, monitor, and power distribution sub-systems are routed internally.

### Major System Components

- FrontEnd processor:
- BackEnd processor: [Section 5.3 on page 5-22](#)
- Control Console (User interface); System I/O with hard keys, Touch Panel and EL-Display: [Section 5.5 on page 5-26](#)
- Monitor: [Section 5.6 on page 5-28](#)
- External I/O: [Section 5.7 on page 5-29](#)
- Peripherals: [Section 5.8 on page 5-30](#)
- Power supply and Isolation transformer for the peripherals, [Section 5.9 on page 5-32](#)
- System mechanical chassis: trolley to keep all major components, [Section 5.10 on page 5-33](#)

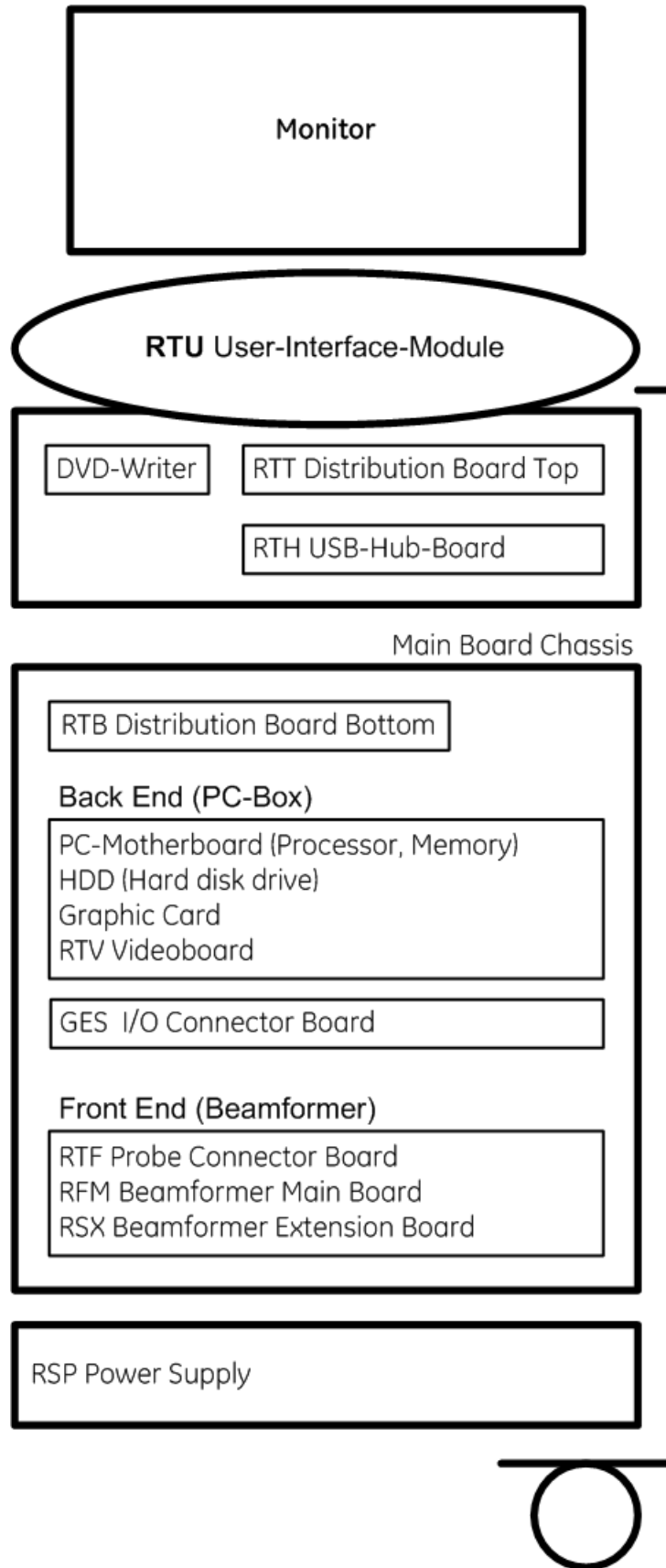


Figure 5-2 Basic Block diagram of Voluson E-Series

The Voluson E-Series used digital beamforming technology which provides high resolution and high penetration performance. It is a general purpose, mobile, software controlled diagnostic ultrasound system. Its function is to acquire ultrasound data and to display the data of different modes gives the operator the ability to measure anatomical structures and offers analysis packages that provide information that is used to make a diagnosis by competent health care professionals.

The Calculation and Report function supports following application packages:

- Abdominal (ABD)
- Obstetrical and Fetal Echo (OB)
- Gynecological (GYN)
- Small Parts and Breast (SM P)
- Vascular (VAS)
- Pediatrics (PED)
- Transrectal (TR)
- Cardiology (CARD)
- Cephalic (CEPH)
- Musculoskeletal (MSK)

The Voluson E-Series supports a variety of linear-, curved-, phased array and pencil CW probes for various clinical applications. Any 3 probes may be connected at the same time (+ 1 pencil CW probe).

Medical application fields include:

- Obstetrics
- Gynecology and Fertility
- Radiology
- Internal Medicine
- Neurology
- Cardiology
- Oncology
- Urology
- Orthopedics
- Pediatrics

The system is designed for follow-up expansion.

In addition to the initial operational settings for each probe preprogrammed in the system, user-customized parameter settings for each probe may be inserted by the operator and stored for recall as needed via the system control console. System configuration is stored on the hard drive and all necessary software is loaded from the hard drive on power up.

Biopsy guidelines are provided on screen to assist in the collection of tissue samples, using biopsy guide adapters offered as an optional accessory.

The system provides the ability to perform remote viewing of images without compression, via DICOM 3.0 compatible output. Management of patient history is possible by image-filing function. High-resolution images are provided by utilizing a technology called digital dynamic receive focusing.

For more detailed explanations of functions and controls refer to the Voluson E-Series Basic User Manual.

## 5.1.1 Description of Operating Modes

### 5.1.1.1 B-Mode or 2D-Mode

B-Mode or 2D-mode is a two-dimensional image of the amplitude of the echo signal. It is used for location and measurement of anatomical structures and for spatial orientation during operation of other modes. In 2D-mode, a two-dimensional cross-section of a three-dimensional soft tissue structure such as the heart is displayed in real time. Ultrasound echoes of different intensities are mapped to different gray scale or color values in the display. The outline of the 2D cross-section may be a rectangle, parallelogram, sector or 360-degree circle, depending on the transducer used. 2D-mode can be used in combination with any other mode.

#### 5.1.1.1.1 Coded Harmonic Imaging (HI)

In Harmonic Imaging, acoustic aberrations due to tissue are minimized by receiving and processing the second harmonic signal that is generated within the insonified tissue. Voluson E-Series high performance HI provides superb detail resolution and penetration, outstanding contrast resolution, excellent acoustic clutter rejection and an easy to operate user interface. Coded Harmonics enhances near field resolution for improved small parts imaging as well as far field penetration. It diminishes low frequency amplitude noise and improves imaging technically difficult patients. It may be especially beneficial when imaging isoechoic lesions in shallow-depth anatomy in the breast, liver and hard-to-visualize fetal anatomy. Coded Harmonics may improve the B-Mode image quality without introducing a contrast agent.

#### 5.1.1.1.2 XTD-View

XTD-View (Extended View) provides the ability to construct and view a static 2D image which is wider than the field of view of a given probe. This feature allows viewing and measurement of anatomy that is larger than what would fit in a single image. XTD-View constructs the extended image from individual image frames as the operator slides the probe along the surface of the skin in direction of the scan plane. Examples include scanning of vascular structures and connective tissues in the arms and legs.

#### 5.1.1.1.3 B-Flow

B-Flow is especially intuitive when viewing blood flow, for acute thrombosis, parenchymal flow and jets. It helps to visualize complex hemodynamics and highlights moving blood in tissue. B-Flow is less angle dependent, no velocity aliasing artifacts, displays a full field of view and provides better resolution when compared with Color-Doppler Mode. It is therefore a more realistic (intuitive) representation of flow information, allowing to view both high and low velocity flow at the same time.

#### 5.1.1.1.4 Coded Contrast Imaging (optional)

For details see: [Section 5.1.4.6 "Coded Contrast Imaging" on page 5-14](#).

#### 5.1.1.1.5 Elastography (optional)

For details see: [Section 5.1.4.7 "Elastography" on page 5-14](#).

### 5.1.1.2 M-Mode

In M-mode, soft tissue structure is presented as scrolling display, with depth on the Y-axis and time on the X-axis. It is used primarily for cardiac measurements such as valve timing on septal wall thickness when accurate timing information is required. M-mode is also known as T-M mode or time-motion mode. Ultrasound echoes of different intensities are mapped to different gray scale values in the display. M-mode displays time motion information of the ultrasound data derived from a stationary beam. Depth is arranged along the vertical axis with time along the horizontal axis. M-mode is normally used in conjunction with a 2D image for spatial reference. The 2D image has a graphical line (M-line) superimposed on the 2D image indicating where the M-mode beam is located.

#### 5.1.1.2.1 MCFM Mode (M Mode + Color Flow Mode)

Color Flow Mode and Color M Mode are Doppler modes intended to add color-coded qualitative information concerning the relative velocity and direction of fluid motion within the 2D mode or M mode image. Color Flow overlays color on the M mode trace using velocity and variance color maps. The Color Flow wedge overlays the 2D mode image and M mode timeline.

### 5.1.1.3 Color Doppler Modes

Color Doppler is used to detect motion presented as a two-dimensional display. There are following applications of this technique:

- Color Flow Mode (C) - used to visualize blood flow velocity and direction
- Power Doppler (PD) - used to visualize the spatial distribution of blood
- Bi-Directional Angio (HD-Flow) - used to visualize flow direction with spatial resolution and low artifact visibility
- Tissue Doppler (TD) - used to visualize tissue motion direction and velocity

#### 5.1.1.3.1 Color Flow Mode

A real-time two-dimensional cross-section image of blood flow is displayed. The 2D cross-section is presented as a full color display, with various colors being used to represent blood flow (velocity, variance, power and/or direction). Often, to provide spatial orientation, the full color blood flow cross-section is overlaid on top of the grayscale cross-section of soft tissue structure (2D echo). For each pixel in the overlay, the decision of whether to display color (Doppler), gray scale (echo) information or a blended combination is based on the relative strength of return echoes from the soft tissue structures and from the red blood cells. Blood velocity is the primary parameter used to determine the display colors, but power and variance may also be used. A high pass filter (wall filter) is used to remove the signals from stationary or slowly moving structures. Tissue motion is discriminated from blood flow by assuming that blood is moving faster than the surrounding tissue, although additional parameters may also be used to enhance the discrimination. Color flow can be used in combination with 2D and Spectral Doppler modes as well as with 3D mode.

#### 5.1.1.3.2 Power Doppler

A real-time two dimensional cross-section of blood flow is displayed. The 2D cross-section is presented as a full color display, with various colors being used to represent the power in blood flow echoes. Often, to provide spatial orientation, the full color blood flow cross-section is overlaid on top of the gray scale cross-section of soft tissue structure (2D echo). For each pixel in the overlay, the decision of whether to display color (Doppler power), gray scale (echo) information or a blended combination is based on the relative strength of return echoes from the soft-tissue structures and from the red blood cells. A high pass filter (wall filter) is used to remove the signals from stationary or slowly moving structures. Tissue motion is discriminated from blood flow by assuming that blood is moving faster than the surrounding tissue, although additional parameters may also be used to enhance the discrimination. The power in the remaining signal after wall filtering is then averaged over time (persistence) to present a steady state image of blood flow distribution. Power Doppler can be used in combination with 2D and Spectral Doppler modes as well as with 3D mode.

#### 5.1.1.3.3 Bi-Directional Angio (HD-Flow Mode)

Directional Power Doppler is a Power Doppler mode incorporating the flow direction (much like Color Doppler) into the displayed image. The focus of the settings for Directional Power Doppler is for high spatial resolution and low artifact visibility, allowing vessels to be seen with less blooming and finer detail.

#### 5.1.1.3.4 Tissue Doppler

The Tissue Color Doppler Imaging is used for color encoded evaluation of heart movements. The TD image provides information about tissue motion direction and velocity.

### 5.1.1.4 Pulsed (PW) Doppler

PW Doppler processing is one of two spectral Doppler modalities, the other being CW Doppler. In spectral Doppler, blood flow is presented as a scrolling display, with flow velocity on the Y-axis and time on the X-axis. The presence of spectral broadening indicates turbulent flow, while the absence of spectral broadening indicates laminar flow. PW Doppler provides real time spectral analysis of pulsed Doppler signals. This information describes the Doppler shifted signal from the moving reflectors in the sample volume. PW Doppler can be used alone but is normally used in conjunction with a 2D image with an M-line and sample volume marker superimposed on the 2-D image indicating the position of the Doppler sample volume. The sample volume size and location are specified by the operator. Sample volume can be overlaid by a flow direction cursor which is aligned, by the operator, with the direction of flow in the vessel, thus determining the Doppler angle. This allows the spectral display to be calibrated in flow velocity (m/sec.) as well as frequency (Hz). PW Doppler also provides the capability of performing spectral analysis at a selectable depth and sample volume size. PW Doppler can be used in combination with 2D and Color Flow modes.

### 5.1.1.5 3D Imaging

The Voluson E-Series Ultrasound System will be used to acquire multiple, sequential 2D images which can be combined to reconstruct a three dimensional image. These 3D images are useful in visualizing three-dimensional structures, and in understanding the spatial or temporal relationships between the images in the 2D sequence. The 3D image is presented using standard visualization techniques, such as surface or volume rendering.

### 5.1.1.6 3D Data Collection and Reconstruction

2D gray scale images including Color Flow or Power Doppler information may be reconstructed. The acquisition of volume data sets is performed by sweeping 2D-scans with special transducers (called 3D-transducers) designed for the 2D-scans and the 3D-sweep.

2D ultrasound imaging modes are used to view a two dimensional cross-sections of parts of the body. For example in 2D gray scale imaging, a 2 dimensional cross-section of a 3-dimensional soft-tissue structure such as the heart is displayed in real time. Typically, the user of an ultrasound machine manipulates the position and orientation of this 2D cross-section in real time during an ultrasound exam.

By changing the position of the cross-section, a variety of views of the underlying structure are obtained, and these views can be used to understand a 3-dimensional structure in the body.

To complete survey a 3-dimensional structure in the body, it is necessary to collect 2D images which span a volume containing the structure. One way is to sweep the imaging cross-section by translating it in a direction perpendicular to the cross-section. Another example method is to rotate the cross section about a line contained in the cross section. The Voluson E-Series Ultrasound System uses the automated so called C-Scan for the motion perpendicular to automated B-scan. Once a representative set of 2D cross-sections are obtained, standard reconstruction techniques can be used to construct other 2D cross-sections, or to view the collection of the cross-sections as a 3D images.

### 5.1.1.7 3D Image Presentation

Several techniques can be used to aid the human observer in understanding the resulting 2D image as a representation of a three-dimensional object. One is to rotate the volume of data, and present the resulting sequence of 2D projections to the observer. The changing direction of observation helps the observer to separate the features in the volume according to their distance from the observer.

### 5.1.1.8 3D Rendering

The 3D (volume) rendering is a calculation process to visualize certain 3D-structures of a scanned volume by means of a 2D-image. The gray value for each pixel of the 2D-image is calculated from the voxels along the corresponding projection path (analyzing beam) through the volume. The render (calculation) algorithm, surface or transparent mode, determines how 3D-structures are visualized.

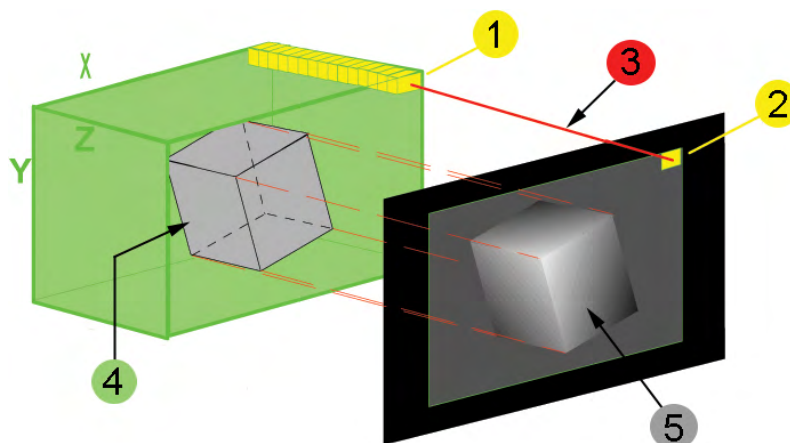


Figure 5-3 Principle: Volume Rendering

1	Voxel	3	Projection Way	5	2D - Display
2	Pixel	4	Volume - Block		



5.1.2 Block diagram Voluson E-Series

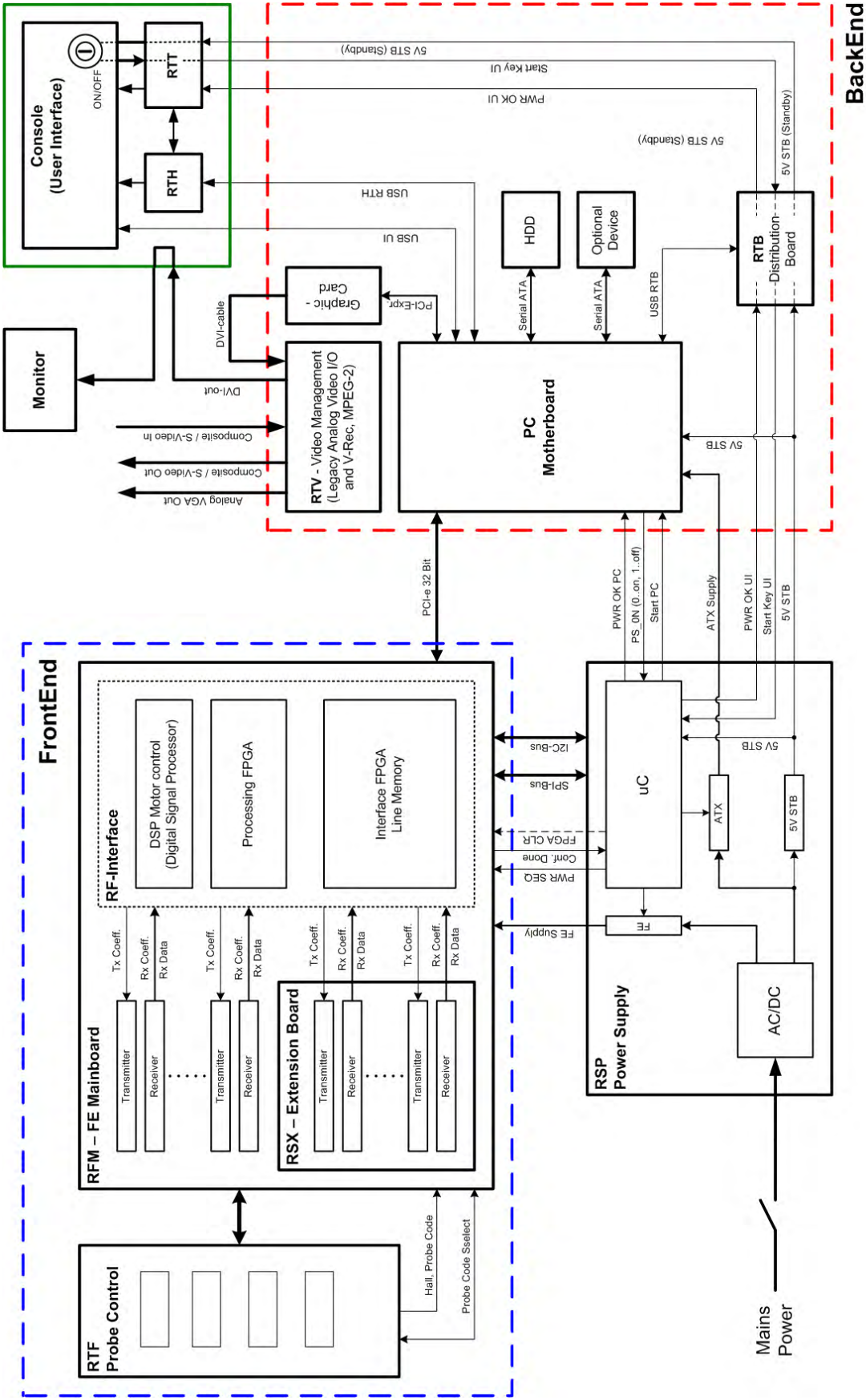


Figure 5-4 Voluson E-Series - Block diagram

### 5.1.3 Data Flow Control Description

This section describes the functions of the boards vs. different operation modes.

- RFM - (RF-Interface & Beamformer) FE Mainboard
- RSX - (Beamformer Receiver/Transmitter) Extension Board
- RTV - Video Management Board

#### 5.1.3.1 B-Mode

##### 1. IF-FPGA

The RFM contains the Clock-Management and PRF-Generator. It generates (drives) Shot-Trigger for the BF-FPGAs. Configures the BF-FPGAs of RFM and RSX with Tx-Frequ, Tx-Focus, Rx-Focus, LineNo (lateral Position), Tx- Apodisation, RX-Apodisation, Multibeam, etc.

Furthermore it contains Multibeam-DeInterleave, Subtraction Filter (for HI-Mode, see [Section 5.1.3.1.1 "Special B-Mode Techniques" on page 5-10](#) , DigitalTGC, DC-Canceler, Mixer (Part of Demodulator), LowPassFilter and Decimation (Pixel rate Conversion).

After DC-cancelling the signal is mixed with RX-Frequency and brought to LF-Spectrum, where the LowPassFilter cuts HF. Mixer and Magnitude-Calculator arrange Complex Demodulation, and Logarithmic Amplifier arrange the conversion from High-Dynamic LinearSignal to the Low-Dynamik(e.g. 8Bit) Log-Signal. Several postprocessing steps (LineFilter, FrameFilter, ReSample, Edge Enhance) enable smooth image quality while keeping contrast high.

##### a. Direct Memory Access (DMA) section

B-mode data from RFM is written via Signal Processor (SP) Channel 0 into SDRAM Fifo Buffer memory. DMA Controller 0 transfers the data into PC main memory where scan conversion is performed per software. Cine Mode: Reserved area in PC main memory is used.

##### 2. BF-FPGAs

Each BF-FPGA handles Rx/Tx of 64 channels. It controls 16 Tx-pulsers and 8 AFE ICs (i.e.: 32 Tx-pulsers and 16 AFE ICs each on RFM and RSX board).

The AFE consists of Low Noise Amplifier (LNA), Rx-TGC-Amplifier, Signal-ADC. Each pulser can support 4 Tx-channels, each AFE can support 8 Rx-channels.

- Tx-channel: The BF-FPGA generates Tx-Freq through dividing 200MHz by 2,3,4,5,... and Tx-Focus.
- Rx-channel: The clock distribution generates Sample-Clocks for the ADC (50 MHz). The BF-FPGA manages Rx-Focus (Delay and Chain-Adder) and Apodization.

##### 3. RTV - Video section

Video Information is provided by the PC on the DVI (Digital Visual Interface) output connector. The signal is connected to RTV, where the analog VGA signals for the monitor and standard video timing outputs are generated.

#### 5.1.3.1.1 Special B-Mode Techniques

1. **HI** (Coded Harmonic Imaging): In one method of HI the RX-Frequency is doubled, so that the radial resolution is increased due to the higher RX-Frequency. The second method of HI is pulse-inversion, that is handled by software: 2 TX-Beams are shot to the same Tissue-location, one with positive, one with negative polarity. The subtraction of both shots (Subtraction Filter) brings to bear the nonlinear-echo-reflection-properties of the tissue (especially in usage of Contrast-medias), which is very useful with extremely difficult-to-image patients.
2. **FFC** (Frequency and Focus Composite): 2 or more TX-Beams are shot to the same Tissue-location. The Beams have different TX-foci. By means of Blending (adaption of Brightnesses) they are composed to one whole RX-Line.
3. **XBeam CRI** (CrossBeam - Compound Resolution Imaging): Does not need any special functions of RFM. Image is composed of more than one different-direction-steered images. PC-calculated.
4. **VCI** (Volume Contrast Imaging): Does not need any special functions of RFM. Image is composed of more than 2 small angle neighbored images. PC-calculated. (Only possible with 4D-Probes).

### 5.1.3.2 M-Mode

1. IF-FPGA  
see: [Section 5.1.3.1 "B-Mode" on page 5-10](#)
2. RTV - Video section  
see: [Section 5.1.3.1 "B-Mode" on page 5-10](#)

### 5.1.3.3 D-Mode (Pulsed Wave- and Continuous Wave Doppler)

1. IF-FPGA
  - PRF-generator; see: [Section 5.1.3.1 "B-Mode" on page 5-10](#)
  - After DC-cancelling the signal is mixed with RX-Frequency and brought to LF-Spectrum, where the LowPassFilter cuts HF. Mixer and Magnitude-Calculator arrange Complex Demodulation.
  - a. DMA section  
I/Q-Data is transferred to the PC where FFT and scan conversion is performed per software, i.e. the sweep image is generated (scaling and interpolation between lines).
2. RTV - Video section  
see: [Section 5.1.3.1 "B-Mode" on page 5-10](#)

### 5.1.3.4 CFM-Mode (Color Flow Mode)

1. IF-FPGA
  - PRF-generator; see: [Section 5.1.3.1 "B-Mode" on page 5-10](#)
  - After DC-cancelling the signal is mixed with RX-Frequency and brought to LF-Spectrum, where the LowPassFilter cuts HF. Mixer and Magnitude-Calculator arrange Complex Demodulation.
2. RTV - Video section  
see: [Section 5.1.3.1 "B-Mode" on page 5-10](#)

### 5.1.3.5 3D-Mode (Freezes after 1 volume sweep)

see: [Section 5.1.3.1 "B-Mode" on page 5-10](#)

### 5.1.3.6 Real Time 4D-Mode (nonstop volume rendering)

see: [Section 5.1.3.1 "B-Mode" on page 5-10](#)

### 5.1.3.7 XBeam CRI-Mode (CrossBeam Compound Resolution Imaging)

see: [Section 5.1.3.1 "B-Mode" on page 5-10](#)

### 5.1.3.8 VCI-Mode (Volume Contrast Imaging)

see: [Section 5.1.3.1 "B-Mode" on page 5-10](#)

### 5.1.3.9 Extern-Video-Mode (display Video from V-Rec)

1. IF-FPGA  
Not used for Signal-Processing
2. RTV - Video section  
Analog input from an external video source (YC or CVBS) is converted to a digital RGB data stream by a video decoder. It is mixed with the DVI video output from PC in an overlay unit (Chroma keying mechanism). Generation of analog VGA signals for the monitor and standard video timing outputs follows this block.

## 5.1.4 Description of Software Options

To activate the software options:

1. Press the **Utilities** key on the control console.
2. In the "Utilities" menu touch the **Setup** button to invoke the setup desktop on the screen.
3. On the right side of the screen select **Administration** and then click the **Options** tab.



It might be possible that some probes, options or features are NOT available

- in some countries.
- at the time of release of this Service Manual.

Table 5-1 Software Options

Software Option	Description	VE6	VE8	VE10
Advanced 4D (incl. Real time 4D, RT-4D Biopsy, VCI "Basic" and TUI)	<i>Advanced 4D</i>	X	X	X
HD <i>live</i>	<i>HDlive</i>	1)	S	-
HD <i>live</i> Silhouette	<i>HDlive Silhouette</i>	-	1)	S
VOCAL II	<i>VOCAL II - Virtual Organ Computer-aided Analysis</i>	1)	1)	1)
Advanced VCI (VCI OmniView)	<i>Advanced VCI</i>	2)	2)	2)
Contrast	<i>Coded Contrast Imaging</i>	X	X	X
Sono VCAD <i>heart</i>	<i>SonoVCAD heart - Computer Assisted Heart Diagnosis Package</i>	1)	-	-
SonoAVC	<i>SonoAVC - Sono Automated Volume Count</i>	1)	1)	1)
SonoVCAD <i>labor</i>	<i>SonoVCAD labor</i>	1)	1)	1)
Anatomical M-Mode	<i>Anatomical M-Mode (AMM)</i>	X	X	X
Advanced STIC (incl. Basic STIC, STIC M-Mode and STIC <i>flow</i> ) + SonoVCAD <i>heart</i>	<i>Advanced STIC (Spatio-Temporal Image Correlation)</i>	-	2)	2)
STIC "Basic"	<i>STIC "Basic" (Spatio-Temporal Image Correlation)</i>	2)	-	-
Elastography (incl. Elastography Analysis)	<i>Elastography</i>	X	X	X
V-SRI	<i>V-SRI Advanced - Speckle Reduction Imaging</i>	-	-	3)
eM6C - E4D Activation	<i>eM6C - E4D Activation (Advanced Features for Electronic 4D Matrix-Probe)</i>	-	-	X
CW	<i>CW - Continuous Wave Doppler</i>	X	X	X
SW DVR	<i>SW DVR - Software Digital Video Recording</i>	X	X	X

**Legend:**

X Optional Feature (separately purchasable)

- not available

S Standard Feature

1) this 3D/4D option can be used in 3D-Mode, but for 4D-Modes the option "Advanced 4D" has to be active as well

2) this 4D option is **only available if the option "Advanced" 4D is active** as well

3) only with probe RM6C, RIC5-9-D, RIC6-12

## 5.1.4.1 Advanced 4D

### 5.1.4.1.1 Real Time 4D

Real Time 4D mode is obtained through continuous volume acquisition and parallel calculation of 3D rendered images. In Real Time 4D mode the volume acquisition box is at the same time the render box. All information in the volume box is used for the render process. In Real Time 4D mode a "frame rate" of up to 40 volumes/second is possible. By freezing the acquired volumes, size can be adjusted, manipulated manually as known from the Voluson 3D Mode.

### 5.1.4.1.2 Real Time 4D Biopsy

For minimal invasive procedures like biopsies, ultrasound is a widely used method to visualize and guide the needle during puncture. The advantage in comparison with other imaging methods is the real-time display, quick availability and easy access to any desired region of the patient. 4D biopsy allows for real time control of the biopsy needle in 3D multi-planar display during the puncture. The user is able to see the region of interest in three perpendicular planes (longitudinal, transversal and frontal section) and can guide the biopsy needle accurately into the centre of the lesion.

### 5.1.4.1.3 VCI - Volume Contrast Imaging

Volume Contrast Imaging utilizes 4D transducers to automatically scan multiple adjacent slices and delivers a real-time display of the ROI. This image results from a special rendering mode consisting of texture and transparency information. VCI improves the contrast resolution and therefore facilitates finding of diffuse lesions in organs. VCI has more information (from multiple slices) and is of advantage in gaining contrast due to improved signal/noise ratio.

**Static VCI** is a part of the VCI option, which allow to apply the contrast enhancing VCI method to 3D data sets after the acquisition.

### 5.1.4.1.4 T.U.I. - Tomographic Ultrasound Imaging

TUI is a new visualization mode for 3D and 4D data sets. The data is presented as slices through the data set which are parallel to each other. An overview image, which is orthogonal to the parallel slices, shows which parts of the volume are displayed in the parallel planes. This method of visualization is consistent with the way other medical systems such as CT or MRI, present the data to the user. The distance between the different planes can be adjusted to the requirements of the given data set. In addition it is possible to set the number of planes. The planes and the overview image can also be printed to a DICOM printer, for easier comparison of the ultrasound data with CT and/or MRI data.

## 5.1.4.2 HDlive

Most current surface reconstructions use an illumination frontal to the rendered object. This can cause the image to look flat. HDlive Rendering uses an illumination source that can be positioned by the user around the rendered 3D object on a spherical surface. By highlighting structures from the side, the three-dimensional impression is improved considerably.

**Note** *"HDLive" is part of the "Advanced 4D" option for Voluson E8 systems. At Voluson E6 systems it is optional (separately purchasable). At Voluson E10 systems it is not available.*

### 5.1.4.3 HDlive Silhouette

HDLive Silhouette is an enhancement of the currently available HDlive Surface Rendering feature. The position of the virtual light source may be altered to get a natural display with an optimized depth impression.

To improve the impression even more, **Silhouette** (emphasizes the contours of surface structures), **Light Brightness** (adjusts the brightness of the light source) and **Shadow Softness** (varies the shadow softness/contrast) can be adapted.

**Note** *"HDLive Silhouette" is part of the "Advanced 4D" option for Voluson E10 systems. At Voluson E8 systems it is optional (separately purchasable). At Voluson E6 systems it is not available.*

#### 5.1.4.4 VOCAL II - Virtual Organ Computer-aided Analysis

Diagnosis and therapy of cancer is one of the most important issues in medical care. The VOCAL II - Imaging program allows completely new possibilities in cancer diagnosis, therapy planning and follow-up therapy control.

**VOCAL II offers additional functions:**

- Manual or Semi automatic Contour detection of structures (such as tumor lesion, cyst, prostate, etc.) and subsequent volume calculation. The accuracy of the process can be visually controlled by the examiner in multi-planar display.
- Construction of a virtual shell around the contour of the lesion. The wall thickness of the shell can be defined. The shell can be imagined as a layer of tissue around the lesion, where the tumor vascularization takes place.
- Automatic calculation of the vascularization within the shell by 3D color histogram by comparing the number of color voxels to the number of grayscale voxels.

#### 5.1.4.5 Advanced VCI

##### 5.1.4.5.1 VCI Omni View - Volume Contrast Imaging (any plane)

More flexibility with Any Plane, VCI plane is freely selectable. Any shape can be drawn. Volumes from older BT's can be loaded and edited with VCI Omni View without any limitations.

- Volumes can be edited in all other Visualization Modes.
- Dual Format is now also possible in Render Mode and Sectional Planes Mode.
- VCI slice thickness can be set to zero.

#### 5.1.4.6 Coded Contrast Imaging

Injected contrast agents re-emit incident acoustic energy at a harmonic frequency much more efficiently than the surrounding tissue. Blood containing the contrast agent stands out brightly against a dark background of normal tissue. Possible clinical uses are to detect and characterize tumors of the liver, kidney and pancreas and to enhance flow signals in the determination of stenosis or thrombus.

#### 5.1.4.7 Elastography

Elastography refers to the measurement of elastic properties of tissues, based on the well-established principle that malignant tissue is harder than benign tissue.

Elastography shows the spatial distribution of tissue elasticity properties in a region of interest by estimating the strain before and after tissue distortion caused by external or internal forces. The strain estimation is filtered and scaled to provide a smooth presentation when displayed.

During scanning in the elastography mode, the examiner manually slightly compresses the tissue using the ultrasound probe. A strain correlation (strain is the deformation of the tissue by compression) is continuously performed for visual perception on the monitor.

##### 5.1.4.7.1 Elastography Analysis

A selectable sequence of Elastography images are analyzed within a ROI (range of interest). The Strain % or the Elasticity Index is displayed as curves over the time.

The mean value of the Strain % is measured within 1 or more ROI's and Ratios are calculated. "Generic Elasto" measurements are located in the generic measurement menu and are only available if "Elastography" is activated.

#### 5.1.4.8 SonoVCAD heart - Computer Assisted Heart Diagnosis Package

VCAD is a technology that automatically generates a number of views of the fetal heart to make diagnosis easier. At this time it can help to find the right and left outflow tract of the heart and the fetal stomach.

**Note** *“SonoVCAD heart” is part of the “Advanced STIC” option for Voluson E8 and Voluson E10 systems. At Voluson E6 systems it is optional (separately purchasable).*

#### 5.1.4.9 SonoAVC - Sono Automated Volume Count

This feature can automatically detect low echogenic objects (e.g., follicles) in a volume of an organ (e.g., ovary) and analyze their shape and volume. From the calculated volume an average diameter can be calculated. It also lists the objects according to their size.

- Each object can be calculated automatically.
- A description name can be defined for each object up to 10 descriptions. With the “Add to Report” button all values of the measured objects can be sent to the worksheet. Also the description name will be sent.
- The description name can be edited in the worksheet.
- If the number button is activated, all objects are assigned a number inside the displayed object according to the measurement index.
- Group function: All objects will be added to one volume. The color of all objects will be changed to red and the measurement will show only one result.

#### 5.1.4.10 SonoVCAD labor

Allows the user to measure fetal progression during the second stage of labor – fetal head progression, rotation and direction. Visual evidence and objective data of the labor process are provided.

All SonoVCAD *labor* measurements (Head direction, Midline Angle, Progression Distance, Progression Angle and associated acquisition time) are automatically added to the worksheet, as soon as they are performed. Only one measurement result is available for each measurement type. If the measurement is repeated, the old result is replaced by the new result.

If a volume is deleted, the according measurements are not deleted from the worksheet.

SonoVCAD *labor* measurement data can be transferred via DICOM SR.

#### 5.1.4.11 Anatomical M-Mode (AMM)

Anatomical M-Mode displays a distance/time plot from a cursor line, which can be defined freely. The M-Mode display changes according to the motion of the M cursor. In the Dual format, two defined distances can be displayed at the same time.

AMM is available in grayscale and color modes (CF, HD Flow, TD)

- simultaneous Display of 2 M-Mode Cursors in 2D Mode
- each Cursor is freely rotatable
- can be done after Freeze and on reloaded Cine

## 5.1.4.12 Advanced STIC (Spatio-Temporal Image Correlation)

### 5.1.4.12.1 STIC “Basic” (Spatio-Temporal Image Correlation)

With this acquisition method the fetal heart or an artery can be visualized in 4D. It is not a Real Time 4D technique, but a post processed 3D acquisition.

In order to archive a good result, try to adjust the size of the volume box and the sweep angle to be as small as possible. The longer the acquisition time, the better the spatial resolution will be. A good STIC, STIC CFM (2D+CFM), STIC PD (2D+PD) or STIC HD (2D+HD-Flow) data set shows a regular and synchronous pumping of the fetal heart or of an artery.

The user must be sure that there is minimal movement of the participating persons (e.g., mother and fetus), and that the probe is held absolutely still throughout the acquisition period. Movement will cause a failure of the acquisition. The acquired images are post processed to calculate a 4D Volume Cine sequence. Please make sure that the borders of the fetal heart or the artery are smooth and there are no sudden discontinuities. If the user (trained operator) clearly recognizes a disturbance during the acquisition period, the acquisition has to be cancelled.

- STIC - Fetal Cardio is only available on RAB & RIC probes in the OB/GYN application.
- STIC - Vascular is only available on the RSP probe in the Peripheral Vascular application.

**Note** *“STIC” is part of the “Advanced STIC” option for Voluson E8 and Voluson E10 systems. At Voluson E6 systems it is optional (separately purchasable).*

### 5.1.4.12.2 STIC M-Mode

Creates a M-spectrum from a STIC acquisition (capture of a full fetal heart cycle in real-time saved as a volume for later analysis). After activating STIC M-Mode the STIC cine is running and the STIC M-spectrum will be shown. In STIC-M all M-Measurements are possible. Furthermore the M-cursor is available as a freeform line type.

- can be done in A, B or C Plane and can be done postprocessing
- possibility to perform measurements for evaluation of ventricle contraction
- possibility to easily detect End Systole and End Diastole for ventricular measurements

### 5.1.4.12.3 STIC flow

Clinical application and advantage:

The STIC function, that is generally used to display high flow velocities at the heart, is now used to represent slow flow (tumor blood circulation) of vessels over the time. One of the objectives is, to display ovarian tumors (which are frequently found in GYN applications), to observe them over the time and consequently visualize them in 4D and/or evaluate them via histogram.

Function:

Similar to STIC Cardio-acquisitions, a volume sweep is made of the lesion. Afterwards the computer displays the heart rate and vessels in multiplanar view and/or visualizes it in 4D



#### 5.1.4.13 SRI Advanced - Speckle Reduction Imaging

A type of image noise or interference is generally considered undesirable and can obscure the quality or interpretation of B-mode images. Although somewhat associated with the underlying echogenicity of tissue scatters, image speckle characteristics such as brightness, density or size have no apparent value in determining tissue structure or related properties. The elimination of or significant reduction in speckle improves the quality or diagnostic potential of the image. The method applied in the subject modification utilizes a nonlinear diffusion filtering technique that permits effective speckle reduction in real time. The speckle reduction filter is available to the user in all B-mode imaging, independent of the used probe.

#### 5.1.4.14 V-SRI Advanced - Speckle Reduction Imaging

V-SRI is an enhancement of the existing SRI algorithms and improves specially the C-plane image. This new algorithm (from Context Vision) is used in the A-, B-, C-planes and rendered images instead of the conventional SRI.

**Note**     *The "V-SRI" option is only available at Voluson E10/Voluson E8 Expert systems with probe RM6C, RIC5-9-D and RIC6-12.*

#### 5.1.4.15 eM6C - E4D Activation (Advanced Features for Electronic 4D Matrix-Probe)

After entering an encrypted Software Option string (password) it is possible to use the Electronic 4D Matrix-Probe eM6C with all the advanced features such as Bi-Plane Mode and eSTIC.

**Note**     *The "eM6C" option is only available at Voluson E10 systems.*

#### 5.1.4.16 SW DVR - Software Digital Video Recording

After entering an encrypted Software Option string (password) it is possible to record Ultrasound data on DVD or an USB device. Videos are created in .mp4 file format.

#### 5.1.4.17 CW - Continuous Wave Doppler

For details see: [Section 5.1.5.1 "CW - Continuous Wave Doppler" on page 5-18](#).

**Note**     *Additional hardware required!*

## 5.1.5 Description of Hardware Options

Table 5-2 Hardware Options

	HW-Options	Description
1	CW-Doppler	<i>CW - Continuous Wave Doppler</i>
2	ECG Digital Module	<i>ECG Preamplifier</i>
3	WLAN Network Adapter	<i>Wireless Network Adapter (WLAN - Wireless Local Area Network)</i>
4	Scan/Freeze Footswitch	<i>Scan/Freeze Footswitch</i>
5	Cellular Modem	<i>Cellular Modem</i>

### 5.1.5.1 CW - Continuous Wave Doppler

CW Doppler mode provides real time spectral analysis of CW Doppler signals. This information describes the Doppler shifted signal from the moving reflectors in the CW Doppler beam. CW Doppler can be referenced through a small pencil probe or phased array scan head, but it can also be used in conjunction with a 2D image which has an M-line superimposed on the 2D image indicating the position of the Doppler sample volume. For through-the-beamformer CW, this beam is steerable by the operator, and is done by adjusting the location of the M-line. The CW Doppler beam, or M-mode line, can be steered allowing interrogation along an operator-selected line within the image. This option can be upgraded by implementing the Pencil Probe board (RSE) and entering an encrypted Software Option string (password).

