

Voluson E-Series BT15 / BT16 / BT17 / BT18

Service Manual

English (English)

- Voluson E6 / Voluson E8 / Voluson E10 with Software version EC300, 15.x.x (BT15)
- Voluson E6 / Voluson E8 / Voluson E10 with Software version EC310, 16.x.x (BT16)
- Voluson E6 / Voluson E8 / Voluson E10 with Software version EC320, 17.x.x (BT17)
- Voluson E6 / Voluson E8 / Voluson E10 with Software version EC330, 18.x.x (BT18)



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3	May 2015	General Update and Improvement, new parts
4	August 2015	Implementation of EC310 (BT16)
5	July 2016	Implementation of EC320 (BT17), general update
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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

- English
(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

- Français
(FR)
- Ce manuel de maintenance est disponible en anglais uniquement.
- Si un client de la personne responsable de la maintenance demande une langue autre que l'anglais, il est de la responsabilité du client de fournir les services de traduction.
 - N'essayez pas d'effectuer vous-même la maintenance de l'équipement avant d'avoir préalablement lu et compris le manuel de maintenance.
 - Le non-respect cet avertissement peut entraîner des blessures dues à un choc électrique, une défaillance mécanique ou à d'autres éléments dangereux chez la personne en charge de la maintenance, l'opérateur ou le patient.

ADVERTENCIA

- Español
(ES)
- Este Manual de servicio está disponible en idioma inglés únicamente.
- Si un proveedor de servicio del cliente requiere un idioma distinto, es responsabilidad del cliente ofrecer servicios de traducción.
 - No intente reparar el equipo a menos que haya consultado y comprendido este Manual de servicio.
 - Si no presta atención a esta Advertencia, se pueden ocasionar lesiones al proveedor de servicio, al operador o al paciente por descarga eléctrica, por riesgos mecánicos o de otra índole.

WARNUNG

- Deutsch
(DE)
- Dieses Wartungshandbuch ist nur auf Englisch verfügbar.
- Wenn der Kundendiensttechniker eines Kunden eine andere Sprache als Englisch benötigt, unterliegt es der Verantwortung des Kunden eine Übersetzung anfertigen zu lassen.
 - Warten Sie das Gerät nur, wenn Sie dieses Wartungshandbuch gelesen und verstanden haben.
 - Die Nichtbeachtung dieses Warnhinweises kann zu Verletzungen des Kundendiensttechnikers, Anwenders oder Patienten durch Stromschläge, mechanische oder andere Gefahren führen.

AVVERTENZA

(IT) italiano

Il presente Manuale di assistenza è disponibile solo in inglese.

- Se il fornitore di servizi di un cliente ne richiede una copia in una lingua diversa dall'inglese, è responsabilità del cliente fornire il servizio di traduzione.
- Non tentare di riparare l'apparecchio se questo Manuale di assistenza non è stato letto e compreso.
- Il mancato rispetto di questa avvertenza può comportare il rischio di lesioni al fornitore di servizi, all'operatore o al paziente causate da scosse elettriche o da pericoli di origine meccanica o di altro tipo.

WAARSCHUWING

(NL) Nederlands

Deze servicehandleiding is alleen beschikbaar in het Engels.

- Als de serviceleverancier van een klant vraagt om een andere taal dan Engels, is het de verantwoordelijkheid van de klant om een vertaalde versie te bieden.
- Probeer geen onderhoud aan de apparatuur uit te voeren tenzij deze servicehandleiding is geraadpleegd en begrepen.
- Het niet opvolgen van deze waarschuwing kan bij de serviceleverancier, de operator of de patiënt leiden tot letsel door elektrische schokken, mechanische of andere gevaren.

ADVERTÊNCIA

(PT-BR) Português

Este Manual de Manutenção está disponível apenas em Inglês.

- Caso um prestador de serviços do cliente solicite o manual em idioma diferente do inglês, é de responsabilidade do cliente o fornecimento de serviços de tradução.
- Não tente realizar a manutenção do equipamento antes de ler e compreender este Manual de manutenção.
- O não cumprimento desta advertência pode resultar em danos por choque elétrico e riscos mecânicos para o prestador de serviços, operador ou paciente.

HOIATUS!

(ET) Eesti

Service Manual (Hooldusjuhend) on saadaval ainult ingliskeelsena.

- Kui kliendi teenusepakkuja nõue on, et juhend oleks mõnes muus keeles, korraldab juhendi tõlkimise klient.
- Tutvuge enne seadme hooldustööde tegemist kindlasti juhendiga Service Manual (Hooldusjuhend).
- Selle nõude eiramise korral võib teenindaja, kasutaja või patsient saada elektrilöögi, samuti võivad kaasneda muud ohud.

OPOZORILO

(SL) Slovenščina

Ta servisni priročnik je na voljo samo v angleščini.

- Če ponudnik servisnih storitev za stranko potrebuje navodila v drugem jeziku, mora stranka sama poskrbeti za prevajanje.
- Ne poskušajte servisirati opreme, ne da bi prej prebrali in razumeli servisni priročnik.
- Če tega opozorila ne upoštevate, obstaja nevarnost električnega udara, mehanskih ali drugih nevarnosti in posledičnih poškodb ponudnika servisnih storitev, uporabnika opreme ali pacienta.

警告

日本語

(JA)

このサービスマニュアルは英語版のみ提供されています。

- お客様の保守担当者が英語以外のマニュアルを必要とされる場合は、お客様の負担にて翻訳サービスをご利用ください。
- 装置の保守を行う前に、必ずサービスマニュアルを読み、内容を理解してください。
- この警告に注意を払わない場合、保守担当者やオペレータ、患者に対して、電気ショック、機械またはその他の危険による傷害が発生する恐れがあります。

警告

繁体中文

(ZH-CN)

本维修手册仅提供英文版。

- 如果客户需要其它语种版本，请自行翻译。
- 在维修机器前，请务必阅读并完全理解本维修手册。
- 若违反本警告，有可能会给维修提供商、操作员或患者带来电击伤害、机械损伤或其它危害。

VARNING

Svenska

(SV)

Den här servicehandboken finns endast på engelska.

- Om en kunds servicetekniker kräver ett annat språk än engelska är det kundens ansvar att tillhandahålla en översatt version.
- Försök inte att utföra service på utrustningen om du inte har läst igenom och förstått den här servicehandboken.
- Om du inte tar hänsyn till den här varningen kan serviceteknikern, operatören eller patienten utsättas för elektriska stötar eller mekaniska eller andra faror, vilket kan leda till personskador.

警告

繁體中文

(ZH-TW)

此服務手冊僅推出英文版。

- 若客戶的維修人員需要英文以外的其他語言版本，客戶需自行負責提供翻譯服務。
- 在詳閱此服務手冊並充分理解其內容之前，請勿試圖開始維修設備。
- 若忽視此警告，可能導致維修人員、操作人員或病患因為觸電、機械問題或其他危險而受傷。

경고

한국어

(KO)

이 서비스 설명서는 영어로만 제공됩니다.

- 고객의 서비스 공급자가 영어 이외의 언어를 요구하는 경우 번역 서비스를 제공할 책임은 고객에게 있습니다.
- 이 서비스 설명서를 참조 및 이해하지 못한 경우 장비를 만지지 마십시오.
- 이 경고를 무시한 경우 서비스 공급자, 오퍼레이터 또는 환자가 감전, 기계적 위험 또는 기타 위험으로 인한 부상을 입을 수 있습니다.

ПРЕДУПРЕЖДЕНИЕ

Данное руководство по обслуживанию доступно только на английском языке.

На русском языке
(RU)

- Если специалисту по техническому обслуживанию клиента требуется документация на каком-либо другом языке, ответственность за выполнение перевода возлагается на клиента.
- Приступайте к обслуживанию оборудования только после того, как изучите данное руководство по обслуживанию и полностью поймете его содержание.
- Несоблюдение данного требования может привести к травмированию специалиста по техническому обслуживанию, пользователя или пациента вследствие поражения электрическим током, механических и прочих повреждений.

OSTRZEŻENIE

Niniejszy podręcznik serwisowy jest dostępny wyłącznie w języku angielskim.

Polski
(PL)

- Jeżeli dostawca usług klienta posługuje się językiem innym niż angielski, za zapewnienie usług tłumaczeniowych odpowiada klient.
- Przed przystąpieniem do czynności serwisowych należy zapoznać się z informacjami zawartymi w niniejszym podręczniku serwisowym i je zrozumieć.
- W przeciwnym wypadku dostawca usług, operator lub pacjent mogą odnieść obrażenia spowodowane porażeniem prądem elektrycznym, działaniem elementów mechanicznych lub innymi zagrożeniami.

ΠΡΟΕΙΔΟΠΟΙΗΣΗ

Ελληνικά
(EL)

Το παρόν Εγχειρίδιο σέρβις διατίθεται μόνο στα Αγγλικά.

- Εάν ο πάροχος σέρβις του πελάτη απαιτεί γλώσσα εκτός των Αγγλικών, η παροχή μεταφραστικών υπηρεσιών αποτελεί ευθύνη του πελάτη.
- Μην επιχειρήσετε να επισκευάσετε τον εξοπλισμό εάν πρώτα δεν συμβουλευτείτε και κατανοήσετε το παρόν Εγχειρίδιο σέρβις.
- Σε περίπτωση μη τήρησης της παρούσας προειδοποίησης, ενδέχεται να προκληθεί τραυματισμός στον πάροχο σέρβις, το χειριστή ή τον ασθενή εξαιτίας ηλεκτροπληξίας καθώς και μηχανικών ή άλλων κινδύνων.

FIGYELMEZTETÉS

Magyar
(HU)

A szervizkézikönyv kizárólag angol nyelven érhető el.

- Amennyiben az ügyfél szolgáltatójának nem felel meg az angol nyelvű dokumentáció, úgy a fordításról az ügyfélnek kell gondoskodnia.
- Kizárólag úgy lásson hozzá a berendezés karbantartásához, hogy elolvasta és megértette a szervizkézikönyvben foglaltakat.
- Ezen figyelmeztetés figyelmen kívül hagyása esetén a szolgáltató, a kezelő vagy a páciens áramütést, mechanikus sérülést vagy más veszély által okozott személyi sérülést szenvedhet.

VAROVANIE

Slovenčina
(SK)

Táto servisná príručka je dostupná iba v anglickom jazyku.

- Ak poskytovateľ služieb zákazníkom vyžaduje iný jazyk ako anglický jazyk, jeho povinnosťou je zabezpečiť prekladateľské služby.
- Zariadenie nepoužívajte bez prečítania a porozumenia tejto servisnej príručky.
- Nedodržanie tejto výstrahy môže viesť k zraneniu poskytovateľa služieb, operátora alebo pacienta spôsobeného elektrickým šokom, mechanickým alebo iným nebezpečenstvom.

VÝSTRAHA

česky
(CZ)

Tato servisní příručka je k dispozici pouze v angličtině.

- Pokud poskytovatel služby zákazníkovi požaduje jiný jazyk než angličtinu, je odpovědností zákazníka poskytnout služby překladu.
- Nepokoušejte se provádět servis zařízení, dokud si neprostudujete a neporozumíte servisní příručce.
- Nevěnování pozornosti této výstraze může způsobit poskytovateli služeb, obsluze nebo pacientovi úraz elektrickým proudem, mechanická nebo jiná nebezpečí.

UYARI

Türkçe
(TK)

Servis Kılavuzu yalnızca İngilizce olarak mevcuttur.

- Müşterinin servis sağlayıcısı için kılavuzun İngilizce dışında başka bir dile çevrilmesi gerekiyorsa çeviri hizmeti sağlamak müşterinin sorumluluğudur.
- Bu Servis Kılavuzu'na bakıp talimatları anlamadan ekipmanı kullanmaya çalışmayın.
- Bu Uyarının göz ardı edilmesi servis sağlayıcısının, operatörün veya hastanın, elektrik çarpması, mekanik arıza ya da diğer tehlikeler nedeniyle yaralanmasına neden olabilir.

ADVARSEL

Dansk
(DA)

Denne servicemanual fås kun på engelsk.

- Hvis en kundes tjenesteudbyder kræver et andet sprog end engelsk, er det kundens ansvar at sørge for oversættelsesydelse.
- Forsøg ikke at udføre service på udstyret, medmindre denne servicemanual er læst og forstået.
- Manglende overholdelse af denne advarsel kan medføre skade på serviceudbyderen, operatøren eller patienten som følge af elektrisk stød, mekaniske eller andre farer.

ADVARSEL

Norsk
(NO)

Denne servicehåndboken er bare tilgjengelig på engelsk.