### 5.1.5.2 ECG Preamplifier

MAN (internal, digital version)

For details see [Section 5.8.4 "ECG-preamplifier \(MAN - optional\)" on page 5-30](#).

### 5.1.5.3 Wireless Network Adapter (WLAN - Wireless Local Area Network)

For details see [Section 5.8.5 "Wireless Network Adapter" on page 5-31](#).

### 5.1.5.4 Scan/Freeze Footswitch

For details see [Section 5.8.6 "Footswitch" on page 5-31](#).

### 5.1.5.5 Cellular Modem

For details see [Section 5.8.7 "Cellular Modem" on page 5-31](#).

## 5.1.6 Data Location

The Voluson E-Series Hard disk drive (HDD) is divided into 4 partitions:

**C:** System partition:

- Operating System (Windows XP) including all Windows settings (IP-address, Network Name, etc.)
- US-Application Software (UISAPP)
- Global Service Platform Software
- Software Options

**D:** User partition:

- User Presets (Backup) database
- Images (Archive), Patient-ID's and Reports database
- Service database
- System settings database

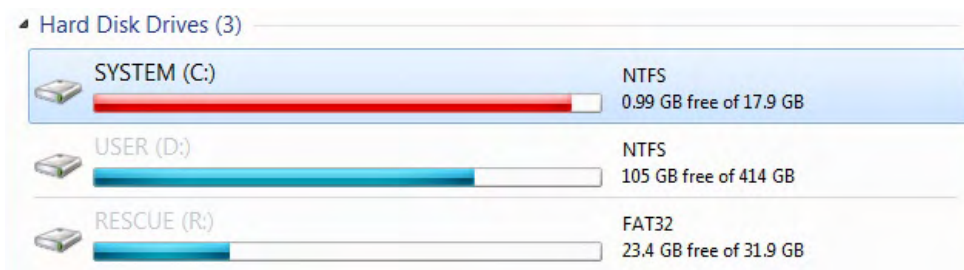
**R:** Rescue partition:

- Factory Images of C: Partition for System recovery after HDD (Windows) crash
- Printer Drivers

LINUX partition: (not visible in Windows)

- Linux operating system for rescue functionality

### Distribution of partitions at 500 Gbyte HDD



## 5.2 FrontEnd Processor

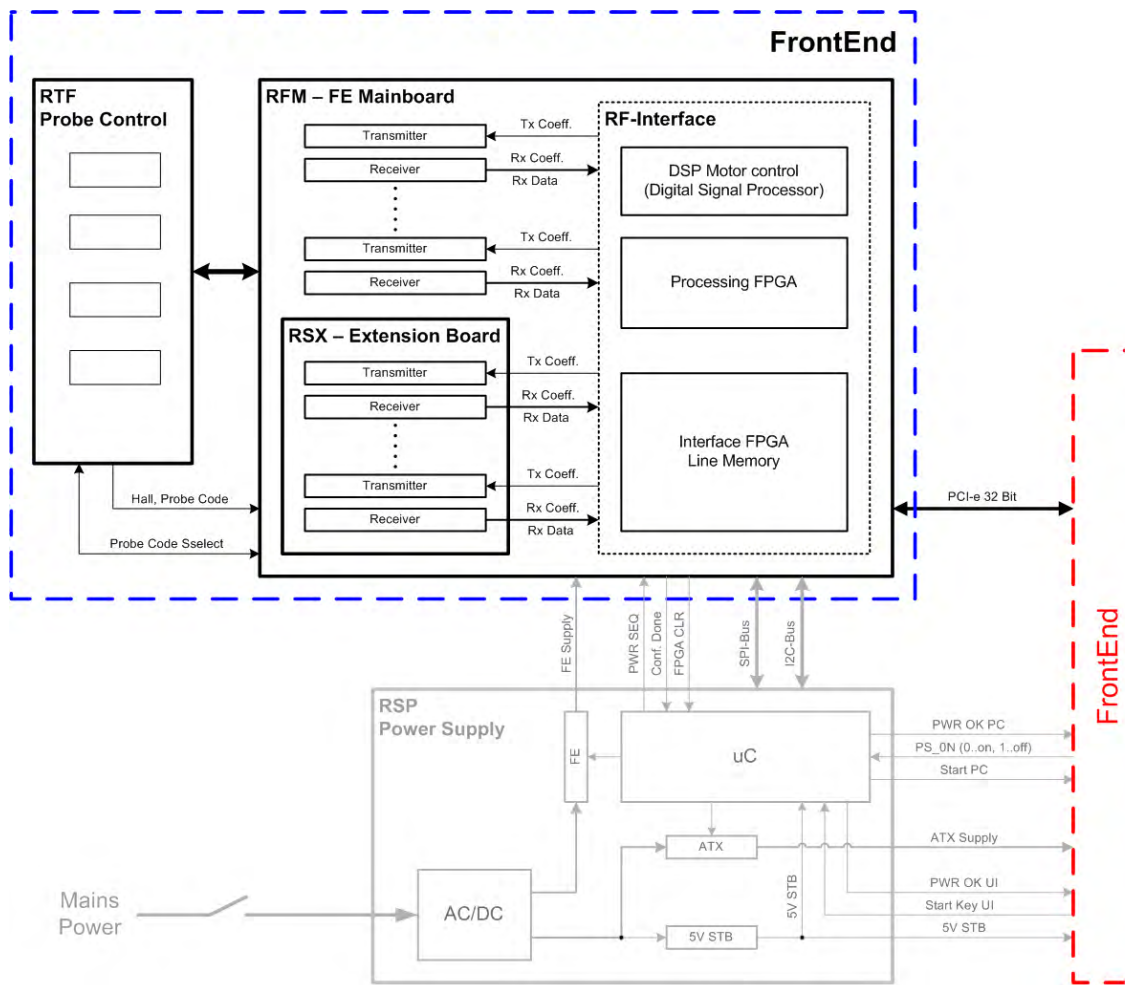


Figure 5-5 FrontEnd - Block diagram

### Content in this section

5.2.1 RTF - Probe Control Board	-----	5-21
5.2.2 RSE - Pencil Probe Board (optional)	-----	5-21
5.2.3 RFM - (RF-Interface & Beamformer) FE Mainboard	-----	5-21
5.2.4 RSX - (Beamformer Receiver/Transmitter) Extension Board	-----	5-21

### 5.2.1 RTF - Probe Control Board

Switches the Probe Connectors (3 DLP-Connectors, 1 CW-Connector) and recognizes Probes

- 1 CW-Probe Connector
- 3 Probe-Connectors 408pin
- 1 Dummy-Probe Connector 408pin
- Probe Select Relays
- Probe Recognition

### 5.2.2 RSE - Pencil Probe Board (optional)

Adapter board for connection of CW pencil probes.

**Note** *The RSE board is required for CW-Option.*

### 5.2.3 RFM - (RF-Interface & Beamformer) FE Mainboard

The FrontEnd Mainboard supports Tx/Rx for 128 channels only. To extend to 192 or 256 channels, the *RSX - (Beamformer Receiver/Transmitter) Extension* board is required.

#### 5.2.3.1 RFM Board - Interface FPGA

1. DMA logic
2. Beamformer Interface
3. RTF Control Interface
4. RTF FPGA Control Interface

#### 5.2.3.2 RFM Board - Processing FPGA

1. Ultrasound Data Pre-Processing
2. System Control
3. Motor Control

### 5.2.4 RSX - (Beamformer Receiver/Transmitter) Extension Board

Subset (for RFM) that is required to extend to 192 or 256 channels.

**Note** *All components of RSX board are also present on RFM - (RF-Interface & Beamformer) FE Mainboard.*

### 5.3 BackEnd Processor

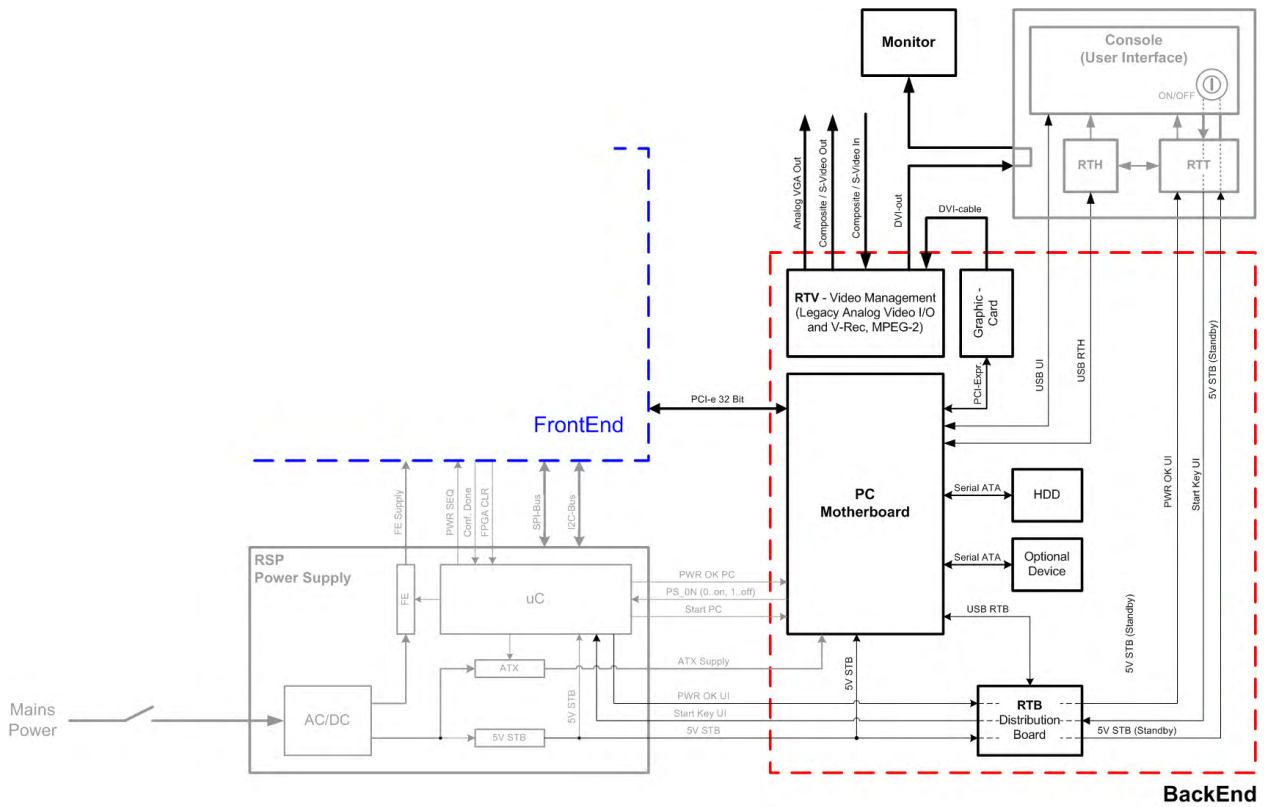


Figure 5-6 BackEnd - Block diagram

**Content in this section**

- 5.3.1 PC-Motherboard ----- 5-23
- 5.3.2 Hard Disk Drive (HDD) ----- 5-23
- 5.3.3 Graphic Card ----- 5-23
- 5.3.4 RTV - Video Management Board ----- 5-23
- 5.3.5 RTB - Distribution Board Bottom ----- 5-23

### 5.3.1 PC-Motherboard

Built in or external Components:

- On Board VGA
- LAN
- USB 2.0
- Sound
- CPU: 2133 MHz Dual

Major Tasks:

- System Control
- 2D- / 3D- / 4D- Image processing and Rendering
- Control DVD drive (USB)
- Control User Interface (USB)

### 5.3.2 Hard Disk Drive (HDD)

The Hard Disk is the main storage device of the Voluson E-Series ultrasound system.

The Voluson E-Series hard disk drive is divided into 4 partitions.

For further details see [Section 5.1.6 "Data Location" on page 5-19](#)

### 5.3.3 Graphic Card

Graphic Card which supplies RTV (Video manager) board with DVI Video. It offers dynamic contrast enhancement and color stretch video processing optimized on a scene by scene basis for spectacular picture clarity.

### 5.3.4 RTV - Video Management Board

Distributes DVI-D-information coming from the Graphic Card to the DVI-D (digital) and DVI-I (integrated) connectors. Converts DVI-D-inputs to S-Video output(s). Displays external playback video and adds overlay graphics to it.

- DVI-D output for the System Main Monitor
- DVI-I output for external device (only RGB signals used)
- S-Video output (2 channels)
- S-Video input for external devices
- USB connector for board configuration

### 5.3.5 RTB - Distribution Board Bottom

Function of the Distribution Board Bottom (RTB):

- USB2.0 Interface, Board is connected to PC via USB cable
- 5 port USB2.0 Hub for connecting peripherals (e.g., optional ECG)
- Feed through DC-Power and Signals for the console (12V\_ATX, 5V\_ATX, 5VSB, PWR\_On, Start\_Key, Loud speaker)
- Multiplexer and Amplifier for PC-Sound, Doppler Audio and VCR/DVD-Recorder

## 5.4 Internal I/O

Internal In/Out depends on

**Note**     *The "Mainboard type" can be read out in the Setup - Administration - SYSTEM INFO page (see Figure 7-1 on page 7-3).*

### **Content in this section**

*5.4.1 Internal I/O Voluson E-Series: ADVANTECH Micro ATX ----- 5-25*



5.4.1 Internal I/O Voluson E-Series: ADVANTECH Micro ATX

Internal I/O – VE6/VE8-BT'15 PC-Motherboard Micro-ATX Advantech

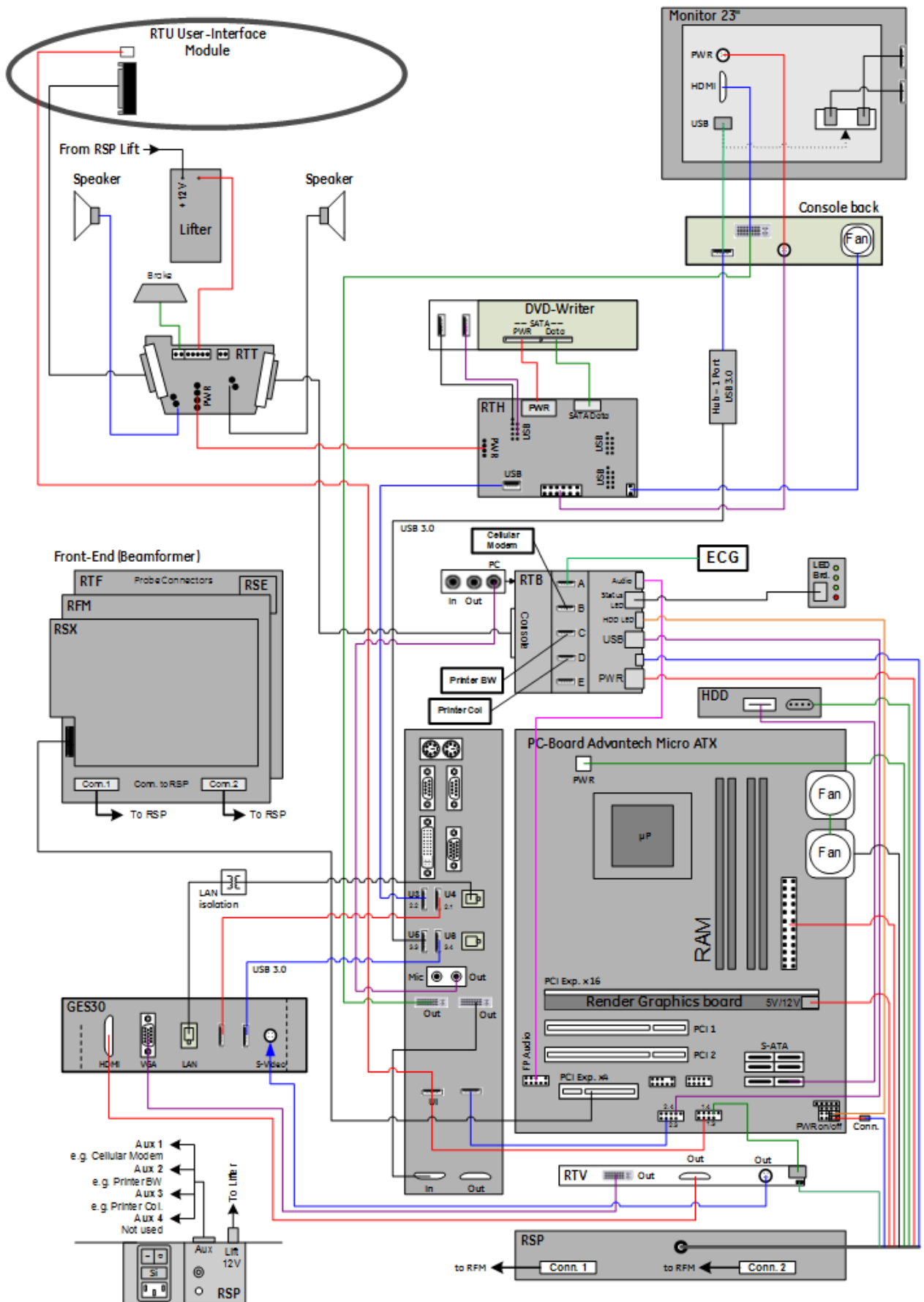


Figure 5-7 Internal I/O Voluson E-Series: ADVANTECH Micro ATX PC-Motherboard installed

## 5.5 Control Console (User Interface)

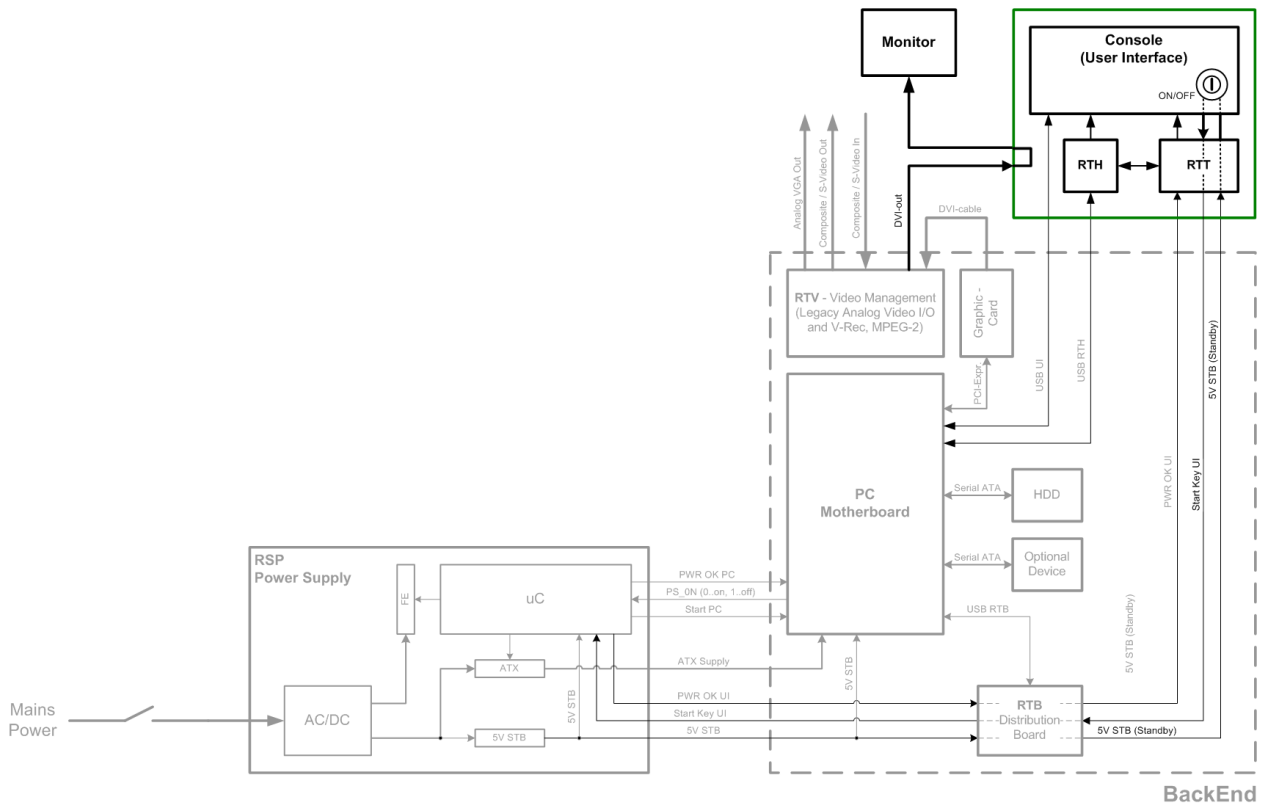


Figure 5-8 Control Console (User Interface) - Block diagram

The Voluson E-Series control console (User Interface) consists of the following electronic sub-assemblies and/or functional components:

- Display/Touch screen module:
  - WXGA display - 1280 x 800 pixels
  - Integrated USB to VGA converter with USB2.0 High Speed Interface
  - Resistive 5 wire analog touch screen
- Console module:
  - Micro controller C8032
  - 4 port USB 2.0 Hub controller
  - Slide pots TGC with zero raster position
  - Rotary controls (Digipot Encoders) with integrated push buttons
  - USB Trackball (2") with dedicated buttons to emulate standard three button mouse
  - USB standard alphanumeric keyboard
  - USB extended keyboard with controller
  - LED Indicators with wide range dimming
- DC/DC Converter:
  - Converts 12VDC input voltage to 5VDC and 3.3VDC output voltage for supplying User Interface components

### 5.5.1 RTH - Distribution Board USB-Hub

Function of the Distribution Board Hub (RTH):

- USB2.0 Interface, Board is connected to PC via USB cable
- 7 port USB2.0 Hub
- 4 USB Ports for external use
- 1 USB to IDE Converter for DVD Drive
- 2 USB Ports not used
- Power distribution for Monitor
- Feed through for DC-Power for the DVD Drive and Fan

### 5.5.2 RTT - Distribution Board Top

Function of the Distribution Board Top RTT:

- Feed through for DC-Power (12V\_ATX, 5V\_ATX, 5VSB) and Signals (PWR\_On, Start\_Key, Speaker, Lifter control, UI\_Brake)
- Power distribution for Monitor
- Power for RTH (Distribution Board Hub)
- Power for DVD-Drive
- Signal switching for UI Brake, Lift and Gel warmer

### 5.5.3 Control Console (UI)

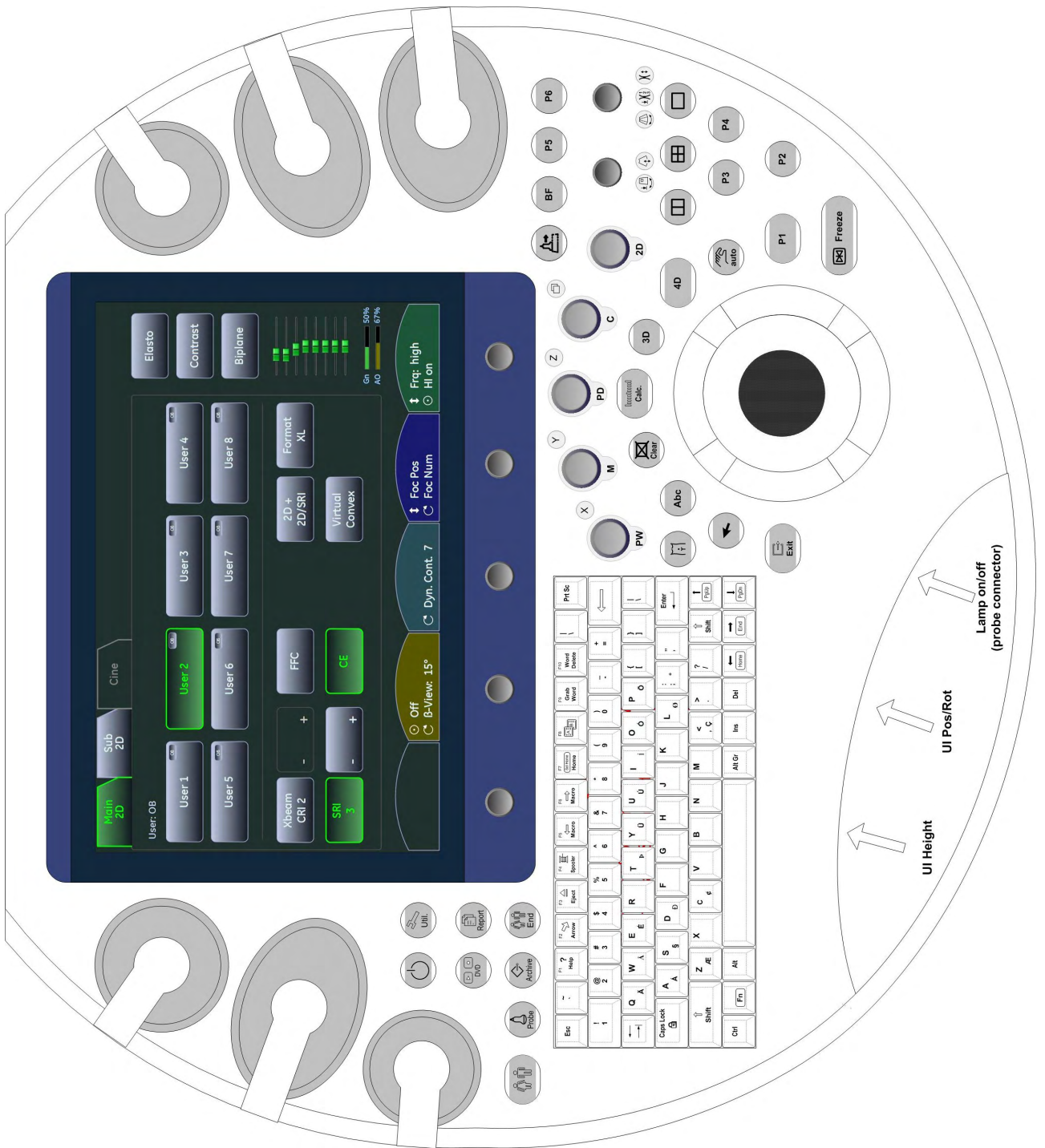


Figure 5-9 Voluson E-Series - Control Console

### 5.6 Monitor

For further details see [Section 6.2.2 "Load Default Monitor Settings" on page 6-3](#)

5.7 External I/O

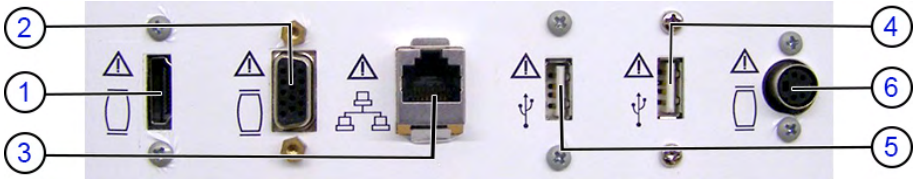


Figure 5-10 External I/O connectors - on rear of system (GES)

Item	Connector Name	Description
1	HDMI OUT	Connector for external monitor
2	VGA OUT	Connector for external monitor
3	Network	DICOM input/output, twisted pair RJ-45 10/100 megabit/s
4	USB	USB 3.0 port
5	USB	USB 2.0 port
6	S-Video OUT	S-Video OUT connector



Figure 5-11 External I/O connectors - next to DVD drive

Item	Connector Name	Description
1	USB	USB 2.0 port
2		

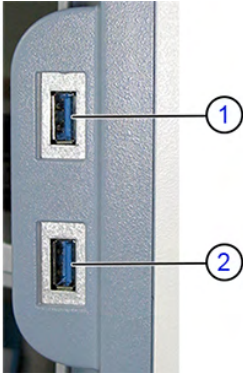


Figure 5-12 External I/O connectors - on the left side of the Monitor

Item	Connector Name	Description
1	USB	USB 3.0 port
2		

**Note** For further description of I/O connectors refer to Section 3.9 "External I/O Connectors" on page 3-45 .

## 5.8 Peripherals

### 5.8.1 Recording Tools

**Note** *There are no recording tools available and released for the Voluson E-Series system.*

### 5.8.2 Printers

#### Black & White Digital Printer

The B&W Digital Printer receives image data via the USB port. The print command is controlled by the keys **P1, P2, P3, P4, P5** and/or **P6** on the Voluson E-Series control console (depending on system configuration).

#### Color Digital Printer

The Color Digital Printer receives image data via the USB port. The print command is controlled by the keys **P1, P2, P3, P4, P5** and/or **P6** on the Voluson E-Series control console (depending on system configuration).

#### Color Deskjet Printer

A Color Deskjet Printer is used to print out reports and exams, but in some cases also ultrasound images. Usually it is controlled via Bluetooth Adapter.

### 5.8.3 DVD Drive



Caution

Laser radiation: Avoid exposure to the beam Class 3B laser product.

Class 3B laser radiation: When open avoid exposure to the beam.

#### DVD Drive

The DVD Drive (Writer) is used to backup images and reports. In addition, it is used as the main source of software upgrades and other service utility operations. It is controlled by the BEP via USB port.

#### Software DVR

The optional SW DVR (**SoftWare Digital Video Recording**) function enables video recording.

Media supported for data burning	Media supported for video recording
<ul style="list-style-type: none"> <li>• DVD+R</li> <li>• DVD-R</li> <li>• DVD-RW</li> <li>• DVD+RW</li> <li>• CD-R</li> <li>• CD-RW</li> </ul>	<ul style="list-style-type: none"> <li>• DVD+RW (formatted for video)</li> <li>• USB stick FAT32*</li> </ul>

**Note** *\* A minimum writing speed of 2 MByte/sec is required to ensure stable video recording on USB devices. Lower writing speed can result in audio and/or video drop-outs. The use of USB3.0 devices is recommended.*

### 5.8.4 ECG-preamplifier (MAN - optional)

The ECG-preamplifier is used for acquiring an ECG-signal to be displayed with the ultrasound image. This optional peripheral serves for gaining an ECG-signal to mark the systolic and end diastolic moments in M-Mode and Doppler evaluations.

The ECG-preamplifier must not be used for ECG-diagnostics. It is not intended for use as a cardiac monitor and must not be used for an intra-operative application on the heart.

### 5.8.5 Wireless Network Adapter

The Voluson E-Series supports a Wireless Network USB Adapter based on industry standards to provide easy-to-use and compatible high-speed wireless connectivity. For details regarding type and installation, see [Section 3.4.6 "Connecting the Wireless Network Adapter" on page 3-19](#).

The Wireless Network USB Adapter provides a mobile network connection to the local area network.

### 5.8.6 Footswitch

The Footswitch is used for comfortable system control when no hand is free. To adjust function of the Footswitch (Left/Middle/Right) see [Section 3.7.1.8 on page 3-43](#).

### 5.8.7 Cellular Modem

Connecting the Voluson E-Series to the Internet allows the user to send images via e-mail and/or MMS to patients or physicians. Whenever no LAN or Wi-Fi Internet connection is available, it is possible to connect the Voluson E-Series to the Internet by using the optional Cellular Modem. To use this feature the peripheral Cellular Modem needs to be installed and a SIM card from your local service provider needs to be ordered.

For details regarding installation and configuration see [Section 3.13.3 on page 3-58](#).

## 5.9 Power Distribution

### 5.9.1 RSP - Power Supply Module

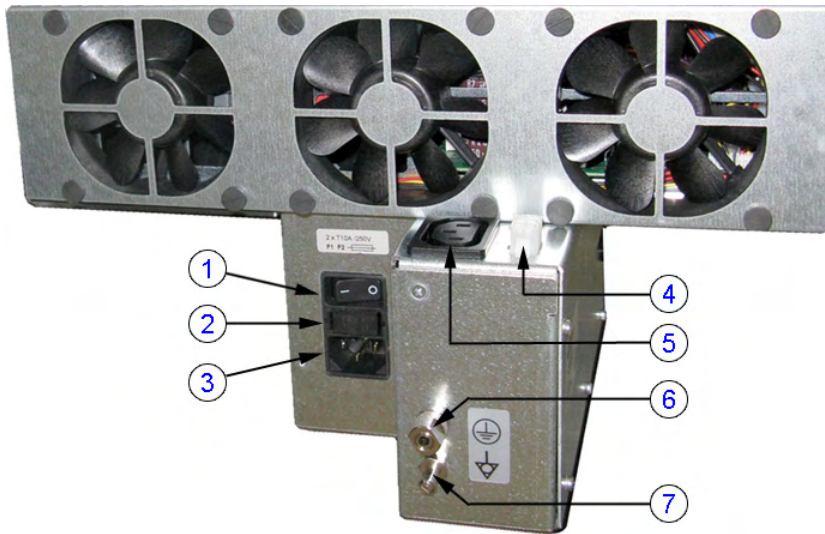


Figure 5-13 Power Supply Module - RSP

1	Circuit Breaker	5	Auxiliary Output
2	Fuses (2x T10A H/250V)	6	Protective Earth connection
3	connector for Main Power Cable	7	Equipotential connection
4	Lift system (12VDC)		

#### 5.9.1.1 Mechanical Concept and Overview

The AC Power's main tasks are to supply the various internal subsystems with AC power and to galvanically isolate the system from the on site Mains Power System. To reduce inrush current, an inrush current limiter is implemented.

From the input voltage from the Power Supply (RSP) the AC/DC device generates all system supply voltages, which are:

- FrontEnd voltages
- Standby voltages
- ATX motherboard supply
- Tx voltages

In addition the AC/DC device contains the digital motor amplifier.

#### 5.9.1.2 Input Voltage Range

input voltage range: 100 - 240VAC; 50/60Hz

#### 5.9.1.3 Auxiliary Output Voltage

nominal 115VAC

All DC-supply voltages for built-in peripherals are generated in the RSP- Power Supply Module.



### 5.10 Mechanical Descriptions

#### 5.10.1 Physical Dimensions

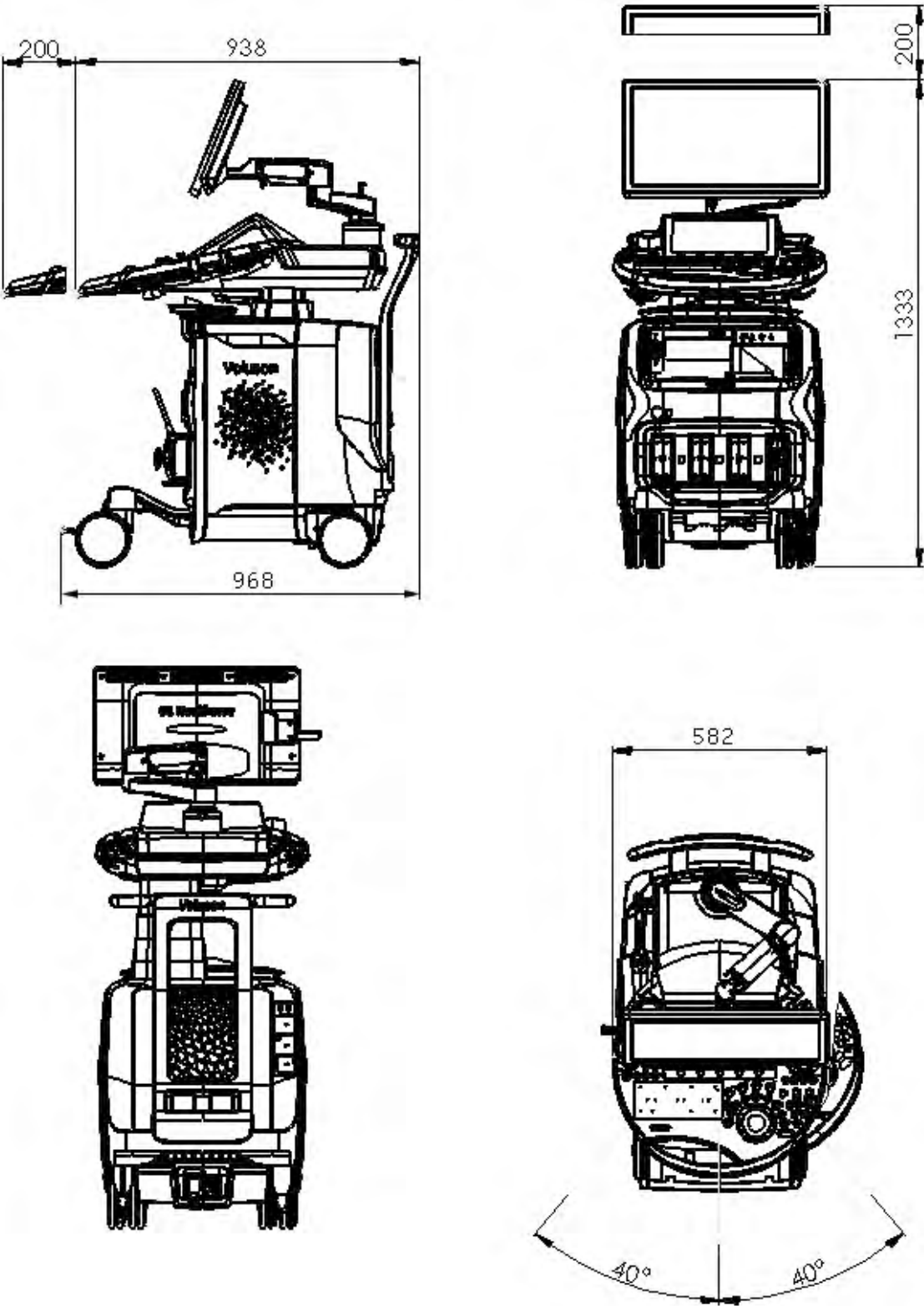


Figure 5-14 Physical Dimensions

### 5.10.2 LCD Monitor

The Voluson E-Series system has a free adjustable LCD Flat panel monitor in relation to the user interface.

- tilt: + 40° / - 90°
- rotate: +/- 90°

### 5.10.3 Control Console Positioning

The control console can be rotated, translated and adjusted in height.

- height adjustment: 20 cm (7.9 inch)
- translation adjustment: 20 cm (7.9 inch)
- rotation adjustment: +/- 40°

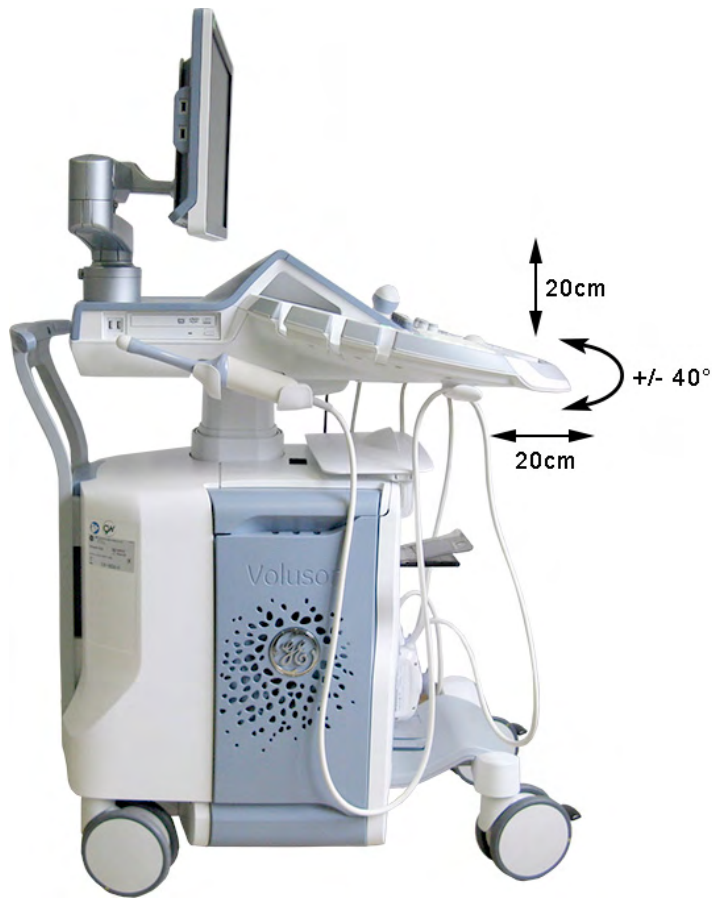


Figure 5-15 adjustable control console

#### 5.10.3.1 Rotation/Translation of the Control Console



Press the **Brake** button inside of the handlebar opening to rotate/translate the console to the desired position. Press the **Brake** button again in order to secure the console against uncontrolled movement.

#### 5.10.3.2 Height Adjustment (Elevation) of the Control Console



Height adjustment is done with the **Lift UP / Lift DOWN** button inside of the handlebar opening. As long as a button is pressed, the control console can be lifted / lowered.

## 5.11 Air Flow Control

### 5.11.1 Air Flow Distribution

Through the filter grid on the back of the system (Main Air Inlet), air flow into the Voluson E-Series system.

- Air holes in the RSP power supply allow the air to pass through; the 3 fans inside the RSP suck in the air and spread it through the beamformer.
- By means of the 2 Backend fans, air is blown through the GEB-box (along its internal components and the PC- Motherboard).

The warm air exits the system through holes in the left side panel (Main Air Outlet).

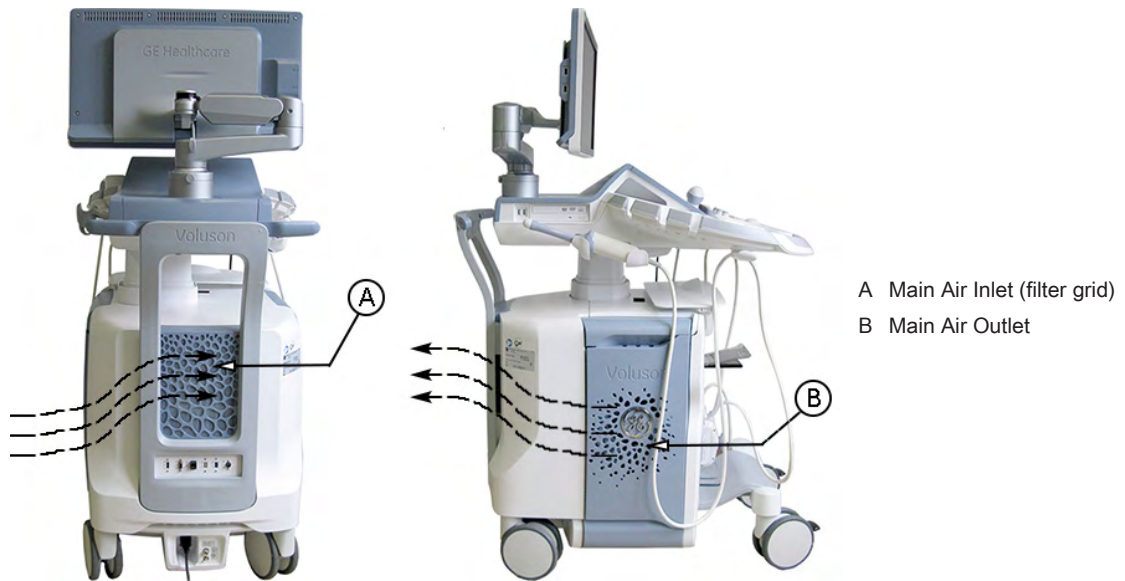


Figure 5-16 Main Air Inlet/Outlet at Voluson E-Series

## 5.12 Service Platform

### 5.12.1 Introduction

InSite ExC (InSite with Express Connect) is the connectivity to the Voluson E-Series system that allows GE to deliver remote diagnostics capability. InSite is your direct link with a GE Online Service Engineer or Applications Support Engineer, or a Request for Service via the InSite ExC link (**GE** icon) at the right bottom of the display screen.

The GE icon in the status bar change symbol and color depending on ongoing activity; see [Table 7-2 on page 7-13](#).

### 5.12.2 Access / Security

The Service Platform has different access and security user levels. Each user is only granted access to the tools that are authorized for their use.

There are different possibilities to access the Common Service Desktop and its available features:

- **Local Access**: via Setup - Administration - **Service** page
- **Remote Access**: This offers GE technicians the possibility to view the entire customer's desktop and operation system. Remote access to the Voluson E-Series system requires permission and customer input to run diagnostics.

#### 5.12.2.1 Local Access

1. If not already in read mode, **Freeze** the image.
2. Press the **Utilities** key on the control console.
3. In the "Utilities" menu touch the **Setup** button to invoke the setup desktop on the screen.
4. On the right side of the screen select **Administration** and then click the **Service** tab.
5. Enter the password <SHE> and click the **Accept** button to display the Service Tools page (see [Figure 5-19 on page 5-39](#)).
6. Click the **CSD** button.
7. As soon as the GEHC Service Home Page appears, select "Operator" from the pull-down menu, enter the password <uls> and then click **Okay**.

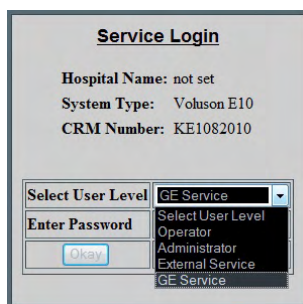


Figure 5-17 Service Login

The Common Service Desktop (CSD) is started and the Home page - containing basic System Information - appears. The navigation bar at the top of the screen allows to select different tools.

For more detailed information see [Section 7.6 "Common Service Desktop \(CSD\)" on page 7-14](#).

### 5.12.2.2 Remote Access

**Note** *Remote access is ONLY possible if the Service Platform is properly configured (either by the user or a GE technician at site). Operation see [Section 3.13.8 "InSite ExC Configuration" on page 3-64](#) .*

This allows GE technicians to view the entire customer's desktop and operation system. Using VCO (Virtual Console Observation) a service technician or the OLC (OnLine Center) can access and modify all settings and programs or run diagnostics on the customer's Voluson E-Series system.

Remote access to the Voluson E-Series system requires permission and customer input before a GE service technician or OLC can access the customer's system remotely.

Disruptive Mode can be selected by the customer directly on the Voluson E-Series (see [Section 7.5.2 on page 7-13](#)), or requested remotely by the service technician or OLC .

## 5.13 Common Service Desktop (CSD)

The Service Platform contains a set of software modules that are common to all ultrasound and cardiology systems. The Service Platform will increase service productivity and reduce training and service costs.

### Internationalization

The user interface provided by the service platform is designed for GE personnel and as such is in English only. There is no multi-lingual capability built into the Service Interface.

There are different possibilities to access the Common Service Desktop and its available features:

- **Local Access** : via Setup - Administration - **Service** page
- **Remote Access**: This offers GE technicians the possibility to view the entire customer's desktop and operation system. Remote access to the Voluson E-Series system requires permission and customer input to run diagnostics.

As soon as the Common Service Desktop (CSD) is started, the Service **Home** Page appears.



Figure 5-18 Common Service Desktop - Home

The navigation bar at the top of the screen allows to select from different tools for troubleshooting/ adjustment. For detailed description see [Section 7.6 "Common Service Desktop \(CSD\)" on page 7-14](#) .

## 5.14 Service Page

### 5.14.1 Introduction

The Service Page contains specific software/hardware test modules, system setup, update, etc. for Voluson E-Series systems only.

### 5.14.2 Access / Security

The service page has different access and security user levels. Each user is only granted access to the tools that are authorized for their use.

### 5.14.3 Service Login

1. Press the **Utilities** key on the control console.
2. In the "Utilities" menu touch the **Setup** button to invoke the setup desktop on the screen.
3. On the right side of the screen select **Administration** and then click the **Service** tab.
4. Enter the password <SHE> and click the **Accept** button to display the Service Tools page (see [Figure 5-19 on page 5-39](#)).

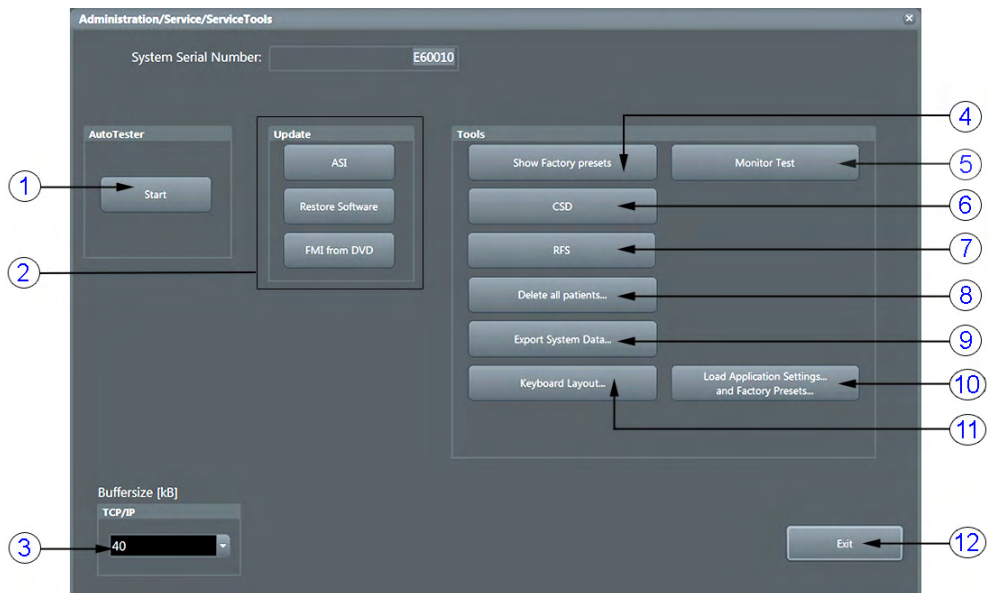


Figure 5-19 Service Tools page

1	Auto Tester	5	Monitor Test	9	Export System Data
2	Update	6	Common Service Desktop	10	Load Application Settings
3	TCP/IP Buffersize	7	Request for Service	11	Keyboard Layout
4		8	Delete all Patients	12	Exit

#### 5.14.3.1 Auto Tester

Autotester is a log function of customer activities. It records all user actions (scanning, Touch Panel entries, performing Calculations, review of Patient Reports, etc....). It is possible to save (record) as file on HDD. But also export to DVD/CD can be done to allow replay of the records on other units.

**Note** For intermittent problems this file can be requested from the Service Engineer or customer. It is possible to burn this file on DVD/CD+R/RW.

Operation see [Section 7.7 "How to use the Auto Tester program" on page 7-18](#).

### 5.14.3.2 Update

#### 5.14.3.2.1 FMI from DVD

By means of the **FMI from DVD** button, the Systems C:\ image is partly or completely updated. The System Software parts to be upgraded depend on contents of the used System DVD.



The first "Boot Device" in BIOS has to be Hard Disk Drive.

**Note** During "FMI from DVD" the used system configuration (incl. Full Backup) will be stored on R:\. If required, the previously used System configuration (before FMI from DVD was performed) can be restored by activating the "Rollback" function. Operation see: [Section 5.15.1.3 on page 5-42](#).

#### 5.14.3.2.2 ASI - Additional Software Installation

Click the **ASI** button to install additional software. The Software parts to be installed depend on the contents of the System DVD that is used.

#### 5.14.3.2.3 Restore Software

Click the **Restore software** button to perform an automatic restore of the system software from your hard disk. The installation procedure starts with saving and recording the settings present on the system (silent "Full Backup" and "Rollback"). During the software restore the system will restart several times.

**Note** Please make sure that **ONLY the DVD writer is connected** on the USB ports. Disconnect all other external USB devices (such as printers, hubs, bluetooth, memory devices) as this might interfere with the recovery/installation procedure.

**Note** Existing User Programs, 3D/4D Programs and Auto Text remain unaffected! Therefore it is not necessary to perform any readout preparations.

### 5.14.3.3 TCP/IP Buffersize

The TCP/IP Buffersize selects the amount of buffer memory used for DICOM transfers (both directions).

### 5.14.3.4 Common Service Desktop (CSD)

Access to the Common Service Desktop (CSD) by entering security level and password. Each user is only granted access to the tools that are authorized for their use.

### 5.14.3.5 Request for Service (RFS)

Fill out the "Request For Service" form and then send the problem description to GE Service/Application representatives. Operation see [Section 7.2 "Request for Service \(RFS\)" on page 7-5](#).

### 5.14.3.6 Delete all Patients

1. Click the **Delete all Patients...** button.  
Following WARNING message appears on the screen.

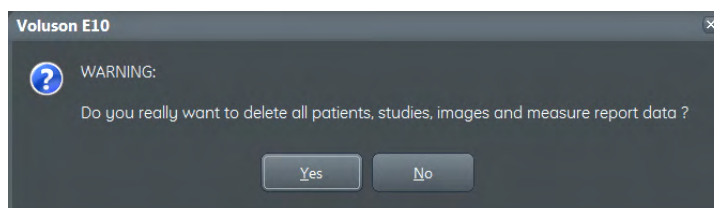


Figure 5-20 Warning message



#### Warning

If you select the **YES** button, all patients data, studies, images and measure report data will be deleted permanently from the hard disk and **cannot be recovered!**



### 5.14.3.7 Export System Data

Select the Export System Data button on the “Service Tools” page to Full Backup the System State. This includes dump-files and text files, the full Service Database informations about probes, boards, Software, Options and the Event Log File. Operation see [Section 7.4.2.2 on page 7-11](#).

### 5.14.3.8 Keyboard Layout

To change the keyboard layout to different languages. Operation see: [Section 6.4 “Modification of Keyboard Layout” on page 6-6](#).

**Note** *Reconfigure the layout of the keyboard is only useful by changing the concerned keys also; see: [Section 8.13 “Replacement of Key Caps \(by special native language keys\)” on page 8-21](#).*

### 5.14.3.9 Monitor Test

Select the **Monitor Test** button to perform color calibration. Operation see: [Section 6.2 “LCD Monitor Adjustment” on page 6-2](#).

### 5.14.3.10 Load Application Settings

If the Tune version of the Application presets does not match the Application Software version, it is probably that there are adverse affects on image quality (e.g., after reloading an old “Full Backup”).

**Note** *When reloading these Application Settings, any existing User Programs, 3D/4D Programs and Auto Text remain unaffected!*

1. Click the **Load Application Settings** button on the “Service Tools” page (see [Figure 5-19 on page 5-39](#)).
2. Choose the media and then click **Load**.

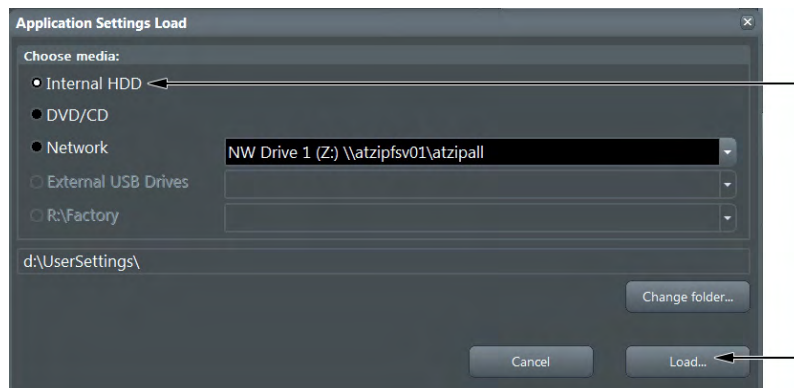


Figure 5-21 Application Settings Load

3. Select the desired file and then click **OK**.  
Load procedure starts immediately including a reboot of the system.

**Note** *If the ID of the Application Setting is not valid for the currently installed Application Software version, a warning message appears during boot up sequence.*

4. If warning message is displayed, confirm it with **OK** and then load appropriate Application Settings (perform loading procedure as described in steps above).

## 5.15 Boot Screen Functions

### 5.15.1 Overview

Following LINUX supported functions are available as soon as the “Boot Screen” appears:

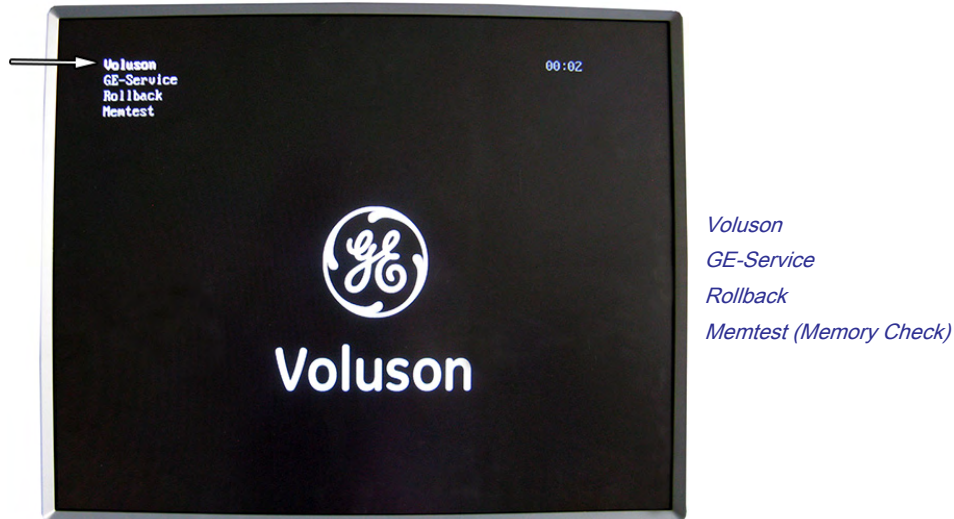


Figure 5-22 Boot screen



After 3 sec. without pressing any key, the system will boot-up in windows (= **Voluson** item). If you missed selection, retry again with **Ctrl + Alt + Del**.

#### 5.15.1.1 Voluson

The System will boot-up in windows. The Ultrasound Application is started. For details see [Section 3.5.1.1 "During a normal boot, you may observe" on page 3-28](#).

#### 5.15.1.2 GE-Service

This function **MUST NOT** be used by the customer!

#### 5.15.1.3 Rollback

This function offers the possibility to simply restore the previously used system configuration (rollback), which was stored on R:\ during “FMI from DVD”.

1. Turn system OFF and then back ON.
2. As soon as the “Boot Screen” appears (see: [Figure 5-22 on page 5-42](#)), press the **[PgDn]** (Arrow down) key on the keyboard until the **Rollback** item is highlighted, then press **Enter**.
3. When the following WARNING message appears, press the **[<-]** (Arrow left) button to highlight **OK** and then press **Enter**.

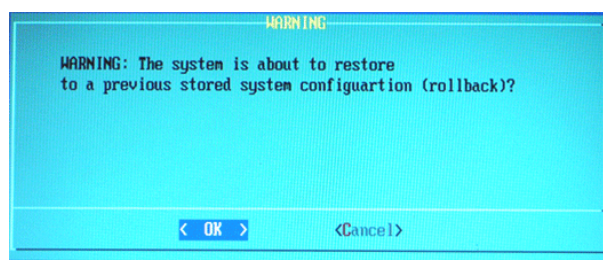


Figure 5-23 Warning message

After performing the rollback, the system reboots. The Ultrasound Application is started and finally the 2D screen is displayed on the monitor.

### 5.15.1.4 Memtest (Memory Check)

1. Turn system OFF and then back ON.
2. As soon as the "Boot Screen" appears (see: *Figure 5-22 on page 5-42*), press the **[PgDn]** (Arrow down) key on the keyboard until the **Memtest** item is highlighted, then press **Enter**.



After 3 sec. without pressing any key, the system will boot-up in windows (= **Voluson** item). If you missed selection, retry again with **Ctrl + Alt + Del**.

The PC Memory Test will start automatically and will take about 2.5 hours. If there are errors they will be listed.

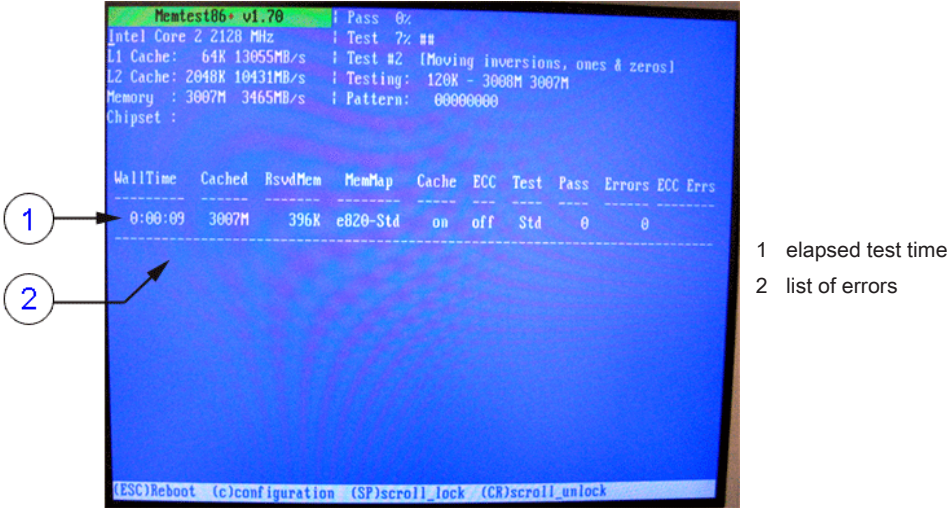


Figure 5-24 Memory check in LINUX

- Note** After one cycle (~ 2.5 hours) the memory check starts again. To interrupt the test, press the **Esc** key. If you don't interrupt the memory test, it will perform never ending cycles of memory checks.
- Note** If after one cycle (about 2.5 hours), no error messages are listed, it can be assumed that the Back End Processor including power supply is working properly.

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# Chapter 6

## Service Adjustments

*This chapter describes how to test and adjust the mechanical capabilities of a system that may be out of specification. Although some tests may be optional they should only be performed by qualified personnel.*

### Content in this chapter

<i>6.1 Regulatory</i>	<i>6-2</i>
<i>6.2 LCD Monitor Adjustment</i>	<i>6-2</i>
<i>6.3 Control Console Positioning</i>	<i>6-4</i>
<i>6.4 Modification of Keyboard Layout</i>	<i>6-6</i>

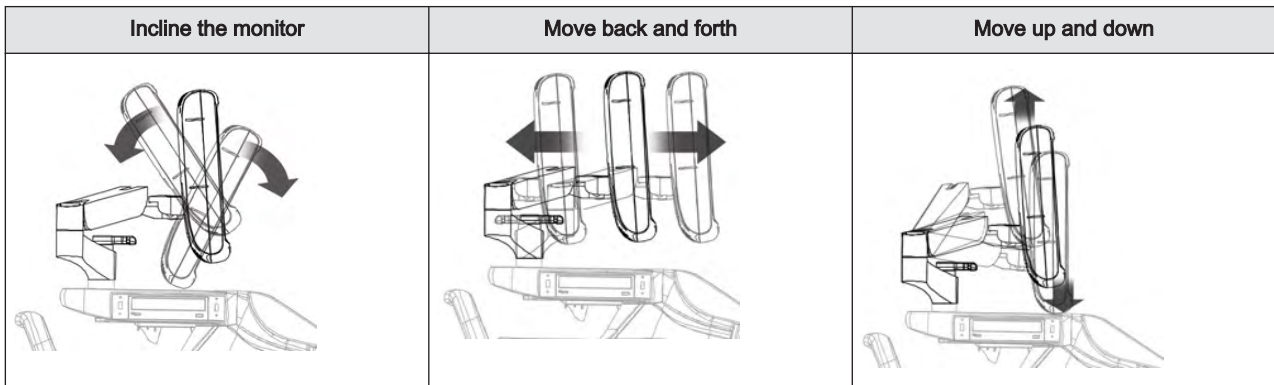
## 6.1 Regulatory

Verify, where applicable, that any regulatory information or tests required by national law are present and accounted for, and any regulatory tests required by national law are performed and documented.

## 6.2 LCD Monitor Adjustment

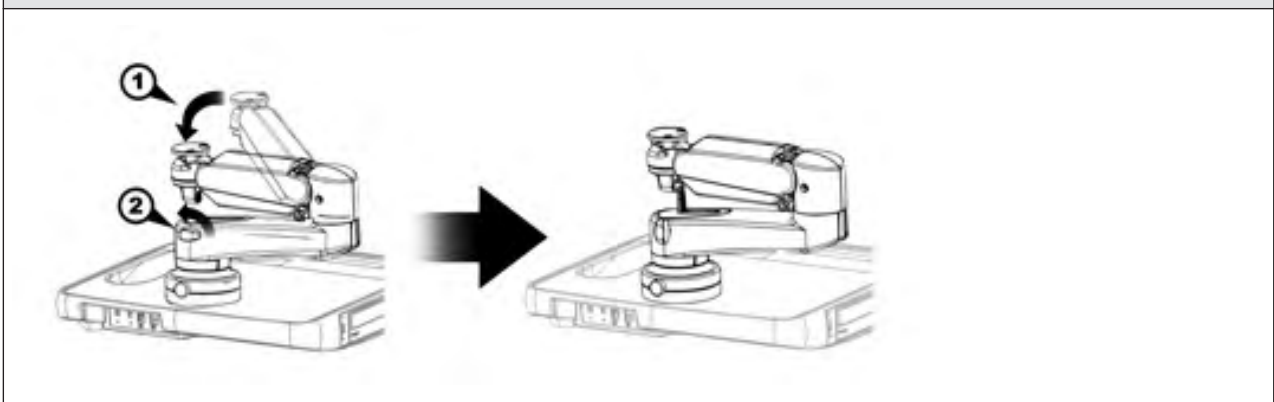
The Voluson E-Series system has a free adjustable LCD Flat panel monitor in relation to the user interface.

- tilt: + 40° / - 90°
- rotate: +/- 90°



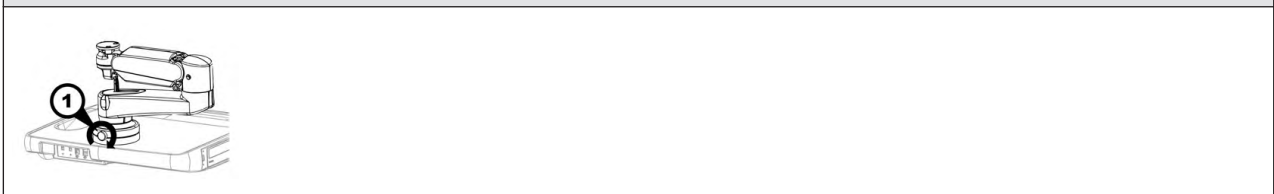
### Lock Height Adjustment

Move the upper monitor arm parallel to the lower arm and push it down (1), then lock it by turning the knob (2) counterclockwise. Release by turning the knob clockwise.



### Lock Arm Rotation

Rotate the arm to center position and turn the knob (1) clockwise till the rotation is locked. Release by turning the knob counterclockwise.



## 6.2.1 Preparing for Transport

To ensure that no part of the monitor can be damaged when transporting or moving the system, the monitor has to be in a secure position.

1. Lock all monitor parts.
2. Incline the monitor to horizontal position.

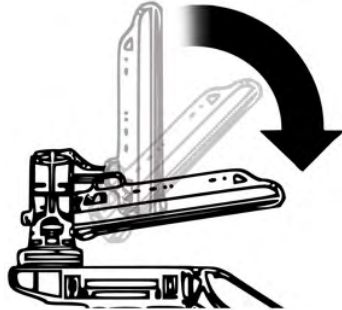


Figure 6-1 incline the monitor

The system can now be safely transported. Nevertheless be careful when transporting or moving the device.

## 6.2.2 Load Default Monitor Settings

1. Press the **Utilities** key on the control console.
2. In the “Utilities” menu touch the **Monitor** button to display the "Monitor Menu".

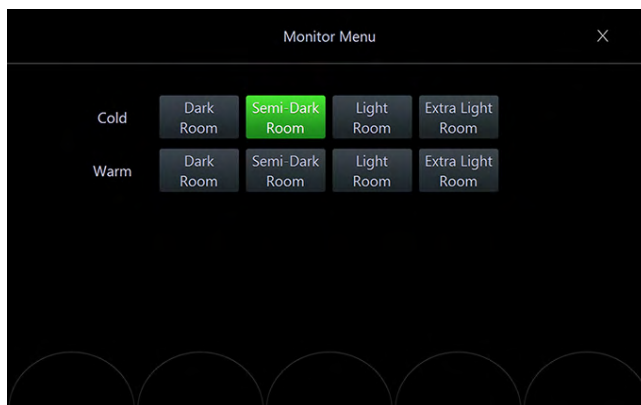


Figure 6-2 Monitor Menu

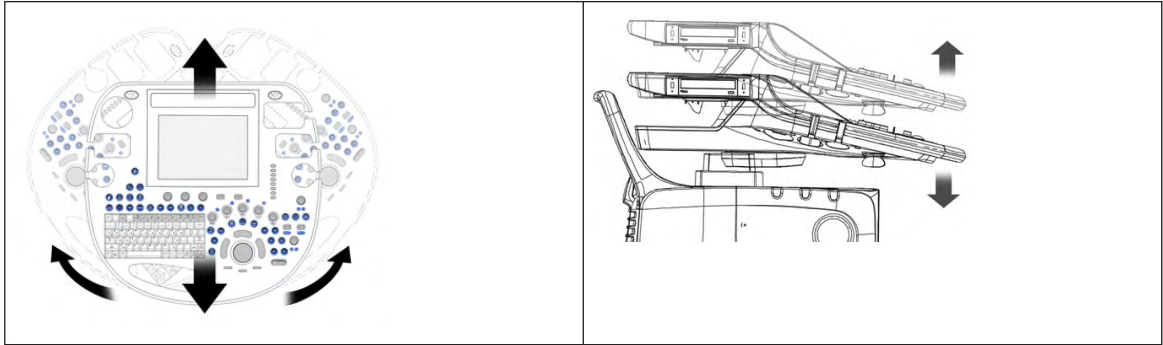
3. Touch the **Semi-Dark Room** button to load default monitor settings for your system.

## 6.2.3 Monitor Test

1. Press the **Utilities** key on the control console.
2. In the “Utilities” menu touch the **Setup** button to invoke the setup desktop on the screen.
3. On the right side of the screen select **Administration** and then click the **Service** tab.
4. Enter the password <SHE> and click the **Accept** button to display the Service Tools page (see [Figure 5-19 on page 5-39](#)).
5. Select the **Monitor Test** button in the “Service Tools” menu.
6. The screen becomes white.
  - WHITE is displayed without any tint (discolor) or colored pixels.
7. Press the **right/left trackball** key repeatedly to step through RED, GREEN, BLUE, BLACK and GRAYSCALE.
  - Each color is displayed correctly (without any tint or discolored pixels).
8. To exit the Monitor Test program, press **ESC**.

## 6.3 Control Console Positioning

The control console can be rotated, moved forward and backward and adjusted in height.



### 6.3.1 Translation/Rotation Adjustment



Press the **Brake** button inside of the handlebar opening to rotate/translate the console to the desired position. Press the **Brake** button again in order to secure the console against uncontrolled movement.



Figure 6-3 Buttons for Control Console Adjustment

- 1 **Elevation** button for height adjustment of the control console
- 2 **Brake** button for locking and unlocking the control console

#### Caution



The system should not be moved with the control console (UI) extended. Do not put your hand between the control console and the main unit when moving the control console to its centered and locked position:  
**Danger of injuries!**



## 6.3.2 Height Adjustment (Elevation)



Height adjustment is done with the **Lift UP / Lift DOWN** button inside of the handlebar opening. As long as a button is pressed, the control console can be lifted / lowered.



Caution

Make sure that nothing would be jammed while moving!

### 6.3.2.1 Moving the Console - without booting up the System

If it is impossible to boot up the system, the user interface can be lowered and/or lifted by pressing 3 keys on the control console.

1. Connect the main power cable to the back of the system.
2. Connect the main power cable to a hospital grade power outlet with the proper rated voltage.
3. Press 3 keys (see [Figure 6-4 below](#)) on the control console simultaneously to move it
  - downwards: **Patient ID** key, **End Exam** key and **Lift DOWN** button
  - upwards: **Patient ID** key, **End Exam** key and **Lift UP** button

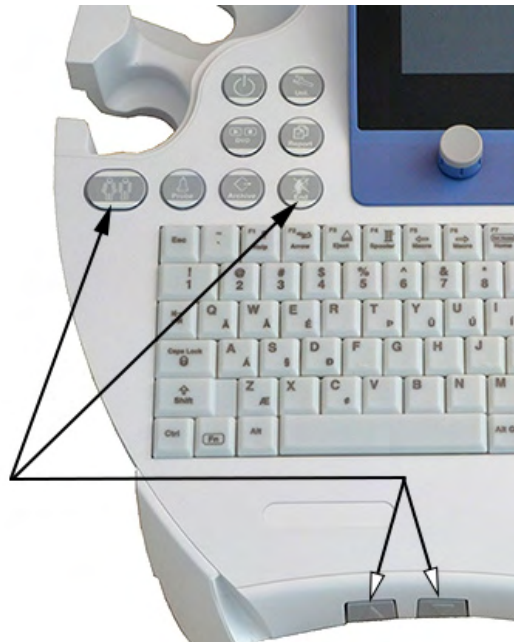


Figure 6-4 keys to lower/lift the control console

**Note** *Shipping the Voluson E-Series ultrasound system in its original packaging is only possible when control console is centered and locked in position, the system is lowered to its minimum height and the monitor is flapped down and locked (see [Figure 6-1 on page 6-3](#)).*

### 6.3.2.2 Moving up (lift) the Console - without booting up the System

**Note** ***Whanam console only:** If it is impossible to boot up the system, the user interface can be moved upwards (lifted) by pressing 4 keys on the control console.*

1. Connect the main power cable to the back of the system.
2. Connect the main power cable to a hospital grade power outlet with the proper rated voltage.
3. Press 3 keys + **BF** (see [Figure 6-4 above](#)) on the control console simultaneously to move it upwards.

## 6.4 Modification of Keyboard Layout

**Note** *Configuring the layout of the keyboard is only useful by changing the concerned keys also; see [Section 8.13 "Replacement of Key Caps \(by special native language keys\)"](#) on page 8-21 .*

1. Press the **Utilities** key on the control console.
2. In the "Utilities" menu touch the **Setup** button to invoke the setup desktop on the screen.
3. On the right side of the screen select **Administration** and then click the **Service** tab.
4. Enter the password <SHE> and click the **Accept** button to display the Service Tools page (see [Figure 5-19 on page 5-39](#)).
5. Click on the **Keyboard Layout** button.
6. Select the default input language from the pull-down menu.

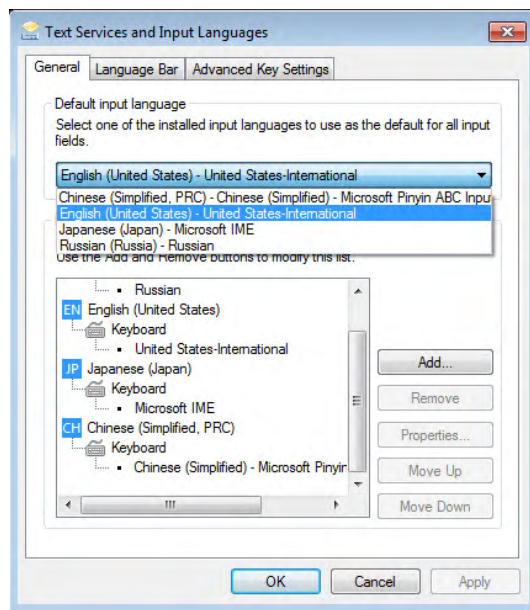


Figure 6-5 default input language

**Note** *If the desired language is not listed, click the **Add** button, choose the desired input language from the pull-down menu, as shown in [Figure 6-6 below](#), and then confirm with **OK**.*

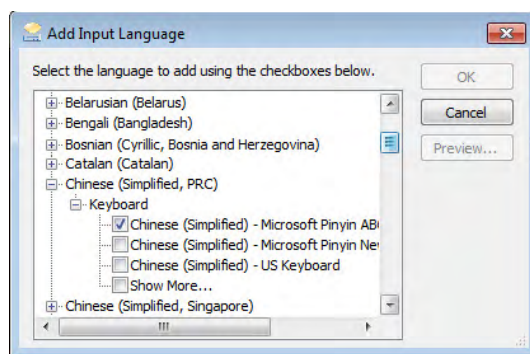


Figure 6-6 add input language

7. If not already done, select the default input language from the pull-down menu. The corresponding keyboard layout is changed accordingly.
8. Click on **Apply** and then close the window with **OK**.
9. Close the Service page with **Save&Exit** and restart the system.
10. Test the Keyboard function:
  - Press the **ABC** key on the control console.
  - Press some keys on the keyboard and verify the entered text.

# Chapter 7

## Diagnostics/Troubleshooting

*This chapter describes how to setup and run the tools and software that help maintain image quality and system operation. Basic host, system, and board level diagnostics are run whenever power is applied. Some Service Tools may be run at the application level.*

### Content in this chapter

<i>7.1 Collect vital System Information</i>	<i>7-2</i>
<i>7.2 Request for Service (RFS)</i>	<i>7-5</i>
<i>7.3 Check Point Voltages</i>	<i>7-7</i>
<i>7.4 Screen Captures and Logs</i>	<i>7-9</i>
<i>7.5 Remote Access to the Service Platform</i>	<i>7-12</i>
<i>7.6 Common Service Desktop (CSD)</i>	<i>7-14</i>
<i>7.7 How to use the Auto Tester program</i>	<i>7-18</i>
<i>7.8 Minimum Configuration to Boot/Scan</i>	<i>7-20</i>
<i>7.9 Troubleshooting Trees, Instructions and Tech Tips</i>	<i>7-21</i>

## 7.1 Collect vital System Information

1. Press the **Utilities** key on the control console.
2. In the “Utilities” menu touch the **Setup** button to invoke the setup desktop on the screen.
3. On the right side of the screen select **Administration** and then click the **System Info** tab.

The following information is necessary in order to properly analyze data or images being reported as a malfunction or being returned to the manufacturer:

- **System Type**
- **System Serial number** (also visible on label on back of the system)
- **Application Software version**
- **Backup version** (File name, Date of Factory Settings, Tune version, etc.)
- **additional information** (e.g., Hardware ID, “Mainboard Type”, HW configuration, etc.)

**Note** *All the above information can be found in the "System Info" page; see: [Figure 7-1 on page 7-3](#) .*

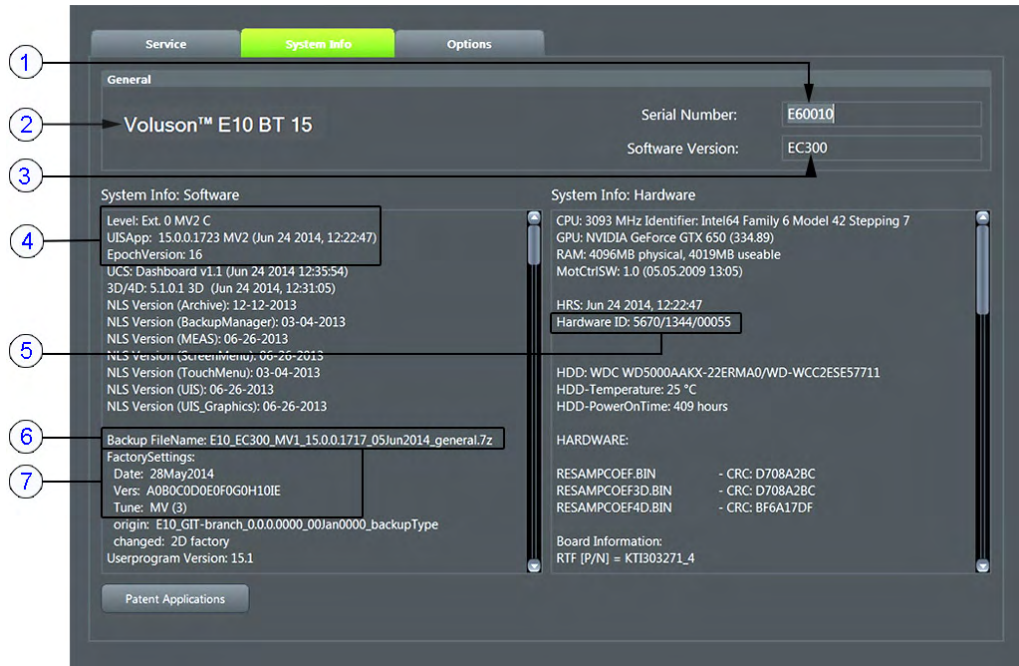


Figure 7-1 System Setup - Administration - SYSTEM INFO page

**Note** Move the scroll bars downwards to view additional information about the installed software/hardware.

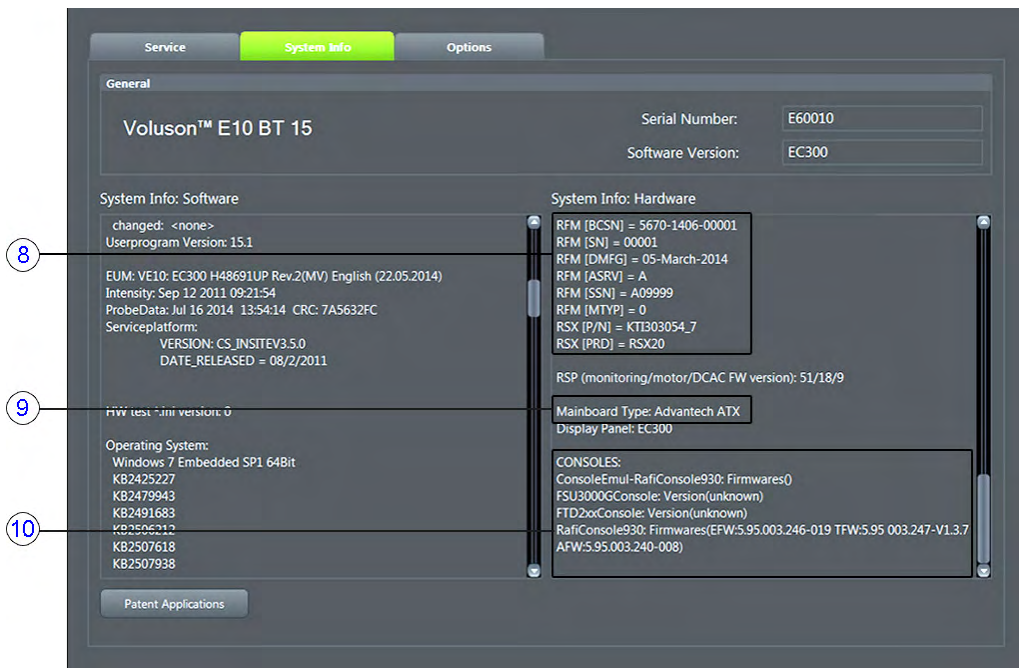


Figure 7-1 System Setup - Administration - SYSTEM INFO page

1	Serial Number	7	Factory Settings: Date & Tune version
2	System Type	8	Hardware configuration (board versions)
3	Software Version	9	Mainboard Type (e.g. ADVANTECH ATX)
4	Application Software	10	Console version (e.g.
5	Hardware ID		
6	Backup File Name		

### 7.1.1 Shortcuts List

Press the **Ctrl + H** key simultaneous to display the shortcuts list and a description of what they do.