- Hvis en kundes tjenestetilbyder krever et annet språk enn engelsk, er det kundens ansvar å tilby oversettelsestjenester.
- Ikke forsøk å utføre service på utstyret før denne servicehåndboken er lest og forstått.
- Dersom det ikke tas hensyn til denne advarselen, kan det føre til skader på tjenestetilbyderen, operatøren eller pasienten fra elektrisk støt, mekaniske eller andre farer.

VAKAVA VAROITUS

- Suomi**
(FI)
- Tämä huolto-opas on saatavana vain englanniksi.
- Jos asiakkaan palveluntarjoaja tarvitsee oppaan jollain muulla kielellä, käännöspalveluiden hankkiminen on asiakkaan vastuulla.
 - Laitetta ei saa huoltaa ellei huolto-oppaaseen ole sitä ennen tutustuttu huolellisesti.
 - Jos tätä varoitusta ei noudateta, palveluntarjoaja, käyttäjä tai potilas saattaa saada sähköiskun, ja saattaa aiheutua mekaanisia tai muita vaurioita.

ПРЕДУПРЕЖДЕНИЕ

- Български**
(BG)
- Настоящото Сервизно ръководство се предлага само на английски език.
- Ако доставчикът на сервизни услуги на клиента изисква ръководство на език, който се различава от английския, клиентът има отговорност да осигури адекватен превод.
 - Не правете опити за сервиз на оборудването, без да проверите и да разберете съветите в Сервизното ръководство.
 - Неспазването на това предупреждение може да доведе до нараняване на доставчика на сервизни услуги, оператора или пациента вследствие на токов удар, механична или други опасности.

AVERTISMENT

- Română**
(RO)
- Acest manual de service este disponibil doar în engleză.
- Dacă furnizorul de servicii al unui client solicită altă limbă decât engleza, este responsabilitatea clientului să ofere servicii de traducere.
 - Nu încercați să efectuați lucrări de service asupra echipamentului, în afară de cazul când ați consultat acest manual de service și l-ați înțeles.
 - Nerespectarea acestui avertisment poate avea ca rezultat rănirea furnizorului de servicii, a operatorului sau a pacientului ca urmare a electrocutării, pericolelor mecanice sau a altor pericole.

UPOZORENJE

- Hrvatski**
(HR)
- Ovaj servisni priručnik dostupan je samo na engleskom jeziku.
- Ako klijentov serviser zahtijeva jezik koji nije engleski, odgovornost klijenta je pružiti usluge prijevoda.
 - Nemojte pokušavati servisirati opremu ako niste pročitali i razumjeli servisni priručnik.
 - Ako ne poštuju ovo upozorenje, može doći do ozljede serviser, operatera ili pacijenta prouzročene strujnim udarom, mehaničkim i drugim opasnostima.

ĮSPĖJIMAS

- Lietuvių k.**
(LT)
- Šis priežiūros vadovas galimas tik anglų kalba.
- Jei kliento paslaugų teikėjas reikalauja kitos kalbos nei anglų, klientas atsako už vertimo paslaugos teikimą.
 - Atlikite įrangos priežiūrą tik gerai susipažinę su priežiūros vadovu ir jį supratę.
 - Nesilaikant šio įspėjimo galimas paslaugos teikėjo, operatoriaus ar paciento sužeidimas dėl elektros šoko, mechaninio ar kito pavojaus.

AVISO

Português
(Portugal)
(PT-PT)

Este manual de assistência está disponível apenas em inglês.

- Se o prestador de serviços de assistência do cliente necessitar do manual noutro idioma, a disponibilização dos serviços de tradução é da responsabilidade do cliente.
- Não tente reparar o equipamento se não tiver consultado e compreendido este manual de assistência.
- O não cumprimento das instruções constantes neste aviso pode resultar em ferimentos no prestador de serviços de assistência, no operador ou no paciente devido a choques eléctricos, perigos mecânicos ou outros problemas.

ПОПЕРЕДЖЕННЯ

Українська
(UK)

Цей посібник із технічного обслуговування доступний лише англійською мовою.

- Якщо постачальнику послуг із технічного обслуговування потрібна інформація мовою, відмінною від англійської, відповідальність за надання послуг перекладу несе користувач.
- Технічне обслуговування обладнання можна виконувати лише після ознайомлення з посібником із технічного обслуговування та усвідомлення його змісту.
- Недотримання цього попередження може призвести до травм постачальника послуг, оператора або пацієнта, спричинених дією електричного струму, механічних або інших пошкоджень.

PERINGATAN

Bahasa
Indonesia
(ID)

Panduan Servis ini hanya tersedia dalam Bahasa Inggris.

- Jika penyedia layanan pelanggan memerlukan bahasa di luar Bahasa Inggris, maka pelanggan bertanggung jawab untuk memberikan layanan tersebut.
- Jangan mencoba menyervis peralatan ini, kecuali Panduan Servis ini telah dijadikan rujukan dan dipahami dengan baik.
- Kelalaian memperhatikan Peringatan ini dapat menyebabkan cedera terhadap penyedia layanan, operator, atau pasien akibat bahaya kejutan listrik, mekanik, dan bahaya lainnya.

คำเตือน

ไทย
(TH)

คู่มือซ่อมบำรุงนี้เฉพาะภาษาอังกฤษเท่านั้น

- หากผู้ให้บริการของลูกค้าต้องการฉบับภาษาอื่นนอกเหนือจากภาษาอังกฤษ ลูกค้าต้องเป็นผู้รับผิดชอบในการจัดเตรียมคู่มือซ่อมบำรุงฉบับแปล
- โปรดอย่าซ่อมบำรุงอุปกรณ์โดยไม่ศึกษา และทำความเข้าใจคู่มือซ่อมบำรุงนี้
- หากไม่ปฏิบัติตามคำเตือนนี้อาจส่งผลให้ผู้ให้บริการ ผู้ใช้งานอุปกรณ์ หรือผู้ป่วยได้รับบาดเจ็บจากไฟฟ้าช็อต อันตรายจากกลไกของอุปกรณ์ หรืออันตรายอื่น ๆ

BRĪDINĀJUMS

- Šī apkalpes rokasgrāmata ir pieejama tikai angļu valodā.
- Ja klienta pakalpojumu sniedzējam ir nepieciešama cita valoda, kas nav angļu valoda, klienta pienākums ir nodrošināt tulkojumu.
 - Nemēģiniet apkalpot aprīkojumu, ja apkalpes rokasgrāmata nav izlasīta un izprasta.
 - Ja šis brīdinājums netiek ievērots, pakalpojumu sniedzējs, operators vai pacients var gūt traumas no elektrošoka vai var rasties mehānisks vai cita veida apdraudējums.

UPOZORENJE

- Ovaj priručnik za servisiranje dostupan je samo na engleskom jeziku.
- Ako klijentov serviser zahteva jezik koji nije engleski, odgovornost je na klijentu da pruži usluge prevođenja.
 - Nemojte da pokušavate da servisirate opremu ako prethodno niste pročitali i razumeli ovaj priručnik.
 - Ako ne poštujete ovo upozorenje, može doći do povređivanja serviser, operatera ili pacijenta uzrokovanog električnim udarom, mehaničkim i drugim opasnostima.

CẢNH BÁO

- Hướng dẫn sử dụng dịch vụ này chỉ sẵn dùng bằng tiếng Anh.
- Nếu nhà cung cấp dịch vụ của khách hàng yêu cầu ngôn ngữ khác ngoài tiếng Anh, thì khách hàng phải có trách nhiệm cung cấp các dịch vụ dịch thuật.
 - Không được tìm cách sửa chữa thiết bị trừ khi đã tham khảo và hiểu rõ Hướng dẫn sử dụng dịch vụ này.
 - Bỏ qua lời cảnh báo này có thể gây thương tích cho nhà cung cấp dịch vụ, nhân viên vận hành hoặc bệnh nhân do sốc điện, những nguy hiểm về máy móc hoặc yếu tố khác.

ЕСКЕРТУ

- Осы қызмет көрсету нұсқаулығы тек ағылшын тілінде қолжетімді.
- Егер тұтынушылардың қызметтер жеткізушісі ағылшын тілінен басқа тілді талап етсе, аудару қызметтерімен қамтамасыз ету тұтынушының жауапкершілігіне кіреді.
 - Осы қызмет көрсету нұсқаулығын түсініп, ол туралы кеңес алмайынша жабдыққа қызмет көрсетуге тырыспаңыз.
 - Осы ескертуді орындамау электр тогының соғуы, механикалық немесе басқа да қауіптер салдарынан қызметтер жеткізушісінің, оператордың немесе емделушінің жарақаттануына алып келуі мүмкін.

BABALA

- Available lamang sa Ingles ang Manwal ng Serbisyon ng ito.
- Kung ang kailangan lamang ng tagabigay ng serbisyo ng kustomer ng wika maliban sa Ingles, responsibilidad ng kustomer na magbigay ng serbisyo sa pagsasalin wika nito.
 - Huwag subukan na iserbisyo ang mga kasangkapan maliban kung nakonsulta ang nauunawaan itong Manwal ng Serbisyo.
 - Ang pagkabigong maunawaan ang Babalang ito ay maaring maging resulta ng pinsala sa tagabigay ng serbisyo, nagpapagana o pasyente mula sa pagkakakoryente, mekanikal o iba pang peligro.

Damage in transportation

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 the global complaint recording tool 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.

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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 and Maintenance</i>	Provides periodic maintenance procedures.



The screen graphics and illustrations in this Service Manual are for illustrative purposes only and may be slightly different from what is displayed on the screen or device.

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
H48691ZF	Voluson E6	BT16
H48701KX	Voluson E6	BT17
H48701WB	Voluson E6	BT18

Table 1-3 Voluson E8 - model designations

Part Number	Description	BT version
H48691RM	Voluson E8	BT15
H48691XJ	Voluson E8 incl. CW	BT15
H48701AY	Voluson E8	BT16
H48701JJ	Voluson E8	BT17
H48701WA	Voluson E8	BT18

Table 1-4 Voluson E10 - model designations

Part Number	Description	BT version
H48691RN	Voluson E10	BT15
H48691XK	Voluson E10 incl. CW	BT15
H48701CJ	Voluson E10	BT16
H48701GT	Voluson E10	BT17
H48701GU	Voluson E10 with OLED Monitor	BT17
H48701UY	Voluson E10	BT18
H48701UZ	Voluson E10 with OLED Monitor	BT18

1.3.3 System History - Hardware and Software Versions

This manual applies to:

Voluson E6 Systems

- with Serial Number E00001 - E03000 (**BT15**)
- with Software version EC300, Ext.x, 15.x.x (BT15)
- with Serial Number E03001 - E06000 (**BT16**)
- with Software version EC310, Ext.x, 16.x.x (BT16)
- that were upgraded to BT16 (EC310, Ext.x, 16.x.x)
- with Serial Number E06001 - (**BT17**)
- with Software version EC320, Ext.x, 17.x.x (BT17)
- that were upgraded to BT17 (EC320, Ext.x, 17.x.x)
- systems with Serial Number E09001 - (**BT18**)
- systems with Software version EC330, Ext.x, 18.x.x (BT18)
- systems that were upgraded to BT18 (EC330, Ext.x, 18.x.x)

Voluson E8 Systems

- with Serial Number E30001 - E33000 (**BT15**)
- with Software version EC300, Ext.x, 15.x.x (BT15)
- with Serial Number E33001 - E36000 (**BT16**)
- with Software version EC310, Ext.x, 16.x.x (BT16)
- that were upgraded to BT16 (EC310, Ext.x, 16.x.x)
- with Serial Number E36001 - (BT17)
- with Software version EC320, Ext.x, 17.x.x (BT17)
- that were upgraded to BT17 (EC320, Ext.x, 17.x.x)
- systems with Serial Number E39001 - (**BT18**)
- systems with Software version EC330, Ext.x, 18.x.x (BT18)
- systems that were upgraded to BT18 (EC330, Ext.x, 18.x.x)

Voluson E10 Systems

- with Serial Number E60001 - E63000 (**BT15**)
- with Software version EC300, Ext.x, 15.x.x (BT15)
- with Serial Number E63001 - E66000 (**BT16**)
- with Software version EC310, Ext.x, 16.x.x (BT16)
- that were upgraded to BT16 (EC310, Ext.x, 16.x.x)
- with Serial Number E66001 - (**BT17**)
- with Software version EC320, Ext.x, 17.x.x (BT17)
- that were upgraded to BT17 (EC320, Ext.x, 17.x.x)
- systems with Serial Number E69001 - (**BT18**)
- systems with Software version EC330, Ext.x, 18.x.x (BT18)
- systems that were upgraded to BT18 (EC330, Ext.x, 18.x.x)

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 OnBase and/or 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 systems 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












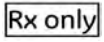
The following table describes the purpose and location of labels, safety icons and other important information provided on the equipment.