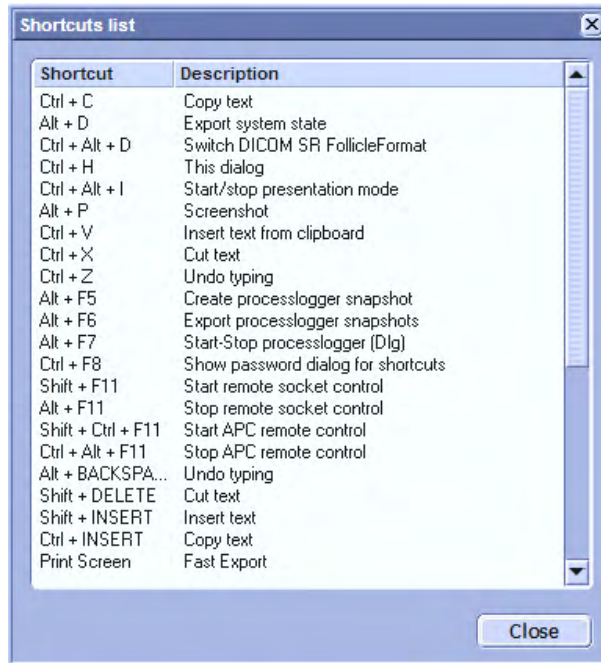


Figure 7-2 Shortcuts list (Ctrl + H)

Table 7-1 list of shortcuts + description of what they do

Shortcut	Description	Shortcut	Description
Ctrl + C	copy text	Alt + F7	start/stop process logger
Alt + D	export system state (Full Backup and Dump files) to D:\export	Ctrl + F8	Factory use ONLY! This function is not intended for the user.
Ctrl+ Alt + D	Factory use ONLY! This function is not intended for the user.	Shift + F11	start remote socket control
Ctrl + H	shortcuts list (see: <i>Figure 7-2 above</i> )	Alt + F11	stop remote socket control
Ctrl + Alt + I	start/stop presentation mode	Shift + Ctrl + F11	Factory use ONLY! This function is not intended for the user.
Alt + P	stores screenshot on D:\export	Ctrl + Alt + F11	Factory use ONLY! This function is not intended for the user.
Ctrl + V	paste, insert text from clipboard	Alt + Backspace	undo typing
Ctrl + X	cut text	Shift + Delete	cut text
Ctrl + Z	undo typing	Shift + Insert	insert text (paste)
Alt + F5	create process logger snapshot	Ctrl + Insert	copy text
Alt + F6	export process logger snapshots (to USB Drive, CD or network share)	Print Screen	fast export

## 7.2 Request for Service (RFS)

**Note** *Service Connectivity has to be checked out once before you can request for service. i.e., Service Platform has to be configured properly; see [Section 3.13.8 "InSite ExC Configuration" on page 3-64](#).*

There are 2 possibilities to contact GE:

- by means of the GE "Remote Status Icon" that is displayed on the bottom of the screen



Move the cursor to the InSite ExC link (GE icon) at the right bottom of the display screen and press the left trackball key (= left-click). The "Contact GE" form (see [Figure 7-3 below](#)) is displayed.

- via the System Setup "Service" page
  1. Press the **Utilities** key on the control console.
  2. In the "Utilities" menu touch the **Setup** button to invoke the setup desktop on the screen.
  3. On the right side of the screen select **Administration** and then click the **Service** tab.
  4. Enter the password <SHE> and click the **Accept** button to display the Service Tools page (see [Figure 5-19 on page 5-39](#)).
  5. Click the **RFS** button and fill out the displayed form. (Enter detailed problem description.)

Figure 7-3 Contact GE - Request for Service

**Note** *Connection must be checked out! (1)*

6. Click the **Send** button to send the problem description to GE Service/Application representatives.

A request confirmation screen is displayed.

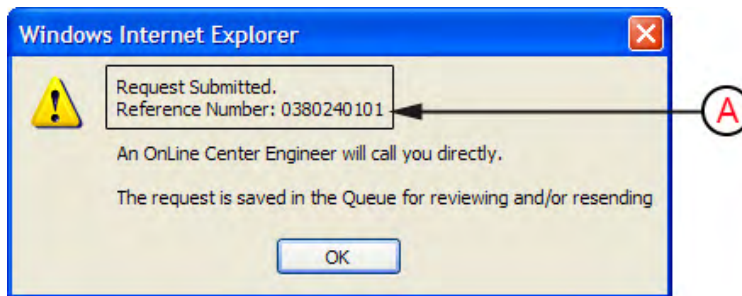


Figure 7-4 Request submitted

7. Write down and keep the Reference Number (A) for follow up procedures, then click **OK**. The request is saved in QUEUE for reviewing and/or resending.

**Note**

*If the service platform is not configured an Error message is displayed. The request is NOT sent!*

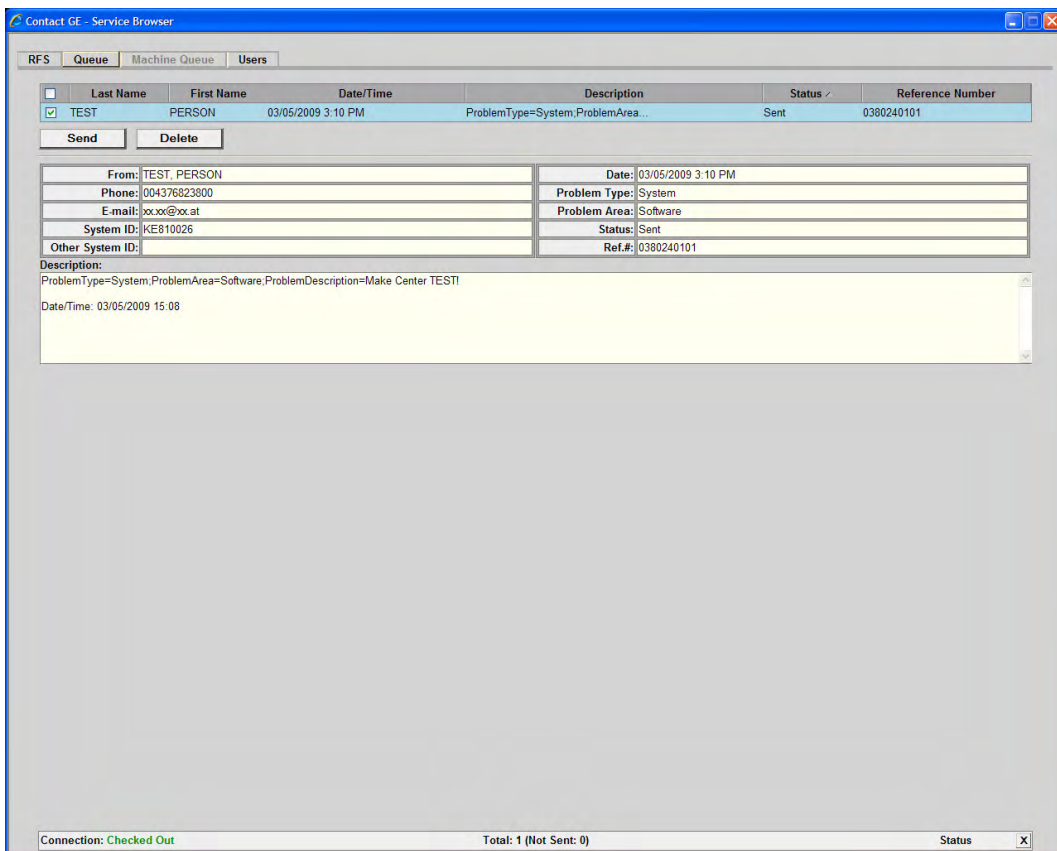


Figure 7-5 Contact GE - Queue








## 7.3 Check Point Voltages

### 7.3.1 User Interface - Status LEDs

The LED within the start key (**ON/OFF** button) on the User Interface is used to signal the status of the Voluson E-Series system.

The following states are implemented:

	<b>Orange</b>	System in standby mode.
	<b>Green</b>	System in normal operation mode.
	blinking <b>Orange &lt;=&gt; Green</b>	FPGA_CONF_DONE = low IF-FPGA not initialized -> probably FrontEnd (RFM board) issue
	<b>NO light</b>	System is switched OFF (circuit breaker)
	<b>NO light</b>	probably Power Supply (RSP) defect

### 7.3.2 Boot Up Diagnostic - Status LEDs

Boot up diagnostic LEDs behind the right side door should help to diagnose system issues easier.

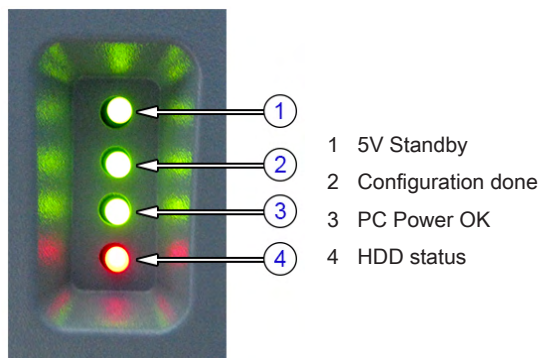


Figure 7-6 LEDs behind right side door

### 7.3.3 Power Supply (RSP) - Status LEDs

On the backside of the ATX board near the fans 3 green status LEDs are mounted. These LEDs are used for signalling the status of the Power Supply (RSP).

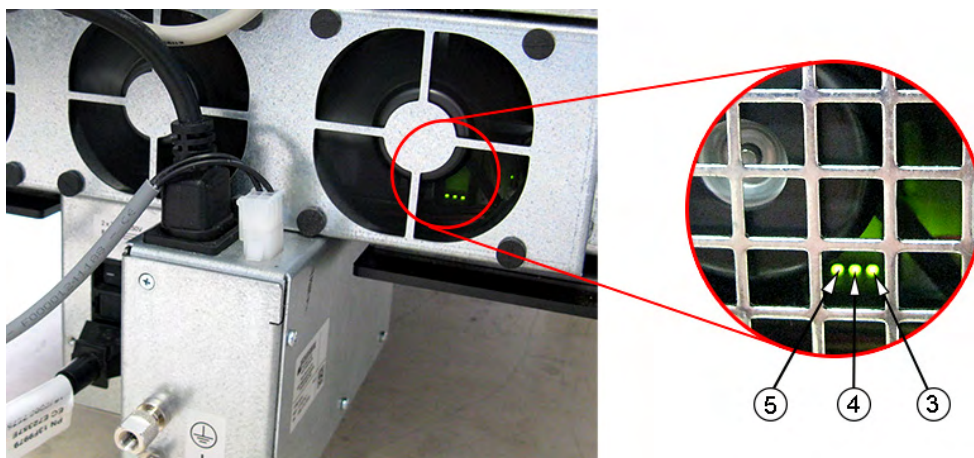


Figure 7-7 check green LEDs inside RSP

---

<b>LED 3</b>	Off: 12V_FE off On: 12V_FE on
<b>LED 4</b>	Off: FPGA_CONF_DONE = low On: FPGA_CONF_DONE = high
<b>LED 5</b>	Off: ATX supply off On: ATX supply on

---

## 7.4 Screen Captures and Logs

There may be times when the customer or field engineer will want to capture a presentation on the screen so it may be recovered by the OnLine Center. This is accomplished by saving the image(s):

1. to archive and export them (as jpg, bmp or tiff) to DVD or external USB drive
2. as jpg and bmp to D:\export by pressing the **Alt + P** key on the alphanumeric keyboard  
**Note:** Successive **Alt + P** keystrokes (max. 20) overwrite existing snapshots at destination HDD!
3. creates one snapshot (Alt-D.bmp) + "Full Backup" of the System state (fullbackup -> fb1) saved on D:\export by pressing the **Alt + D** key on the alpha-numeric keyboard

### 7.4.1 Capturing a Screen

The following is the generic process to capture any screen from the Voluson E-Series system.

1. Navigate to, and display the image/screen/volume to be captured.
2. Press the **P1, P2, P3, P4, P5** or **P6** key (depending on system configuration) on the control console and store the image onto the clipboard (frame on left side of the screen).

**Note** *A short summary of P1, P2, P3, P4, P5 or P6 keys configuration is shown in the status area on the screen.*

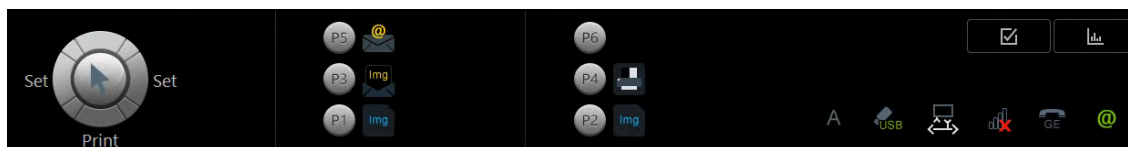


Figure 7-8 summary of keys configuration

3. Select the stored image(s) and export them to DVD drive, an external USB drive (optional) or mapped Network drive (jpg, bmp, tiff or Volume file).

## 7.4.2 Export Log's and System Data

There are two possibilities to export system data (and log's):

1. by pressing the **Alt + D** key to save a snapshot and "Full Backup" of the System state; see [Section 7.4.2.1 on page 7-10](#)
2. via the **Export System Data** button in the System Setup - Administration - Service page; see [Section 7.4.2.2 on page 7-11](#)

### 7.4.2.1 Export System Data (by pressing the ALT + D key)

**Alt + D** uses "Full Backup" to gather data from the system. In addition it creates one screen shot (Alt-D.bmp) of the point in time when **Alt + D** was pressed. The main use is when R&D or OLC need detailed information about the system (e.g., when experiencing strange behaviour or when the problem should be investigated by R&D). It is not intended to replace or enhance the existing Full Backup functionality.



The Full Backup created by **Alt + D** is protected by a password that can be customized. Whenever transmitting system state to R&D, do not forget to inform them about any password change.

Data can be stored on the hard disk (D:\export\fullbackup\fb1), or you can export them to DVD/CD, etc. Including the D:\export folder, which contains dump files (for details see [Section 7.4.2.2.1 on page 7-11](#)), Autotester script files, SMART logs, sniffer logs and screen shots (**Alt + P**).

#### Note

*Successive **Alt + D** keystrokes overwrite existing snapshots at destination (Internal) HDD.*

1. Press the **Alt + D** key on the keyboard simultaneously.

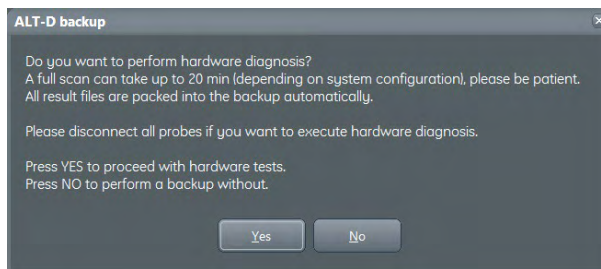


Figure 7-9 "Alt-D" backup

2. Select whether you want to backup data with or without hardware diagnosis tests.



Please detach all probes if you want to execute hardware diagnosis, then click **Yes**.

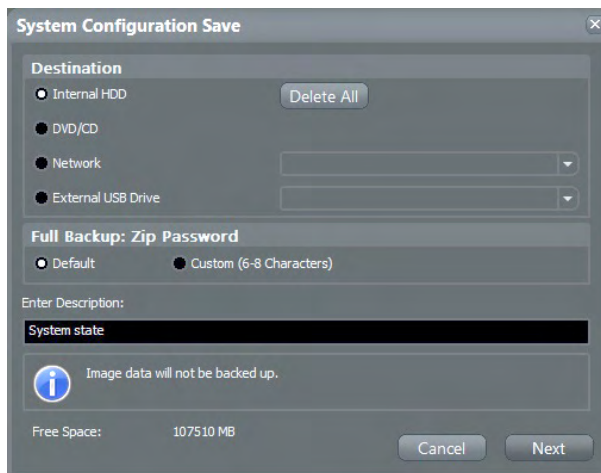


Figure 7-10 System Configuration Save

3. Select the destination of the "System state" backup.
  4. Select the **Next** button to start the backup process.
- After saving the data, the Voluson E-Series reboots and the application starts again.

### 7.4.2.2 Export Log's and System Data (via Service Page)

1. Press the **Utilities** key on the control console.
2. In the "Utilities" menu touch the **Setup** button to invoke the setup desktop on the screen.
3. On the right side of the screen select **Administration** and then click the **Service** tab.
4. Enter the password <SHE> and click the **Accept** button to display the Service Tools page (see [Figure 5-19](#) on page 5-39).
5. Click on the **Export System Data** button to Full Backup the System state. This includes dump files and text files, full Service Database informations about probes, boards, Software, Options and the Event Log File.

#### 7.4.2.2.1 Dump file

Every time an error message is produced, a dump file and a text file containing the error dump and the error message are created in D:\export. Up to 20 dump files are stored there.

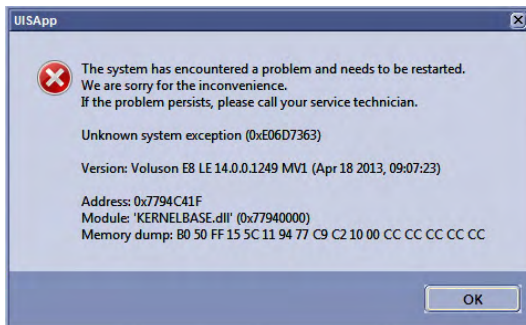


Figure 7-11 system has encountered a problem

After clicking on **OK** the system reboots automatically.

## 7.5 Remote Access to the Service Platform

### Content in this section

<a href="#">7.5.1 General</a> -----	7-12
<a href="#">7.5.2 How the Customer enables/disables Disruptive Mode and VCO</a> -----	7-13

### 7.5.1 General

This allows GE technicians to view the entire customer's desktop and operation system. Using VCO (Virtual Console Observation) a service technician or the OLC (OnLine Center) can access and modify all settings and programs or run diagnostics on the customer's Voluson E-Series system.

**Note** *Remote access is ONLY possible if the Service Platform is properly configured (either by the user or a GE technician at site). Operation see [Section 3.13.8 "InSite ExC Configuration" on page 3-64](#) .*

Remote access to the Voluson E-Series system requires permission and customer input before a GE service technician or OLC can access the customer's system remotely.

Disruptive Mode can be selected by the customer directly on the Voluson E-Series (see [Section 7.5.2 on page 7-13](#)), or requested remotely by the service technician or OLC .

## 7.5.2 How the Customer enables/disables Disruptive Mode and VCO

1. If not already in read mode, **Freeze** the image.
2. Move the cursor to the InSite ExC link (**GE** icon at the right bottom of the display screen) and press the **right trackball key** (= right-click).
3. Select *Connect Clinical Lifeline* (see: [Figure 7-12 below](#)). This activates “Disruptive Mode” and “VCO” for the application OLC to quickly assist the customer.

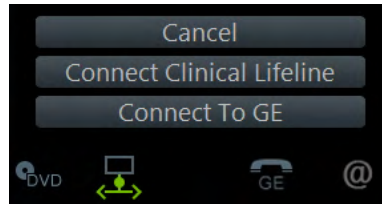


Figure 7-12 Connect Clinical Lifeline

4. If you select **Cancel**, “Disruptive Mode” and “VCO” is turned OFF.

### Note

Visual information about GE remote service status is shown in the status area on the right bottom of the screen.

	<b>Gray</b> = Idle State	Remote access is inactive.
	<b>Yellow</b> = Access pending	Remote Access connection is active, but Disruptive Mode and Virtual Console Observation (VCO) is not yet enabled.
	<b>Red</b> = Disrupted State	Remote Access is active. All processes [UL_VNC and UL_CSD] are active. In this state the Voluson E-Series system should NOT be used clinically.
	<b>Gray + envelope</b>	New Software Update Package is available for download and installation. Operation see <a href="#">Section 8.2.3 "Software Update Package - Download/Installation Procedure"</a> on page 8-9 .

### If a GE Service Technician requests Remote Access Permission

If a GE Service technician requests remote access to your Voluson E-Series system, following message appears on the screen.

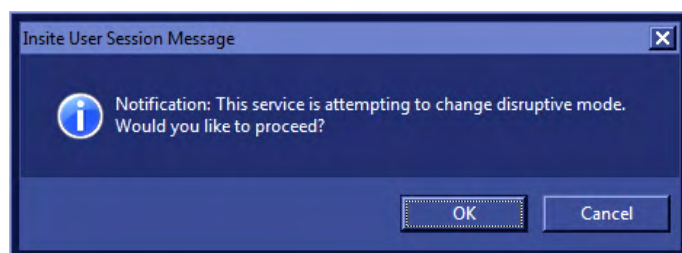


Figure 7-13 Insite User Session Message

To enable Disruptive Mode click **OK**.

### Note

If the customer does not wish to have diagnostics running at the time of the request, select **Cancel**. A message is sent back to the OLC or FE that permission to change Disruptive Status is denied.

## 7.6 Common Service Desktop (CSD)

There are different possibilities to access the Common Service Desktop and its available features:

- **Local Access** : via Setup - Administration - **Service** page
- **Remote Access**: This offers GE technicians the possibility to view the entire customer's desktop and operation system. Remote access to the Voluson E-Series system requires permission and customer input to run diagnostics.



Whenever any hardware diagnostic tests have to be executed on site, the CSD **must be accessed** via the - *All Programs - Voluson - GE Field Engineer - Common Service Desktop*.

The navigation bar at the top of the screen shows the top level menu choices.

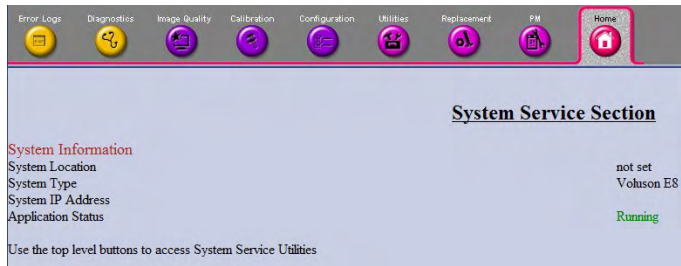


Figure 7-14 Common Service Desktop - Home

**Note**

As described in *Section 5.13 on page 5-38* , the service platform uses a web-based user interface to provide access to common service components. The Service platform is designed for GE personnel and as such is in English only. There is no multi-lingual capability.

**Content in this section**

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7.6.2 Diagnostics	-----	7-15
7.6.3 Image Quality	-----	7-15
7.6.4 Calibration	-----	7-15
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7.6.6 Utilities	-----	7-16
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### 7.6.1 Error Logs

When the **Error Logs** page is selected, different log viewing options are available.

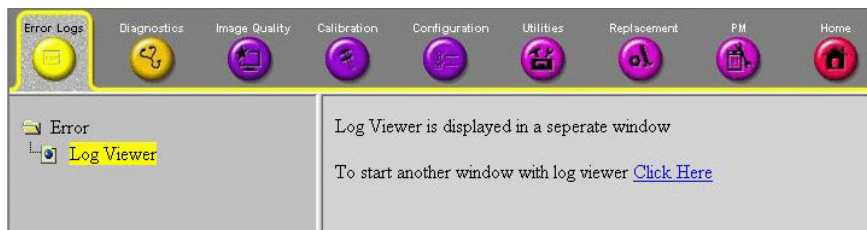


Figure 7-15 Common Service Desktop - Error Logs

Select the Log Viewer option in the left pane of the Error Logs page. Available logs are displayed in a separate window.



## 7.6.2 Diagnostics

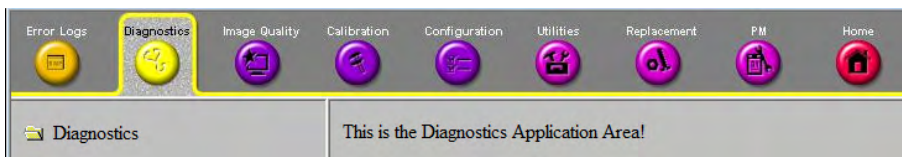


Figure 7-16 Common Service Desktop - Diagnostics

**Note** *This page is not populated in this version.*

## 7.6.3 Image Quality

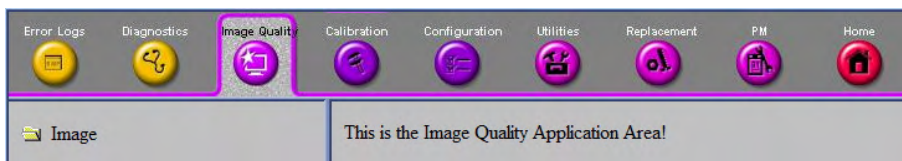


Figure 7-17 Common Service Desktop - Image Quality

**Note** *This page is not populated in this version.*

## 7.6.4 Calibration

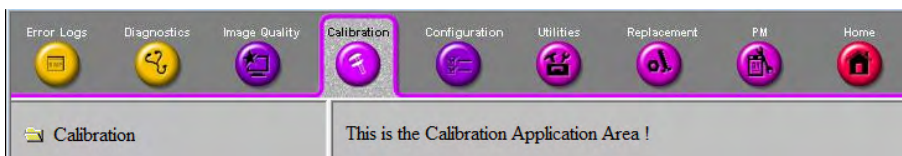


Figure 7-18 Common Service Desktop - Calibration

**Note** *This page is not populated in this version.*

## 7.6.5 Configuration

In the **Configuration** page, you can view and modify different device informations and configurations in the “InSite ExC Agent Configuration” option field.

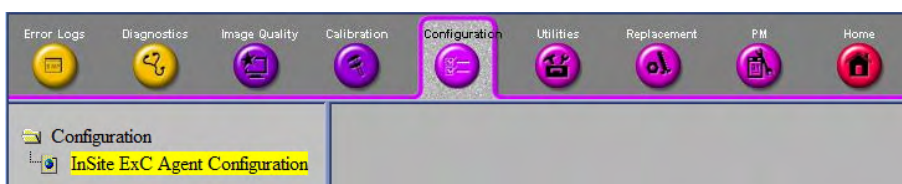


Figure 7-19 Common Service Desktop - Configuration

**Note** *Remote access is ONLY possible if the Service Platform is properly configured (either by the user or a GE technician at site). Operation see Section 3.13.8 “InSite ExC Configuration” on page 3-64 .*

## 7.6.6 Utilities

The **Utilities** page contains a variety of Windows utility tools to indicate the status of the system, in addition to various other tools.

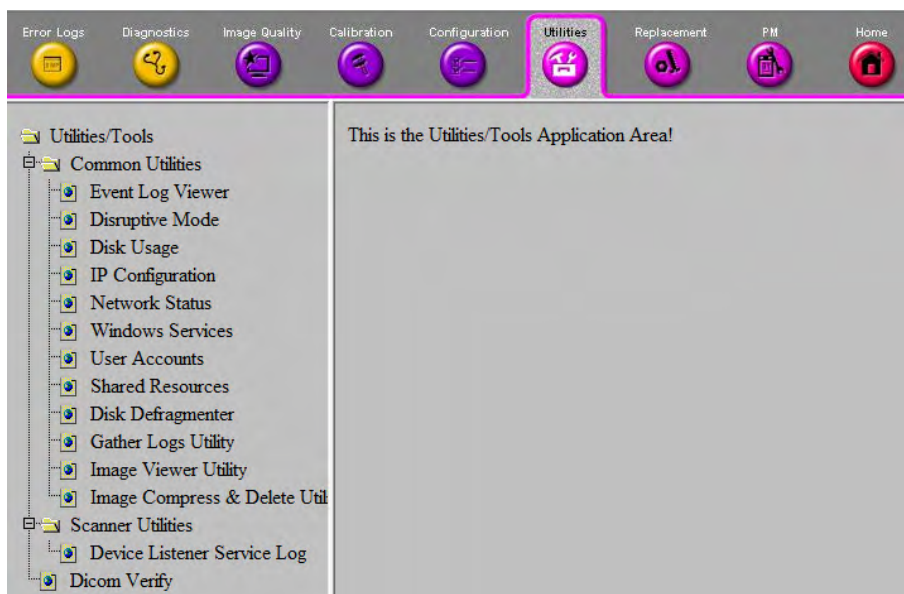


Figure 7-20 Common Service Desktop - Utilities

### Content in this section

<a href="#">7.6.6.1 Common Utilities</a>	-----	7-16
<a href="#">7.6.6.2 Scanner Utilities</a>	-----	7-17

### 7.6.6.1 Common Utilities

#### Event Log Viewer

Select the log you wish to view:

- Application link = an event log relative to application events
- System link = an event log relative to system events
- Log Name = enter the Log Name you want to view and click the **View** button

#### Disruptive Mode

Allows to enable or disable disruptive mode.

#### Disk Usage

All drives (real & virtual) mounted on the system will be shown in the right frame. Each drive will display the total size in bytes and the total number of free bytes.

#### IP Configuration

Windows IP Configuration: The TCP/IP information for the device + all real and virtual networking interfaces are displayed.

#### Network Status

All ports (listening & established) are displayed along with any external/foreign address that might be connected to the device.

#### Windows Services

The currently active windows services (applications) are displayed.

### User Accounts

Shows the internal account information that was provided and set up on the system by the OLC.

### Shared Resources

Indicates the resources being shared by the system.

### Disk Defragmenter

Shows how to execute a Disk Defragmentation.

### Gather Logs Utility

This will gather up logs and presets. Logs are zipped up and located in (D:\export\Logs\_XXXX.zip) for retrieval by the OnLine Center.

### Image Viewer Utility

A list of all images stored in D:\export is displayed. It is possible to display the Images.

### Image Compress & Delete Utility

A list of all images stored in D:\export is displayed. It is possible to compress or delete the select the images. The compressed files are added to (D:\export\XXXX.zip).

## 7.6.6.2 Scanner Utilities

### Device Listener Service

This will analyze the USB connect/disconnect logs from the Device Listener Server. The output is displayed on the screen.

### Dicom Verify

This enables to verify DICOM devices.

## 7.6.7 Replacement

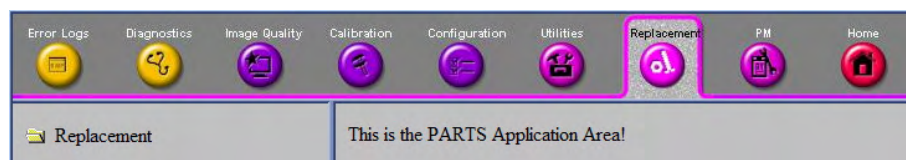


Figure 7-21 Common Service Desktop - Replacement

**Note** *This page is not populated in this version.*

## 7.6.8 PM

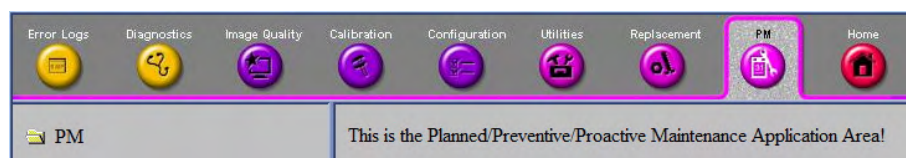


Figure 7-22 Common Service Desktop - PM

**Note** *This page is not populated in this version.*

## 7.7 How to use the Auto Tester program

1. Press the **Utilities** key on the control console.
2. In the “Utilities” menu touch the **Setup** button to invoke the setup desktop on the screen.
3. On the right side of the screen select **Administration** and then click the **Service** tab.
4. Enter the password <SHE> and click the **Accept** button to display the Service Tools page (see [Figure 5-19 on page 5-39](#)).
5. Activate the “Auto Tester” program by clicking **Start**. The following message box appears.

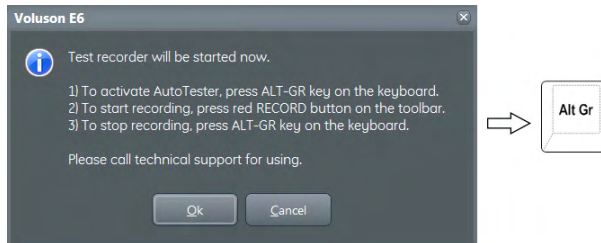


Figure 7-23 Autotester activation

6. Click **OK**.
7. Press the **Alt Gr** key on the alphanumeric keyboard.
8. Activate the “Auto Tester” program by clicking the “Record” icon on the displayed screen.

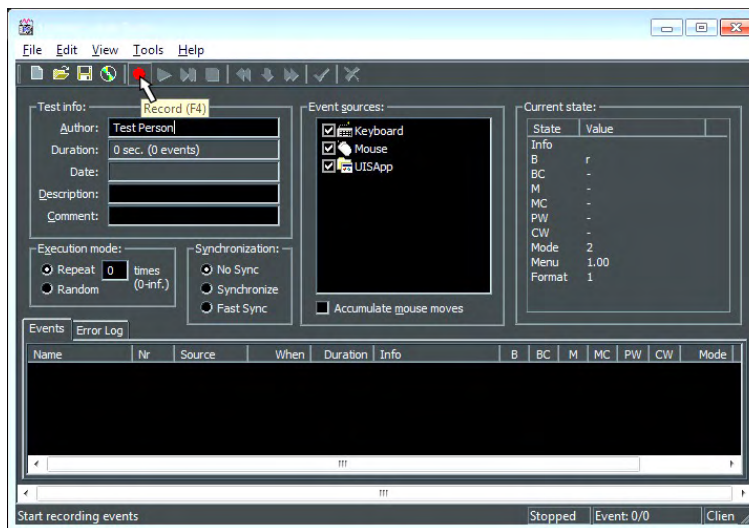
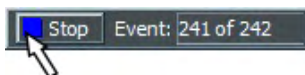


Figure 7-24 Autotester record

9. Start scanning. You can scan normally and everything will be recorded to the program (up to several hours).

**Note**

*It is important that you are recording the processes where the errors normally occur.*



Stop the program by clicking on [Stop] shown on the screen, or by pressing the **Alt Gr** key on the alphanumeric keyboard.

The following screen appears.

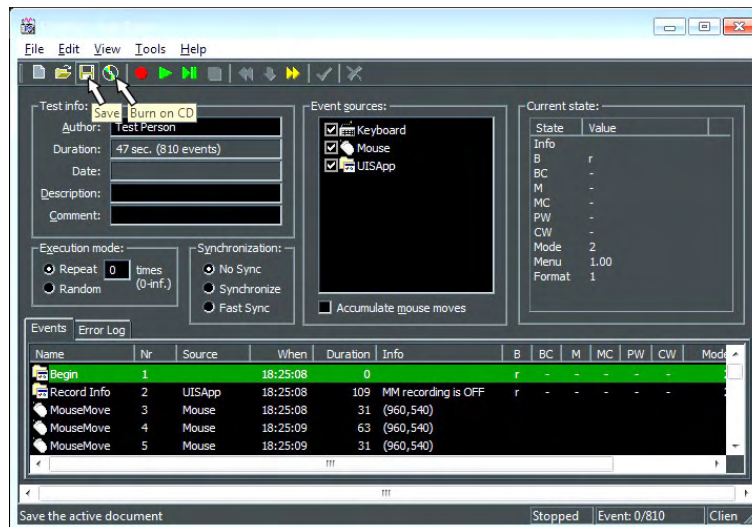


Figure 7-25 Autotester finished

10. Select the "Save" icon. The file will be saved in D:\Export\AutotesterScripts\\*. \*.
11. Press **Alt + D** to export system data and the needed logs. Operation see [Section 7.4.2.1 "Export System Data \(by pressing the ALT + D key\)"](#) on page 7-10 .

**Note**

*The standalone recorded "Auto Tester" file makes only sense with the **Alt + D** log! To analyze the workflow the exact date and time of occurrence needs to be documented!*

12. If desired, save the script file also on DVD/CD. Therefore:
  - Insert an empty DVD/CD+R/RW in the Drive and select the "Burn on CD" icon.
  - Enter a Filename.
  - After the DVD/CD write is finished click the **OK** button.
13. Close the "Auto Tester" program.

### 7.7.1 Limitation of the Auto Tester

The following information will not be recorded. Depending on the moment the Auto Tester is activated, this must be provided by the customer or the field engineer.

- Which probe is in use and which probes are connected?
- Which Mode is activated?
- Which peripherals are connected (Dicom, Printer, etc..)?

Collected information from all steps above + exported system data and needed logs (**Alt + D**) can be sent to the Make Center. With this information the Make Center can see how the customer is using the system and reproduce potential failures.

**Note**

*Providing all information at once will help the Make Center find the root cause and speeds up finding a solution for the customer.*

## 7.8 Minimum Configuration to Boot/Scan

### 7.8.1 Minimum Configuration to Scan

1. Connect the minimum configuration of cables as shown in figures below:
  - a. Console (RTU)
  - b. USB UI (User Interface) and USB Hub Top
  - c. DVI Cable (Digital Visual Interface) from Graphic Card DVI Out to Monitor
2. Connect the mains power cable and mount the pull-out protection, see: [Figure 4-1 on page 4-3](#).
3. Connect the mains power cable to an appropriate mains power outlet and switch ON the circuit breaker.
4. Press the **ON/OFF** Standby button on the control console to boot up the system.
5. Connect a probe and start an User Program.

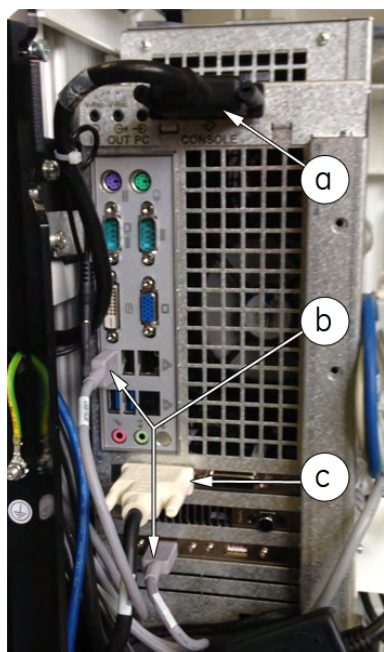


Figure 7-26 cable minimum configuration (BT15)

## 7.9 Troubleshooting Trees, Instructions and Tech Tips

### Content in this section

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<i>7.9.2 Noise disturbs the Image</i> -----	7-23
<i>7.9.3 Trackball - Malfunction</i> -----	7-24
<i>7.9.4 Printer Malfunction</i> -----	7-25
<i>7.9.5 Monitor Troubleshooting</i> -----	7-26
<i>7.9.6 DVD/CD-Drive Tests</i> -----	7-27
<i>7.9.7 Network Troubleshooting</i> -----	7-30
<i>7.9.8 Tech Tips</i> -----	7-31

### 7.9.1 System does not boot up

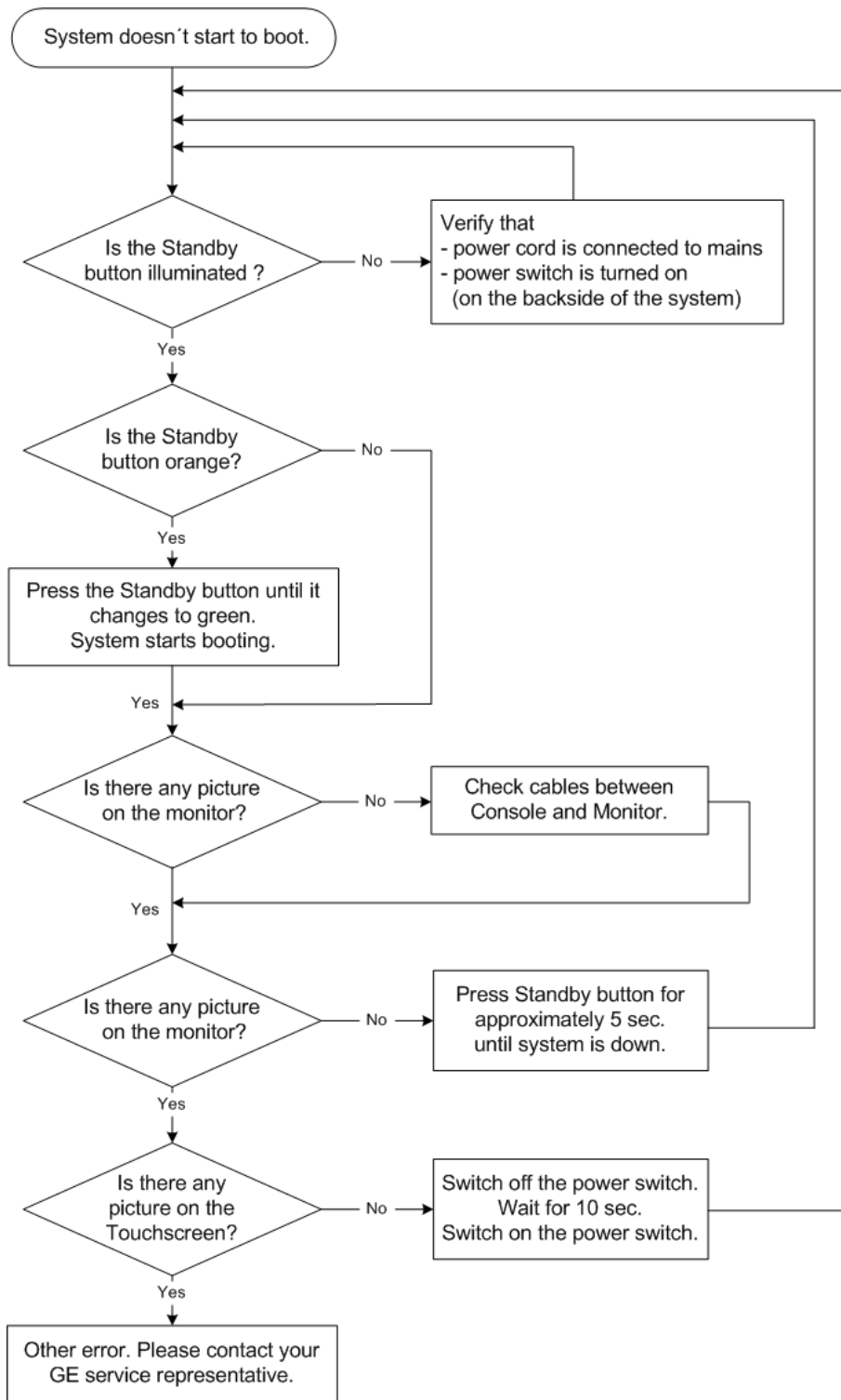


Figure 7-27 System does not start to boot up - Troubleshooting



## 7.9.2 Noise disturbs the Image

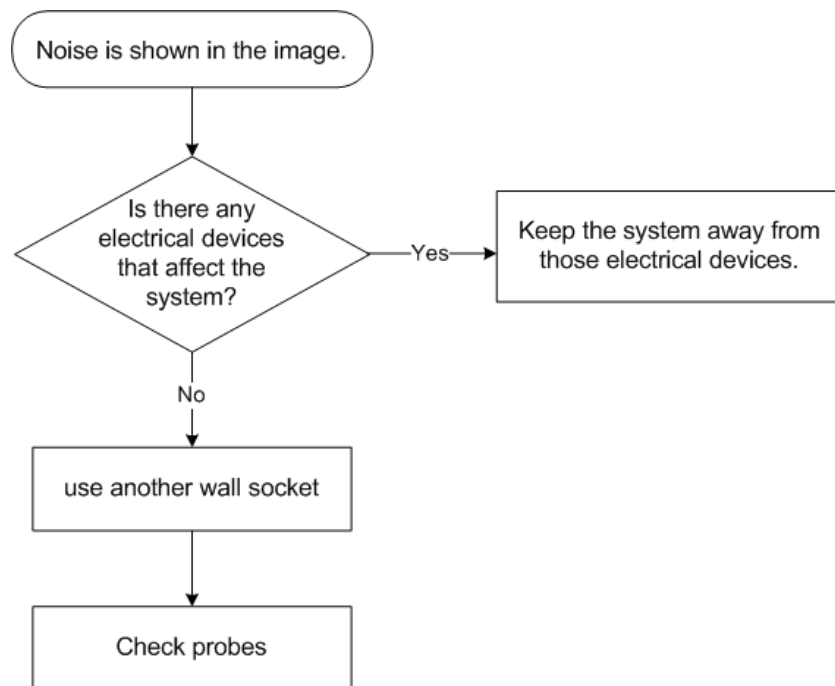


Figure 7-28 Noise disturbs the Image - Troubleshooting

### 7.9.3 Trackball - Malfunction

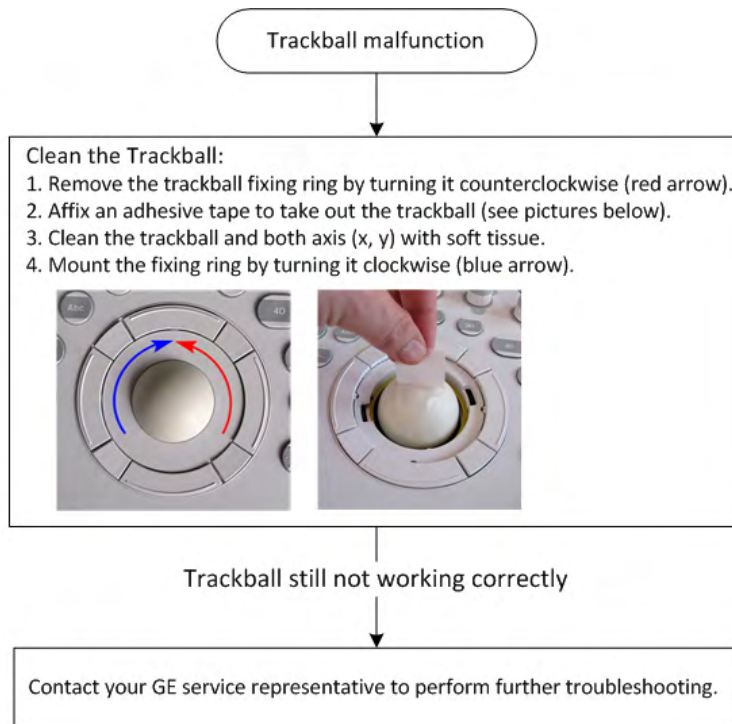


Figure 7-29 Trackball - Malfunction



Connect an USB-Mouse to one of the USB-Connectors of the Voluson E-Series system (the USB connectors beside the DVD-Drive are recommended). So the system remains operable until the trackball problems are solved.

## 7.9.4 Printer Malfunction

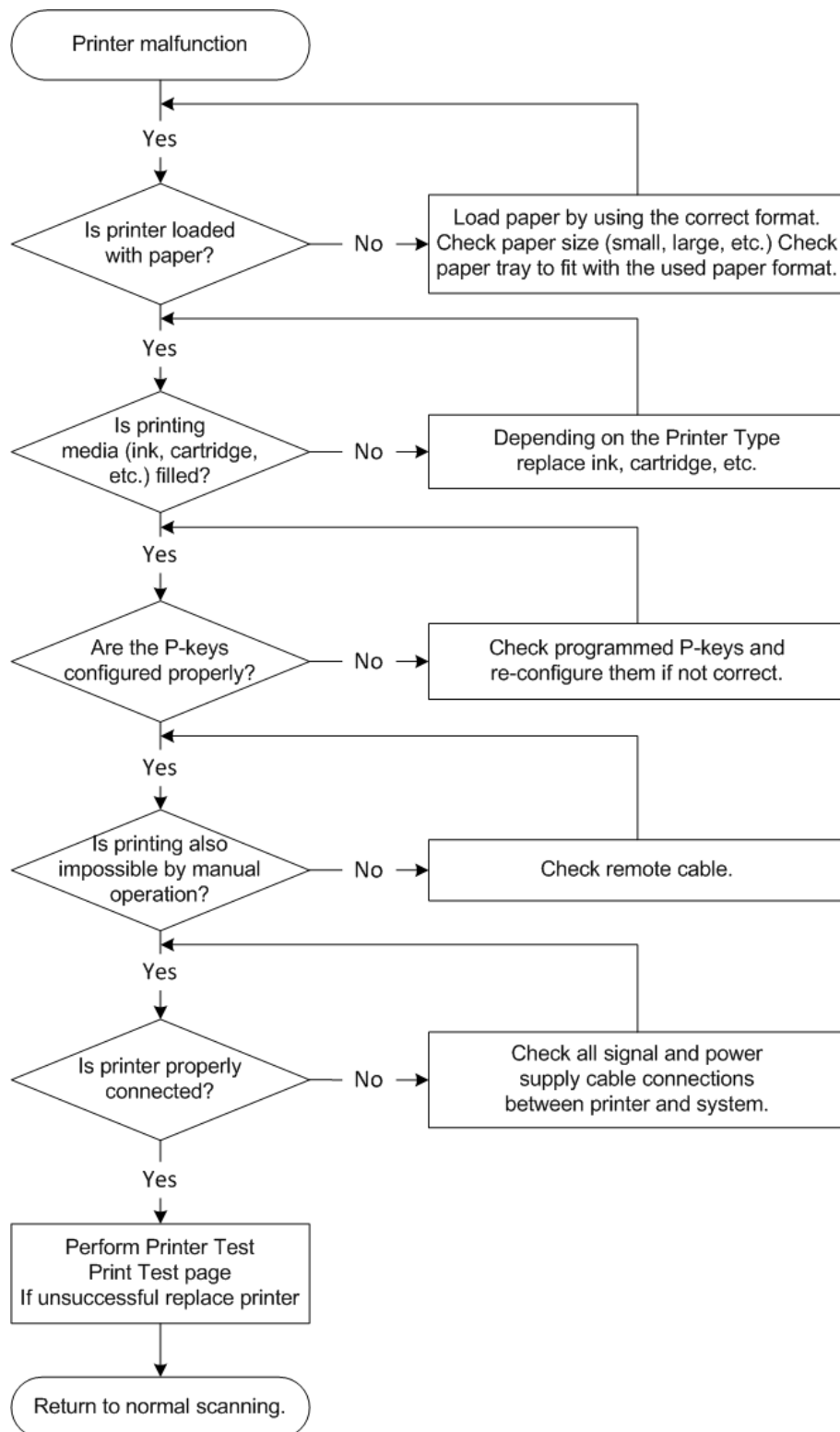


Figure 7-30 Printer Malfunction

### 7.9.5 Monitor Troubleshooting

Fault symptom	Check these items
No image	Check the power cord is properly connected.
	Check the video cable is properly connected.
	Check no pins of the video cable are bent.
	Check if video is present on backplane.
Picture is fuzzy	Adjust the picture contrast and picture brightness. Some SVGA cards having an excessive video output level will cause a fuzzy picture at the maximum contrast level.
Video test patterns are not clear, bright, parallel or square	Replace the monitor.

**Note**

*For further details see [Section 6.2 "LCD Monitor Adjustment"](#) on page 6-2.*

## 7.9.6 DVD/CD-Drive Tests

### Content in this section

7.9.6.1 Export images from "Local Archive" to DVD/CD+R/RW ----- 7-27

7.9.6.2 Record Spectral Doppler display ----- 7-29

### 7.9.6.1 Export images from "Local Archive" to DVD/CD+R/RW

1. Insert an empty, formatted DVD/CD+R/RW disc into the drive. At a DVR-Drive use a DVD+RW only!
2. Enter "Patient Archive" by pressing the **Patient ID** key on the control console.



Figure 7-31 Patient Archive - ARCHIVE

3. On the right side of the screen select **Archive (1)**.
4. If not already selected, choose "Local Archive" from the "Source" pull-down menu (2).
5. Select an exam with images (3).

6. Export images of the selected exam to DVD/CD+R/RW



Figure 7-32 Export images to DVD/CD - \*.4dv format

- a. Click on **Export**.
- b. If not already selected, choose "DVD/CD" resp. "DVD Rec" from the pull-down menu.
- c. Enter "File name".
- d. Select any Voluson Format (\*.4dv) from the pull-down menu.
- e. Click the **Save** button.

**After successful export, perform an import of images**

1. On the right side of the screen select **Import**.
2. Choose "DVD/CD" resp. "DVD Rec" from the "Source" pull-down menu.
3. Select the folder where the file was stored and the file name.
4. Click **Open** to display the images.

**Limits:** All images, which have been exported to DVD/CD+R/RW are visible.



Press the **Eject** key on the alphanumeric keyboard and remove the media from the drive.

### 7.9.6.2 Record Spectral Doppler display

**Note** The option **SW DVR** (Software Digital Video Recording) is required to perform this test.

1. Insert an empty, formatted DVD/CD+R/RW disc into the drive.

**Note** If you use an unformatted DVD+RW, recording is impossible! To format the DVD, press the **DVD** key and then select the **Format** button.

2. Press the **PW** key on the control panel to start PW preparation mode.
3. Activate Doppler motion display by pressing the **right/left trackball key**.
4. Press the **DVD** key on the control console once to display the remote control menu.

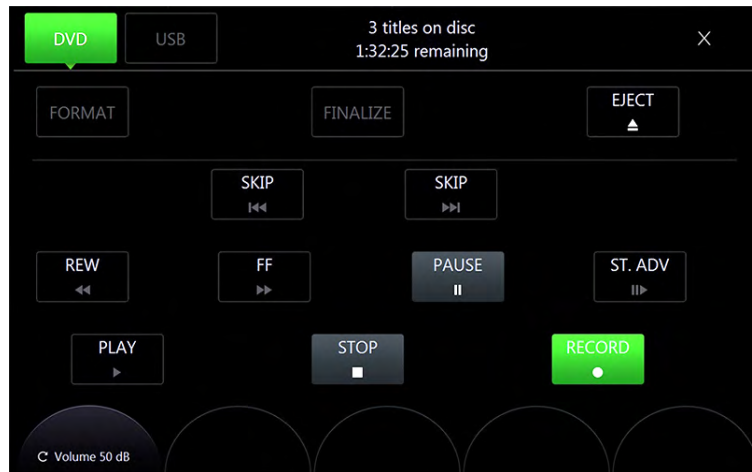




Figure 7-33 Remote Control menu

5. In the remote menu touch the **Record** button to record a Doppler motion display (e.g., of the *Carotid*).
6. Touch the **Stop** button to stop recording.
7. Touch the **Finalize** button. The recorded motion sequence is stored on DVD.
8. Touch the **Play** button to play-back the recorded Doppler motion sequence. With the **Skip** buttons the next/previous sequence can be selected.

**Limits:** The recorded Doppler motion sequence is running. The audio signal of the arterial flow can be heard in the loudspeaker(s).

## 7.9.7 Network Troubleshooting





### 7.9.7.1 No Connection to the Network at all

	<b>Gray</b> = Cable disconnected or no network signal on a connected cable.
	<b>Green</b> = Cable connected to a network. <b>Does not imply</b> proper network settings.

1. Check that the network cable between the Voluson E-Series system and the wall network is connected and well seated in both ends. (Use a network cable that is known to be OK.)
2. Connect a network cable between the system and a PC by either using a hub or a cross-over cable. Try to ping from system to IP address on PC. If OK, hardware connection inside the system is OK.

### 7.9.7.2 GE remote service connection

**Note** *Visual information about GE remote service status is shown in the status area on the right bottom of the screen.*

	<b>Gray</b> = Idle State	Remote access is inactive.
	<b>Yellow</b> = Access pending	Remote Access connection is active, but Disruptive Mode and Virtual Console Observation (VCO) is not yet enabled.
	<b>Red</b> = Disrupted State	Remote Access is active. All processes [UL_VNC and UL_CSD] are active. In this state the Voluson E-Series system should NOT be used clinically.
	<b>Gray + envelope</b>	New Software Update Package is available for download and installation. Operation see <a href="#">Section 8.2.3 "Software Update Package - Download/Installation Procedure"</a> on page 8-9 .



## 7.9.8 Tech Tips

### Content in this section

7.9.8.1 Storing SonoView images to Voluson E-Series systems ----- 7-31

### 7.9.8.1 Storing SonoView images to Voluson E-Series systems

**Issue:** Storing SonoView images from Voluson 730/Expert/Pro/ProV to Voluson E-Series systems.

**Cause:** Archive is different (no SonoView on Voluson E-Series systems).

**Solution:**

1. Perform SonoView backup on Voluson 730/Expert/Pro/ProV to external hard disk (USB) or DVD.
2. Import file "V730.mdb" from external hard disk (USB) or DVD to your Voluson E-Series system.

#### Procedure

1. Connect the external hard disk (USB) or insert the DVD with the SonoView backup to the Voluson E-Series system.
2. Enter "Patient Archive" by pressing the **Patient ID** key on the control console.



Figure 7-34 Patient Archive -ARCHIVE

3. On the right side of the screen select **Archive** (1).
4. Click on **Import** (2). The "Open File" window appears.
5. If not already selected, choose the proper drive from the "Look In" pull-down menu (3).
6. Change the "File of type" field to **V730Format (v730.mdb)** (4).
7. Browse for the folder where the SonoView Backup was stored.
8. Select the file **v730.mdb** and then click on **Open** (5).

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# Chapter 8

## Replacement Procedures

*This chapter contains replacement procedures for different modules and their subsystems.*

**Note** *The Manpower, time and **Tools** indicated in the Sub-sections include all requirements from Preparations to Installation Procedures.*



**Warning:** DO NOT touch any boards with integrated circuits prior to taking necessary ESD precautions.

1. When installing boards, ESD may cause damage to a board. ALWAYS connect yourself, via an arm-wrist strap, to the advised ESD connection point located on the rear of the system (to the right of the power connector).
  2. Follow general guidelines for handling of electrostatic sensitive equipment.
- 



**Warning**

No covers or panels should be removed from the system (high-voltage risk). Service and repairs must only be performed by authorized personal. Attempting do-it-yourself repairs invalidate warranty and are an infringement to regulations and are inadmissible acc. to IEC 60601-1.

---



The Waste of Electrical and Electronic Equipment (WEEE) **must not be disposed as unsorted municipal waste** and must be collected separately. Please contact the manufacturer or other authorized disposal company for information concerning the decommission of your equipment.

**Content in this chapter**

8.1 Returning/Shipping System, Probes and Repair Parts ----- 8-2

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8.16 Replacement of Fuses at Power Supply Module (RSP) ----- 8-24

8.17 Replacing optional Peripherals / How to mount Peripherals at a later date ----- 8-25

**8.1 Returning/Shipping System, Probes and Repair Parts**

When returning or shipping the Voluson E-Series system in the original packaging:

- system must be lowered to its minimum height with monitor flapped down
- the control console has to be centered and locked in “unextended” position

**Note** *For control console positioning see Section 6.3 on page 6-4 .*

Equipment being returned must be clean and free of blood and other infectious substances.

GE policy states that body fluids must be properly removed from any part or equipment prior to shipment. GE employees, as well as customers, are responsible for ensuring that parts/equipment have been properly decontaminated prior to shipment. Under no circumstance should a part or equipment with visible body fluids be taken or shipped from a clinic or site (for example, body coils or and ultrasound probe).

The purpose of the regulation is to protect employees in the transportation industry, as well as the people who will receive or open this package.

**Note** *The US Department of Transportation (DOT) has ruled that “items what were saturated and/or dripping with human blood that are now caked with dried blood; or which were used or intended for use in patient care” are “regulated medical waste” for transportation purpose and must be transported as a hazardous material.*

**Note** *The user/service staff should dispose of all the waste properly, per federal, state, and local waste disposal regulations.*

The Voluson E-Series system is not meant to be used for long-term storage of patient data or images. The user is responsible for the data on the system and a regular backup is highly recommended.

If the system is sent for repair, please ensure that any patient information is backed up and erased from the system before shipping. It is always possible during system failure and repair to lose patient data. GE is not responsible for the loss of this data.

If PHI (Patient Healthcare Information) data needs to be sent to GE employees for service purposes, GE will ascertain agreement from the customer. Patient information shall only be transferred by approved service processes, tools and devices restricting access, protecting or encrypting data where required, and providing traceability in the form of paper or electronic documents at each stage of the procedure while maintaining compliance with cross-border restrictions of patient information transfers.

## 8.2 System software - Installation/Upgrade procedure

### **Manpower**

One person ~ 1 hour (depends on contents of System DVD, peripherals, etc.)

### **Tools**

System DVD

## 8.2.1 Before the Installation/Upgrade Procedure

Before performing the Software Upgrade:

- perform an initial verification of the system and its functions
- check the current Application Software version and the installed Options as described in [Section 8.2.1.1 on page 8-4](#)
- if the currently installed software has to be upgraded by a newer version, calculate new software specific “Permanent key” in OKOS. Please contact your local distributor or GE service representative to get the necessary key.

**Note** *It is **NOT necessary** to save Full System Configuration (Full Backup) prior to the upgrade. All existing User Programs, 3D/4D Programs and Auto Text settings remain untouched!*

### 8.2.1.1 Check vital System Setup data

1. Press the **Utilities** key on the control console.
2. In the “Utilities” menu touch the **Setup** button to invoke the setup desktop on the screen.
3. On the right side of the screen select **Administration** and then click the **System Info** tab.
4. Check the currently installed Software/Hardware version of the Voluson E-Series system.

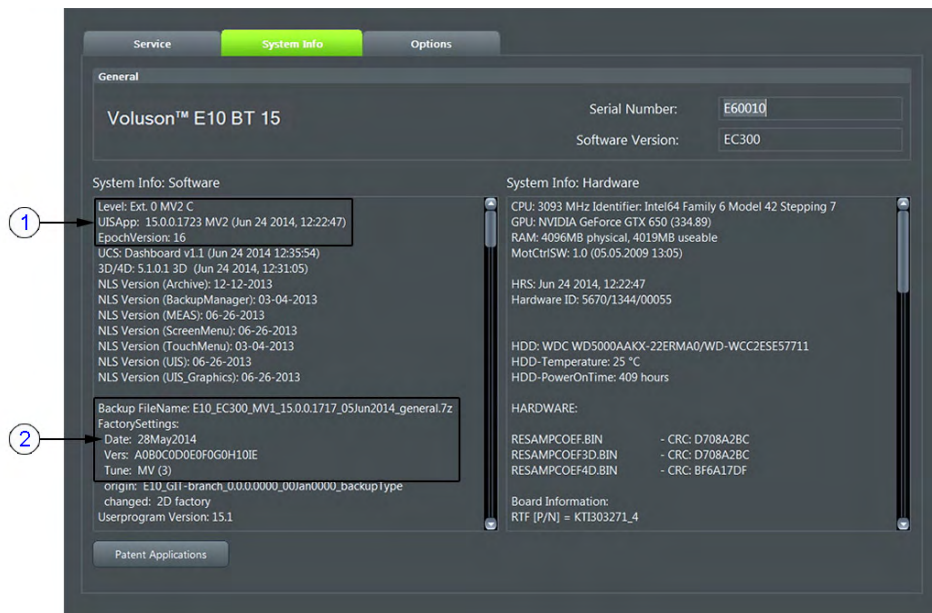


Figure 8-1 Version check: System Setup - Administration - System Info page

- 1 currently installed Ultrasound **Application Software version**
- 2 Date of Factory Settings

5. Select the **Option** tab to see which Options (and Application Packages) are installed.

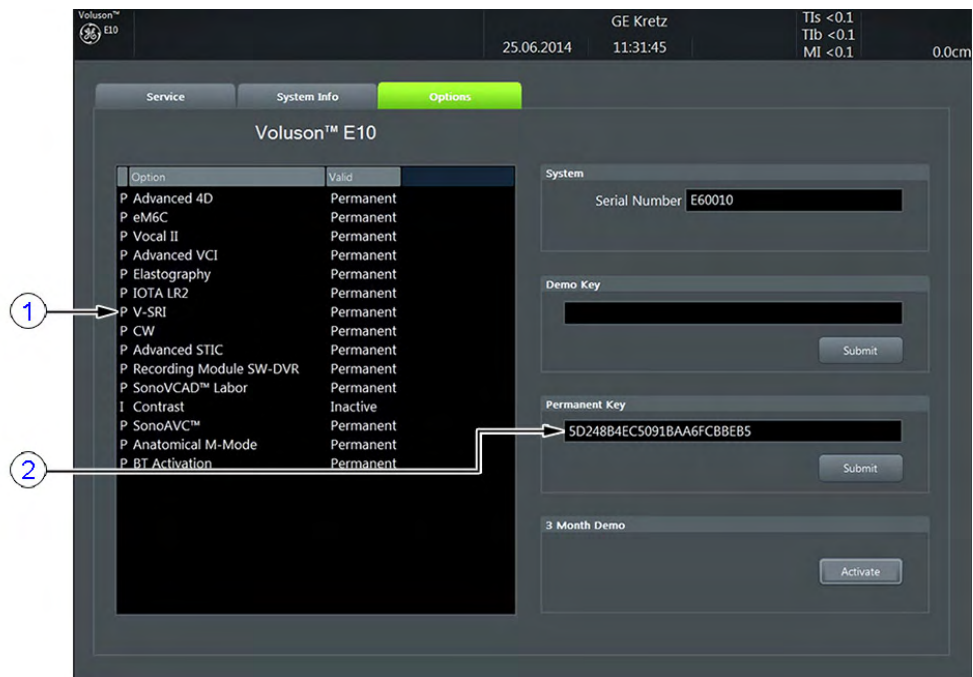


Figure 8-2 System Setup - Administration - Options page

- 1 **D = Demo** (Option is activated for demo and expires at date shown in the "Valid" column)  
**I = Inactive** (Option is not activated)  
**P = Permanent** (Option is permanently activated, i.e. purchased)
- 2 Permanent Key

**Note**

*Please print out the options page or write down the "Permanent Key".*

*If the currently installed software has to be upgraded to a newer version, and the system has to be updated via the **FMI from DVD** button, a new software specific "Permanent key" is required. Please contact your local distributor or GE service representative.*

## 8.2.2 System Software - Installation Procedure (FMI from DVD)

The system software installation procedure starts with saving and recording the settings present on the system (silent “Rollback”). Then the new software is written to the hard disk using the System DVD. Application Settings are automatically updated, to match with new Software version.

Existing User Programs, 3D/4D Programs and Auto Text remain unaffected! Afterwards the new software is configured such that it is integrated again in its environment.

**Note** For more detailed information, see *Section 5.14.3.2.1 "FMI from DVD" on page 5-40*.

1. Perform Preparations as described in *Section 8.2.1 on page 8-4*.
2. If not already done, disconnect all external USB devices (except DVD drive).
3. Insert the System DVD into the drive.
4. **Restart** the system. (Turn system OFF and then back ON.)

**Note** *If the system boots into LINUX, the “Boot priority order” in BIOS is incorrect. In this case, cancel the software installation procedure (select Exit/Reboot by means of the [Arrow] keys (right, left, up, down) and the [Enter] key on the keyboard) and then contact your service representative.*

5. Press the **Utilities** key on the control console.
6. In the “Utilities” menu touch the **Setup** button to invoke the setup desktop on the screen.
7. On the right side of the screen select **Administration** and then click the **Service** tab.
8. Type in the password **SHE** and click **Accept**.

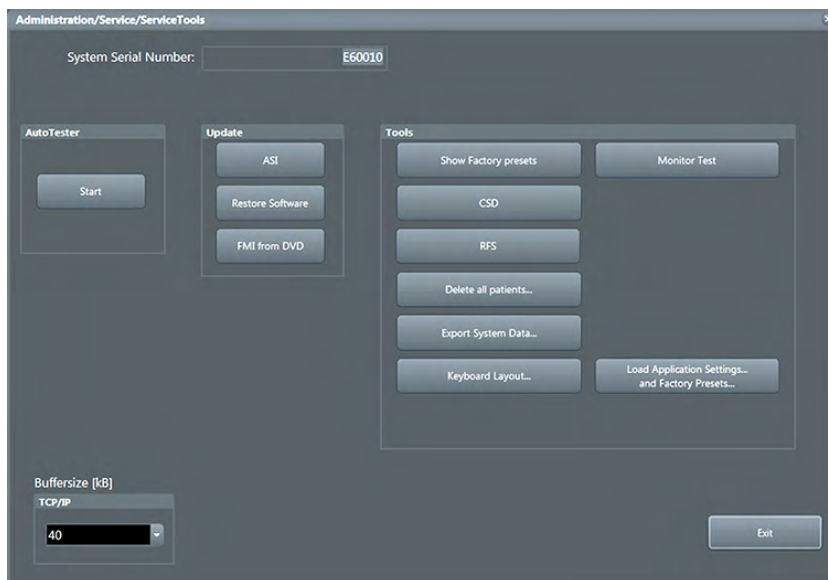


Figure 8-3 Service Tools

9. Click the **FMI from DVD** button for updating the System Software.
10. Verify that only the DVD drive is connected to the system, then click **OK**.

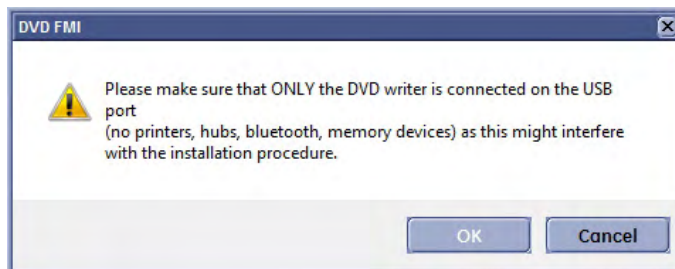


Figure 8-4 Verify that USB devices are disconnected, then click OK

11. To start update procedure click **Yes**.  
The system saves Full Backup in silent mode on R:, then it reboots into LINUX. A silent “Rollback” image from C:\ is stored on R:\. After executing all LINUX commands, the system reboots again.

**Note** *If the currently installed software has to be upgraded to a newer version, a new software specific “Permanent key is required.*



12. Enter the appropriate "Permanent Key" (calculated in OKOS; <http://3.187.187.9/OKOS>), select **OK** and confirm with **Enter**.

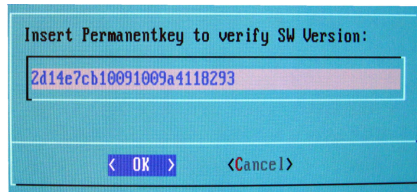


Figure 8-5 enter Permanent Key

If the entered Permanent key is correct, following window appears, confirm with **Enter**.

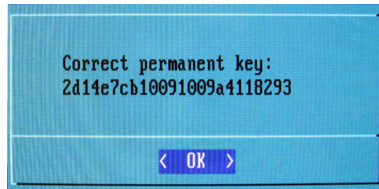


Figure 8-6 confirm Permanent Key

13. Check disk is performed automatically - restart.

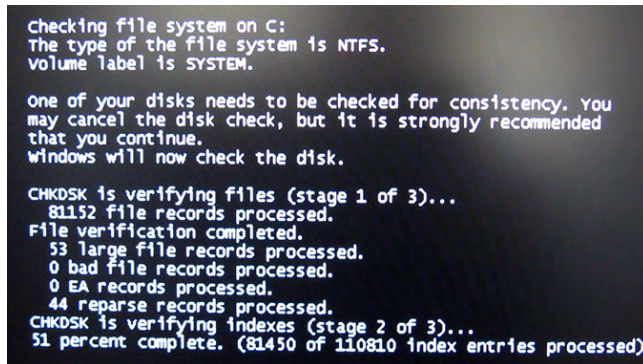


Figure 8-7 Check disk is performed automatically

14. 3 dots (one after the other) appear on the screen.
15. Booting **auto** ....



Figure 8-8 Boot screen - auto

- Updating will take some time ....

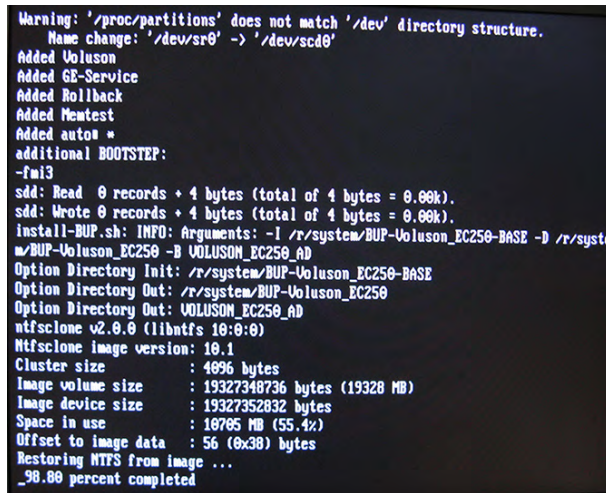


Figure 8-9 Please wait ...

- Please wait until all processes are finished (100 percent completed).
- The system is rebooting into windows (Boot screen - Voluson).

**Note**

An automated process was developed to install the required software parts, perform check disk, remap drive letters and match settings. *During this process the system might reboot several times!*

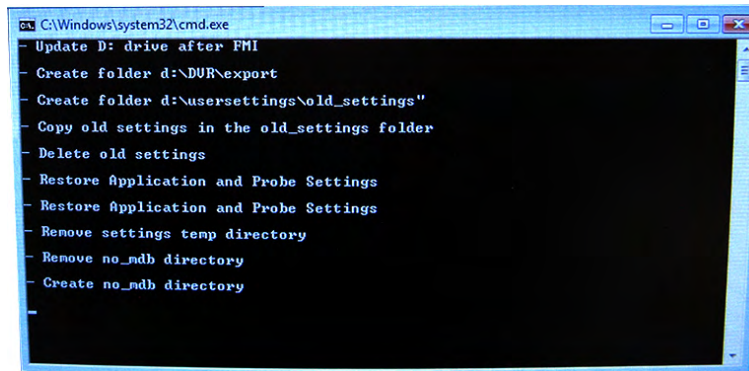


Figure 8-10 automatic processes are running

- Please wait until all processes are finished. Finally the 2D screen is displayed on the monitor.
- If the BT warning dialog appears, enter proper "Permanent key" previously recorded and click **Submit**.

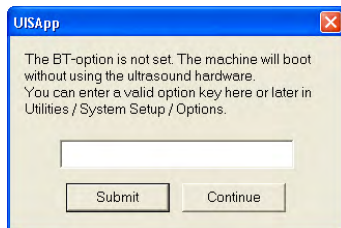


Figure 8-11 enter Permanent Key

- Remove the System DVD from the DVD/CD+R/RW Drive drive.
- If the Touch panel is not working after first boot up, please **shutdown** the system; then boot up again.

**Note**

After turning off a system, wait at least 10 seconds before turning it on again. The system may not be able to boot if power is recycled too quickly.

- Reconnect the external devices, install all the printers and adjust the printer settings as described in [Section 3.6 "Printer Installation" on page 3-31](#).
- Check and match Printer Remote Control selection in the *Setup - Connectivity - Button Configuration* page.
- Confirm date and time setting in the *Setup - General Settings - General Settings* page.
- Perform Software and Functional checks as described in [Section 8.3 on page 8-13](#).

## 8.2.3 Software Update Package - Download/Installation Procedure

### Overview



This icon (at right bottom of the screen) indicates that a new Software Update Package is available for download and installation.



An **InSite permanent user is required** for automatic system error reporting to the digital service network; see [Section 3.13.8.1 "How to create an InSite permanent User" on page 3-65](#).

The system software installation procedure starts with saving and recording the settings present on the system (silent "Full Backup" and "Rollback"). Then the new software is written to the hard disk. Application Settings are automatically updated, to match with new Software version.

Existing User Programs, 3D/4D Programs and Auto Text remain unaffected! Afterwards the new software is configured such that it is integrated again in its environment.

### Update Procedure

1. Perform Preparations as described in [Section 8.2.1 on page 8-4](#).
2. If not already done, disconnect all external USB devices (except DVD drive).
3. Press the **ON/OFF** Standby button on the control console.
4. In the displayed screen click **Download**.

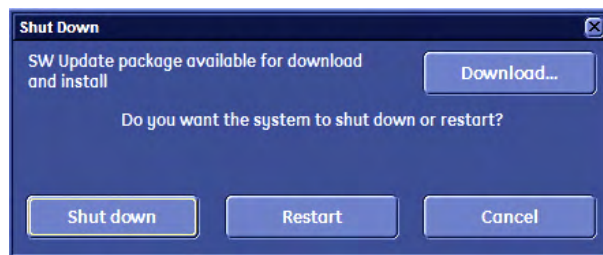


Figure 8-12 download SW update package

5. Download takes some time; please wait. (Download may be paused by means of the **Pause** button.)
6. When download is finished, click **Install**.

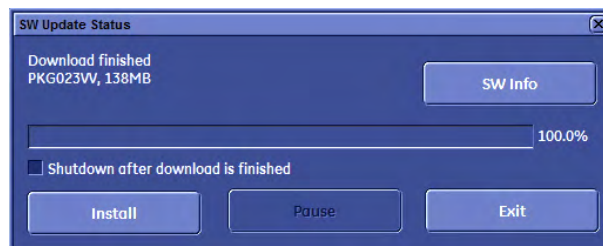
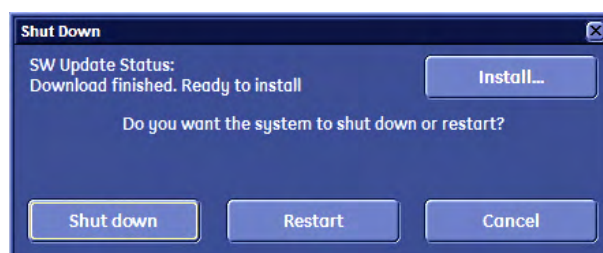


Figure 8-13 download finished - click Install

### Note

*Installation may take up to one hour. DO NOT interrupt the installation!*

*If you want to install the new software later, click **Exit**. Installation can be resumed by clicking **Install** (in the Shutdown window).*



7. After clicking **Install**, the SW update procedure starts.

The system saves Full Backup in silent mode on R:, then it reboots into LINUX.

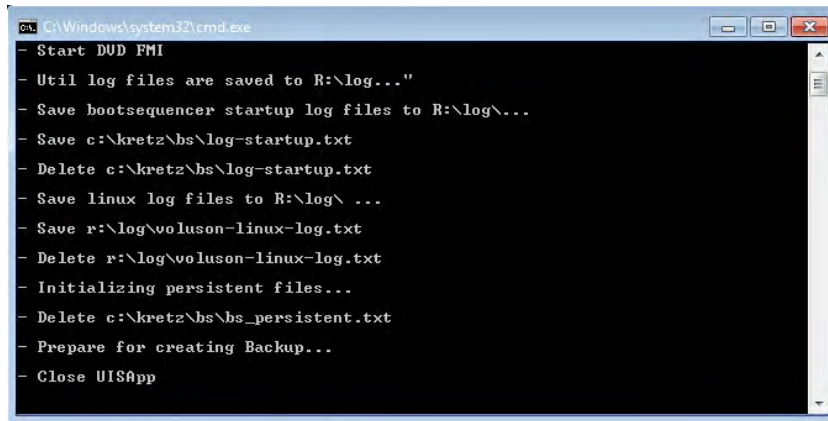


Figure 8-14 installation in progress

8. Check disk is performed automatically - restart.

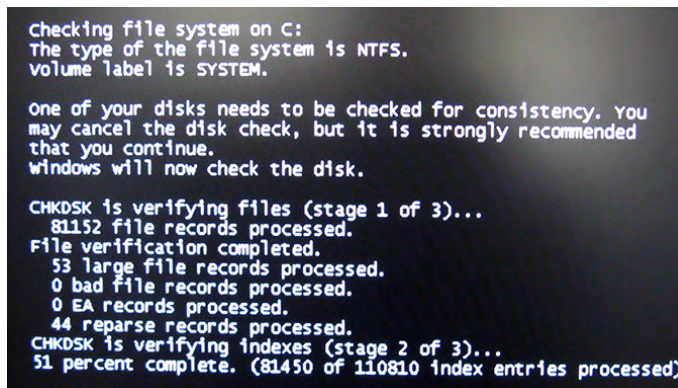


Figure 8-15 Check disk is performed automatically

A silent "Rollback" image from C:\ is stored on R:\. After executing all LINUX commands, the system reboots again.

9. 3 dots (one after the other) appear on the screen.
10. Booting **auto** ....



Figure 8-16 Boot screen - auto

11. Updating will take some time ....

First the image is saved to R:\ (*Saving NTFS to image ....*); then the image is restored from R:\ (*Restoring NTFS from image ....*).

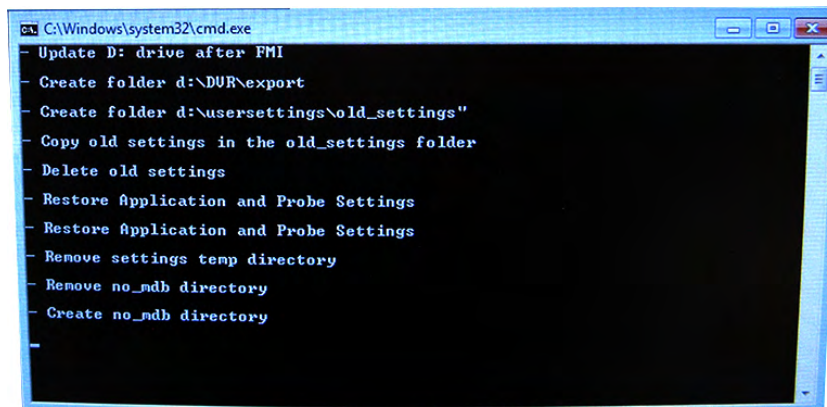
```
Warning: '/proc/partitions' does not match '/dev' directory structure.
Name change: '/dev/sr0' -> '/dev/scd0'
Added Voluson
Added GE-Service
Added Rollback
Added Newtest
Added auto! *
additional BOOTSTEP:
-fmi3
sdd: Read 0 records + 4 bytes (total of 4 bytes = 0.00k).
sdd: Wrote 0 records + 4 bytes (total of 4 bytes = 0.00k).
install-BUP.sh: INFO: Arguments: -I /r/system/BUP-Voluson_EC250-BASE -D /r/system/BUP-Voluson_EC250 -B VOLUSON_EC250_AD
Option Directory Init: /r/system/BUP-Voluson_EC250-BASE
Option Directory Out: /r/system/BUP-Voluson_EC250
Option Directory Out: VOLUSON_EC250_AD
ntfscclone v2.0.0 (libntfs 10:0:0)
Ntfscclone image version: 10.1
Cluster size      : 4096 bytes
Image volume size : 19327348736 bytes (19328 MB)
Image device size : 19327352832 bytes
Space in use      : 10765 MB (55.4%)
Offset to image data : 56 (0x38) bytes
Restoring NTFS from image ...
_98.00 percent completed
```

Figure 8-17 Please wait ...

12. Please wait until all processes are finished (100 percent completed).  
 13. The system is rebooting into windows (Boot screen - Voluson).

**Note**

*An automated process was developed to install the required software parts, perform check disk, remap drive letters and match settings. **During this process the system might reboot several times!***



```
C:\Windows\system32\cmd.exe
- Update D: drive after FMI
- Create folder d:\DUR\export
- Create folder d:\usersettings\old_settings"
- Copy old settings in the old_settings folder
- Delete old settings
- Restore Application and Probe Settings
- Restore Application and Probe Settings
- Remove settings temp directory
- Remove no_mdb directory
- Create no_mdb directory
```

Figure 8-18 automatic processes are running

14. Please wait until all processes are finished.

Finally the 2D screen with the "New Software Verification" report is displayed on the monitor.

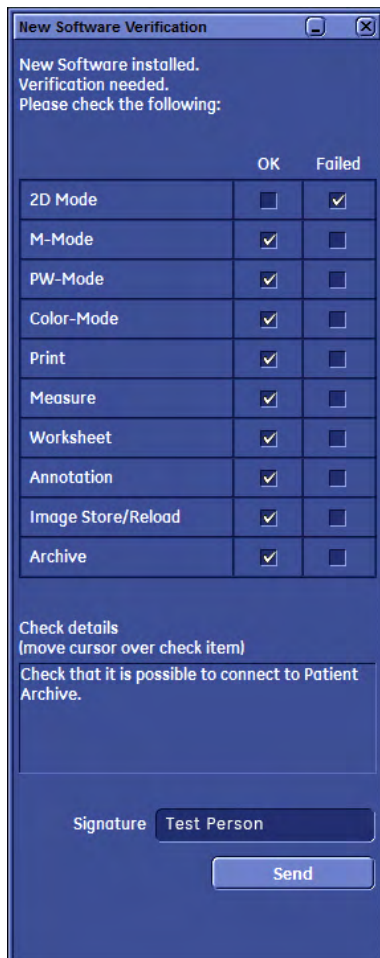


Figure 8-19 New Software Verification

15. Reconnect the external devices, install all the printers and adjust the printer settings as described in [Section 3.6 "Printer Installation" on page 3-31](#).
16. Check and match Printer Remote Control selection in the *Setup - Connectivity - Button Configuration* page.
17. Confirm date and time setting in the *Setup - General Settings - General Settings* page.
18. Perform a check of all modes and features listed. (Move the cursor over the feature name to get information how to check.)
19. When all features are **OK** enter your signature and then click **Send**; see: [Figure 8-19 above](#).

**Note**

*If one feature gets "Failed", rollback the installation (restore the previously used system configuration). For more detailed information, see [Section 5.15.1.3 on page 5-42](#).*

## 8.3 Software and Functional Checks after Installation/Upgrade procedure

1. Press the **Utilities** key on the control console.
2. In the "Utilities" menu touch the **Setup** button to invoke the setup desktop on the screen.
3. On the right side of the screen select **Administration** and then click the **Options** tab.
4. Verify the correct settings of the **Options** page; see: [Figure 8-2 on page 8-5](#) . If necessary, customize the settings according to the printout.
5. Click the **System Info** tab.