Note

For more detailed 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)
	Brand and model (reference 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
 0123	CE Conformity mark according to Medical Device Directive 93/42/EEC. 0123 : 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 60417-5333) 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 paddle, symbol IEC 60417-5336) 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
	Pinch point Watch your hands and fingers when adjusting the monitor. Keep hands clear of openings.	rear side of the Monitor
	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)

LABEL/SYMBOL	PURPOSE/MEANING	LOCATION
	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)
	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
	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 accompanying documents for important safety-related information such as warnings and precautions 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" CAUTION: System shutdown using this button DOES NOT disconnect the Voluson E-Series from mains voltage!	ON/OFF 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
	This symbols indicate that the product contains hazardous materials in excess of the limits established by the Chinese standard GB/T 26572 Requirements of concentration limits for certain restricted substances in electrical and electronic products.	rear side of the system on the plug of each probe
	Every system has a unique marking for identification, the Unique Device Identification (UDI) Label. The UDI label consists of a series of (alpha-) numeric characters and barcode which uniquely identify the Voluson E-Series system as a medical device manufactured by General Electric.	Identification and Rating Plate (rear side of the system / on plug of each probe) Upgraded systems adjacent to the Rating Plate
	The Common Mark of Products Circulation certifies that the products bearing this mark, passed all conformity assessment (approval) procedures.	Identification and Rating Plate (rear side of the system)

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).



An optional veterinary/animal use kit is available.
Do not cross-use the Voluson E-Series ultrasound system between human use and veterinary use.

1.5.3 Mechanical Safety

Moving the system on plains	Moving the system on inclines
	

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 system 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 AC 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 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 standards (e.g. IEC60950 for data processing equipment and IEC60601-1 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. The medical device may be connected to a single IEC XXX device (protection class I) placed in a room which is not medically used.
2. If the device is to be connected in a medically-used room the following rule applies:

- IEC XXX compliant devices (protection class I) may be connected with an additional safety measure.
- IEC 60601 compliant devices may be connected as such.

For all situations 1 and 2, the additional device shall be installed outside the typical patient environment.

Possible additional safety measures are additional protective earth connection between the 2 devices, or a safety isolation mains transformer for the other device.

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 air clearance and creepage distance of the isolation device in agreement with IEC60601 incl. national deviations. 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.

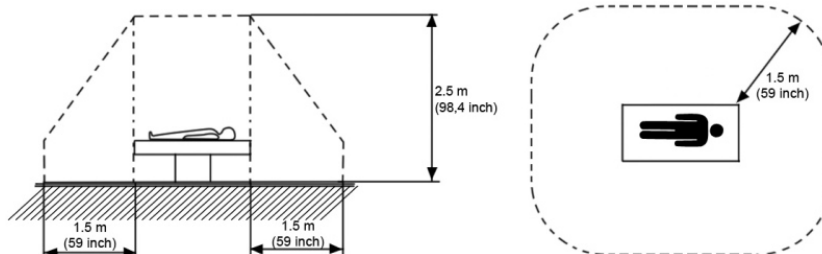


Caution

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 CSA, IEC or other relevant requirements.

Caution

Please observe that some printers may not be medical devices! If Bluetooth-, Line- or Laser 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, 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 1-16](#) 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.



The layout of the Identification and Rating Plate depends on BT-version and/or date of manufacture.

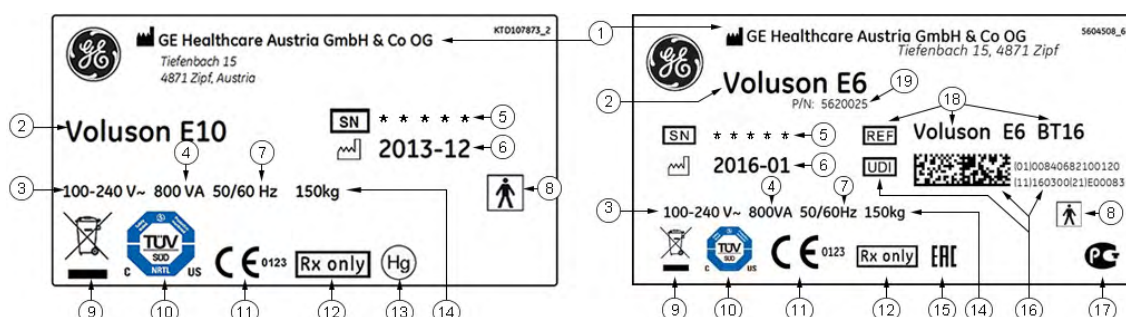


Figure 1-1 Identification and Rating Plate: Examples

1	Manufacturer	7	Frequency	13	Hg label
2	Model Type	8	Safety type: Type BF	14	approx. weight of the system
3	System Voltage range	9	WEEE Disposal Icon	15	EAC label
4	Power Consumption nominal	10	TUEV NRTL Certification mark	16	UDI label (barcode and characters)
5	System Serial Number	11	CE Conformity mark	17	GOST-R label
6	Manufacturing date	12	FDA Guidance	18	Brand and model, BT version
				19	Part number

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 Voluson E-Series system.
4. Maintain control of the Voluson E-Series system power plug.
5. Wait for at least 30 seconds for capacitors to discharge as there are no test points to verify isolation.

Ultrasound 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



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

LOCATION	PHONE NUMBER	
USA GE Healthcare Ultrasound Service Engineering 9900 Innovation Drive (RP-2123) Wauwatosa, WI 53226, USA	USCAN Service: On-site: Service Parts: OLC: Application Support:	1-800-437-1171 1-800-558-2040 1-800-321-7937 or 1-262 524-5300 1-800-682-5327 or 1-262-524-5698
Canada	OLC - USCAN	1-800-321-7937 1-800-668-0732
Latin America	LATAM Service: Application Support:	+1-262-524-5300 +1-262-524-5698
EUROPE Ultrasound Europe GE Ultraschall Deutschland GmbH Beethovenstraße 239 Postfach 11 05 60, D-42655 Solingen Germany	OLC - EUROPE Support Phone: English/German, all segments Support Fax:	+49 (0) 212 2802 652 +33 1 3083 1300 +49 (0) 212 2802 431
EAGM	OLC - EAGM Phone: Egypt Service center: UAE Service center:	+49 (0) 212-2802-652 00202 2322 1252 00971 8003646
APAC	Online Services Ultrasound Asia ANZ - Service Support: Australia: Japan Support Center: Korea: Singapore:	1800 647 855 +(61) 1-800-659-465 +(81) 42-846-9008(PHONE) +(82) 2-1544-6119 +(65) 6291-8528 (PHONE) +(65) 6291-7006 (FAX)
China	Phone:	+(86) 800-810 8188 +(86) 400-812 8188 +(86) 10-6788 2652
India Wipro GE Healthcare Pvt. Ltd. 4, Kadugodi Industrial Area, Bangalore - 560 067 India	Phone:	+(91) 1-800-425-8025 +(91) 1-800-425-7255 +(91) 1-800-102-7750

Figure 1-2 phone numbers for customer assistance

1.7.2 System Manufacturer

Table 1-7 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.
Assemble all screws, Radio Frequency gaskets, covers and cores.	After you finish repairing or updating the system, assemble 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 to another more suitable location.
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 5-46](#).*

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 lifted and moved forwards to the maximum)

** minimum at "normal" monitor position (no control console lifted 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 (8.2 ft. / 98.4 in.) from the system's proposed location.; see [Section 2.1.2 "Electrical Requirements" on page 2-2](#).
- door opening is at least 76 cm (2.5 ft./ 30 in.) wide
- proposed location for the system is at least 0.5 m (1.6 ft. / 19.6 in.) from the wall for cooling
- power outlet and place for any external peripheral are within 2 m (6.5 ft. / 78.7 in.) 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. / 39.4 in.) 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 3-65](#) 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.*

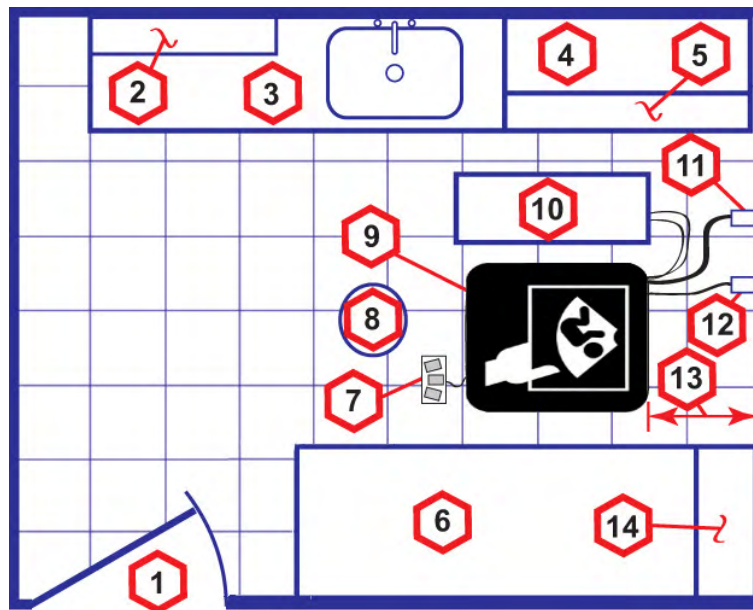


Figure 2-1 recommended Floor Plan 4.3 m x 5.2 m (14 by 17 foot)

1 door – at least 76 cm (2.5 foot / 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. / 36 in.) 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

DICOM¹ (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 3-64 on page 3-73](#) 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.*

¹ 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 3-73](#)) to help ensure that all the required information is available, prior to setup the system.

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3.3 Preparing for Setup	3-7
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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 1-20](#).

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 8-21 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 it's 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 it's 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 it's 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

When connecting the optional PE (potential equalization) and/or the optional additional GND (ground cable) it is mandatory to also use the Power Filter (H48701EL).



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)

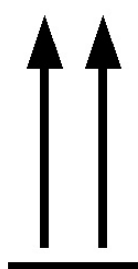
The User Manual(s) should be fully read and understood before operating the Voluson E-Series. Keep manuals near the system for reference.