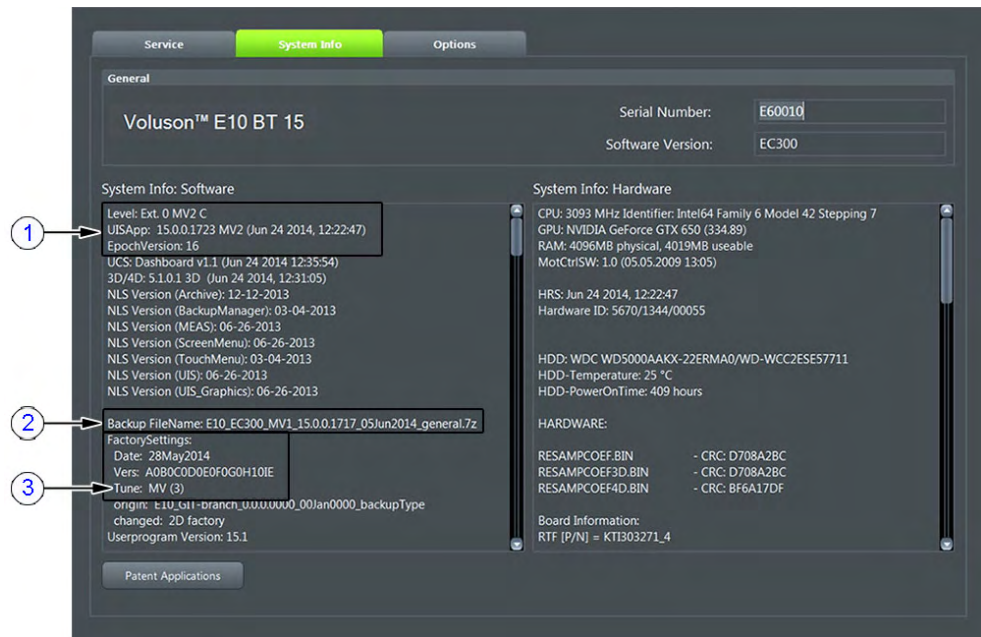


Figure 8-20 System Setup - Administration - System Info page

- |   |  |   |  |
|---|--|---|--|
| 1 | Ultrasound <b>Application Software version</b> | 3 | <b>Tune version</b> of Application presets |
| 2 | Backup File Name                               |   |  |

6. Check the Application Software version.
7. Check that the Tune version of the Application presets match the Application Software version.

### Note

*It is neither required nor advisable to reload a previously stored "Full Backup" after a software upgrade that was performed by means of the **FMI from DVD** button! If the Tune version does not match the Application Software version, a warning message appears whenever booting up the system. In this case, it is essential to load the **proper Application Settings** (image presets), adapted for the installed software version. Refer to: [Section 5.14.3.10 "Load Application Settings" on page 5-41](#) .*

8. Perform basic functional checks to ensure system is functioning normally.
9. Check Service Connectivity; if required, perform InSite Checkout. i.e., Service platform has to be configured properly; see [Section 7.6.5 "Configuration" on page 7-15](#) .

## 8.4 Image Settings Only - Loading Procedure

### Introduction

The image settings contain:

- Application Settings
- 2D Factory and 2D User Presets
- 3D/4D Factory and 3D/4D User Presets
- Annotation Presets
- Scan Assistant Configuration
- Measure Configuration
- Biopsy Lines

### Loading Procedure

see: [Section 4.4.2 "Load Small Backup \(Scan Settings\)" on page 4-13](#)

## 8.5 Full Backup (Full System Configuration) - Loading Procedure

### Introduction

The Full Backup contains following data:

- User Settings (databases and files containing User Programs, 2D/3D/4D Programs, Auto Text entries, gray curves and complete System settings such as language, time/date format, etc.)
- Measure Configuration (user specific measure setup settings)
- Patient Archive (database containing patient demographic data and measurements) - **no images**
- Options (Permanent Key that is specific for enabled software options and Demo Key)
- Image Transfer Configuration (DICOM settings e.g., DICOM servers, AE Title, Station Name, etc.)
- Network Configuration (network settings including the computer name)
- Service Platform (state of the Service Software)

### Loading Procedure

see: [Section 4.4.4 "Load Full System Configuration \(Full Backup\)" on page 4-18](#)

## 8.6 Image Archive - Loading Procedure

### Introduction

A backup of the Image Archive contains the Patient Archive (database containing patient demographic data and measurements) + **images**.

### Loading Procedure

see: [Section 4.4.6.2 "Load Image Archive" on page 4-23](#)



## 8.7 Replacement or Activation of Options

Following SW Options are available:

Voluson E6 EC300 (BT15) systems	Voluson E8 EC300 (BT15) systems	Voluson E10 EC300 (BT15) systems
Advanced 4D	Advanced 4D	Advanced 4D
VOCAL II	VOCAL II	eM6C (E4D Activation)
HD <i>live</i>	HD <i>live</i> Silhouette	VOCAL II
Advanced VCI (Volume Contrast Imaging)	Advanced VCI (Volume Contrast Imaging)	Advanced VCI (Volume Contrast Imaging)
Elastography (incl. Elastography Analysis)	Elastography (incl. Elastography Analysis)	Elastography (incl. Elastography Analysis)
CW (Continuous Wave Doppler)	CW (Continuous Wave Doppler)	V-SRI
STIC (Spatio-Temporal Image Correlation)	Advanced STIC (Spatio-Temporal Image Correlation)	CW (Continuous Wave Doppler)
Recording Module SW-DVR	Recording Module SW-DVR	Advanced STIC (Spatio-Temporal Image Correlation)
SonoVCAD <i>labor</i>	SonoVCAD <i>labor</i>	Recording Module SW-DVR
Contrast (Coded Contrast Imaging)	Contrast (Coded Contrast Imaging)	SonoVCAD <i>labor</i>
SonoVCAD <i>heart</i>	SonoAVC (Sono Automated Volume Count)	Contrast (Coded Contrast Imaging)
SonoAVC (Sono Automated Volume Count)	Anatomical M-Mode	SonoAVC (Sono Automated Volume Count)
Anatomical M-Mode		Anatomical M-Mode

**Note** *Additional options are not yet implemented in the Voluson E-Series system. For more details, see: [Section 5.1.4 "Description of Software Options" on page 5-12](#)*



It might be possible that some probes, options or features are NOT available

- in some countries.
- at the time of release of this Service Manual.

### 8.7.1 How to activate Options by means of a "Demo Key" or a "Permanent Key"

1. Press the **Utilities** key on the control console.
2. In the "Utilities" menu touch the **Setup** button to invoke the setup desktop on the screen.
3. On the right side of the screen select **Administration** and then click the **Option** tab.

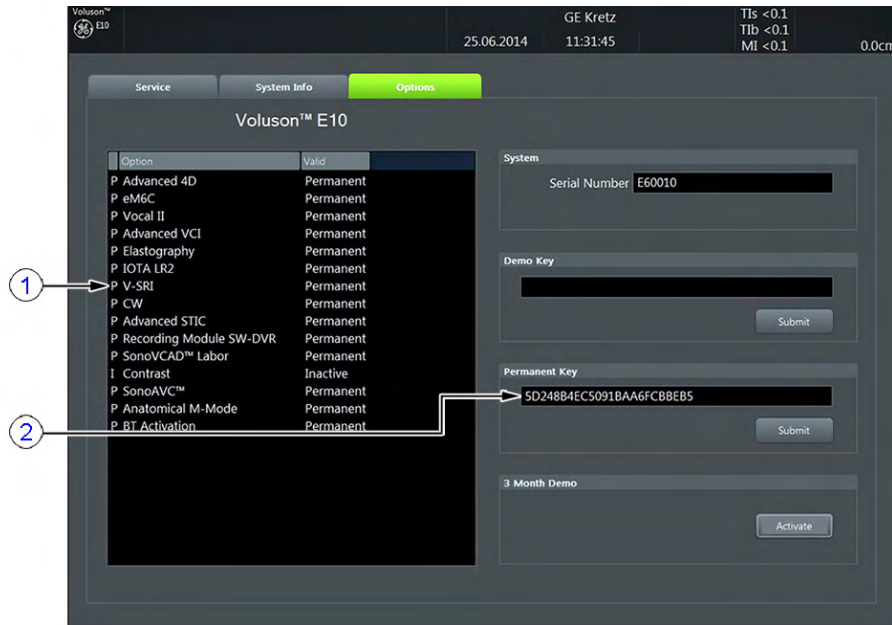


Figure 8-21 Setup - Administration - Options page (e.g., Voluson E10)

- 1 **D = Demo** (Option is activated for demo and expires at date shown in the "Valid" column)
- I = Inactive** (Option is not activated)
- P = Permanent** (Option is permanently activated, i.e. purchased)

2 Permanent Key

4. Position the cursor inside the input field desired and press the **right/left trackball** key.
5. If one exists, clear/edit the current Permanent Key.
6. Enter the encrypted Permanent Key with the keyboard and click on **Submit**. (Code will be checked.)
7. Click the **Save&Exit** button.

**Note** After activating a Permanent Key, restart (turn off and on) the Voluson E-Series system.

## 8.8 Replacement of Covers

### Content in this section

- 8.8.1 Replacement of Footrest Cover & Wheel Axis Cover* ----- 8-17
- 8.8.2 Replacement of Air Filter Cover* ----- 8-18

### 8.8.1 Replacement of Footrest Cover & Wheel Axis Cover

#### Manpower

One person, 1 minute

#### Tools

none

#### Preparations

1. Power Off/Shutdown the system as described in *Section 4.2.2 on page 4-4*.

#### 8.8.1.1 Footrest Cover & Wheel Axis Cover - Removal Procedure

1. For unlocking, turn the 4 quick release devices below the footrest 90°.

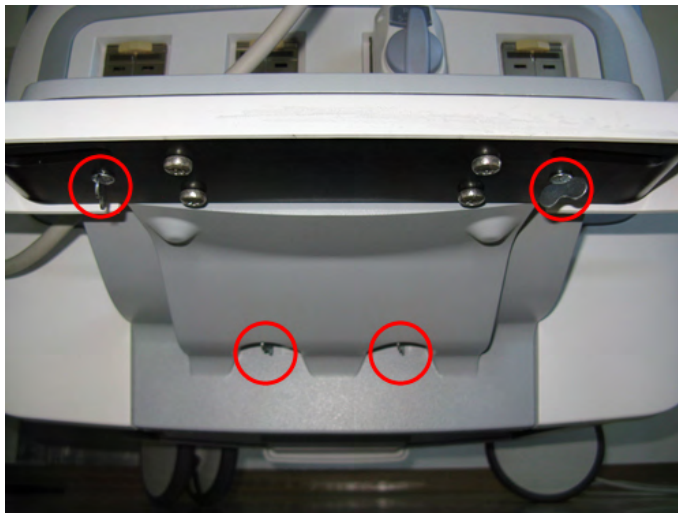


Figure 8-22 turn quick release devices 90° and remove the footrest cover

2. Remove the Footrest Cover & Wheel Axis Cover.

#### 8.8.1.2 Footrest Cover & Wheel Axis Cover - Installation Procedure

1. Place the (new) Footrest Cover & Wheel Axis Cover on the original position.
2. For locking, turn the 4 quick release devices below the footrest 90°.

## 8.8.2 Replacement of Air Filter Cover

### Manpower

One person, 1 minute

### Tools

none

### Preparations

1. Power Off/Shutdown the system as described in [Section 4.2.2 on page 4-4](#) .

### 8.8.2.1 Air Filter Cover - Removal Procedure

1. Pull the Air Filter Cover up.



Figure 8-23 pull the Air Filter Cover up

### 8.8.2.2 Air Filter Cover - Installation Procedure

1. Place the (new) Air Filter Cover on its original position.

## 8.9 Replacement of the Cable Holder

### Manpower

One person, 3 minutes

### Tools

Phillips screwdriver PH1 and PH2

### 8.9.1 Cable Holder - Replacement Procedure

1. Loosen 2 screws below the control console and then remove the Cable Holder.

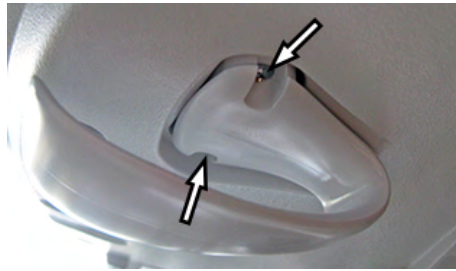


Figure 8-24 loosen 2 screws and remove cable holder

2. Place the new Cable Holder at its original position and fasten it with 2 screws.

## 8.10 Replacement of the Probe Holder (Kit)

### Manpower

One person, 1 minute

### Tools

none

### 8.10.1 Probe Holder (Kit) - Replacement Procedure

1. Simply pinch the clip and then pull out the Probe Holder to be replaced.

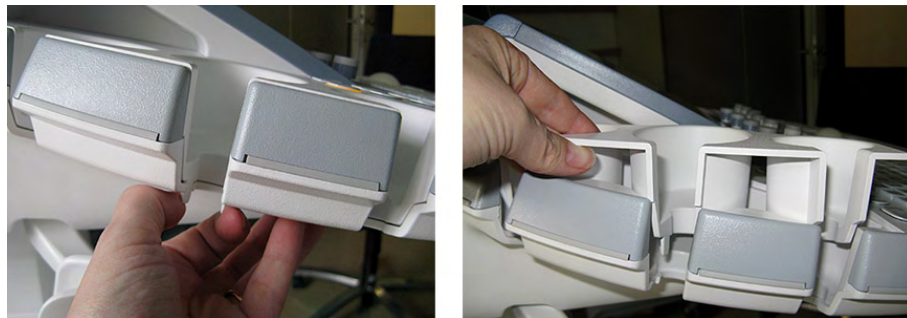


Figure 8-25 remove the probe holder

2. Insert the new Probe Holder from the kit.

## 8.11 Replacement of the Probe Holder for Endocavity probes

### Manpower

One person, 5 minutes

### Tools

Phillips screwdriver PH1 and PH2

### 8.11.1 Probe Holder (endocavity) - Replacement Procedure

1. Loosen 3 screws and then remove the Probe Holder for Endocavity probes.

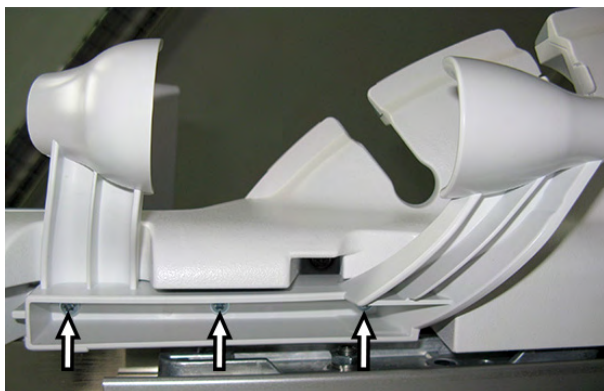


Figure 8-26 loosen screws and then remove probe holder

2. Place the new Probe Holder at its original position and fasten it with 3 screws.

## 8.12 Replacement of the Trackball Ring

### Manpower

One person, 1 minute

### Tools

none

### 8.12.1 Trackball Ring - Replacement Procedure

1. Remove the Trackball Ring by turning it counterclockwise (red arrow).

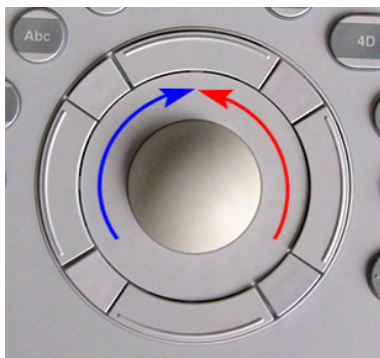


Figure 8-27 Trackball with Trackball  
"fixation" ring

2. Mount the Trackball Ring by turning it clockwise (blue arrow).

## 8.13 Replacement of Key Caps (by special native language keys)

**Note** The table in [Section 9.8 "Options and Upgrades" on page 9-21](#) shows the available Key Cap Kits. Keys to be removed depend on the (special native) language kit.

### Manpower

One person, 30 minutes

### Tools

small-sized slotted screwdriver or tweezers

### Preparations

1. Power Off/Shutdown the system as described in [Section 4.2.2 on page 4-4](#).

### 8.13.1 Key Caps - Removal Procedure

1. Place a small slotted screwdriver between the Key Cap to be removed and its neighboring Key Cap.
2. Gently lift the Key Cap, until it is completely loosened from its base.



Figure 8-28 key cap replacement

3. Remove the Key Cap.

### 8.13.2 Key Caps - Installation Procedure

1. Carefully place the appropriate Key Cap in position on the keyboard, taking care to place the plastic alignment pin in the correct position so that the Key Cap is the right way up and reads correctly.
2. Push the Key Cap down until it snaps into position.
3. Power On/Boot Up the system as described in [Section 4.2.1 on page 4-3](#).
4. Setup the Keyboard Language Layout as described in [Section 6.4 on page 6-6](#) and then type with the keyboard to check the function of each key.

## 8.14 Replacement of the Caps for Encoders and/or Joycoders

### Manpower

One person, 10 minutes

### Tools

none (poss. small-sized slotted screwdriver or tweezers)

### 8.14.1 Caps for Encoders and/or Joycoders - Replacement Procedure

1. Remove the caps for Encoders and/or Joycoders.

**Note** *Do not loose integrated metal spring in each cap.*



Figure 8-29 remove caps

2. Mount the caps for Encoders and/or Joycoders.



## 8.15 Replacement of the Caps for Hardkeys

**Note** *Replacement procedure depends on key caps that have to be replaced!*

- *If just the circle key caps have to be replaced, refer to: [Section 8.15.1 on page 8-23](#)*
- *If trackball buttons or mode key slices have to be replaced too, please contact your local distributor or GE service representative*

### 8.15.1 Replacement of Circle Key Caps only

#### Manpower

One person, approx. 1 minute/cap

#### Tools

small-sized slotted screwdriver or tweezers

#### 8.15.1.1 Circle Key Caps - Replacement Procedure

1. By means of a small slotted screwdriver, carefully push against the Circle Key Cap.
2. Lift the cap, until it is completely loosened from its base.



Figure 8-30 push against the circle cap and lift it

3. Place the new Key Cap down until it snaps into position.

## 8.16 Replacement of Fuses at Power Supply Module (RSP)

### Manpower

One person, 30 minutes

### Tools

small-sized slotted screwdriver

### Preparations

1. Power Off/Shutdown the system as described in [Section 4.2.2 on page 4-4](#).

### 8.16.1 Fuses at Power Supply Module (RSP) - Replacement Procedure

1. Open the fuse protection at the power inlet block (1) with a small-sized slotted screwdriver.

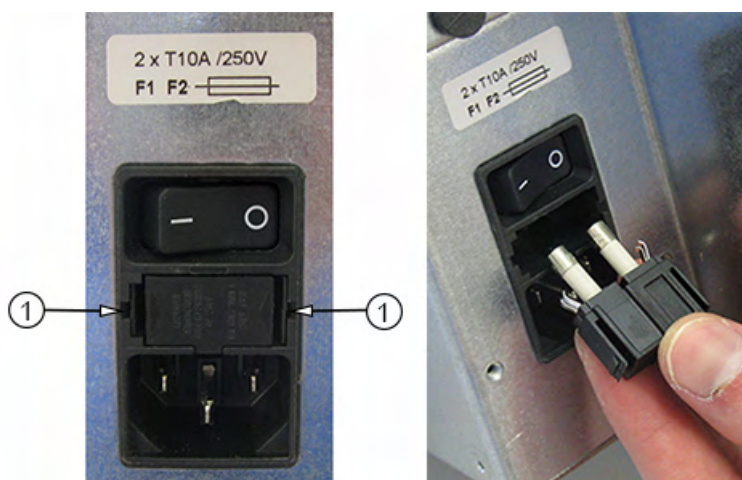


Figure 8-31 exchange fuses

2. Remove the fuse holder and exchange fuses.

## 8.17 Replacing optional Peripherals / How to mount Peripherals at a later date

**Note** Normally auxiliary devices and peripherals come pre-installed with the Voluson E-Series system.

### Manpower

One person, 30 - 60 minutes (depending on peripherals)

### Tools

slotted screwdriver

### Preparations

#### Content in this section

*8.17.1 Mounting/Replacing a Secondary "Patient" Monitor - - - - - 8-26*

**Note** The VGA Image (Video) Resizer is required whenever the used Secondary "Patient" Monitor has a different screen resolution than the Voluson E-Series system!



#### Caution

A Secondary "Patient" Monitor **MUST NEVER** be connected to the Voluson E-Series systems mains supply directly! Always connect it to an appropriate Isolation Transformer (see [Section 9.10.3 on page 9-30](#)).



#### Warning

After each installation, the leakage currents have to be measured according to IEC 60601-1, UL 60601-1, IEC 62353 or other relevant standard.

---

### 8.17.1 Mounting/Replacing a Secondary "Patient" Monitor

**Note** *A Secondary Monitor is **NOT** intended for diagnostic use. It is an additional device used to allow the patient to watch the proceedings.*

#### 8.17.1.1 Preparing the Isolation Transformer



Figure 8-32 Isolation Transformer kit for Secondary Monitor



**Caution**

For changing the input/output voltage or fuses the isolation transformer should not be connected. The wrong fuses and position of the input/output voltage selector may cause major damage on connected peripherals.

1. Before using the Isolation Transformer you must check the input/output voltage settings to meet the ratings of the line power available in your location or country.
2. For changing the input/output voltage, remove the label by means of a small socket wrench.
3. Switch both voltage selectors (input **as well as** output voltage) to 115V or 230V. Consider that changing the input/output voltage also requires to change the fuses!



Figure 8-33 change input/output voltage

4. For changing the fuses, open the fuse protection at the power inlet block with a small screwdriver, remove the fuse holder and exchange fuses.



**115V (100-130V) -> 4AT**  
**230V (220-240V) -> 2AT**

Figure 8-34 exchange fuses

5. Assure that the connected loads can be operated with the chosen voltage.

### 8.17.1.2 Connection of a Secondary Monitor and Isolation Transformer

**Note** *DO NOT connect a Secondary Monitor to the Voluson E-Series via USB cable. Use the supplied VGA cable.*



Caution

A Secondary "Patient" Monitor **MUST NEVER** be connected to the Voluson E-Series systems mains supply directly! Always connect it to an appropriate Isolation Transformer (see [Section 9.10.3 on page 9-30](#)).



Caution

The transformer must be out of the reach of the patient. However, it needs to be within cable length from the monitor and a socket. The transformer is IPX 0. There is no protection against ingress of liquids!



Caution

All necessary modifications to wall and buildings must be performed by a professional to avoid structural damage and electrical hazard.

**Note** *For connection scheme see: [Figure 3-9 on page 3-21](#).*

1. Plug the VGA cable (from Secondary Monitor) to the **VGA Out** connector on the external I/O connector panel (GES) on the rear of the system.
2. Place the isolation transformer on the floor or mount it on the wall.
3. Plug the Power cable (from Secondary Monitor) to the isolation transformer. The Power cable of the transformer itself connect to a wall socket.
4. Use this power switch to power on the Transformer.

**Note** *Wait ~ 1 minute before turning on your monitor.*

5. Press the main power switch on the Secondary Monitor.
6. Power On/Boot Up the system as described in [Section 4.2.1 on page 4-3](#).
7. Compare the picture on the newly installed monitor with the picture on the Voluson E-Series monitor.
8. Measure Leakage Currents according to IEC 60601-1 respectively UL 60601-1.

**Note** *If you need to change the configuration of the newly installed monitor, please, refer to the manual of the Secondary Monitor, which is enclosed in the Wall mount kit.*

**Note** *The monitor needs to be switched of separately at the main power switch of the monitor.*

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# Chapter 9

## Renewal Parts

*This chapter gives an overview of replacement parts available for the Voluson E-Series system.*



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*It might be possible that some probes, options or features are NOT available*

- *in some countries.*
  - *at the time of release of this Service Manual.*
- 

### Content in this chapter

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<i>9.7 Main Board Module</i>	<i>9-17</i>
<i>9.8 Options and Upgrades</i>	<i>9-21</i>
<i>9.9 Miscellaneous Cables</i>	<i>9-22</i>
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<i>9.11 System Manuals</i>	<i>9-32</i>
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## 9.1 List of Abbreviations

<b>AC</b>	Alternating Current
<b>ADC</b>	Analog to Digital Converter
<b>ASIC</b>	Application Specific Integrated Circuit
<b>Assy</b>	Assembly
<b>BEP</b>	BackEnd Processor
<b>CPU</b>	Central Processing Unit
<b>CRU</b>	Customer Replaceable Unit
<b>CSD</b>	Common Service Desktop
<b>DAC</b>	Digital to Analog Converter
<b>DC</b>	Direct Current
<b>DSP</b>	Digital Signal Processing
<b>DVI</b>	Digital Visual Interface
<b>EUM</b>	Electronic User Manual
<b>FE</b>	FrontEnd
<b>FRU</b>	Y = Replacement part / N = Non Stock part Beamformer Module
<b>HDD</b>	Hard Disk Drive
<b>HVPS</b>	High Voltage Power Supply
<b>Int</b>	Internal
<b>I/O</b>	Input/Output
<b>LCD</b>	Liquid Crystal Display
<b>LVPS</b>	Low Voltage Power Supply
<b>MAN</b>	ECG Module
<b>PCI</b>	Peripheral Component Interconnect
<b>PWA</b>	Printed Wire Assembly
<b>RTB</b>	Distribution Board Bottom
<b>RTF</b>	Probe Control Board
<b>RTH</b>	Distribution Board USB-Hub
<b>RTT</b>	Distribution Board Top
<b>RTU</b>	Control Console
<b>RTV</b>	Video Converter Board
<b>SMBus</b>	System Management Bus
<b>UI</b>	User Interface
<b>UIS</b>	Ultrasound Application Software



## 9.2 Parts List Groups







Figure 9-1 Console Views

Table 9-1 Mechanical and user accessible parts

Item	Part Group Name	Description
100 -	<i>"Housing - Mechanical Hardware Parts &amp; Covers" on page 9-4</i>	Housing Covers (except UI and Monitor), Caster Wheels, Handle
200 -	<i>"User Interface" on page 9-8</i>	Console (keyboard, trackball, display, special knobs and switches) Loudspeakers, Disk Drive, Probe holder, Console Covers, etc.
300 -	<i>"Monitor + Monitor Replacement Parts" on page 9-15</i>	Monitor + Monitor Replacement Parts
400 -	<i>"Main Power Modules" on page 9-16</i>	Power Supply Module
500 -	Main Board Module - <i>"FrontEnd (US-Part) Components" on page 9-17</i> - <i>"BackEnd (PC-Part) Components" on page 9-19</i>	Ultrasound (FrontEnd) Components PC-Part (BackEnd) Components
600 -	<i>"Options and Upgrades" on page 9-21</i>	Software Options and Upgrades
700 -	<i>"Miscellaneous Cables" on page 9-22</i>	
800 -	Optional Peripherals and Accessories - <i>"Printers" on page 9-28</i> - <i>"Drives and additional Devices" on page 9-29</i> - <i>"Optional Equipment" on page 9-30</i>	B/W Printer, Color Printer, DeskJet Printer USB Stick, HDD Drive, WLAN, etc. Secondary Patient Monitor, etc.
	<i>"System Manuals" on page 9-32</i>	
900 -	Probes - <i>"2D-Probes - Curved Array Probes" on page 9-33</i> - <i>"2D-Probes - Linear Array Probes" on page 9-35</i> - <i>"2D-Probes - Phased Array Probes" on page 9-36</i> - <i>"Real-Time 4D Volume Probes" on page 9-37</i> - <i>"CW-Doppler - Pencil Probes" on page 9-39</i>	
950 -	<i>"Biopsy Needle Guides" on page 9-40</i>	

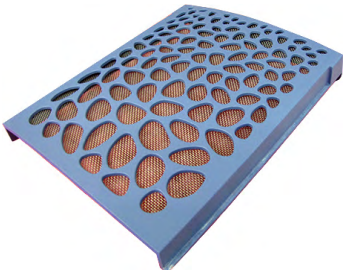





### 9.3 Housing - Mechanical Hardware Parts & Covers

Table 9-2 Housing - Mechanical Hardware Parts & Covers

Item	Part Name	Part Number	Description	Qty	CRU	FRU
101	Top Cover	<a href="#">KTZ303564</a>	Top Cover EC300 	1	N	Y
102	Side Cover incl. Door (left)	<a href="#">KTZ303548</a>	Side Cover left (incl. Door for probe cables) EC300 	1	N	Y
103	Side Cover incl. Door (right)	<a href="#">KTZ303554</a>	Side Cover right (incl. Door for probe cables) EC300 	1	N	Y
104	Cable Hook	KTZ303615	Cable Hook, EC300 	2	N	Y


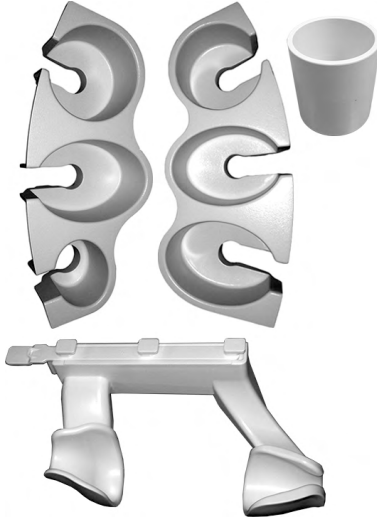

Item	Part Name	Part Number	Description	Qty	CRU	FRU
105	Front Cover	<a href="#">KTZ303559</a>	Front Cover EC300 incl. Plug Support 	1	N	Y
106	Front Frame	KTZ303557	Front Frame EC300 	1	N	Y
107	Printer Flap incl. Hinges	<a href="#">KTZ303815</a>	Printer Flap (incl. Hinges) EC300 	1	N	Y
108	Printer Box Extension (for Color Printer)	KTZ303932	Additional Printer Box for Color Printer A6, EC300 	1	N	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
109	Footrest	<i>KTZ303565</i>	Footrest EC300 	1	N	Y
110	Wheel Axis Cover	<i>KTZ303567</i>	Wheel Axis Cover EC300 	1	N	Y
111	Back Cover	<i>KTZ303569</i>	Back Cover (Back Door) EC300 	1	N	Y
112	Handle Base	<i>KTZ303568</i>	Handle Base EC300 	1	N	Y
113	Handle Bar	<i>KTZ303570</i>	Handle Bar EC300 	1	N	Y

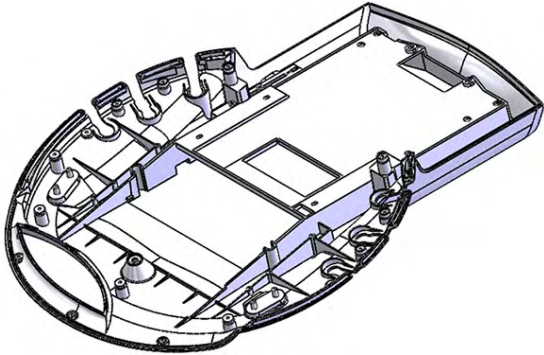


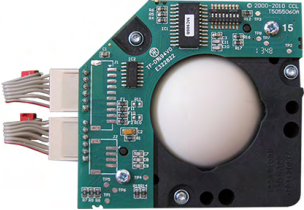
Item	Part Name	Part Number	Description	Qty	CRU	FRU
114	Air Filter Cover	<a href="#">KTZ303826</a>	Air Filter Cover EC300 	1	N	Y
115	Power Supply Cover	<a href="#">KTZ303563</a>	Power Supply Cover EC300 	1	N	Y
116	Caster front	<a href="#">KTZ303911</a>	Caster front (lockable, 2 pcs.) EC300 	2	N	Y
117	Caster back	<a href="#">KTZ303912</a>	Caster back EC300 	1	N	Y
118	Caster back, lockable	<a href="#">KTZ303913</a>	Caster back (lockable) EC300 	1	N	Y
119	Lifting Column, 12V	<a href="#">KTZ302806</a>	Lifting Column, 12V 	1	N	Y

## 9.4 User Interface

Table 9-3 User Interface

Item	Part Name	Part Number	Description	Qty	CRU	FRU
201	Cable Holder	<i>KTZ134656</i>	Probe Cable Holder (1 pcs.) for Voluson E-Series 	2	Y	Y
202	Probeholder Set	<i>KTZ303933</i>	Probeholder Set RTU100 (Probe holder inlet left/right, Gel holder inlet and holder for Endocavity probe) 	1	Y	Y
203	Back Cover Set	<i>KTZ304031</i>	Back Cover Set RTU100   1 Monitor Plug Cover 2 Monitor Adapter Cover 3 Top Housing Cover	1	Y	Y

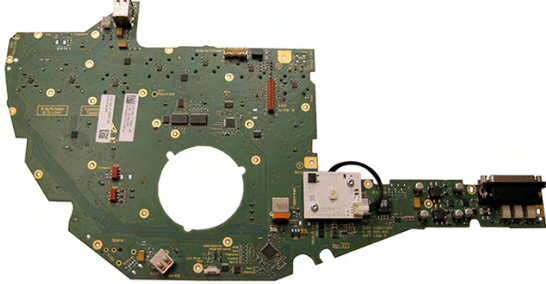
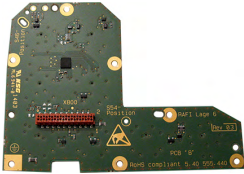



Item	Part Name	Part Number	Description	Qty	CRU	FRU
204	Bumper Set	<a href="#">KTZ303585</a>	Bumper Set RTU100 	1	Y	Y
205	Edge Protector Set	<a href="#">KTZ303934</a>	Edge Protector Set RTU100 	1	Y	Y
206	Caps Alphanumeric Keyboard	<a href="#">KTZ303965</a>	Caps Alphanumeric Keyboard RTU100, English 	1	N	Y
207	Hardkey Set	<a href="#">KTZ303936</a>	Hardkey Set RTU100 	1	Y	Y
208	Caps for Encoder and Joycoder	<a href="#">KTZ303937</a>	Caps for Encoder and Joycoder RTU100 	5/7	Y	Y

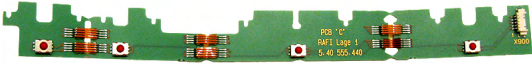
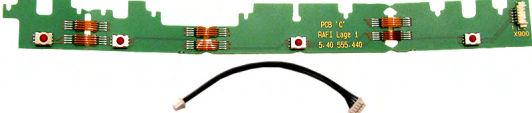
Item	Part Name	Part Number	Description	Qty	CRU	FRU
209	Bottom Housing RTU100	<a href="#">KTZ303583</a>	Bottom Housing RTU100 	1	Y	Y
210	RTU100 Console	<a href="#">KTZ303935</a>	RTU100 Console EC300 	1	Y	Y
211	Top Cover RTU100	<a href="#">KTZ303938</a>	Top Cover RTU100; incl. 3 Voluson logo stickers 	1	Y	Y
212	Trackball Kit	<a href="#">KTZ303939</a>	Trackball Kit RTU100 	1	Y	Y



Item	Part Name	Part Number	Description	Qty	CRU	FRU
213	Trackball Ring	<a href="#">KTZ303940</a>	Trackball Ring RTU100 (2 pcs.) 	1	N	Y
214	Encoder Mechanic	<a href="#">KTZ303941</a>	Encoder Mechanic RTU100 (5 pcs.) 	5	N	Y
215	Joycoder Mechanic	<a href="#">KTZ303942</a>	Joycoder Mechanic RTU100 (7 pcs.) 	7	N	Y
216	Console Cable Set	KTZ303943	Console Cable Set RTU100  	1	N	Y
217	Disk Drive3 DVD+(R)W - SATA	<a href="#">KTZ303258</a>	DVD+(R)W Writer internal (no own cabinet) 	1	N	Y


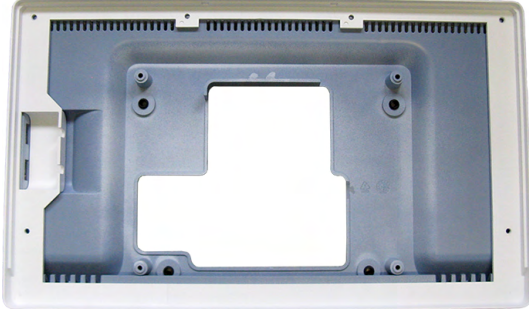

Item	Part Name	Part Number	Description	Qty	CRU	FRU
218	RTH6b.Px - Distribution USB-Hub Board	<a href="#">KTZ304007</a>	Distribution Board USB-Hub 	1	N	Y
219	RTT3.P3 - Distribution Board Top	<a href="#">KTZ280290</a>	Distribution Board Top 	1	N	Y
220	USB3.0 Hub - 1 Port	<a href="#">KTZ304012</a>	USB3.0 Hub (1 Port) RTU100 	1	N	Y
221	Loudspeaker Top Console	<a href="#">KTZ208132</a>	Loudspeaker on User Interface (1 pcs.) 	2	N	Y
222	Fan User Interface	<a href="#">KTZ220645</a>	Fan User Interface 	1	N	Y
223	Console Alphanumeric Keyboard	<a href="#">KTZ303944</a>	Console Alphanumeric Keyboard RTU100 	1	N	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
224	Console Main Board	<a href="#">KTZ303945</a>	Console Main Board RTU100 	1	N	Y
225	Console Sub Board	<a href="#">KTZ303946</a>	Console Sub Board RTU100 	1	N	Y
226	Console Touchscreen complete	<a href="#">KTZ303947</a>	Console Touchscreen complete RTU100 	1	N	Y
227	Console Touch with Housing	<a href="#">KTZ303948</a>	Console Touch with Housing RTU100; <b>without</b> any electronics 	1	N	Y
228	Display-Joycoder Board	<a href="#">KTZ303949</a>	Display-Joycoder Board RTU100 	1	N	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
229	Front Key Board	<i>KTZ303950</i>	Front Key Board RTU100 	1	N	Y
230	Front Key Board with cable	<i>KTZ303966</i>	Front Key Board with cable RTU100 	1	N	Y



## 9.5 Monitor + Monitor Replacement Parts

Table 9-4 Monitor + Monitor Replacement Parts

Item	Part Name	Part Number	Description	Qty	CRU	FRU
301	Monitor Color LCD 23" (MDM200) complete	<i>KTZ303839</i>	23" Color Image LCD Monitor (MDM200) complete 	1	N	Y
302	Monitor Housing Set MDM200	<i>KTZ303951</i>	Monitor Housing Set for 23" LCD Monitor (MDM200) 	1	N	Y
303	Monitor Arm 23" MDT20	<i>KTZ303879</i>	MDT20 Monitor Arm for 23" LCD Monitor 	1	Y	Y
304	Monitor Cable Set MDT20	<i>KTZ303952</i>	MDT20 Monitor Cable Set for 23" LCD Monitor	1	N	Y

## 9.6 Main Power Modules

Table 9-5 Main Power Modules

Item	Part Name	Part Number	Description	Qty	CRU	FRU
401	RSP3.Px - Power Supply EC300	<a href="#">KTZ303892</a>	Power Supply Module (RSP) 	1	N	Y
402	Fuse Set	<a href="#">KTZ280043</a>	Fuses for Power Supply (1.25A, 1.6A, 10A and 15A; 10 pcs. each = 40) 	-	N	Y

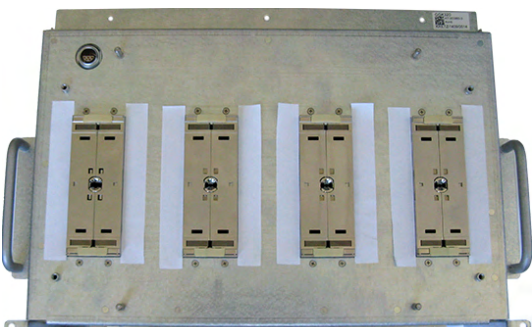
## 9.7 Main Board Module

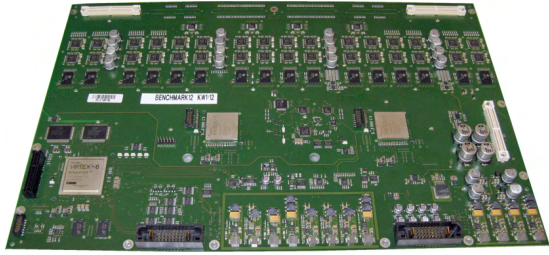
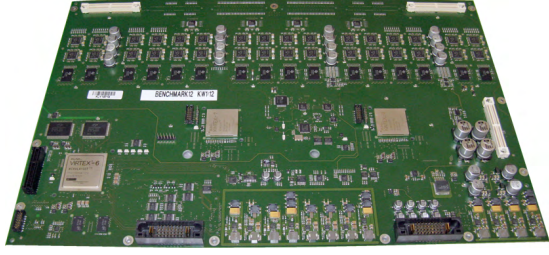
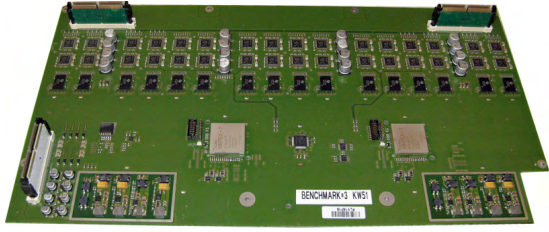
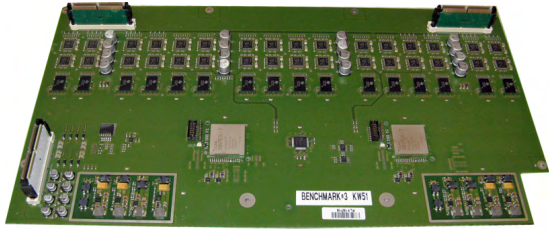
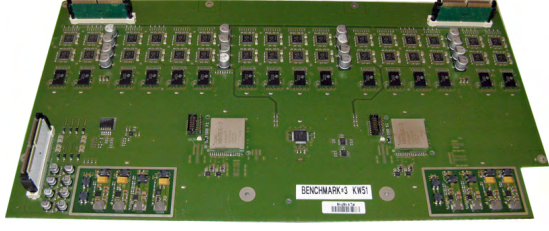
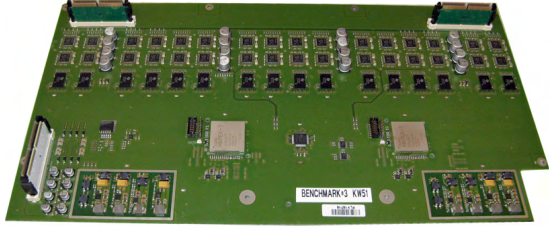
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9.7.1 FrontEnd (US-Part) Components ----- 9-17  
 9.7.2 BackEnd (PC-Part) Components ----- 9-19

### 9.7.1 FrontEnd (US-Part) Components

Table 9-6 FrontEnd (US-Part) Components




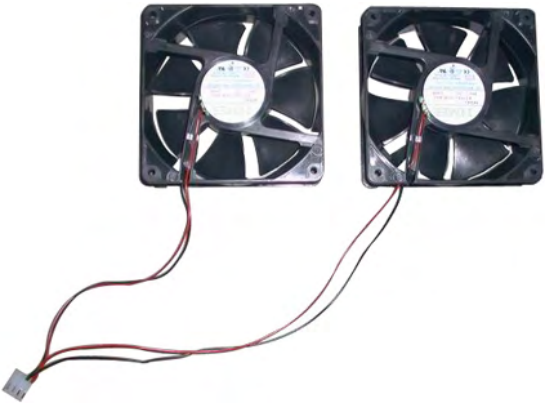
Item	Part Name	Part Number	Description	Qty	CRU	FRU
501	RTF100-EC300 Probe Control Board	<i>KTZ303953</i>	Probe Control Assembly (Voluson E6 <b>only</b> ) 	1	N	Y
502	RTF200-EC300 Probe Control Board	<i>KTZ303954</i>	Probe Control Assembly (Voluson E8 <b>only</b> ) 	1	N	Y
503	RTF300-EC300 Probe Control Board	<i>KTZ303955</i>	Probe Control Assembly 	1	N	Y
504	RSE10 Pencil Probe Board	<i>KTZ302856</i>	Pencil Probe Board 	1	N	Y


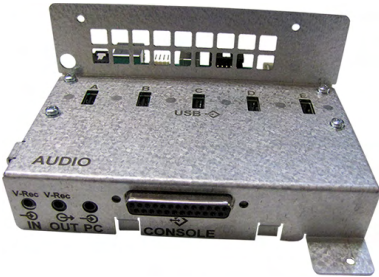
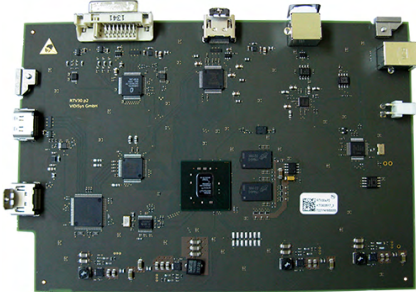
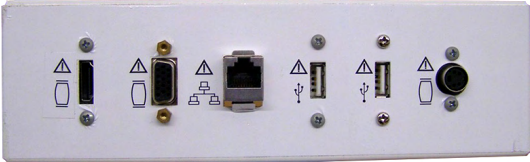
Item	Part Name	Part Number	Description	Qty	CRU	FRU
505	RFM201 - FE-Mainboard without MUX	<a href="#">KTZ303916</a>	FE-Mainboard; <b>without MUX</b> 	1	N	Y
506	RFM221 - FE-Mainboard without MUX	<a href="#">KTZ303915</a>	FE-Mainboard; <b>without MUX</b> 	1	N	Y
507	RSX10 - Extension Board for RFM	<a href="#">KTZ303250</a>	Extension Board for FE-Mainboard RFM 	1	N	Y
508	RSX110 - Extension Board for RFM	<a href="#">KTZ303759</a>	Extension Board for FE-Mainboard RFM (Voluson E6 <b>only</b> ) 	1	N	Y
509	RSX20 - Extension Board for RFM	<a href="#">KTZ303054</a>	Extension Board for FE-Mainboard RFM 	1	N	Y
510	RSX120 - Extension Board for RFM	<a href="#">KTZ303760</a>	Extension Board for FE-Mainboard RFM (Voluson E6 <b>only</b> ) 	1	N	Y



## 9.7.2 BackEnd (PC-Part) Components

Table 9-7 BackEnd (PC-Part) Components

Item	Part Name	Part Number	Description	Qty	CRU	FRU
551	Graphic Card 5, EC300	<a href="#">KTZ304029</a>	Graphic Card for PC-Motherboard 	1	N	Y
552	Battery Lithium CR2032 (3V)	<a href="#">KTZ208791</a>	Lithium Battery CR2032 (3V) for PC-Motherboard 	1	N	Y
553	Hard Disk Drive (HDD)	<a href="#">KTZ302446</a>	Hard disk drive SATA 500 Gbyte (Western Digital or Hitachi) System/Boot DVD (see: <a href="#">Table 9-8 on page 9-21</a> ) is required 	1	N	Y
554	Fan Set (2 fan) for PC - BackEnd	<a href="#">KTZ134698</a>	Fan for PC-box (2 fan) - BackEnd 	1	N	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
555	Back End Processor (BEP) Kit, EC300 (BT15), incl. housing and cables	<a href="#">KTZ303830</a>	Kit contains ATX Motherboard "ADVANTECH", CPU cooler, RAM, Fan(s), housing + internal cables premounted 	1	N	Y
556	RTB50.P1 - Distribution Board Bottom	<a href="#">KTZ303930</a>	Distribution Board Bottom 	1	N	Y
557	RTV30 - Video Management Board	<a href="#">KTZ303517</a>	Video Management Board 	1	N	Y
558	GES30 - External I/O Connection Panel	<a href="#">KTZ303754</a>	External Rear Panel incl. VGA, USB, Network and S-Video cables to the Voluson E-Series system (internal) 	1	N	Y

## 9.8 Options and Upgrades

Table 9-8 Software Options and Upgrades

Item	Part Name	Part Number	Description	Qty	CRU	FRU
601	System/Boot DVD EC300 (BT15 - Ext.1, 15.x.x) <b>Note:</b> Refer to <b>SN79009</b> , which is the best source for the latest revision.	KTZ304037	bootable DVD for System HDD recovery <u>Contents:</u> SP with newest MS patches, Linux rescue partition, System C: Image (Windows 7), UISApp, Backup, EUM, Database Repair Tool, etc.	1	Y	Y
602	Advanced 4D	H48681FM	encrypted Software Option string (password)	-	N	N
603	VOCAL II - Volume Calculation	H48681FN	encrypted Software Option string (password)	-	N	N
604	Advanced VCI - Volume Contrast Imaging	H48681FP	encrypted Software Option string (password)	-	N	N
605	STIC "Basic" - Spatio-Temporal Image Correlation	H48681FS	encrypted Software Option string (password)	-	N	N
606	Coded Contrast Imaging - Contrast Media	H48681FT	encrypted Software Option string (password)	-	N	N
607	SonoVCAD - Heart	H48681FW	encrypted Software Option string (password)	-	N	N
608	SonoAVC - Sono Automated Volume Count	H48681FX	encrypted Software Option string (password)	-	N	N
609	SonoVCAD labor	H48681FY	encrypted Software Option string (password)	-	N	N
610	Anatomical M-Mode	H48681FZ	encrypted Software Option string (password)	-	N	N
611	Advanced STIC * - Spatio-Temporal Image Correlation	H48681GD	encrypted Software Option string (password)	-	N	N
612	Elastography	H48681GB	encrypted Software Option string (password)	-	N	N
613	V-SRI	H48681TK	encrypted Software Option string (password)	-	N	N
614	HDL <i>ive</i> (Europe and Latin America only)	H48691KK	encrypted Software Option string (password)	-	N	N
615	HDL <i>ive</i> Silhouette	H48691XZ	encrypted Software Option string (password)	-	N	N
616	eM6C (Electronic 4D Probe) enabling	H48691YA	encrypted Software Option string (password)	-	N	N
617	SW DVR (Software Digital Video Recorder)	H48691XF	encrypted Software Option string (password)	-	N	N
618	RLS Option (Russian Language Support)	H48691KG	encrypted Software Option string (password)	-	N	N
619	4D View Package (PC software)	H48691KL	encrypted Software Option string (password)	-	N	N
620	Swedish Key Kap Kit - RTU100	KTZ303956	kit includes special native language keys	-	Y	Y
621	Danish Key Kap Kit - RTU100	KTZ303957	kit includes special native language keys	-	Y	Y
622	Norwegian Key Kap Kit - RTU100	KTZ303958	kit includes special native language keys	-	Y	Y
623	Finnish Key Kap Kit - RTU100	KTZ303959	kit includes special native language keys	-	Y	Y
624	Spanish Key Kap Kit - RTU100	KTZ303960	kit includes special native language keys	-	Y	Y
625	French Key Kap Kit - RTU100	KTZ303961	kit includes special native language keys	-	Y	Y
626	German Key Kap Kit - RTU100	KTZ303962	kit includes special native language keys	-	Y	Y
627	Italian Key Kap Kit - RTU100	KTZ303963	kit includes special native language keys	-	Y	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
628	Russian Key Kap Kit - RTU100	KTZ303964	kit includes special native language keys	-	Y	Y
629	Polish Key Kap Kit - RTU100	KTZ304024	kit includes special native language keys	-	Y	Y

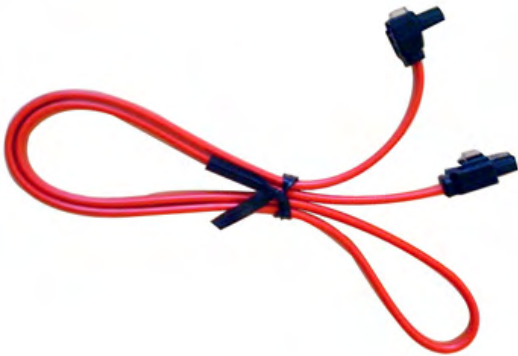
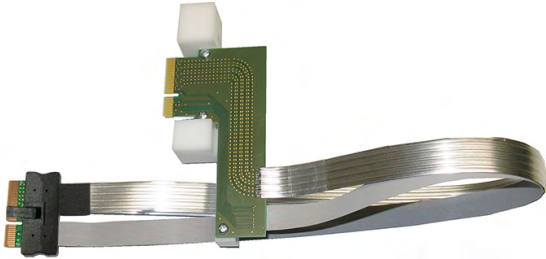
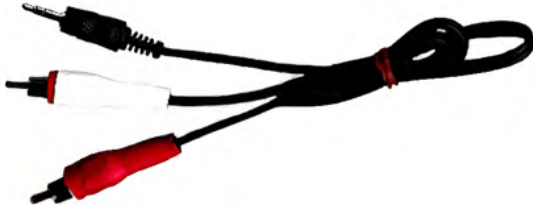
**Note** *A sales order has to be obtained for item 602 - 619!*  
*Software Options (item 602 - 618): Once the order has been processed, the option string can be either entered by the customer, FE or Applications support.*

**Note** *For more detailed description of Software options and their functions, see: [Section 5.1.4 "Description of Software Options"](#) on page 5-12 .*

**Note** *Not every feature is released in every country. Please contact Sales & Marketing in your region for information on feature availability.*



## 9.9 Miscellaneous Cables

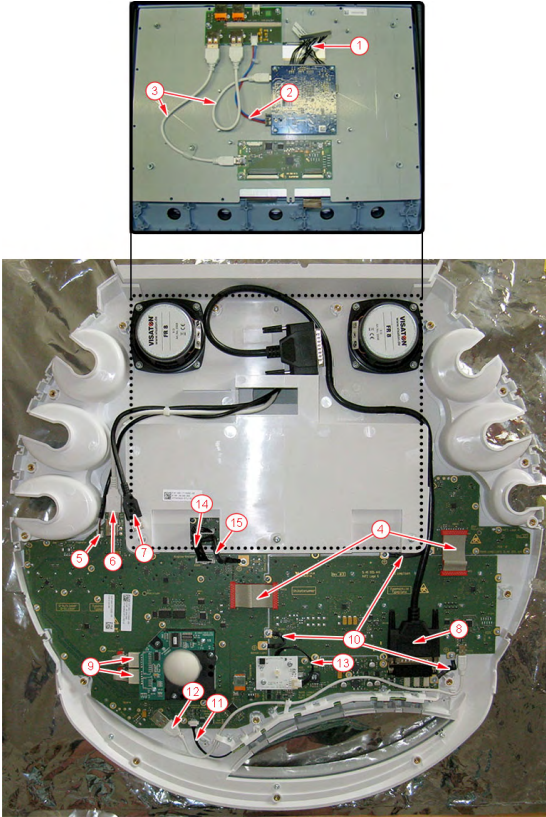
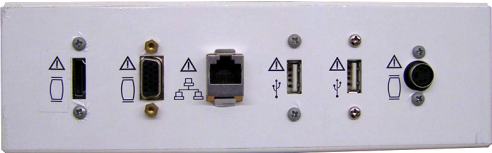
Table 9-9 Miscellaneous Cables

Item	Part Name	Part Number	Description	Qty	CRU	FRU
701	SATA Data Cable for HD-Drive	KTZ300244	SATA Data Cable for HD-Drive 	1	N	Y
702	PCI-E Connection Cable (FEP - BEP)	KT303121	PCI-E Connection from FrontEnd to BackEnd Cable 	1	N	Y
703	Cable Stereo Jack - Chinch RoHS	KTZ280285	Cable from PC-Sound-StereoJack to DVD Shelf 	2	N	Y

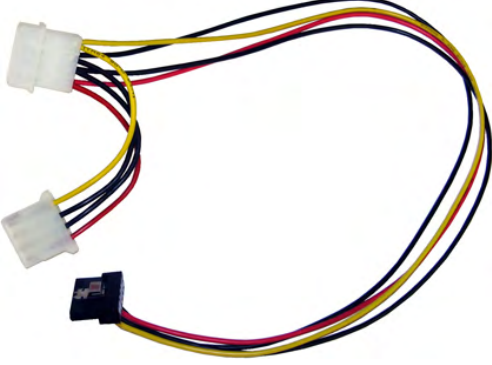




Item	Part Name	Part Number	Description	Qty	CRU	FRU
704	Cable DVI (M) to HDMI (M)	KTZ303895	Cable DVI (M) to HDMI (M), 30 cm 	1	N	Y
705	Monitor Cable Set MDT20	<a href="#">KTZ303952</a>	MDT20 Monitor Cable Set for 23" LCD Monitor	1	N	Y
706	Power Cord - Europe 230V	KTZ220388	Power Cord Europe 230V/240V used at Mains Input Connector C14 (10A type) 	-	Y	Y
707	Power Cord - China	KTZ220391	Power Cord China used at Mains Input Connector C14 (10A type) 	-	Y	Y
708	Power Cord - Australia	KTZ220392	Power Cord Australia used at Mains Input Connector C14 (10A type) 	-	Y	Y
709	Power Cord - India RoHS	KTZ280289	Power Cord India used at Mains Input Connector C14 (10A type) 	-	Y	Y
710	Power Cord - United Kingdom (UK)	KTZ220476	Power Cord United Kingdom (UK) 240V used at Mains Input Connector C14 (10A type) 	-	Y	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
711	Power Cord - South Africa	KTZ220477	Power Cord South Africa used at Mains Input Connector C14 (10A type) 	-	Y	Y
712	Power Cord - Argentina	KTZ220478	Power Cord Argentina used at Mains Input Connector C14 (10A type) 	-	Y	Y
713	Power Cord - Israel	KTZ220479	Power Cord Israel used at Mains Input Connector C14 (10A type) 	-	Y	Y
714	Power Cord - Switzerland	KTZ220480	Power Cord Switzerland used at Mains Input Connector C14 (10A type) 	-	Y	Y
715	Power Cord - Denmark	KTZ220481	Power Cord Denmark used at Mains Input Connector C14 (10A type) 2 pcs. 	-	Y	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
716	Power Cord - Brazil	KTZ280185	Power Cord Brazil used at Mains Input Connector C14 (10A type) 	-	Y	Y
717	Power Cord - Extension	KTZ301990	Power Cord Extension for C13 connector (2m) 	-	Y	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
718	Console Cable Set RTU100	KTZ303943	<p>Console Cable Set RTU100</p>  <ul style="list-style-type: none"> <li>1 cable LVDS</li> <li>2 cable Backplane -&gt; Display</li> <li>3 cable USB-A -&gt; USB-mini</li> <li>4 cable Main &lt;-&gt; Satellite</li> <li>5 cable Main -&gt; Backplane</li> <li>6 cable USB-A &lt;-&gt; USB-B, white</li> <li>7 cable USB-A &lt;-&gt; USB-B, black</li> <li>8 cable UI main power D-SUB</li> <li>9 cable Trackball</li> <li>10 cable earth connection, 50mm</li> <li>11 cable USB Main PCB &lt;-&gt; AN PCB (USB)</li> <li>12 cable Frontkey &lt;-&gt; Main</li> <li>13 cable Main -&gt; Light</li> <li>14 cable Display/Joycoder PCBA -&gt; Main (JST PA)</li> <li>15 cable earth connection, 100mm</li> </ul>	1	N	Y
719	GES30 External I/O Connection Panel	<i>KTZ303754</i>	<p>External Rear Panel incl. VGA, USB, Network and S-Video cables to the Voluson E-Series system (internal)</p> 	1	N	Y



Item	Part Name	Part Number	Description	Qty	CRU	FRU
720	2nd HDD Power Cable	KTZ280126	S-ATA Power Y-splitter cable for data transfer from old to new HDD 	-	N	Y
721	SATA Data Cable for DVD-Drive	KTZ303261	SATA Data cable for DVD-Drive 	1	N	Y
722	SATA Power Cable for DVD-Drive	KTZ303260	SATA Power cable for DVD-Drive 	1	N	Y
723	USB Cable for ECG module	KTZ303296	USB cable for ECG module 	1	N	Y
724	ECG patient cable	KTZ303297	ECG patient cable, IEC Type 			

## 9.10 Optional Peripherals and Accessories

**Content in this section**

9.10.1 Printers ----- 9-28  
 9.10.2 Drives and additional Devices ----- 9-29  
 9.10.3 Optional Equipment ----- 9-30

### 9.10.1 Printers

Table 9-10 Optional Peripherals and Accessories - Printers

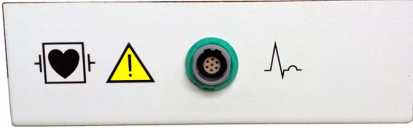

Item	Part Name	Part Number	Description	Qty	CRU	FRU
811	Digital B/W Video Printer (Sony UP-D897)	<i>KTZ220507</i> <i>H48651ML</i>	Digital B/W Video Printer, USB-Port 	-	N	Y
812	Digital Color Printer ( Sony UP-D25MD)	<i>KTZ211373</i> <i>H46831B</i>	Digital Color Printer, A6, USB-Port 	-	N	Y
813	DeskJet Color Printer Bluetooth (HP Officejet 100)	<i>KTZ300182</i> <i>H48661MT</i>	DeskJet Color Line Printer Bluetooth incl. Ink, Bluetooth Adapter(s) + power cable US and EU 	-	N	Y
814	Printer Box Extension (for Color Printer)	KTZ303932 H48691WX	Additional Printer Box for Color Printer A6, incl. mounting plates and screws 	-	N	N

**Note**      *Illustrations may not correspond to the actual product!*

### 9.10.2 Drives and additional Devices

Table 9-11 Optional Peripherals and Accessories - Drives and additional Devices



Item	Part Name	Part Number	Description	Qty	CRU	FRU
821	LAN Optical Isolation Box	EP200132 H45021EC	LAN Patient Isolation Box 	-	Y	Y
822	Gigabit Network Isolator	KTZ303975 H48691RK	Gigabit Network Isolator 	-	Y	Y
823	Cellular Modem	<i>KTZ304025</i> <i>H48691WL</i>	Cellular Modem (SIM Card Connection) incl. power supply and USB cable 	-	Y	Y
824	USB Stick 512MB	<i>2411544</i> <i>H48651TB</i>	USB Flash Memory Stick (512 MB) 	-	Y	Y
825	Wireless Network Interface	<i>KTZ196269</i> <i>H48671DT</i>	Wireless Network Interface ("Netgear" WLAN Adapter) 	-	Y	Y
826	USB-WLAN Stick Japan	<i>KTZ280076</i> <i>H48681TR</i>	USB-WLAN Stick Japan 	-	Y	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
827	ECG-preamplifier (MAN30)	KTZ304009 H48691LN	consists of ECG-preamplifier and patient connection cable 	-	N	Y
828	ECG patient cable	KTZ303297	ECG patient cable, IEC Type 	-	Y	Y

**Note** *Illustrations may not correspond to the actual product!*

### 9.10.3 Optional Equipment

Table 9-12 Optional Peripherals and Accessories - Optional Equipment

Item	Part Name	Part Number	Description	Qty	CRU	FRU
831	Isolation Transformer kit	<i>H48671WN</i>	Isolation Transformer kit for Secondary Monitor incl. power cord set for US, EU and ROW (rest of world), monitor power cable, fuses, documentation, etc. 	-	-	N
832	Isolation Transformer	<i>KTZ220714</i>	Isolation Transformer <b>without</b> cables, etc. 	-	Y	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
833	Fuses for Isolation Transformer	KTZ196333	Fuses for Isolation Transformer (2AT, 4AT; 10 pcs. each = 20) 	-	Y	Y
834	RIC-Holder	KTZ225469	Probe holder used for Real-time 4D endocavity probes (RIC) during disinfection process 	-	Y	Y
835	Footswitch 3 buttons	<i>5380960</i> <i>H48681WS</i>	Footswitch 3 buttons 	-	Y	Y
836	UPS (Uninterruptible Power Supply) for 220-240V AC countries	H48691PE	Medical-grade UPS protection with built-in line-interactive voltage regulation (corrects brownouts as low as 155V and overvoltages as high as 274V back to normal 230V levels). 	-	-	N

**Note** *Illustrations may not correspond to the actual product!*

## 9.11 System Manuals

### 9.11.1 System Manuals for EC300

#### Service Manuals

Part Name	Part No. - Voluson E8	Part No. - Voluson E6	Part No. - Voluson E10
Service Manual	5539550APB	5539550APB	5539550APB

#### User Manuals

Part Name	Part No. - Voluson E8	Part No. - Voluson E6	Part No. - Voluson E10
Basic User Manual - English	H48691TE	H48691RU	H48691UP
Basic User Manual - German	H48691TF	H48691RW	H48691UR
Basic User Manual - Spanish	H48691TG	H48691RX	H48691US
Basic User Manual - Italian	H48691TH	H48691RY	H48691UT
Basic User Manual - French	H48691TJ	H48691RZ	H48691UU
Basic User Manual - Portuguese (Brazil)	H48691TK	H48691SA	H48691HP
Basic User Manual - Portuguese (European)	H48691TL	H48691SB	H48691GA
Basic User Manual - Danish	H48691TM	H48691SC	H48691WR
Basic User Manual - Dutch	H48691TN	H48691SD	H48691WS
Basic User Manual - Finnish	H48691TP	H48691SE	H48691GD
Basic User Manual - Greek	H48691TR	H48691SF	H48691GE
Basic User Manual - Norwegian	H48691TS	H48691SG	H48691GF
Basic User Manual - Polish	H48691TT	H48691SH	H48691UW
Basic User Manual - Russian	H48691TU	H48691SJ	H48691WT
Basic User Manual - Swedish	H48691TW	H48691SK	H48691WU
Basic User Manual - Turkish	H48691TX	H48691SL	H48691GK
Basic User Manual - Czech	H48691TY	H48691SM	H48691WW
Basic User Manual - Hungarian	H48691TZ	H48691SN	H48691GM
Basic User Manual - Latvian	H48691UA	H48691SP	H48691GN
Basic User Manual - Lithuanian	H48691UB	H48691SR	H48691GP
Basic User Manual - Estonian	H48691UC	H48691SS	H48691GR
Basic User Manual - Slovakian	H48691UD	H48691ST	H48691GS
Basic User Manual - Romanian	H48691UE	H48691SU	H48691GT
Basic User Manual - Bulgarian	H48691UF	H48691SW	H48691GU
Basic User Manual - Croatian	H48691UG	H48691SX	H48691GW
Basic User Manual - Serbian	H48691UH	H48691SY	H48691GX
Basic User Manual - Japanese	H48691UJ	H48691SZ	H48691UX
Basic User Manual - Korean	H48691UK	H48691TA	H48691GZ
Basic User Manual - Chinese	H48691UL	H48691TB	H48691HN
Basic User Manual - Indonesian	H48691UM	H48691TC	H48691HA
Basic User Manual - Slovenian	H48691UN	H48691TD	H48691HB

Part Name	Part No. - Voluson E8	Part No. - Voluson E6	Part No. - Voluson E10
Advanced Reference Manual - English	H48691UY	H48691UY	H48691UY
Advanced Reference Manual - French	H48691XG	H48691XG	H48691XG
Advanced Acoustic Output References - English	KTIxxxxxx	KTIxxxxxx	KTIxxxxxx

## 9.12 Probes



### Content in this section



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<a href="#">9.12.2 2D-Probes - Linear Array Probes</a>	9-35
<a href="#">9.12.3 2D-Probes - Phased Array Probes</a>	9-36
<a href="#">9.12.4 Real-Time 4D Volume Probes</a>	9-37
<a href="#">9.12.5 CW-Doppler - Pencil Probes</a>	9-39

**Note** Please observe that some probes are not applicable on all Voluson E-Series systems (depending on system type and/or configuration).

### 9.12.1 2D-Probes - Curved Array Probes

Table 9-13 2D Curved Array Transducers




Item	Part Name	Part Number	Description	Qty	CRU	FRU
900	4C-D	5162351 H4001BC	broadband curved array transducer, 2.0 - 5.0 MHz, 128 Elements <u>Applications:</u> Abdominal, Obstetrics, Gynecology 	-	Y	Y
901	C1-5-D	5304539 H40452LE	broadband curved array transducer, 2.0 - 5.0 MHz, 192 Elements <u>Applications:</u> Abdominal, Obstetrics, Gynecology 	-	Y	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
902	C4-8-D	5336339 H48681AS	<p>broadband curved array transducer, 2.0 - 8.0 MHz, 192 Elements <u>Applications:</u> Abdominal, Obstetrics, Gynecology, Urology, Pediatrics</p> 	-	Y	Y
903	IC5-9-D	5212417 H40442LK	<p>endocavity broadband curved array transducer, 4.0 - 9.0 MHz, 192 Elements, field of view: max. 175° <u>Applications:</u> Obstetrics, Gynecology, Urology</p> 	-	Y	Y





### 9.12.2 2D-Probes - Linear Array Probes

Table 9-14 2D Linear Array Transducers

Item	Part Name	Part Number	Description	Qty	CRU	FRU
910	11L-D	5410800 H40432LN	broadband linear array transducer, 4.0 - 10.0 MHz, 192 Elements, electronically steerable <u>Applications:</u> Small Parts, Peripheral Vascular, Pediatrics, Orthopedics 	-	Y	Y
911	9L-D	5212849 H40442LM	broadband linear array transducer, 3.0 - 8.0 MHz, 192 Elements, electronically steerable <u>Applications:</u> Small Parts, Peripheral Vascular, Pediatrics, Orthopedics 	-	Y	Y
912	ML6-15D	5271060 H40452LG	1,25D Matrix linear array transducer, 4.0 - 13.0 MHz, 336 Elements / 3 rows (= 1008) <u>Applications:</u> Small-Part (Breast), Peripheral Vascular, Pediatrics, Orthopedics (Musculoskeletal), Neonatal, Urology 	-	Y	Y



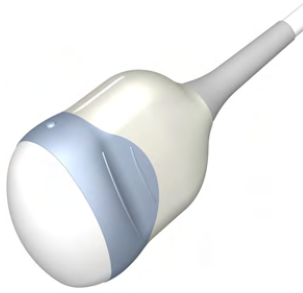

### 9.12.3 2D-Probes - Phased Array Probes

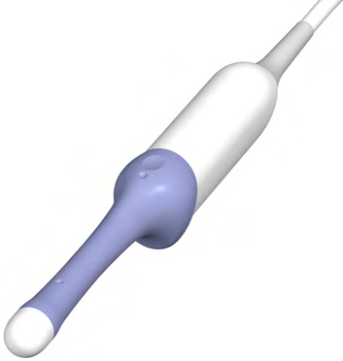
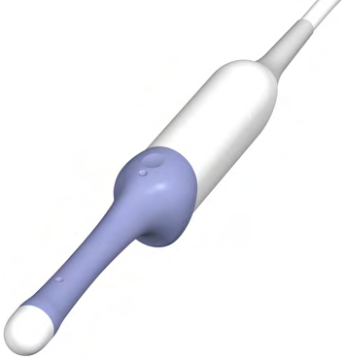


Table 9-15 2D Phased Array Transducers

Item	Part Name	Part Number	Description	Qty	CRU	FRU
920	3SP-D	KTZ280293 H48681AZ	broadband phased array transducer, 1.0 - 5.0 MHz, 64 Elements <u>Applications:</u> Abdominal, Obstetrics, Cardiology, Pediatrics, Neurology 	-	Y	Y
921	S4-10-D	5336208 H45302LA	broadband phased array transducer, 4.0 - 9.0 MHz, 128 Elements <u>Applications:</u> Small Parts, Cardiology, Pediatrics 	-	Y	Y

## 9.12.4 Real-Time 4D Volume Probes

Table 9-16 Real-Time 4D Volume Probes

Item	Part Name	Part Number	Description	Qty	CRU	FRU
930	RAB2-5-D	KTZ303980 H48651MN	Real-time 4D broadband electronic curved-array transducer 1.0 - 4.0 MHz, 192 Elements <u>Applications:</u> Abdominal, Obstetrics, Gynecology, Interventional Radiology 	-	Y	Y
931	RAB6-D	KTZ303986 H48681MG	UltraLight Real-time 4D broadband electronic curved-array transducer 2.3 - 7.3 MHz, 192 Elements <u>Applications:</u> Abdominal, OB, Gyn, Pediatrics, Urology, Interventional Radiology 	-	Y	Y
932	RM6C*	KTZ303993 H48671ZG	1,5D Abdominal Matrix Array Real-time 4D broadband electronic transducer 2.0 - 6.0 MHz, 192 Elements / 5 rows (= 960) <u>Applications:</u> Abdominal, OB, Gyn, Pediatrics, Urology, Interventional Radiology 	-	Y	Y
933	eM6C*	KTZ302457 H48681MJ	1,5D Abdominal Matrix Array Real-time 4D broadband electronic transducer, 128 azimuthal x 64 elevation elements (= 8192) <u>Applications:</u> Abdominal Obstetrics, Gynecology/Fertility, Pediatrics 	-	Y	Y



Item	Part Name	Part Number	Description	Qty	CRU	FRU
934	RIC5-9-D	KTZ303987 H48651MS	Real-time 4D endocavity broadband electronic curved array transducer 4.0 - 9.0 MHz, 192 Elements, field of view: max. 175° <u>Applications:</u> Gynecology/Fertility, Obstetrics, Urology 	-	Y	Y
935	RIC6-12*	KTZ303991 H48651NA	Real-time 4D endocavity broadband electronic curved array transducer 5.0 - 13.0 MHz, 256 Elements, field of view: max. 190° <u>Applications:</u> Gynecology/Fertility, Obstetrics, Urology 	-	Y	Y
936	RSP6-16-D	KTZ303997 H48651MR	Real-time 4D broadband electronic linear array transducer 6.0 - 18.0 MHz, 192 Elements <u>Applications:</u> Small Parts, Peripheral Vascular, Pediatrics, Urology, Orthopedics 	-	Y	Y
937	RNA5-9-D	KTZ303994 H48651MY	Real-time 4D neonatal broadband electronic curved array transducer 3.0 - 9.0 MHz, 192 Elements, field of view: max. 144° <u>Applications:</u> Abdominal, Small Parts, Obstetrics, Cardiology, Pediatrics 	-	Y	Y

**Note** Probes marked with an asterisk (\*) are not applicable at Voluson E6 systems.

**Note** The Electronic Matrix probe "eM6C" is only applicable at Voluson E10 systems.

### 9.12.5 CW-Doppler - Pencil Probes

Table 9-17 CW-Doppler - Pencil Probes






Item	Part Name	Part Number	Description	Qty	CRU	FRU
940	P2D	KTZ280051 H4830JE	<p>Continuous Wave (CW) Doppler pencil probe with a center frequency of 2.0 MHz (no B-image), 2 Elements  <u>Applications:</u> Cardiology (suprasternal), Peripheral Vascular, Neurology</p> 	-	Y	Y
941	P6D	KTZ280050 H4830JG	<p>Continuous Wave (CW) Doppler pencil probe with a center frequency of 6.0 MHz (no B-image), 2 Elements  <u>Applications:</u> Cardiology, Peripheral Vascular, Pediatrics</p> 	-	Y	Y

## 9.13 Biopsy Needle Guides



Table 9-18 2D Curved Array Transducers

Item	Part Name	Part Number	Description	Qty	CRU	FRU
950	***** (disposable)	E8385MJ	disposable Biopsy needle guide for probe <b>IC5-9-D</b> needle diameter: 16-18GA (gauge); 1.2 - 1.6 mm 	-	-	N
951	***** (reusable)	H40412LN	reusable Biopsy needle guide for probe <b>IC5-9-D</b> needle diameter: < 1.65 mm 	-	-	N
952	PEC63	H46721R	reusable Biopsy needle guide for probe <b>RIC5-9-D / RIC6-12</b> needle diameter: < 1.8 mm 	-	-	N
953	RIC Single-angle bracket	H48681GF	disposable Biopsy needle guide for probe <b>RIC5-9-D / RIC6-12</b> needle diameter: 16-18GA (gauge); 1.2 - 1.6 mm 	-	-	N
954	RIC Single-angle bracket + Latex Cover	H48691Z		-	-	N
955	PEC74	H48621Y	reusable Biopsy needle guide for probe <b>RAB2-5-D</b> needle diameter: < 1 mm, 1.4 mm, 2.2 mm 	-	-	N
956	RAB Single-angle bracket	H46701AE	Non Sterile Single Angle Bracket needle guide for probe <b>RAB2-5-D</b> needle diameter: 8.5FR, 14-23GA (gauge); > 0.6 mm - < 2.1 mm 	-	-	N

Item	Part Name	Part Number	Description	Qty	CRU	FRU
957	eM6C Biopsy Starter Kit	H48681MK	Biopsy Starter Kit for Matrix probe <b>eM6C</b> needle diameter: 8.5FR, 14-23GA (gauge); > 0.6 mm - < 2.1 mm 	-	-	N
958	PEC75	H46721W	reusable Biopsy needle guide for probe <b>RSP6-16-D</b> needle diameter: < 1 mm, 1.4 mm, 2.2 mm 	-	-	N
959	RSP Single-angle bracket	H46701AD	Non Sterile Single Angle Bracket needle guide for probe <b>RSP6-16-D</b> needle diameter: 8.5FR, 14-23GA (gauge); > 0.6 mm - < 2.1 mm 	-	-	N
960	PEC76	H48651DG	reusable Biopsy needle guide for probe <b>RNA5-9-D</b> needle diameter: < 1 mm, 1.4 mm, 2.2 mm 	-	-	N
961	RNA Single-angle bracket	H46701AF	Non Sterile Single Angle Bracket needle guide for probe <b>RNA5-9-D</b> needle diameter: 8.5FR, 14-23GA (gauge); > 0.6 mm - < 2.1 mm 	-	-	N
962	RAB6 Biopsy Starter Kit	H48681ML	Biopsy Starter Kit for UltraLight probe <b>RAB6-D</b> needle diameter: 8.5FR, 14-23GA (gauge); > 0.6 mm - < 2.1 mm 	-	-	N

Item	Part Name	Part Number	Description	Qty	CRU	FRU
963	4C Multi-angle bracket	E8385NA	Non Sterile Multi Angle Bracket needle guide starter kit for probe <b>4C-D</b> needle diameter: 8.5FR, 14-23GA (gauge); > 0.6 mm - < 2.1 mm 	-	-	N
964	C1-5-D Biopsy guide	H40432LE	Non Sterile Multi Angle Bracket needle guide for probe <b>C1-5-D</b> needle diameter: 8.5FR, 14-23GA (gauge); > 0.6 mm - < 2.1 mm 	-	-	N
965	C4-8-D Biopsy guide	H48681AT	Non Sterile Multi Angle Bracket needle guide for probe <b>C4-8-D</b> needle diameter: 8.5FR, 14-23GA (gauge); > 0.6 mm - < 2.1 mm 	-	-	N
966	12L-RS Multi-angle bracket	H40432LC	Non Sterile Multi Angle Bracket needle guide for probe <b>11L-D</b> needle diameter: 8.5FR, 14-23GA (gauge); > 0.6 mm - < 2.1 mm 	-	-	N
967	9L Multi-angle bracket	H4906BK	Non Sterile Multi Angle Bracket needle guide for probe <b>9L-D</b> needle diameter: 8.5FR, 14-23GA (gauge); > 0.6 mm - < 2.1 mm 	-	-	N



Item	Part Name	Part Number	Description	Qty	CRU	FRU
968	ML6-15D Biopsy kit	H40432LJ	<p>Non Sterile Multi Angle Bracket needle guide for probe  <b>ML6-15-D</b> needle diameter: 8.5FR, 14-23GA (gauge); &gt; 0.6 mm - &lt; 2.1 mm</p> 	-	-	N
969	3SP Multi-angle bracket	H46222LC	<p>Non Sterile Multi Angle Bracket needle guide for probe  <b>3SP-D</b> needle diameter: 8.5FR, 14-23GA (gauge); &gt; 0.6 mm - &lt; 2.1 mm</p> 	-	-	N

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# Chapter 10

## Care & Maintenance

*This chapter describes **Care & Maintenance** on the Voluson E-Series system and its peripherals. These procedures are intended to **maintain the quality** of the ultrasound **systems performance**. Read this chapter completely and familiarize yourself with the procedures before performing a task.*

### Content in this chapter

<i>10.1 Why do Maintenance</i>	<i>10-2</i>
<i>10.2 Maintenance Task Schedule</i>	<i>10-2</i>
<i>10.3 Tools required</i>	<i>10-4</i>
<i>10.4 System Maintenance</i>	<i>10-5</i>
<i>10.5 Using a Phantom</i>	<i>10-9</i>
<i>10.6 Electrical Safety Tests</i>	<i>10-10</i>
<i>10.7 When there's too much Leakage Current...</i>	<i>10-21</i>
<i>10.8 Ultrasound Equipment Quality Check (EQC and IQC)</i>	<i>10-21</i>



Caution: Practice good ESD prevention.

Wear an anti-static strap when handling electronic parts and even when disconnecting/connecting cables.

---



### Warning

Be sure to disconnect the system power plug and switch off the main circuit breaker before you remove any parts. Be cautious whenever power is still on and covers are removed.

---



### Caution

Do not pull out or insert circuit boards while power is ON.

---



### Caution

The system requires all covers. Operate the system only when all board covers and frame panels are securely in place. The covers are required for safe operation, good system performance and cooling purposes. When covers are removed, EMI may be present.

---



### Caution

To ensure the mutual protection and safety of GE service personnel and our customers, all equipment and work areas must be clean and free of any hazardous contaminants before a service engineer starts a repair. This includes, but is not limited to, decontamination and/or sterilization, depending on the application or use of the medical device.

---

## 10.1 Why do Maintenance

### 10.1.1 Periodic Maintenance Inspections

It has been determined by engineering that your Voluson E-Series system does not have any high wear components that fail with use, therefore no Periodic Maintenance Inspections are mandatory. However, some Customers Quality Assurance Programs may require additional tasks and/or inspections at a different frequency than listed in this manual.

### 10.1.2 Keeping Records

It is good business practice that ultrasound facilities maintain records of quality checks and corrective maintenance. The Ultrasound Equipment Quality Check form provides the customer with documentation that the ultrasound system is maintained on a periodic basis.

A copy of the Ultrasound Equipment Quality Check (EQC) form should be kept in the same room or near the system.

### 10.1.3 Quality Assurance

In order to gain accreditation from organizations such as the American College of Radiology (USA), it is the customer's responsibility to have a quality assurance program in place for each system. The program must be directed by a medical physicist, the supervising radiologist/physician or an appropriate designer.

Routine quality control testing must occur regularly. The same tests are performed during each period so that changes can be monitored over time and effective corrective action can be taken.

Testing results, corrective action and the effects of corrective action must be documented and maintained on the site.

Your GE service representative can help you with establishing, performing and maintaining records for a quality assurance program. Please contact us for coverage information and/or price for service.

## 10.2 Maintenance Task Schedule

### 10.2.1 How often should Care & Maintenance Tasks be performed?

The Care and Maintenance task schedule (see: [Table 10-1 on page 10-3](#)) specifies how often your Voluson E-Series should be serviced and outlines items requiring special attention.

**Note** *It is the customer's responsibility to ensure that the Voluson E-Series care & maintenance is performed as scheduled in order to retain its high level of safety, dependability and performance.*

Your GE Service Representative has an in-depth knowledge of your Voluson E-Series ultrasound system and can best provide competent, efficient service. Please contact us for coverage information and/or price for service.

The service procedures and recommended intervals shown in the Customer Care Schedule assumes that you use your Voluson E-Series for an average patient load (10 per day) and not use it as a primary mobile system which is transported between diagnostic facilities.

**Note** *If conditions exist which exceed typical usage and patient load, then it is recommended to increase the maintenance frequencies.*

Abbreviations used in the Customer Care Schedule [Table 10-1](#):

- D = Daily
- W = Weekly
- M = Monthly
- A = Annually

Table 10-1 customer care schedule

Item	Service at indicated Time	D	W	M	A	Notes
Air Filter Grid	Remove the filter grid and clean the air filter grid with vacuum cleaner from outside.			•		more frequently depending on your environment
Air Filter Grid	Remove filter grid, back top cover and back cover and clean the housing from inside. (vacuum cleaner and soft brush)				•	more frequently depending on your environment
AC Mains Cable	Inspect AC mains cable			•		mobile systems check weekly
Cables and Connectors	Check if all cables are fixed and well seated at the correct position and if there is no mechanical damage visible.				•	also after corrective maintenance
User Interface	Clean alphanumerical keyboard, functional keys, digital potentiometers, TGC potentiometers. (vacuum cleaner, lukewarm soap water on a soft, damp cloth)		•			Be careful not to get the cloth too wet so that moisture does not enter the loudspeakers or other keys!
LCD Monitor, Touch Panel and Probe holder	Clean LCD monitor surface, Touch Panel and probe holder with a fluid detergent in warm water on a soft, damp cloth.		•			Be careful not to get the cloth too wet so that moisture does not enter the entire system.
Mechanical parts	Clean and inspect the mechanical function of wheels, casters, brakes and swivel locks as well as side door, foot rest, front and rear handle, and monitor holder. Remove dust and coupling gel.			•		mobile systems check daily
Control Console movement	Check translation/rotation and height adjustment (elevation)				•	more frequently at mobile systems
Trackball Check	Check proper operation (cursor movement X, Y direction)	•				If failure occurs go to trackball cleaning.
Trackball Cleaning	Remove trackball ring; open the trackball housing and take out the trackball (see <a href="#">Section 7.9.3 on page 7-24</a> ). Clean the trackball (and X,Y axes) with soft tissue and screwdriver shaft.				•	
Disk Drives (Data Backup)	Test image filing (Archive) import and export data capability (DVD/CD Drive)		•	•*		* save the image filing data weekly or at least monthly on DVD/CD depending on the number of examinations
Safe Probe Operation	Clean probes and probe cables and check acoustic lens housing (cracks) and probe cables. In case of mechanical damage, don't use them! Danger: Safety risk for operator and patient.	•*				* or before each use
Probe Air bubbles	To detect air bubbles in filling liquid, shake the probe carefully and check for abnormal noise.					
Probe Connectors	Remove dust/dirt of all probe connectors. Clean with vacuum cleaner if dust is visible.			•		
Chassis Leakage Current Checks					•	Also after corrective maintenance or as required by your facilities QA program.
Peripheral Leakage Current Checks					•	Also after corrective maintenance or as required by your facilities QA program.
Surface Probe Leakage Current Checks					•	Also after corrective maintenance or as required by your facilities QA program.
Endocavity Probe Leakage Current Checks					•	Also after corrective maintenance or as required by your facilities QA program.