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 VOLUSON E-SERIES 1011 (REV. 12/2014) & THE 1011/1012/1013/1014/1015/1016/1017/1018/1019/1020/1021/1022/1023/1024/1025/1026/1027/1028/1029/1030/1031/1032/1033/1034/1035/1036/1037/1038/1039/1040/1041/1042/1043/1044/1045/1046/1047/1048/1049/1050/1051/1052/1053/1054/1055/1056/1057/1058/1059/1060/1061/1062/1063/1064/1065/1066/1067/1068/1069/1070/1071/1072/1073/1074/1075/1076/1077/1078/1079/1080/1081/1082/1083/1084/1085/1086/1087/1088/1089/1090/1091/1092/1093/1094/1095/1096/1097/1098/1099/1100/1101/1102/1103/1104/1105/1106/1107/1108/1109/1110/1111/1112/1113/1114/1115/1116/1117/1118/1119/1120/1121/1122/1123/1124/1125/1126/1127/1128/1129/1130/1131/1132/1133/1134/1135/1136/1137/1138/1139/1140/1141/1142/1143/1144/1145/1146/1147/1148/1149/1150/1151/1152/1153/1154/1155/1156/1157/1158/1159/1160/1161/1162/1163/1164/1165/1166/1167/1168/1169/1170/1171/1172/1173/1174/1175/1176/1177/1178/1179/1180/1181/1182/1183/1184/1185/1186/1187/1188/1189/1190/1191/1192/1193/1194/1195/1196/1197/1198/1199/1200/1201/1202/1203/1204/1205/1206/1207/1208/1209/1210/1211/1212/1213/1214/1215/1216/1217/1218/1219/1220/1221/1222/1223/1224/1225/1226/1227/1228/1229/1230/1231/1232/1233/1234/1235/1236/1237/1238/1239/1240/1241/1242/1243/1244/1245/1246/1247/1248/1249/1250/1251/1252/1253/1254/1255/1256/1257/1258/1259/1260/1261/1262/1263/1264/1265/1266/1267/1268/1269/1270/1271/1272/1273/1274/1275/1276/1277/1278/1279/1280/1281/1282/1283/1284/1285/1286/1287/1288/1289/1290/1291/1292/1293/1294/1295/1296/1297/1298/1299/1300/1301/1302/1303/1304/1305/1306/1307/1308/1309/1310/1311/1312/1313/1314/1315/1316/1317/1318/1319/1320/1321/1322/1323/1324/1325/1326/1327/1328/1329/1330/1331/1332/1333/1334/1335/1336/1337/1338/1339/1340/1341/1342/1343/1344/1345/1346/1347/1348/1349/1350/1351/1352/1353/1354/1355/1356/1357/1358/1359/1360/1361/1362/1363/1364/1365/1366/1367/1368/1369/1370/1371/1372/1373/1374/1375/1376/1377/1378/1379/1380/1381/1382/1383/1384/1385/1386/1387/1388/1389/1390/1391/1392/1393/1394/1395/1396/1397/1398/1399/1400/1401/1402/1403/1404/1405/1406/1407/1408/1409/1410/1411/1412/1413/1414/1415/1416/1417/1418/1419/1420/1421/1422/1423/1424/1425/1426/1427/1428/1429/1430/1431/1432/1433/1434/1435/1436/1437/1438/1439/1440/1441/1442/1443/1444/1445/1446/1447/1448/1449/1450/1451/1452/1453/1454/1455/1456/1457/1458/1459/1460/1461/1462/1463/1464/1465/1466/1467/1468/1469/1470/1471/1472/1473/1474/1475/1476/1477/1478/1479/1480/1481/1482/1483/1484/1485/1486/1487/1488/1489/1490/1491/1492/1493/1494/1495/1496/1497/1498/1499/1500/1501/1502/1503/1504/1505/1506/1507/1508/1509/1510/1511/1512/1513/1514/1515/1516/1517/1518/1519/1520/1521/1522/1523/1524/1525/1526/1527/1528/1529/1530/1531/1532/1533/1534/1535/1536/1537/1538/1539/1540/1541/1542/1543/1544/1545/1546/1547/1548/1549/1550/1551/1552/1553/1554/1555/1556/1557/1558/1559/1560/1561/1562/1563/1564/1565/1566/1567/1568/1569/1570/1571/1572/1573/1574/1575/1576/1577/1578/1579/1580/1581/1582/1583/1584/1585/1586/1587/1588/1589/1590/1591/1592/1593/1594/1595/1596/1597/1598/1599/1600/1601/1602/1603/1604/1605/1606/1607/1608/1609/1610/1611/1612/1613/1614/1615/1616/1617/1618/1619/1620/1621/1622/1623/1624/1625/1626/1627/1628/1629/1630/1631/1632/1633/1634/1635/1636/1637/1638/1639/1640/1641/1642/1643/1644/1645/1646/1647/1648/1649/1650/1651/1652/1653/1654/1655/1656/1657/1658/1659/1660/1661/1662/1663/1664/1665/1666/1667/1668/1669/1670/1671/1672/1673/1674/1675/1676/1677/1678/1679/1680/1681/1682/1683/1684/1685/1686/1687/1688/1689/1690/1691/1692/1693/1694/1695/1696/1697/1698/1699/1700/1701/1702/1703/1704/1705/1706/1707/1708/1709/1710/1711/1712/1713/1714/1715/1716/1717/1718/1719/1720/1721/1722/1723/1724/1725/1726/1727/1728/1729/1730/1731/1732/1733/1734/1735/1736/1737/1738/1739/1740/1741/1742/1743/1744/1745/1746/1747/1748/1749/1750/1751/1752/1753/1754/1755/1756/1757/1758/1759/1760/1761/1762/1763/1764/1765/1766/1767/1768/1769/1770/1771/1772/1773/1774/1775/1776/1777/1778/1779/1780/1781/1782/1783/1784/1785/1786/1787/1788/1789/1790/1791/1792/1793/1794/1795/1796/1797/1798/1799/1800/1801/1802/1803/1804/1805/1806/1807/1808/1809/1810/1811/1812/1813/1814/1815/1816/1817/1818/1819/1820/1821/1822/1823/1824/1825/1826/1827/1828/1829/1830/1831/1832/1833/1834/1835/1836/1837/1838/1839/1840/1841/1842/1843/1844/1845/1846/1847/1848/1849/1850/1851/1852/1853/1854/1855/1856/1857/1858/1859/1860/1861/1862/1863/1864/1865/1866/1867/1868/1869/1870/1871/1872/1873/1874/1875/1876/1877/1878/1879/1880/1881/1882/1883/1884/1885/1886/1887/1888/1889/1890/1891/1892/1893/1894/1895/1896/1897/1898/1899/1900/1901/1902/1903/1904/1905/1906/1907/1908/1909/1910/1911/1912/1913/1914/1915/1916/1917/1918/1919/1920/1921/1922/1923/1924/1925/1926/1927/1928/1929/1930/1931/1932/1933/1934/1935/1936/1937/1938/1939/1940/1941/1942/1943/1944/1945/1946/1947/1948/1949/1950/1951/1952/1953/1954/1955/1956/1957/1958/1959/1960/1961/1962/1963/1964/1965/1966/1967/1968/1969/1970/1971/1972/1973/1974/1975/1976/1977/1978/1979/1980/1981/1982/1983/1984/1985/1986/1987/1988/1989/1990/1991/1992/1993/1994/1995/1996/1997/1998/1999/2000/2001/2002/2003/2004/2005/2006/2007/2008/2009/2010/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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: Figure 1-1 on page 1-23)
	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 1-26.*

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 Completing the Setup

Connecting the System to a Power Source



Caution

Prior to connecting 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).

3.4.1 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 3-2 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 3-3 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 3-3 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 .

3.4.1.1 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).

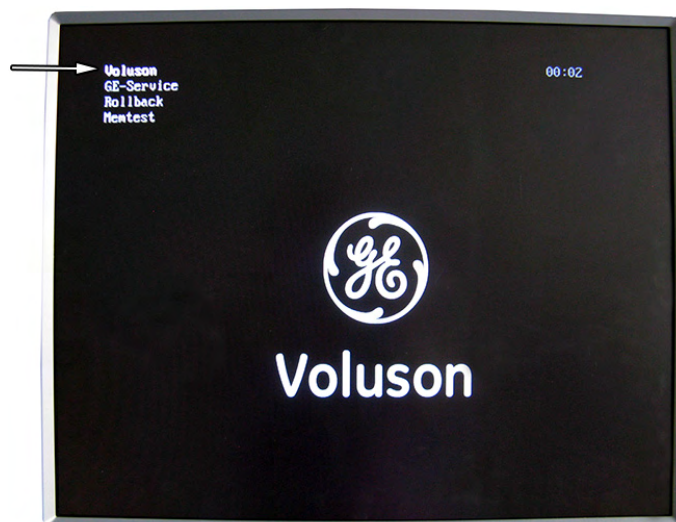


Figure 3-4 Boot screen

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 3-5 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 backlight is lit.
8. As soon as the software has been loaded, the 2D screen is displayed on the monitor.

EC320/EC330 (BT17/BT18) only:



1. If patient data stored on the internal HDDs D:\ partition are encrypted (protected), the system has to be unlocked by **Password**, **Recovery key** or **USB device with unlock key**.
For further details refer to [Section 3.7.1.13.2 "Unlock an encrypted Disk" on page 3-47](#).
 2. If **Activate User Login** is check marked in the *Setup - General Settings - Authentication* page, a system login window appears. Please enter the proper *User Name* and *Password* and then click **Login**.
-

3.4.2 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.

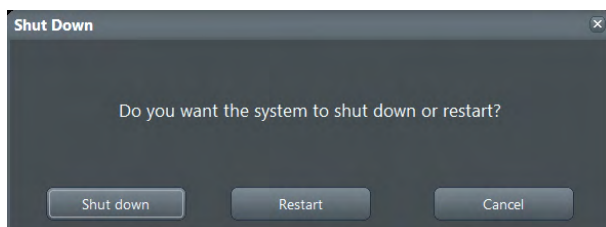


Figure 3-6 Shutdown dialog

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 3-7 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).

3.4.3 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.

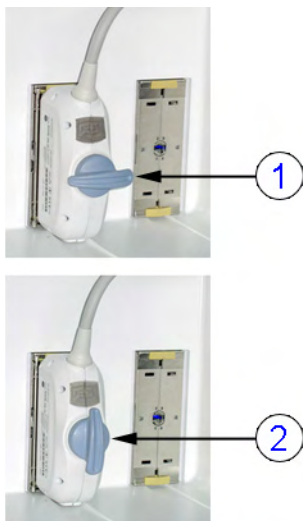


Figure 3-8 probe connection

- | | |
|---|-----------------------------------------------------------------|
| 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.*

3.5 Connection of Auxiliary Devices

Content in this section

3.5.1 Connecting the LCD Monitor	3-15
3.5.2 Connecting the OLED Monitor	3-16
3.5.3 Connecting the Black & White Printer	3-17
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Note Always observe the instructions given in the manual of the peripheral/auxiliary device.

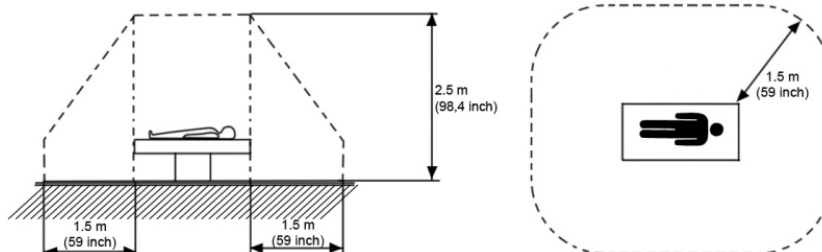


Warning

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

Caution

Please observe that some printers may not be medical devices! If Bluetooth-, Line- or Laser 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 1-21](#).

3.5.1 Connecting the LCD Monitor

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

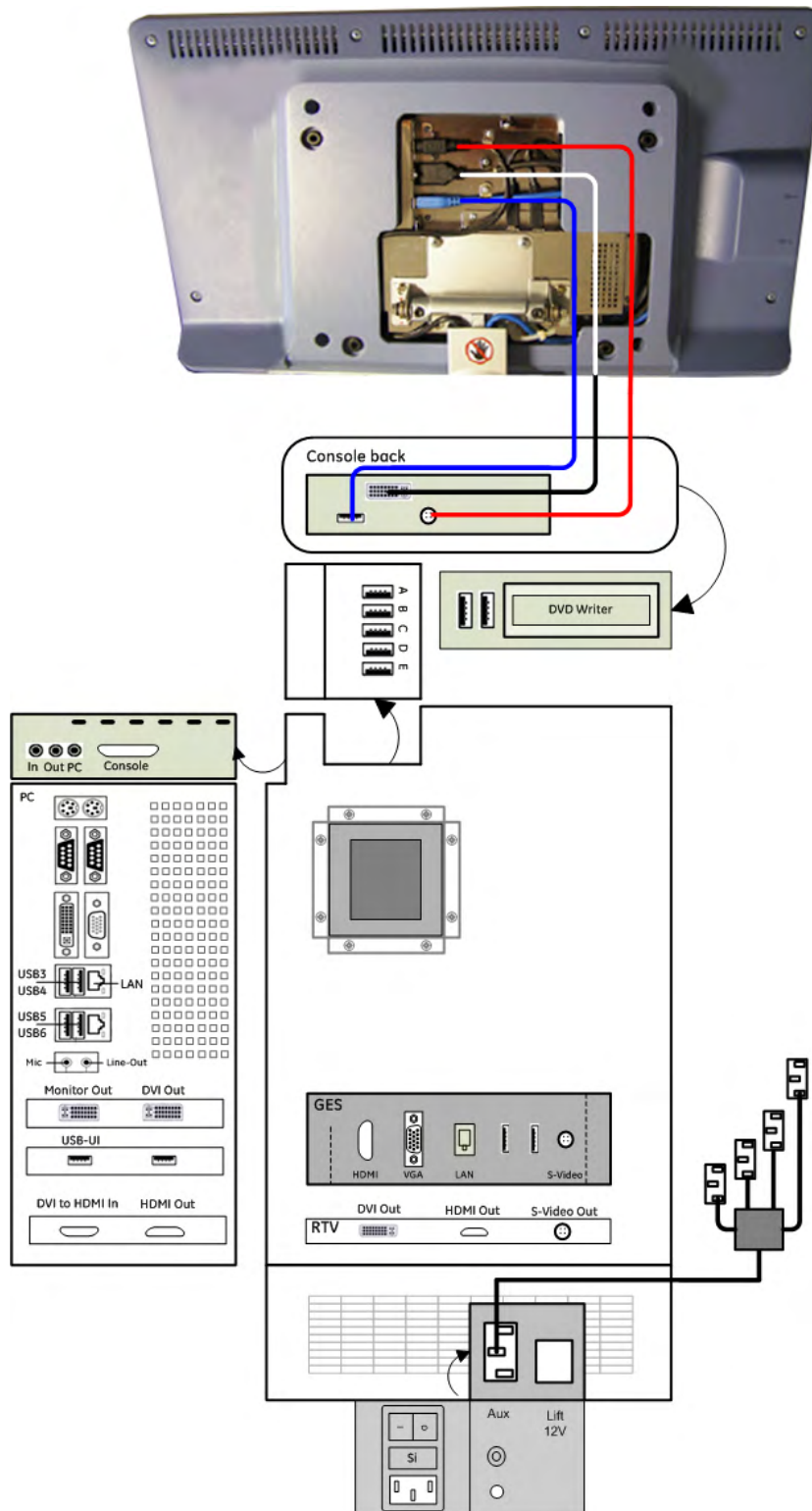


Figure 3-9 Connection Scheme - LCD Monitor

3.5.2 Connecting the OLED Monitor

Note *The OLED Monitor is only available for BT17 (EC320) and BT18 (EC330) Voluson E10 systems. Usually it comes pre-installed with the system.*

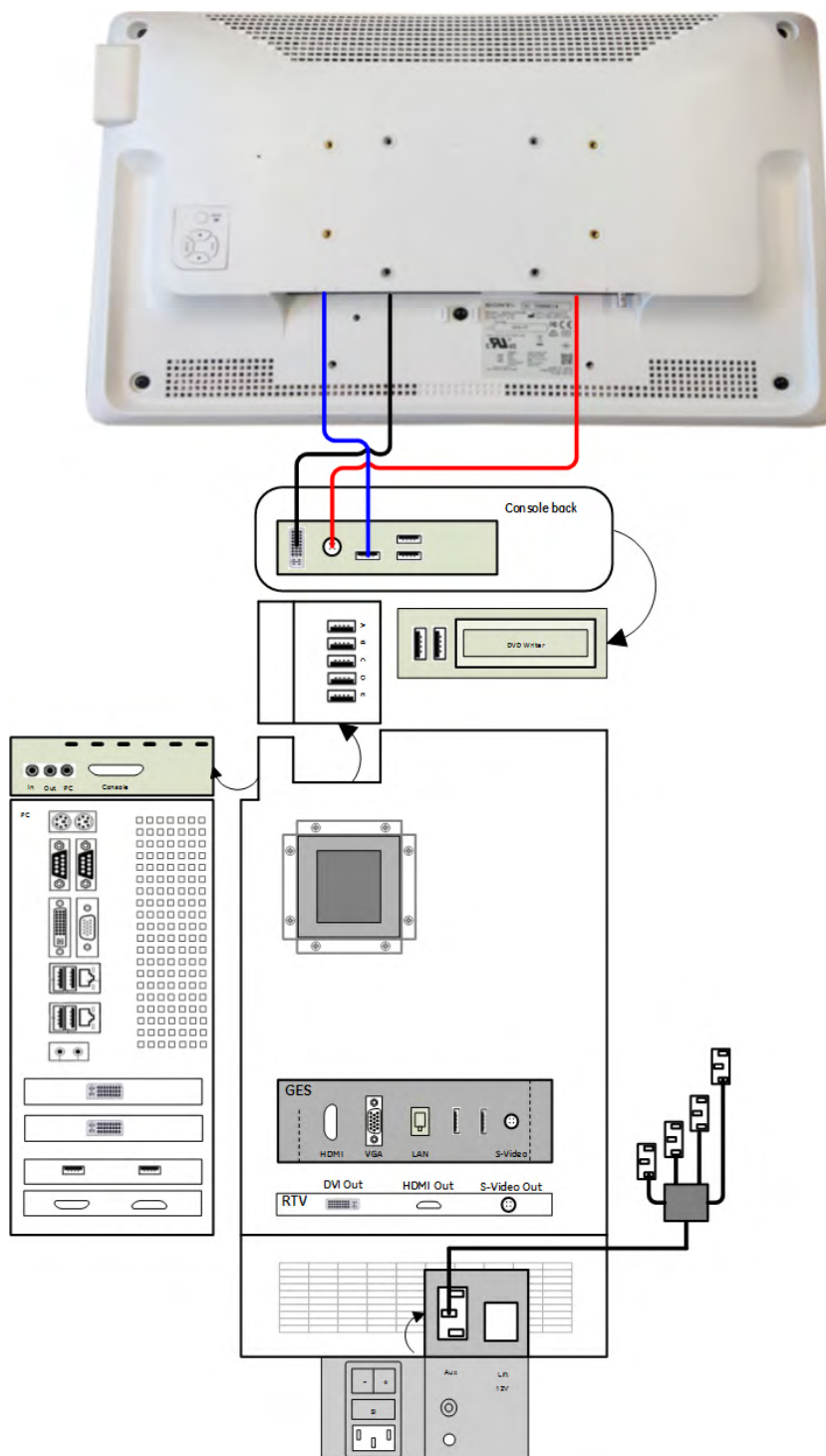


Figure 3-10 Connection Scheme - OLED Monitor

3.5.3 Connecting the Black & White Printer

1. Power Off/Shutdown the system as described in [Section 4.2.2 on page 4-4](#).
2. If your printer is **UP-D898MD**:²



- a. Connect your printer to any power source.
Note: If you connect the printer directly to an AC mains power outlet for auxiliary devices (provided by the Voluson E-Series system), DO NOT yet connect the USB cable!
- b. Press the Power ON button (1) on the printer.
- c. Enter the Menu by pushing the **Joystick** key (2).
- d. Display "*Digital*" by shifting the **Joystick** key up or down.
- e. Push the **Joystick** key to enter the sub menu.
- f. Display "*Driver*" by shifting up or down.
- g. Push the **Joystick** key to enter the sub menu.
- h. Display "*DRV:897*" by shifting up or down.
- i. Push the **Joystick** key again to confirm selection. The printer is now set-up with the driver of UP-D897.
- j. Proceed installation procedure as described below.
3. Connect the Black & White printer according to connection scheme, see: [Figure 3-11 on page 3-18](#).
4. When all cables are connected, press the Power ON button on the printer.
5. Power ON/Boot up the Voluson E-Series system as described in [Section 3.4.1 on page 3-9](#).
 All software drivers are pre-installed for the designated printer only.
6. 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 3-41](#).
7. Verify correct printer settings; see [Section 3.6.5 "Adjustment of Printer Settings" on page 3-38](#).

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, IEC 62353 or other relevant standard.

² The UP-D898MD features a legacy mode driver mode. In this mode the printer identifies itself as UP-D897 via the USB interface. This enables the use of the printer with the driver of UP-D897. Through this feature the new medical printer UP-D898MD can be used to easily replace an existing UP-D897 unit in the field.

3.5.3.1 Connection Scheme: B&W Printer

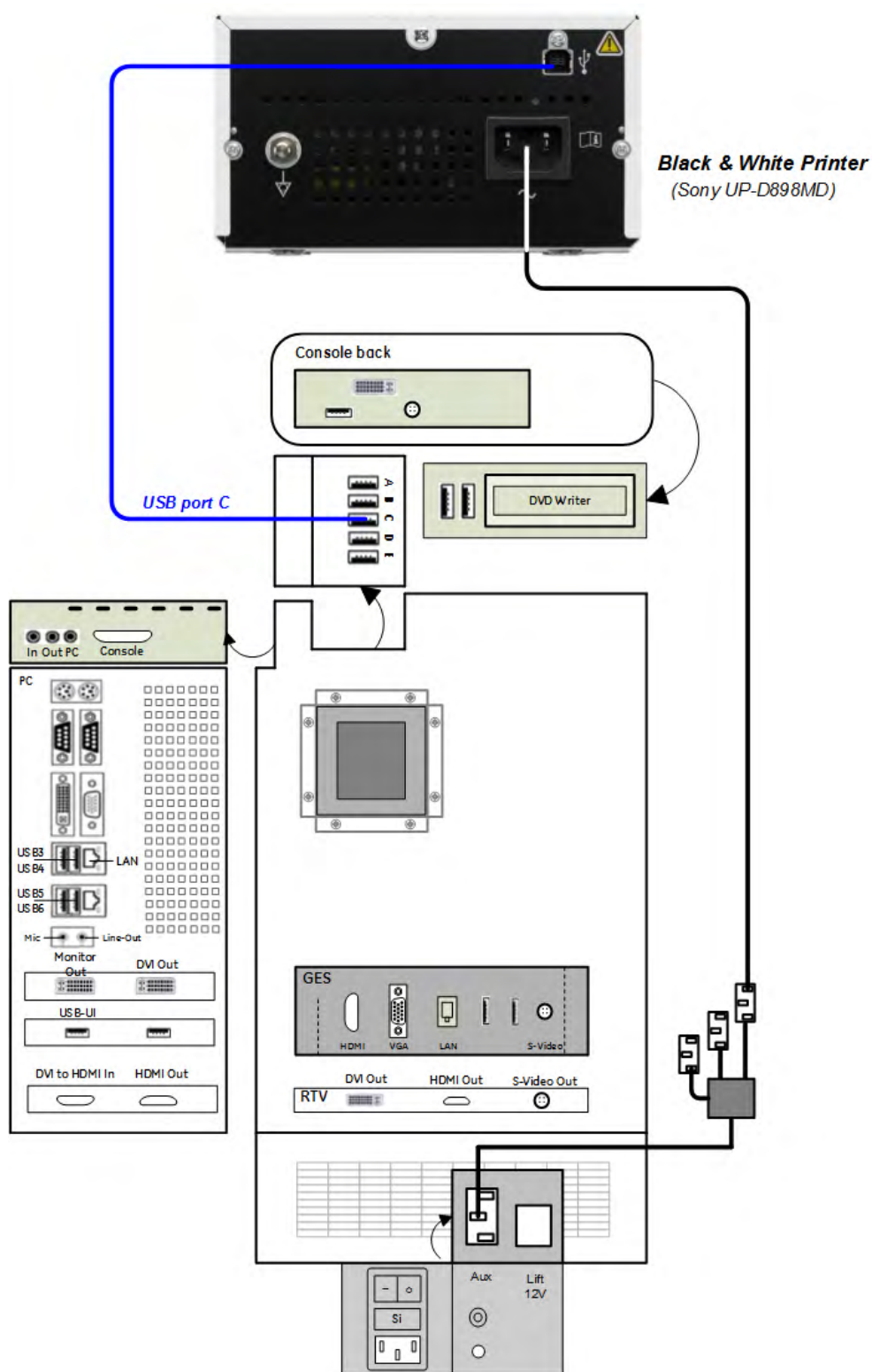


Figure 3-11 Connection Scheme - B&W Printer

3.5.4 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 3-12 on page 3-20](#).
3. When all cables are connected, press the Power ON button on the printer.
4. Power ON/Boot up the Voluson E-Series system as described in [Section 3.4.1 on page 3-9](#).
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 3-41](#).
6. Verify correct printer settings; see [Section 3.6.5 "Adjustment of Printer Settings" on page 3-38](#).

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, IEC 62353 or other relevant standard.

3.5.4.1 Connection Scheme: Color Printer

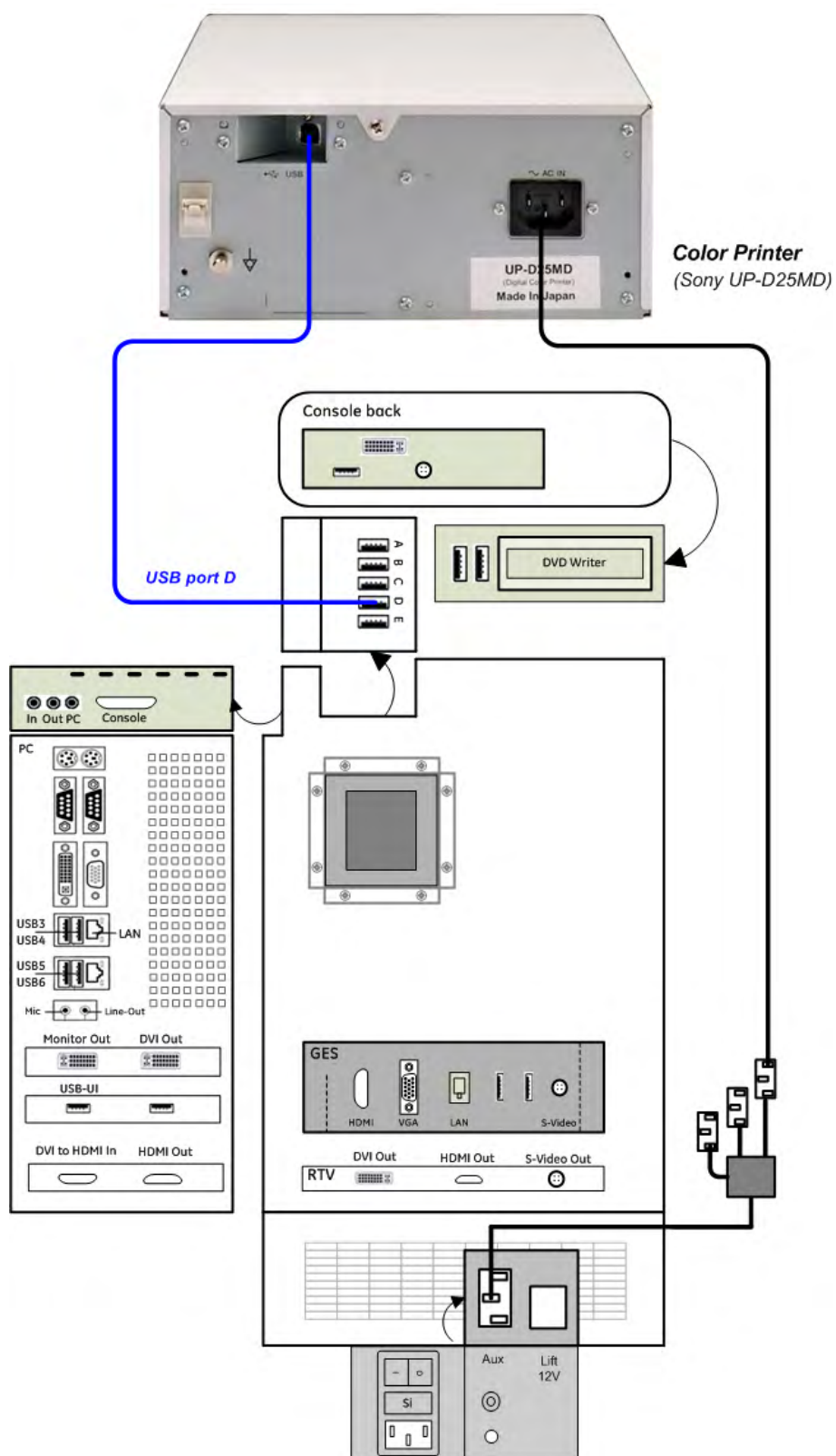


Figure 3-12 Connection Scheme - Color Printer

3.5.5 Connecting the Network Color Laser Printer


Caution

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


Caution

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

Note

It does not matter, whether an Ethernet crossover cable or a patch cable (straight through cable) is used. The Network Color Laser Printer automatically reconfigures signals to yield expected results.