Item	Service at indicated Time	D	W	M	A	Notes
Measurement Accuracy Checks						• Also after corrective maintenance or as required by your facilities QA program.
Probe/Phantom Checks	Check gain and TGC changes, vary the focus and check reaction on screen.  <i>NOTE! The use of a Phantom is not required during Preventive Maintenance. Customer may use it as part of their Quality Assurance Program tests.</i>					• Also after corrective maintenance or as required by your facilities QA program.
Functional Checks of all probes <i>Section 10.4.2 on page 10-5</i>						• Also after corrective maintenance or as required by your facilities QA program.

## 10.3 Tools required

### 10.3.1 Special Tools, Supplies and Equipment used for Care & Maintenance

Table 10-2 overview of requirements for care & maintenance

Tools	Part Number	Comments
Digital Volt Meter (DVM)		minimum 5% accuracy, 3.5 digit and 200 Ohm range required
Anti Static Kit	46-194427P231 46-194427P279 46-194427P369 46-194427P373 46-194427P370	Kit includes anti-static mat, wrist strap and cables for 200 to 240V system 3M #2204 Large adjustable wrist strap 3M #2214 Small adjustable wrist strap 3M #3051 conductive ground cord
Anti Static Vacuum Cleaner	46-194427P278 46-194427P279	120V 230V
QIQ Phantom	E8370RB	RMI Grayscale Target Model 403GS  <i>NOTE! The use of a Phantom is not required during Preventive Maintenance. Customer may use it as part of their Quality Assurance Program tests.</i>
CD-RW Media		(minimum quad speed)
DVD+RW Disc Media blank		blank 4,7GB DVD+RW disc
B/W Printer Cleaning Sheet		see printer user manual for requirements
Color Printer Cleaning Sheet		see printer user manual for requirements
Disposable Cloves		•

## 10.4 System Maintenance

### 10.4.1 Preliminary Checks

The preliminary checks take about 15 minutes to perform. Refer to the Voluson E-Series Basic User Manual whenever necessary.

Table 10-3 system checks

Step	Item	Description
1	Ask and Listen	Ask the customer if they have any problems or questions about the equipment.
2	Paperwork	Fill in the top of the EQC (Ultrasound Equipment Quality Check) form. Record all probes and system options.
3	Power up	<ul style="list-style-type: none"> <li>Turn the system power on and verify that all fans and peripherals turn on.</li> <li>Watch the displays during power up to verify that no warning or error messages are displayed.</li> </ul>
4	Probes	Verify that the system properly recognizes all probes.
5	Displays	Verify proper display function on the LCD monitor and Touch Panel.
6	Presets	"Full Backup" all customer presets to an appropriate media (see: <a href="#">Section 4.4.3 "Save Full System Configuration (Full Backup)" on page 4-16</a> ).
7	Image Archive	Backup the Image Archive onto appropriate media (see: <a href="#">Section 4.4.6.1 "Save Image Archive" on page 4-21</a> ).

### 10.4.2 Functional Checks

The functional checks take about 60 minutes to perform. Refer to the Voluson E-Series Basic User Manual whenever necessary.

#### 10.4.2.1 System Checks

Table 10-4 system functional checks

Step	Item	Description
1	B Mode	Verify basic B Mode (2D) operation. Check the basic system controls that affect this mode of operation.
2	M Mode	Verify basic M Mode operation. Check the basic system controls that affect this mode of operation.
3	C Mode	Verify basic CFM Mode (Color Flow Mode) operation. Check the basic system controls that affect this mode of operation.
4	PD Mode	Verify basic PD Mode (Power Doppler Mode) operation. Check the basic system controls that affect this mode of operation.
5	Doppler Modes	Verify basic Doppler Mode operation (PW and CW if available). Check the basic system controls that affect this mode of operation.
6	3D Mode	Verify basic 3D Mode operation. Check the basic system controls that affect this mode of operation.
7	RealTime 4D Mode (optional)	Verify basic RealTime 4D Mode operation. Check the basic system controls that affect this mode of operation.
8	*Applicable Software Options	Verify the basic operation of all optional modes. Check the basic system controls that affect each options operation.
9	Keyboard Test	Perform the Keyboard Test Procedure to verify that all keyboard controls are OK.
10	LCD Monitor	Verify basic LCD Monitor display functions.

Step	Item	Description
11	Touch Panel	Verify basic Touch Panel display functions.
12	Basic Measurements	Check distance and tissue depth measurement. <i>NOTE! The use of a Phantom is not required during Preventive Maintenance. Customer may use it as part of their Quality Assurance Program tests.</i> Refer to the Basic User Manual, for measurement accuracy specifications.

**Note** \* Some software may be considered standard depending upon system configuration.

### 10.4.2.2 Peripheral/Option Checks

If any peripherals or options are not part of the system configuration, the check can be omitted. Refer to [Section 3.8 "On-board optional Peripherals" on page 3-44](#) for a list of approved peripherals.

Table 10-5 approved peripheral/hardware option functional checks

Step	Item	Description
1	B/W Printer	Verify hardcopy output of the B/W video page printer. Clean heads and covers if necessary.
2	Color Printer	Verify hardcopy output of the Color video page printer. Clean heads and covers if necessary.
3	Color Deskjet (Bluetooth) Printer	Verify hardcopy output of the Deskjet (Bluetooth) printer. Clean heads and covers if necessary.
4	VCR	Verify record/playback capabilities of the VCR. Clean heads and covers if necessary.
5	DVD Recorder	Verify record capabilities of the DVD Recorder. Clean heads and covers if necessary.
6	DICOM	Verify that DICOM is functioning properly. Send an image to a DICOM device.
7	Footswitch	Verify that the footswitch is functioning as programmed. Clean as necessary.
8	DVD-Drive	Verify that the DVD-drive reads/writes properly (export/recall image in Image Management System = Archive)
9	ECG	Verify basic operation with customer.
10	Cellular Modem	Verify basic operation.

### 10.4.2.3 Mains Cable Inspection

Table 10-6 mains cable inspection

Step	Item	Description
1	Unplug Cord	Disconnect the mains cable from the wall and system.
2	Inspect	Inspect it and its connectors for damage of any kind.
3	Verify	Verify that the LINE, NEUTRAL and GROUND wires are properly attached to the terminals, and that no strands may cause a short circuit.
4	Verify	Inlet connector retainer is functional.

### 10.4.2.4 Optional Diagnostic Checks

Optionally you can access the diagnostic software as described in Chapters 5 or 7. View the error logs and run desired diagnostics.



### 10.4.3 Physical Inspection

Table 10-7 physical checks

Step	Item	Description
1	Labeling	Verify that all system labeling is present and in readable condition.
2	Scratches & Dents	Inspect the exterior for dents, scratches or cracks.
3	LCD Monitor Display	Inspect the LCD monitor display for scratches and bad pixels. Verify proper operation of contrast and brightness controls.
4	Control Console and Keyboard	Inspect the control console and keyboard. Record any damaged or missing items. (Replace faulty components, as required).
5	DVD+R/RW Drive	Clean the drive head and media with the vendor-supplied cleaning kit. Advise the user to repeat this often, to prevent future problems. DVDs/CDs must be stored away from dust and cigarette smoke. Do not use alcohol or benzene to clean the drive.
6	Wheels & Brakes	Check all wheels and casters for wear and verify operation of foot brake, to stop the system from moving, and release mechanism. Check all wheel locks and swivel locks for proper operation.
7	Cables & Connectors	Check all internal cable harnesses and connectors for wear and secure connector seating. Pay special attention to probe strain or bend reliefs.
8	Power Cord	Check the power cord for cuts, loose hardware, tire marks, exposed insulation or other deterioration, and verify continuity. Tighten the clamps that secure the power cord to the system and the outlet plug to the cord.
9	Shielding & Covers	Check to ensure that all EMI shielding, internal covers, air flow panels and screws are in place. Missing covers and hardware could cause EMI/RFI problems during scanning.
10	Peripherals	Check and clean the peripherals according to the manufacturer's directions. To prevent EMI or system overheating, dress the peripheral cables inside the peripheral cover.
11	External I/O	Check all connectors for damage.
12	Control Console Lighting	Check proper operation of all control console.

### 10.4.4 Cleaning

The Basic User Manual of the Voluson E-Series system provides a complete description of system/probe care, maintenance, cleaning and disinfection.

#### 10.4.4.1 General Cleaning

Frequent and diligent cleaning of the Voluson E-Series ultrasound system reduces the risk of spreading infection from person to person, and also helps to maintain a clean work environment.

Table 10-8 general cleaning

Step	Item	Description
1	Console	Use a fluid detergent in warm water on a soft, damp cloth to carefully wipe the entire system. Be careful not to get the cloth too wet so that moisture does not enter the console. <b>Caution:</b> DO NOT allow any liquid to drip or seep into the system.
2	LCD Monitor + Touch Panel	Clean LCD Monitor surface and Touch Panel with a fluid detergent in warm water on a soft, damp cloth. <b>Caution:</b> DO NOT spray any liquid directly onto the Voluson E-Series covers, LCD Monitor, keyboard, etc.

## 10.4.5 Probe Maintenance

### 10.4.5.1 Probe related Checks

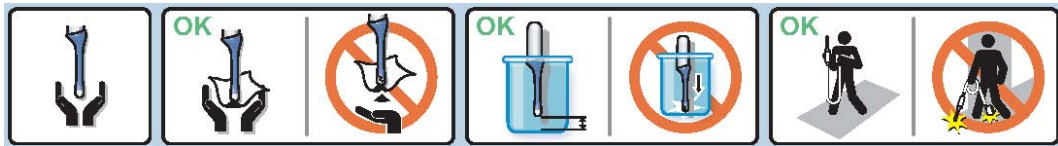
Table 10-9 probe related checks

Step	Item	Description
1	Probes	Thoroughly check the system probe connectors and remove dust from inside the connector sockets if necessary. Visually check for bent, damaged or missing pins.
2	Probe Holder	Clean probe holders (they may need to be soaked to remove excess gel).

### 10.4.5.2 Basic Probe Care

The Basic User Manual and/or care card provides a complete description of probe care, maintenance, cleaning and disinfection. Ensure that you are completely familiar with the proper care of GE probes.

Ultrasound probes can be easily damaged by improper handling. Review the Basic User Manual of Voluson E-Series for more details. Failure to follow these precautions can result in serious injury and equipment damage. Failure to properly handle or maintain a probe may also void its warranty.



Any evidence of wear indicates the probe cannot be used.

Do a visual check of the probe pins and system sockets before plugging in a probe.

### 10.4.5.3 Basic Probe Cleaning and/or Disinfection

Refer to the Basic User Manual of Voluson E-Series for details on cleaning and disinfection.



**Caution**

To help protect yourself from blood borne diseases, wear approved disposable gloves. These are made of nitrile derived from vegetable starch to prevent allergic latex reactions.



**Caution**

Failure to follow the prescribed cleaning or disinfection procedures will void the probes warranty. Do not soak or wipe the lens with any product not listed in the Voluson E-Series Basic User Manual and/or care card. Doing so could result in irreparable damage to the probe and/or Voluson E-Series system.



**Caution**

Disinfect a defective probe before you return it. Be sure to tag the probe as being disinfected.



**Caution**

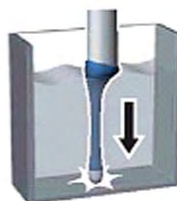
Follow the Care Card instructions supplied with each probe (inside the probe boxes) for disinfectants and gels that are compatible with the surface material of the probes.

**Note**

For the latest list of compatible cleaning solutions and disinfectants refer to: [http://www.gehealthcare.com/user/ultrasound/products/probe\\_care.html](http://www.gehealthcare.com/user/ultrasound/products/probe_care.html).



Please be aware of the sensitive probe head. TAKE EXTREME CARE!



NEVER place or store a probe on its scan head!

OK



When disinfecting a probe, ensure that there is sufficient space between the probe and the container bottom!

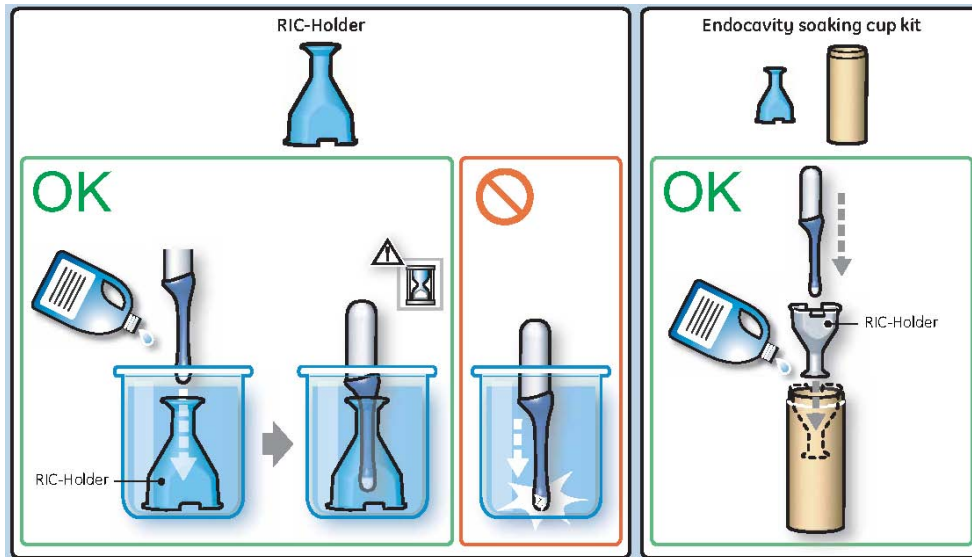
#### 10.4.5.4 Disinfection by means of the RIC-Holder

Especially for Real-time 4D endocavity probes (RIC), it is necessary to take extreme care when transporting the system with the probe attached, or during the disinfection process. Inadequate handling may lead to dead elements, shocked head mechanics, etc.

The RIC-Holder (especially developed for RIC Real-time 4D endocavity probes) guarantees that the sensitive probe head does not hit the bottom of the container during the disinfection procedure.

**Note**

*Instructions are supplied with each RIC-Holder (KTZ225469).*



#### 10.5 Using a Phantom

The use of a Phantom is not required during Preventive Maintenance. Customer may use it as part of their Quality Assurance Program tests.

## 10.6 Electrical Safety Tests

### 10.6.1 Safety Test Overview

---

#### Warning

Energy Control and Power Lockout for Voluson E-Series:



When servicing parts of the system where there is exposure to voltage greater than 30 Volts:

1. Follow LOTO (Lockout/Tagout) procedures.
2. Turn off the breaker.
3. Unplug the system.
4. Maintain control of the system power plug.
5. Wait for at least 30 seconds for capacitors to discharge as there are no test points to verify isolation.

System components may be energized.

---

The electrical safety tests in this section are based on IEC60601 standard including national deviations for Health Care Facilities and IEC 62353 Medical electrical equipment – Recurrent test and test after repair of medical electrical equipment. These standards provide guidance on evaluating electrical safety of medical devices which are placed into service and are intended for use in planned maintenance (PM) or testing following service or repair activities. They differ somewhat from the standards that are used for design verification and manufacturing tests (e.g., IEC 60601-1 including national deviations) which require a controlled test environment and can place unnecessary stress on the ultrasound system.

These tests may refer to specific safety analyzer equipment as an example. Always refer to the safety analyzer's user manual that will be used to perform the tests.

Prior to initiating any electrical test, the system must be visually inspected. Perform following visual checks:

- Check for missing or loose enclosure covers that could allow access to internal live parts.
  - Examine the mains cord, mains plug and appliance inlet for damaged insulation and adequacy of strain relief and cable clamps.
  - Locate and examine all associated probes. Inspect the cables and strain relief at each end. Inspect the probe enclosure and lens for cracks, holes and similar defects.
- 

#### Caution

For all instructions in this section: In case of using an UPS (uninterruptable power supply) the terms outlet, wall outlet, AC wall outlet or power outlet refer to the AC wall outlet to which the UPS power input is connected to. In case of further available AC (or DC) power outlets at the same used UPS these must remain unused; i.e. not connected to any other devices.

---



#### Warning

Users must ensure that safety inspections are performed whenever damage is suspected and on a regular basis in accordance with local authorities and facility procedures. DO NOT use the system or individual probes which fail any portion of the safety test.

---



#### Warning

To minimize the risk and to avoid an electric shock, only trained persons are allowed to perform the electric safety inspections and tests.

---



#### Caution

Compare all safety-test results with safety-test results of previously performed safety tests (e.g., last year ect). In case of unexplainable abrupt changes of safety-test results consult experienced authorized service personnel or GE for further analysis.

---



#### Caution

To avoid electrical shock, the system under test must not be connected to other electrical equipment. Remove all interconnecting cables and wires. The system under test must not be contacted by users or patients while performing these tests.

---



#### Caution: Possible risk of infection.

Do not handle soiled or contaminated probes and other components that have been in patient contact. Follow appropriate cleaning and disinfecting procedures before handling the equipment.

---



## 10.6.2 Leakage Current Limits

The following acceptance limits and test conditions are summarized from IEC60601 including national deviations and IEC 62353 and in some cases are lower than that specified by the standards. In accordance with these standards, fault conditions like Reverse Polarity of the supply mains and Open Neutral are no longer required for field evaluation of leakage current. Because the main source of leakage current is the mains supply, there are different acceptance limits depending on the configuration of the mains (100-130VAC or 220-240VAC).

Table 10-10 leakage current limits for operation on 100-130 Volt mains (US/Canada/Japan)

Leakage Current Test	System Power	Grounding/PE Conductor	Limit mA
Chassis/Enclosure Leakage	On and Off	Open and Closed	0.3
Type BF Applied Parts	On (transmit)	Closed Open	0.1 0.5
Type CF Applied Parts	On (transmit)	Closed Open	0.01 0.05
Type BF Applied Parts (sink leakage, mains voltage on applied part)	On and Off	Closed	5.0
Type CF Applied Parts (sink leakage, mains voltage on applied part)	On and Off	Closed	0.05

Table 10-11 leakage current limits for system operation on 220-240 Volt mains



Leakage Current Test	System Power	Grounding/PE Conductor	Limit mA
Chassis/Enclosure Leakage	On and Off	Open and Closed	0.5
Type BF Applied Parts	On (transmit)	Closed Open	0.1 0.5
Type CF Applied Parts	On (transmit)	Closed Open	0.01 0.05
Type BF Applied Parts (sink leakage, mains voltage on applied part)	On and Off	Closed	5.0
Type CF Applied Parts (sink leakage, mains voltage on applied part)	On and Off	Closed	0.05

Table 10-12 ISO and mains applied limits\*

Probe Type	Measurement
BF	5.0 mA
CF	0.05 mA

\* **ISO and Mains Applied** refers to the sink leakage test where mains (supply) voltage is applied to the part to determine the amount of current that will pass (or sink) to ground if a patient is in contact with mains voltage.

Table 10-13 equipment type and test definitions

Applied Parts (AP)	Parts or accessories that contact the patient to perform their function. For ultrasound equipment, this includes transducers and ECG leads.	
Type BF	Body Floating or non-conductive ultrasound probes which are marked with the 'man in box' BF symbol. This includes all transducers.	
Type CF	Cardiac Floating or non-conductive intraoperative probes for direct cardiac contact and isolated ECG connections so marked with the 'heart in box' CF symbol.	
Sink Leakage	The current resulting from the application of mains voltage to the applied part. This test is required for Type BF and CF applied parts.	

### 10.6.3 Outlet Test - Wiring Arrangement - USA & Canada

Test all outlets in the area for proper grounding and wiring arrangement by plugging in the neon outlet tester and noting the combination of lights that are illuminated. Any problems found should be reported to the hospital immediately and the receptacle should not be used.

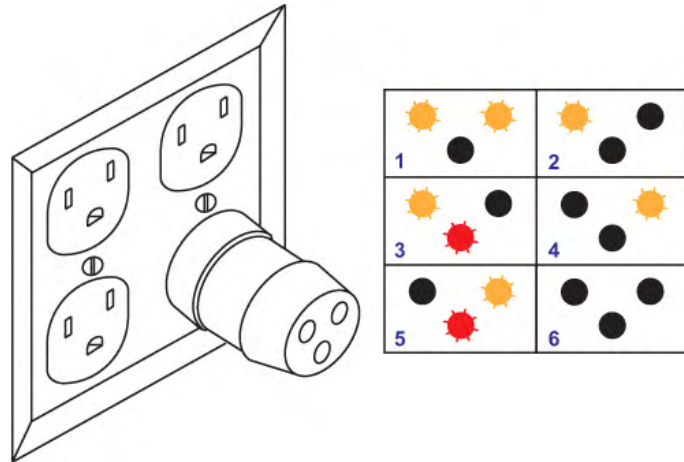


Figure 10-1 Typical Alternate Outlet Tester

1	Correct Wiring	3	Reversed Polarity	5	Hot and Ground Reversed
2	Open Ground Wire	4	Open Neutral Wire	6	Open Hot Wire

**Note** *No outlet tester can detect the condition where the Neutral (grounded supply) conductor and the Grounding (protective earth) conductor are reversed. If later tests indicate high leakage currents, this should be suspected as a possible cause and the outlet wiring should be visually inspected.*

## 10.6.4 Grounding Continuity



**Danger : Electric Shock Hazard!**

The patient or operator **MUST NOT** come into contact with the equipment during this test.

Measure the resistance from the third pin of the attachment plug to the exposed metal parts of the case. The ground wire resistance should be less than 0.2 ohms. Reference the procedure in the IEC60601-1-1 and/or IEC62353.

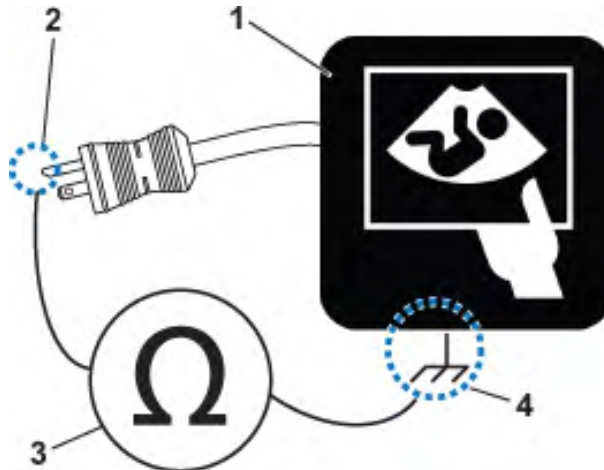


Figure 10-2 Ground Continuity Test

1	Ultrasound System	3	Ohmmeter
2	Ground Pin	4	accessible Metal Parts such as: <ul style="list-style-type: none"> <li>• Potential equilibrium connector</li> <li>• Monitor housing</li> <li>• Probe connector</li> </ul>



**Caution**

Lacquer is an isolation barrier! Measure only on blank accessible metal parts.

### 10.6.4.1 Meter Procedure

Follow these steps to test the Ground wire resistance.

1. Turn the Voluson E-Series system OFF.
2. Plug the system into the meter, and the meter into the tested AC wall outlet.
3. Plug the black chassis cable into the meter's "CHASSIS" connector and attach the black chassis cable clamp to an exposed metal part of the Voluson E-Series system.
4. Set the meter's "FUNCTION" switch to the RESISTANCE position.
5. Set the meter's "POLARITY" switch to the OFF (center) position.
6. Measure and record the Ground wire resistance. This should be less than 0.2 Ohm.

## 10.6.5 Chassis Leakage Current Test

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**Warning:** Electric Shock Hazard!  
When the meter's ground switch is OPEN, DO NOT touch the unit!

---



**Caution:** Equipment damage possibility!  
Never switch the Polarity and the status of Neutral when the unit is powered ON. Be sure to turn the unit power OFF before switching them using the POLARITY switch and/or the NEUTRAL switch.

---

### 10.6.5.1 Definition

This test, also known as Enclosure Leakage current test, measures the current that would flow through a grounded person who touches the accessible conductive parts of the equipment during normal and fault conditions. The test verifies the isolation of the power line from the chassis.

The meter is connected to parts of the equipment, easily contacted by the user or patient.

Record the highest reading.

### 10.6.5.2 Generic Procedure

The test verifies the isolation of the power line from the chassis. The testing meter is connected from accessible metal parts of the case to ground. Measurements should be made under the test conditions specified in:

- [Table 10-10 on page 10-11](#) , or
- [Table 10-11 on page 10-11](#) , as applicable.

Record the highest reading on the EQC inspection certificate.

1. Connect the Safety analyzer to an AC wall outlet.
2. Plug the equipment under test into the receptacle on the panel of the meter.
3. Connect the meter to an accessible metal surface (see: [Table 10-14](#)) of the Voluson E-Series using the cable provided with the meter.
4. Select the "Chassis" or "Enclosure Leakage" function on the meter.
5. Test opening and closing the ground with the system on and off.

**Note** *For more information, refer to the safety analyzer's user manual that will be used to perform the test.*

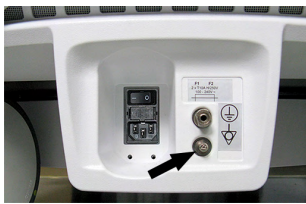
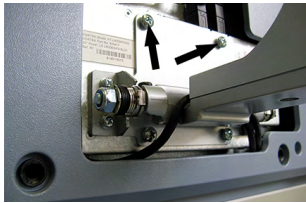
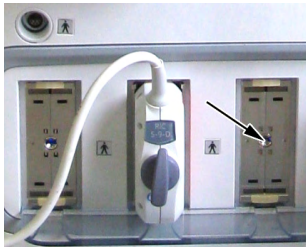
The maximum allowable limit for chassis source leakage is shown in:

- [Table 10-10 on page 10-11](#) , or
- [Table 10-11 on page 10-11](#) , as Chassis/Enclosure Leakage.



Follow the test conditions described for respective test points shown in the table below.

Table 10-14 chassis leakage current test condition

Test	Condition	Test Point (image)
1	<b>Potential equilibrium connector</b> (rear of system, on power supply RSP)	
2	<b>Monitor housing</b> (mounting screw for LCD Monitor housing, rear of monitor)	
3	<b>Probe connector</b> (probe mounting receptacle on front of system)	

### 10.6.5.3 Data Sheet for Enclosure/Chassis Leakage Current

Table 10-15 shows a typical format for recording the enclosure/chassis leakage current. Measurements should be recorded from multiple locations for each set of test conditions.

The actual location of the test probe may vary by system. Record all data in the Electrical safety tests log.

Table 10-15 Typical Data Format for recording Enclosure/Chassis Leakage Current

Unit under Test:		Date of Test:			
Test Conditions		Measurement/Test Point Location			
System Power	Grounding/PE	Potential equilibrium connector	Monitor housing	Probe connector	
off	closed				
off	open				
on	closed				
on	open				

## 10.6.6 Isolated Patient Lead (Source) Leakage-Lead to Ground



Caution: Equipment damage possibility!

Never switch the Polarity when the system is powered ON. Be sure to turn the system power OFF before switching the polarity using the POLARITY switch.

### 10.6.6.1 Definition

This test measures the current which would flow to ground from any of the isolated ECG leads. The meter simulates a patient who is connected to the monitoring equipment and is grounded by touching some other grounded surface.

For each combination the operating controls, such as the lead switch, should be operated to find the worst case condition.

### 10.6.6.2 Generic Procedure

1. Connect the Safety analyzer to an AC wall outlet.
2. Plug the equipment under test into the receptacle on the panel of the meter.
3. Connect the ECG cable to the system and the patient leads to the analyzer.
4. Select the "Patient Lead Leakage" function on the meter.
5. Test opening and closing the ground with the system on and off.

**Note** For more information, refer to the safety analyzer's user manual that will be used to perform the test.

Measurements should be made under the test conditions specified in:

- [Table 10-10 on page 10-11](#), or
- [Table 10-11 on page 10-11](#), as applicable.

For each combination, the operating controls, such as the lead switch, should be operated to find the worst case condition.

Record all data on the EQC Inspection Certificate.

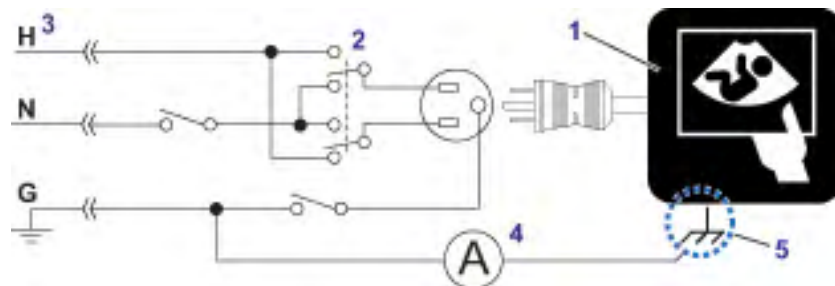


Figure 10-3 Set Up for test of Earth Leakage Current, UL60601-1/IEC60601-1

- |   |  |
|---|--|
| 1 | Voluson E-Series ultrasound system                                       |
| 2 | Polarity Reversing Switch  |
| 3 | Power Outlet (colors depend on region)                                   |
| 4 | Leakage Test Meter (Ammeter)   |
| 5 | Accessible Metal Parts (chassis - non-earth ground, unprotected surface) |

**USA and Canada:**

- **H** - Hot (Black)
- **N** - Neutral (White)
- **G** - Ground (Green or Green-Yellow)

**Others:**

- **H** - Hot (Brown)
- **N** - Neutral (Blue)
- **G** - Ground (Green-Yellow)

## 10.6.7 Isolated Patient Lead (Source) Leakage-Lead to Lead

Select and test each of the ECG lead positions (except ALL) on the LEAD selector, testing each to the power and ground condition combinations found in:

- *Table 10-10 on page 10-11*, or:
- *Table 10-11 on page 10-11*, as applicable.

Record the highest leakage current measured.

### 10.6.7.1 Lead to Lead Leakage Test Record

*Table 10-16* shows a typical format for recording the patient lead to lead leakage current.

Measurements should be recorded from each lead combination under each set of test conditions specified in:

- *Table 10-10 on page 10-11*, or
- *Table 10-11 on page 10-11*, as applicable.

Record all data on the EQC inspection certificate.

1. Connect the Safety analyzer to an AC wall outlet.
2. Plug the equipment under test into the receptacle on the panel of the meter.
3. Connect the ECG cable to the system and the patient leads to the analyzer.
4. Select the "Patient Lead Leakage" function on the meter.
5. Test opening and closing the ground with the system on and off.

**Note** *For more information, refer to the safety analyzer's user manual that will be used to perform the test.*

*Table 10-16 Typical Data Format for Recording Patient Lead to Lead Leakage*

Unit under Test:		Date of Test:		
Test Conditions		Patient Lead or Combination Measured		
System Power	Grounding/PE	<i>RA-LA</i>	<i>LA-LL</i>	<i>LL-RA</i>
System Off	open			
System On (Transmit)	open			

**Note** *Values in italics font are given as examples only.*

## 10.6.8 Isolated Patient Lead (Sink) Leakage-Isolation Test



**Caution**

Line voltage is applied to the ECG leads during this test. To avoid possible electric shock hazard, the system being tested must not be touched by patients, users or anyone while the ISO TEST switch is depressed.

### 10.6.8.1 Isolated Lead (Sink) Leakage Test Record

*Table 10-17* shows a typical format for recording the isolated patient lead sink leakage current.

Measurements should be recorded for full lead combination under each set of test conditions specified in:

- *Table 10-10 on page 10-11* , or
- *Table 10-11 on page 10-11* , as applicable.

Record all data on the EQC inspection certificate.

1. Connect the Safety analyzer to an AC wall outlet.
2. Plug the equipment under test into the receptacle on the panel of the meter.
3. Connect the ECG cable to the system and the patient leads to the analyzer.
4. Select the "Patient Lead Leakage" function on the meter.
5. Test opening and closing the ground with the system on and off.

**Note** *For more information, refer to the safety analyzer's user manual that will be used to perform the test.*

*Table 10-17 Typical Data Format for Recording Isolated Lead (sink) Leakage*

Unit under Test:		Date of Test:
Test Conditions		Patient Lead
System Power	Grounding/PE	<i>RA-LA+LL</i>
on	closed	
off	closed	

**Note** *Values in italics font are given as examples only.*

## 10.6.9 Probe Leakage Current Test



### Warning

Do not use the probe if the insulating material has been punctured or otherwise compromised. Integrity of the insulation material and patient safety can be verified by safety testing according to IEC60601-1.

### 10.6.9.1 Definition

This test measures the current that would flow to ground from any of the probes through a patient who is being scanned and becomes grounded by touching some other grounded surface.

### Note

*Each probe will have some amount of leakage, dependent on its design. Small variations in probe leakage currents are normal from probe to probe. Other variations will result from differences in line voltage and test lead placement. It is abnormal if no leakage current is measured. If no leakage current is detected, check the configuration of the test equipment.*

### 10.6.9.2 Generic Procedure on Probe Leakage Current

The most common method of measuring probe leakage is to partly immerse the probe into a saline bath while the probe is connected to the ultrasound system and active. This method measures the actual leakage current resulting from the probe RF drive.

Measurements should be made under the test conditions specified in:

- *Table 10-10 on page 10-11*, or
- *Table 10-11 on page 10-11*, as applicable for every probe.

For each combination, the probe must be active to find the worst case condition.

Record all data on the EQC inspection certificate.

### Note

*Saline water pod should be insulated from floor and earth ground.*

*The Saline solution is a mixture of water and salt. The salt adds free ions to the water, making it conductive. Normal saline solution is 0.9% salt and 99.1% water. If ready-mixed saline solution is not available, a mixture of 1 quart or 1 liter water with 9 or more grams of table salt, mixed thoroughly, will substitute.*

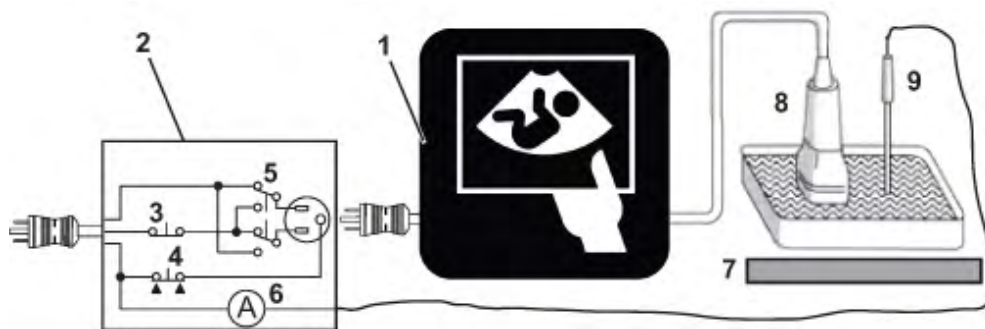


Figure 10-4 Set Up for Probe Leakage Current

1	Ultrasound System	4	Ground Switch	7	Isolator
2	Tester	5	Polarity Reversing Switch	8	Ultrasound Probe
3	Neutral Switch	6	Meter	9	Saline Probe

### Note

*Each probe will have some amount of leakage current, dependent on its design. Small variations in probe leakage currents are normal from probe to probe. Other variations will result from differences in line voltage and test lead placement.*

The ultrasound probes imaging area is immersed in the Saline solution along with a grounding probe from the test meter to complete the current path.

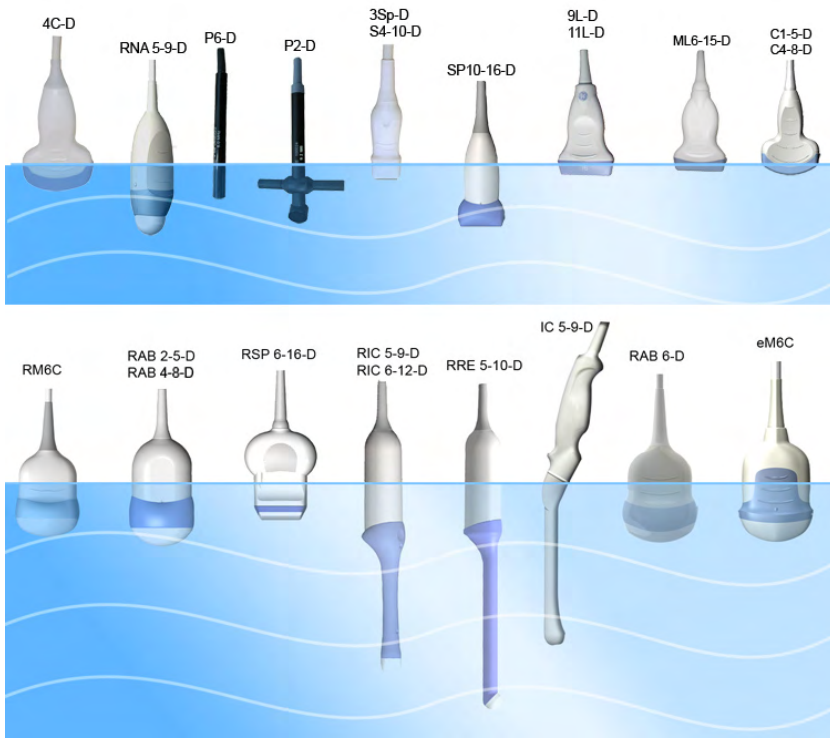
1. Turn the Voluson E-Series system OFF.
2. Connect the Safety analyzer to an AC wall outlet.
3. Plug the equipment under test into the receptacle on the panel of the meter.
4. Plug the Ground Probe (saline probe) into the tester's connector.

5. Select the "Chassis" or "Enclosure Leakage" function on the meter.
6. Connect the ultrasound probe to be tested to the Voluson E-Series system.
7. Put the saline probe and the ultrasound probes face (imaging area of the probe) into the saline bath.

**Caution**

To avoid probe damage and possible electric shock, do not immerse probes into any liquid beyond the level indicated shown below.

Do not touch the probe, conductive liquid or any part of the system under test while doing the test.



8. Power ON the Voluson E-Series system.
9. After the Voluson E-Series system has completed the boot process, select the probe to be tested so it is the active probe.
10. Record the highest current reading.

Table 10-18 on page 10-20 shows a typical format for recording ultrasound probe source leakage current. Measurements should be recorded for each probe under the set of test conditions specified in:

- Table 10-10 on page 10-11 , or
- Table 10-11 on page 10-11 , as applicable.

The actual location of the test probe may vary by system. Record all data on the EQC inspection certificate.

Table 10-18 Typical Data Format for recording Probe (source) Leakage Current

Unit under Test:		Date of Test:			
Test Conditions		Probe as measured in Saline Bath			
System Power	Grounding/PE	<i>4C-D</i>	<i>11L-D</i>	<i>RIC5-9-D</i>	RM6C
off	closed				
off	open				
on	closed				
on	open				

**Note** Values in italics font are given as examples only.

## 10.7 When there's too much Leakage Current...

### 10.7.1 Chassis fails

Check the ground on the power cord and plug for continuity. Ensure the ground is not broken, frayed, or intermittent. Replace any defective part.

Tighten all grounds. Ensure star washers are under all ground studs. Inspect wiring for bad crimps, poor connections, or damage.

Test the wall outlet; verify it is grounded and free of other wiring abnormalities. Notify the user or owner to correct any deviations. As a work around, check the other outlets to see if they could be used instead.

**Note** *No outlet tester can detect the condition where the white neutral wire and the green grounding wire are reversed. If later tests indicate high leakage currents, this should be suspected as a possible cause and the outlet wiring should be visually inspected.*

### 10.7.2 Probe fails

- Test another probe to isolate if the fault lies with the probe or the system.

**Note** *Each probe will have some amount of leakage, dependent on its design. Small variations in probe leakage currents are normal from probe to probe. Other variations will result from differences in line voltage and test lead placement. The maximum allowable leakage current for body surface contact probe differs from inter-cavity probe. Be sure to enter the correct probe type in the appropriate space on the check list.*

- Test the probe in another connector to isolate if the fault lies with the probe or the system.  
If excessive leakage current is slot dependent, inspect the system connector for bent pins, poor connections, and ground continuity.  
If the problem remains with the probe, replace the probe.

### 10.7.3 Peripheral fails

Tighten all grounds. Ensure star washers are under all ground studs.

Inspect wiring for bad crimps, poor connections, or damage.

### 10.7.4 Still fails

If all else fails, begin isolation by removing the probes, external peripherals, then the on board ones, one at a time while monitoring the leakage current measurement.

### 10.7.5 New System

If the leakage current measurement tests fail on a new system and if situation can not be corrected, submit a Safety Failure Report to document the system problem. Remove system from operation.

### 10.7.6 ECG fails

Inspect cables for damage or poor connections.

### 10.7.7 In case of using an UPS (Uninterruptable Power Supply)

In case of using an UPS (Uninterruptable Power Supply) repeat the tests without using the UPS, i.e. directly plug the ultrasound system to the AC wall outlet.

## 10.8 Ultrasound Equipment Quality Check (EQC and IQC)

Download and use the latest version of these forms. They can be retrieved from MyWorkshop.

- EQC -- Refer to DOC0929340 in MyWorkshop
- IQC -- Refer to DOC0535485 in MyWorkshop

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