Note

*The Network Color Laser printer **MUST NOT** be installed by the user! For installation please contact your local distributor or GE service representative.*

Connection directly to the Voluson E-Series

Physical connection:

1. Connect the Color Laser Printer.
 - Connect the network cable to the Ethernet **LAN** connector on the Voluson E-Series system. The other end connect to the Ethernet connector of the Color Laser Printer.
 - Connect the power cable of the printer to an external, non-isolated power source.

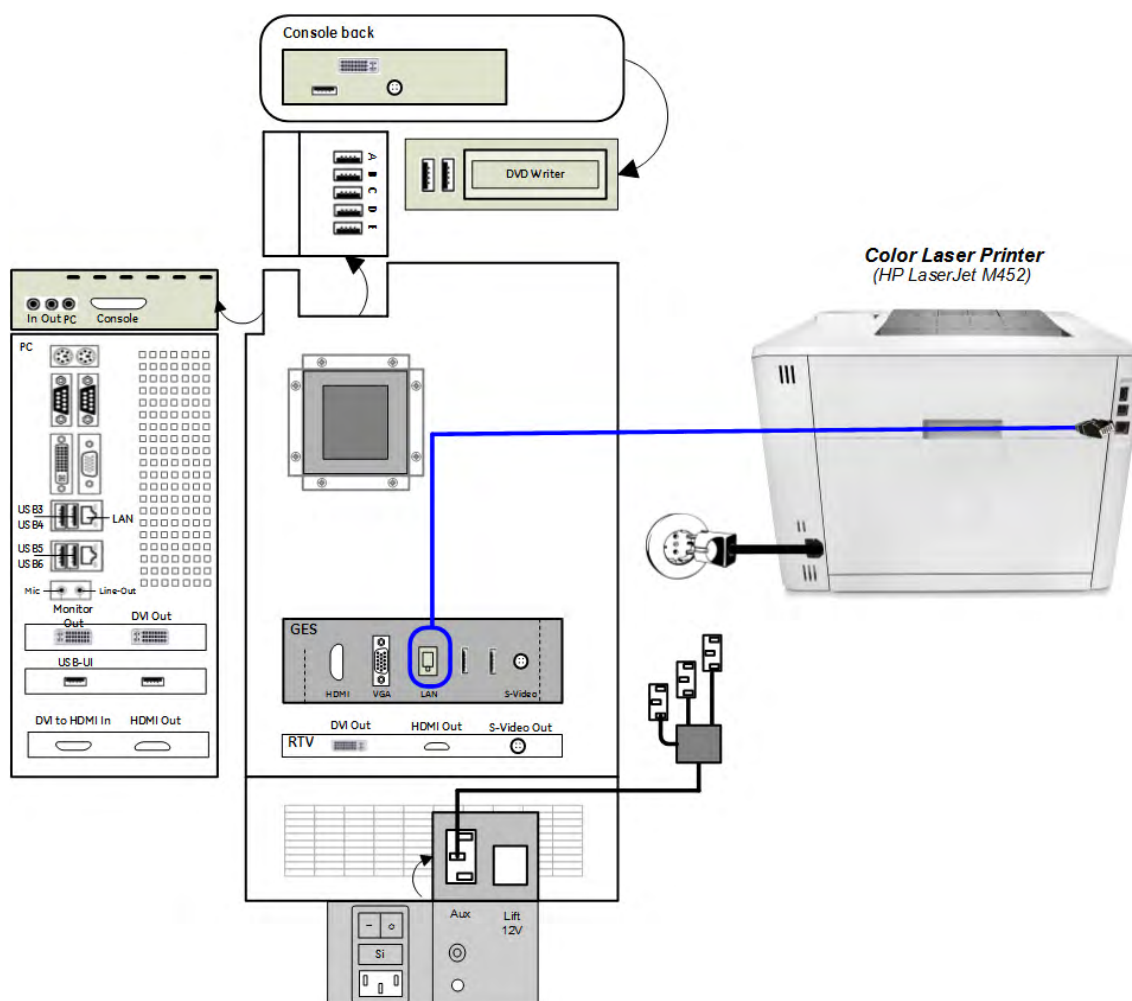


Figure 3-13 Connection Scheme - Color Laser Printer (directly via network cable)

Connection to work within the Network Environment

The Color Laser Printer can be connected to work within the network environment. Usually this will be the hospital network.

Physical connection:

Two network cables are needed.

1. Connect the Color Laser Printer.
 - Connect the first network cable to the Ethernet **LAN** connector on the Voluson E-Series system. The other end connect to a hospital network wall outlet.
 - Connect the second network cable to the Ethernet connector of the Color Laser Printer. The other end connect to a hospital network wall outlet.
 - Connect the power cable of the printer to an external, non-isolated power source.

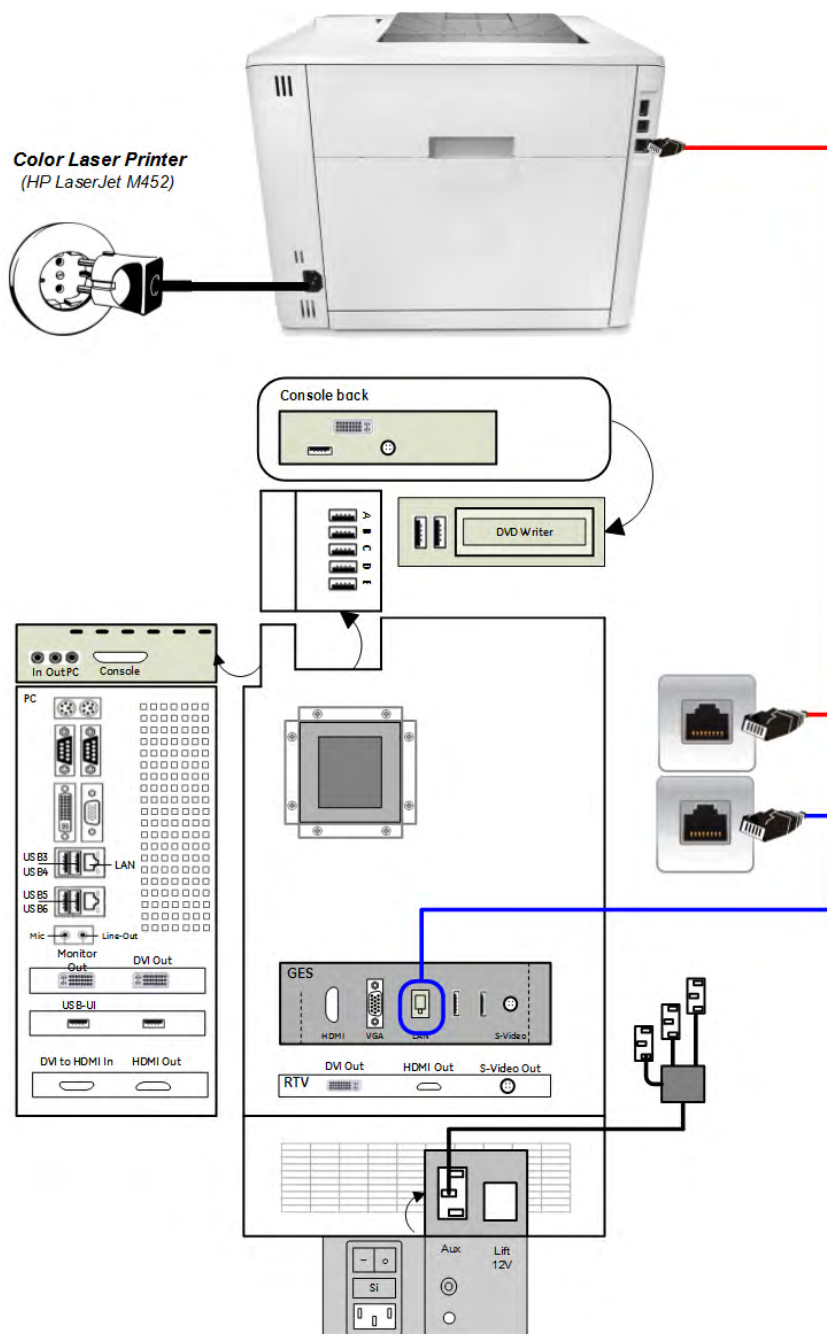


Figure 3-14 Connection Scheme - Color Laser Printer (within Network Environment)

Connection for Wi-Fi Direct Communication

Note

Wi-Fi Direct Communication is only possible with printer type HP LaserJet M452nw, see [Table 9-10](#).

Physical connection:

A WLAN network adapter is required.

1. Connect the power cable of the printer to an external, non-isolated power source.
2. Plug the proper WLAN adapter into an accessible USB port of the Voluson E-Series system.

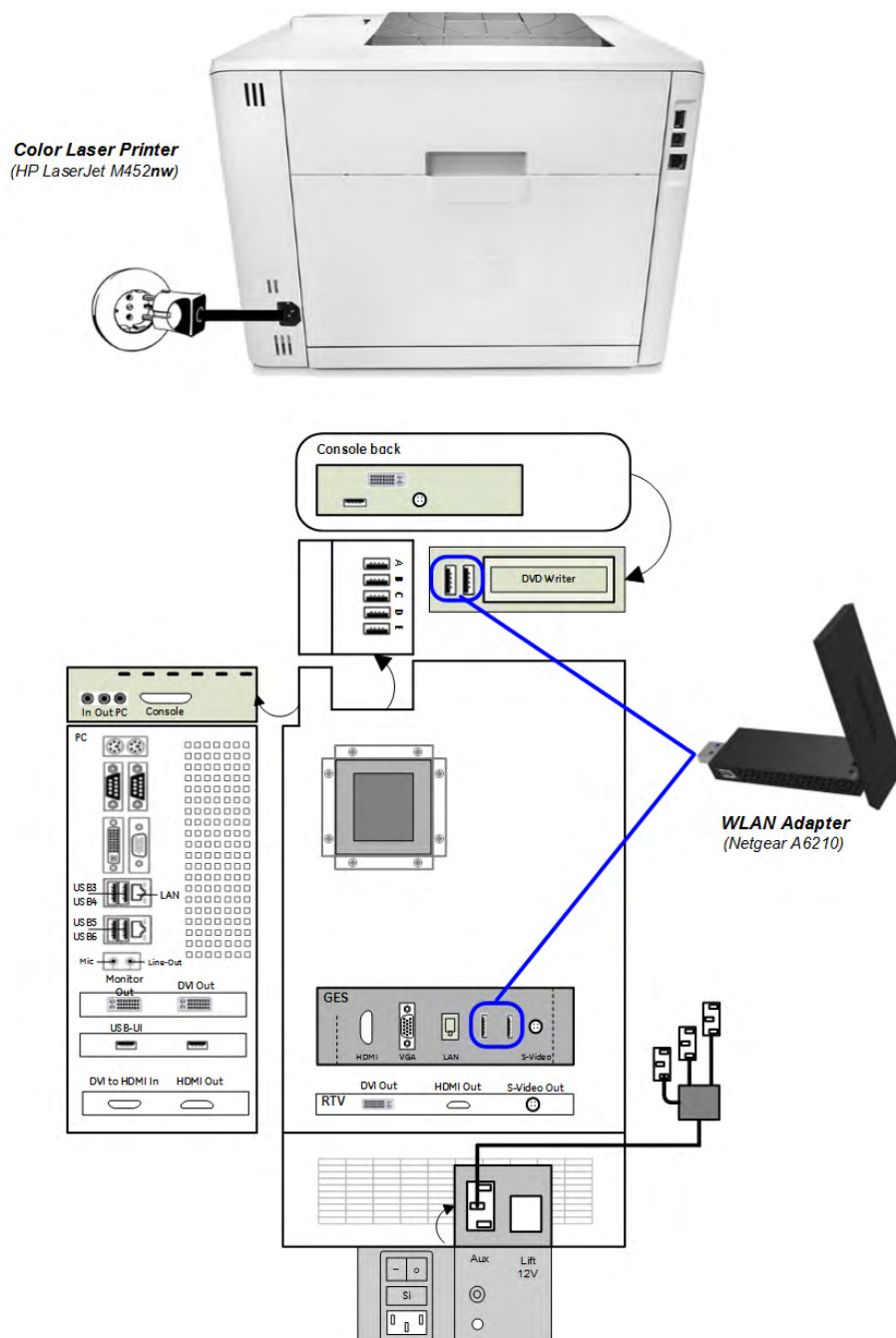


Figure 3-15 Connection Scheme - Color Laser Printer (Wi-Fi Direct Communication)

3.5.6 Connecting the DeskJet Color Printer



Caution

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



Caution

The printer being used may not be a medical device. The (Bluetooth) Printer Set and the Power Supply 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 9-37](#).

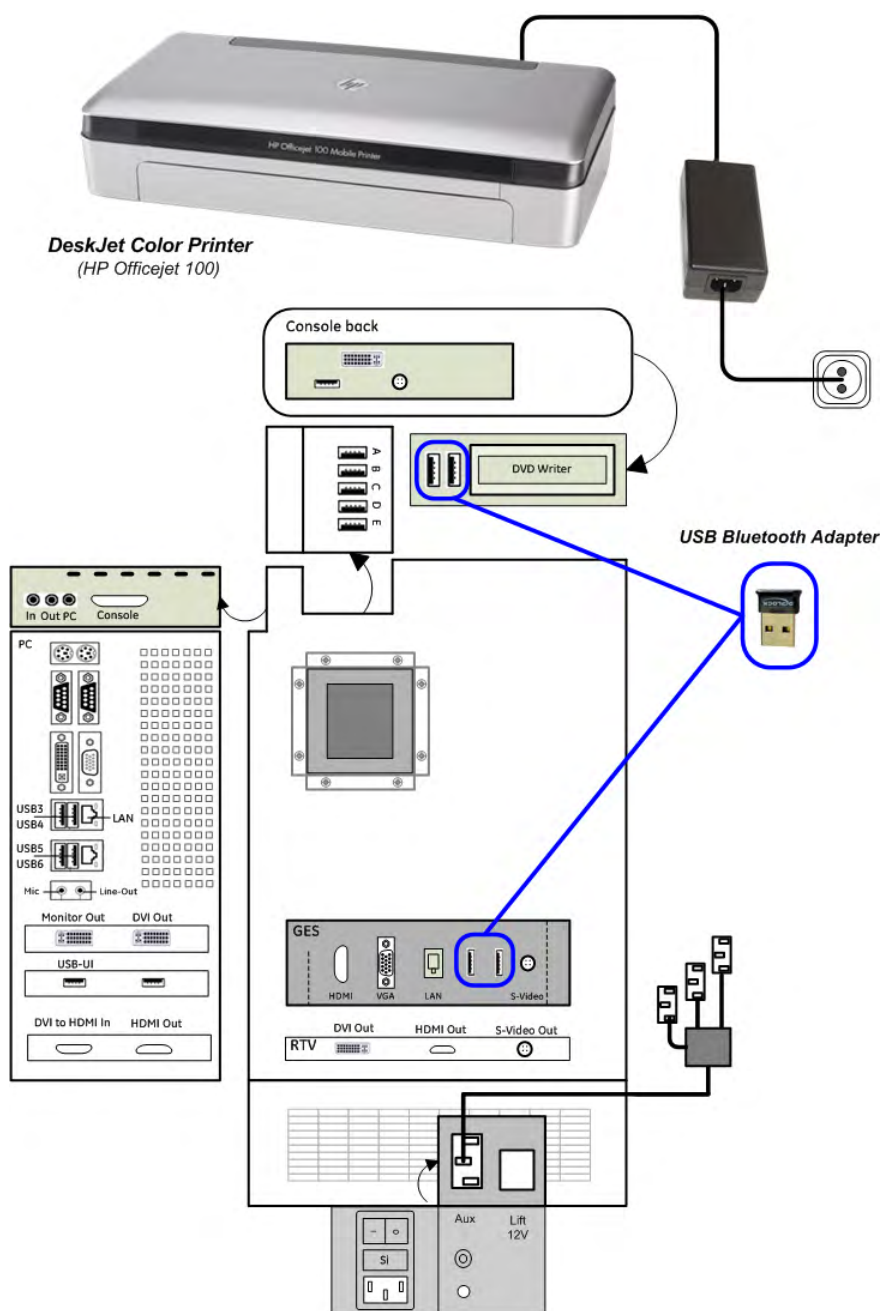


Figure 3-16 Connection Scheme - DeskJet Color Printer (via Bluetooth Adapter)

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.

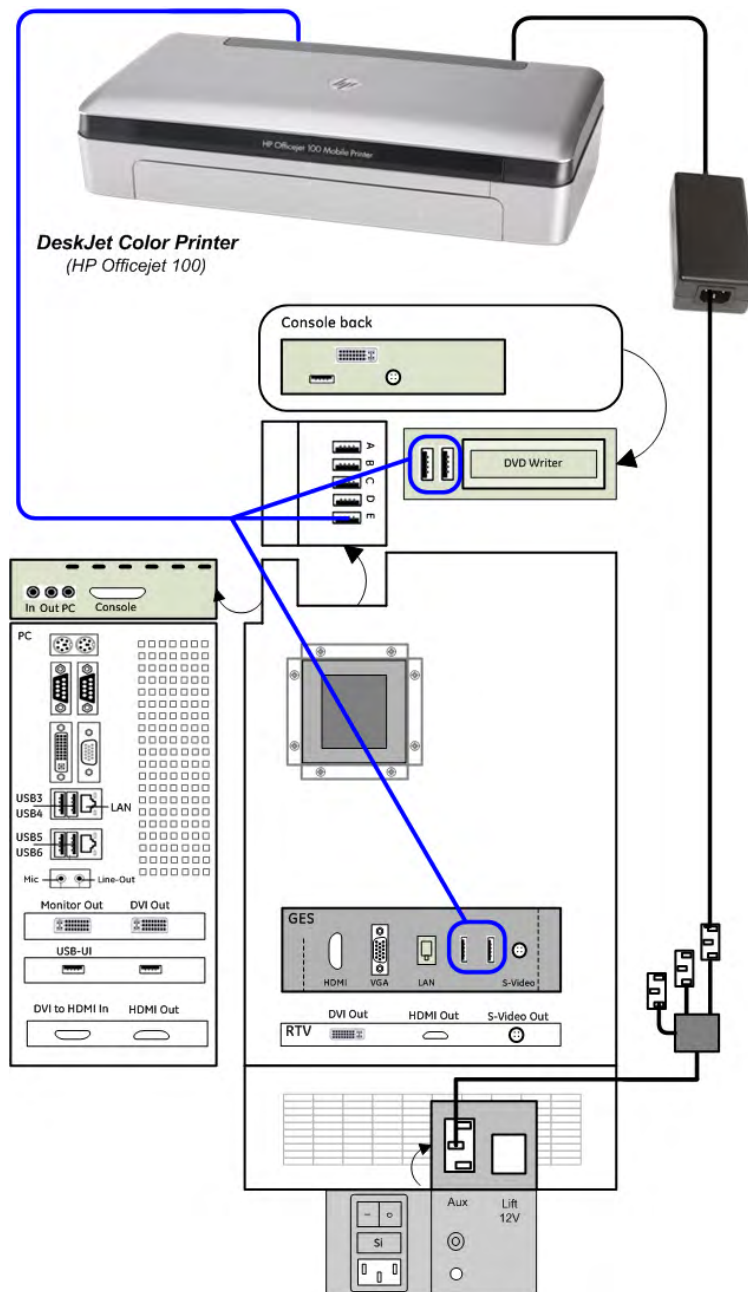


Figure 3-17 Connection Scheme - DeskJet Color Printer (directly via USB cable)

3.5.7 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.
 - a. Slide up the upper cover of the Cellular Modem Module to get access to the SIM card holder.



Figure 3-18 open the Cellular Modem cover

- b. Insert the SIM card (see images below), fix it with the mounted clips and return the upper cover.



Figure 3-19 insert SIM card

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 3-20 on page 3-27](#).
4. Power ON/Boot up the Voluson E-Series system as described in [Section 3.4.1 on page 3-9](#).
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 3-64](#).
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 3-66](#).
8. If it is desired to use also MMS, adjust settings as described in [Section 3.13.5 on page 3-67](#).
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 3-41](#) 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 3-68](#).

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, IEC 62353 or other relevant standard.

3.5.7.1 Connection Scheme: Cellular Modem

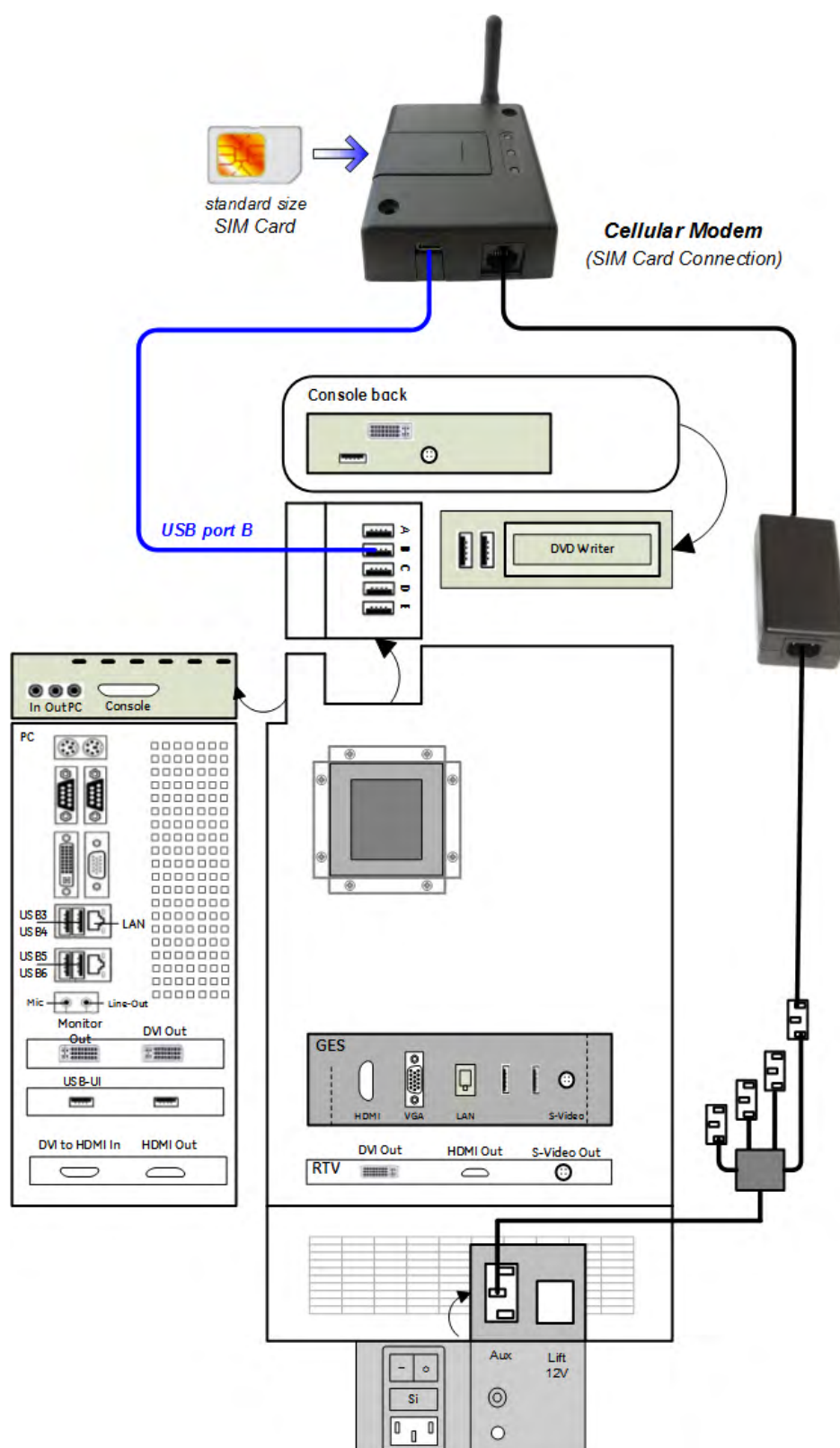


Figure 3-20 Connection Scheme - Cellular Modem

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

3.5.8 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.

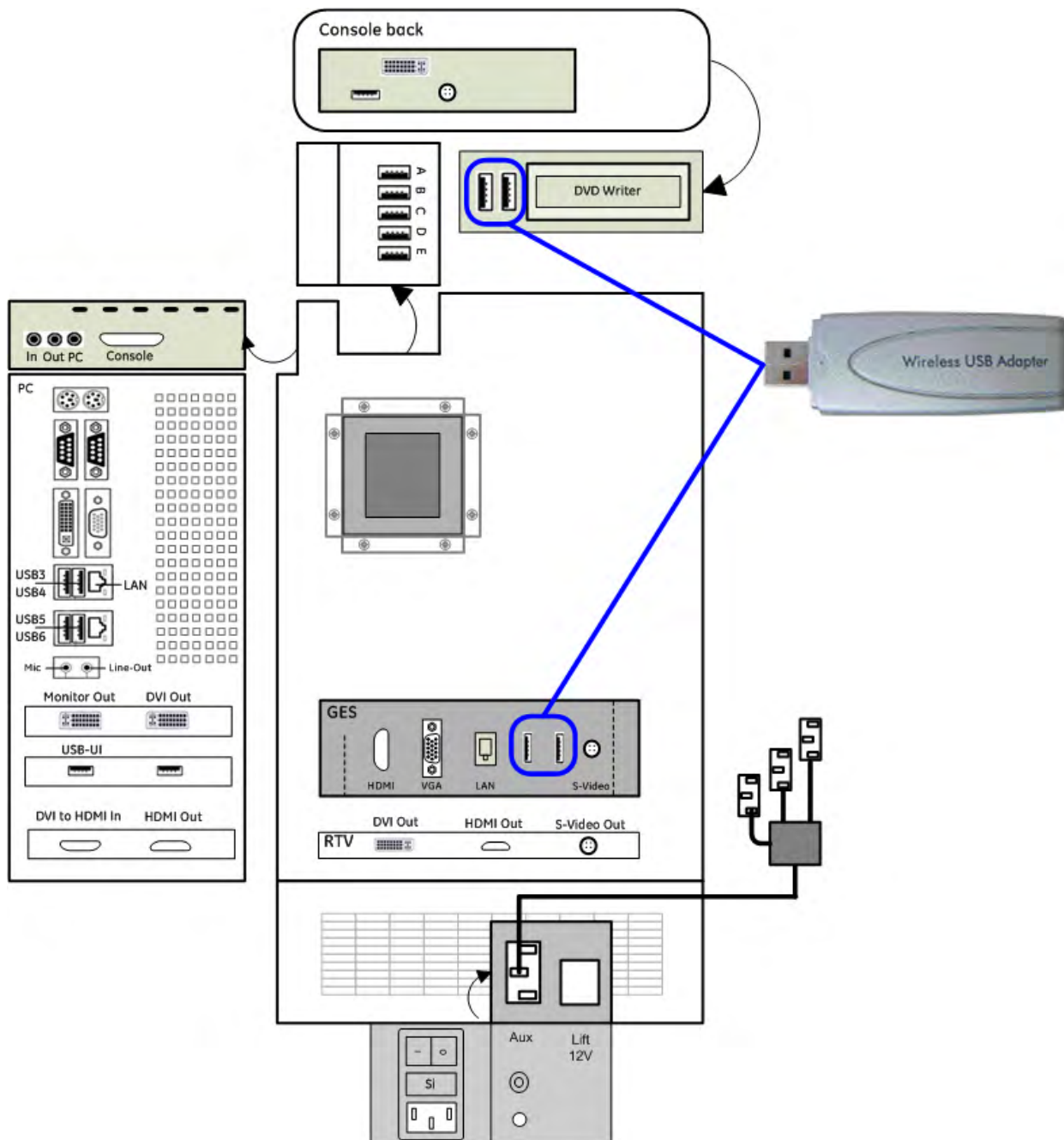


Figure 3-21 Connection Scheme - Wireless (USB) Network Adapter

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 3-59.

3.5.9 Connecting a Secondary "Patient" Monitor

**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 9-42](#)).

**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 3-22 on page 3-30](#).
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 3-45](#).

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

3.5.9.1 Connection Scheme: Secondary "Patient" Monitor

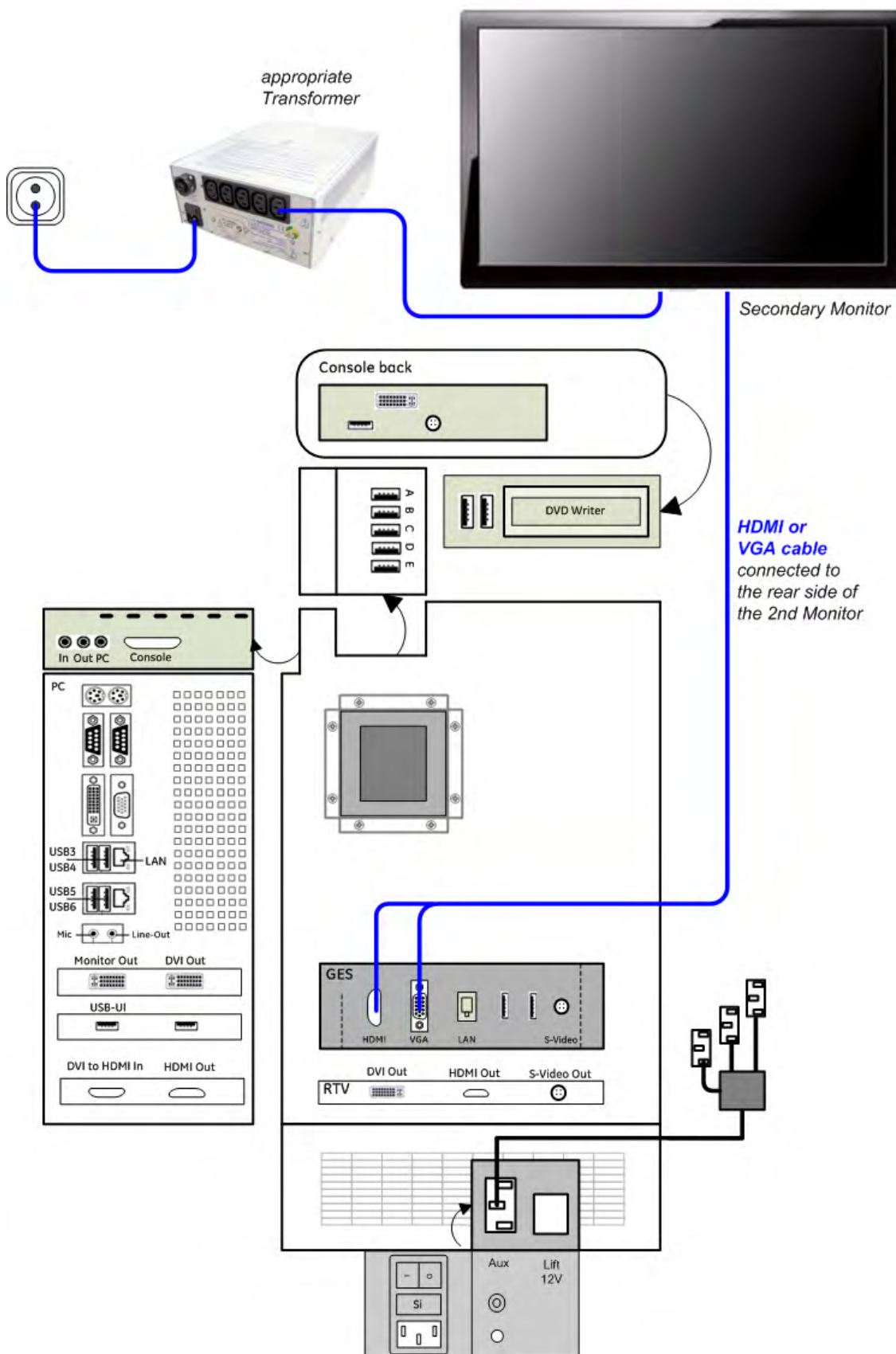


Figure 3-22 Connection Scheme - Secondary Monitor

3.5.10 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 3-45](#).

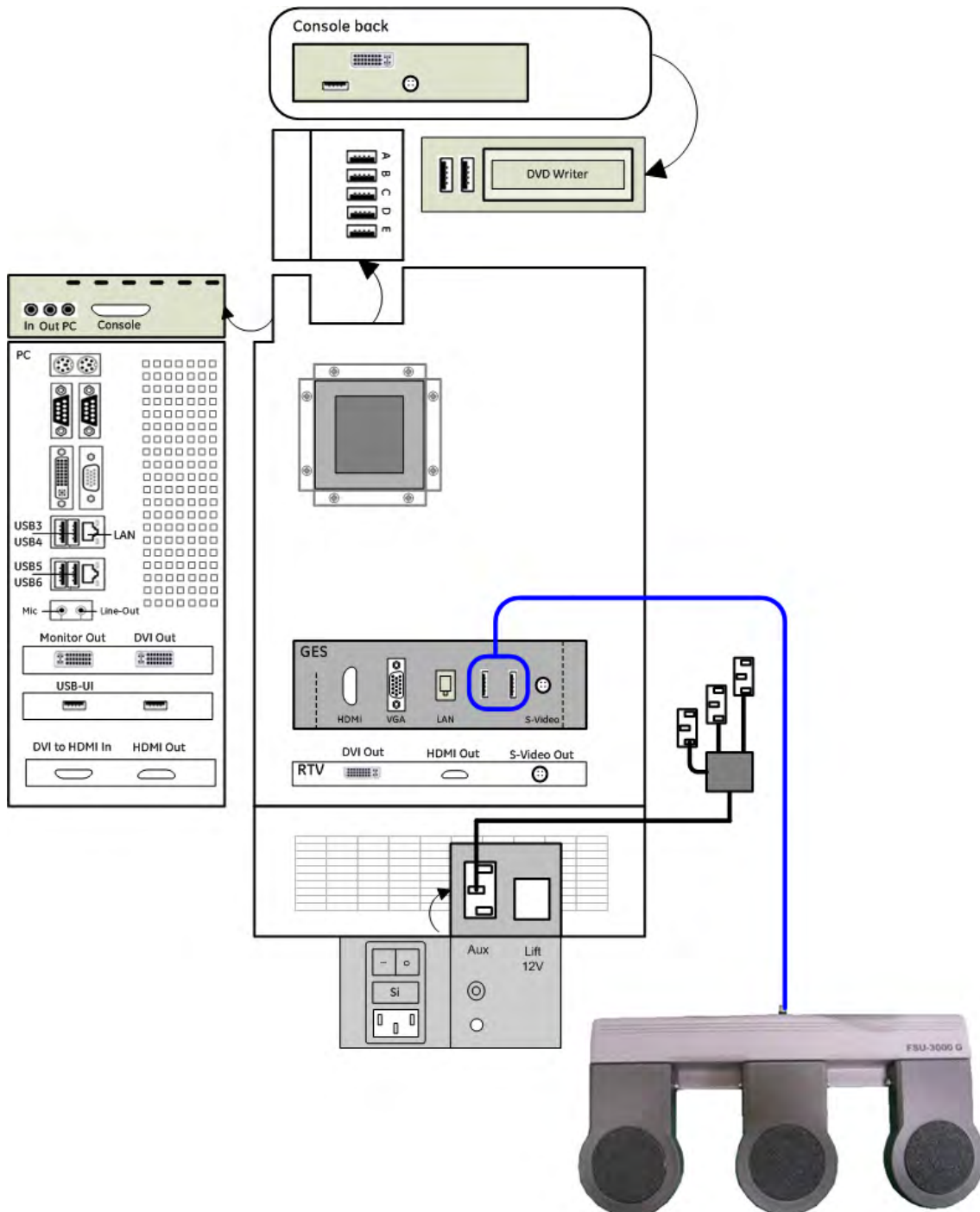


Figure 3-23 Connection Scheme - Footswitch

3.5.11 Connecting the Barcode Scanner

The Barcode Scanner should be directly connected to any accessible USB-port on the Voluson E-Series (e.g., next to DVD drive).

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

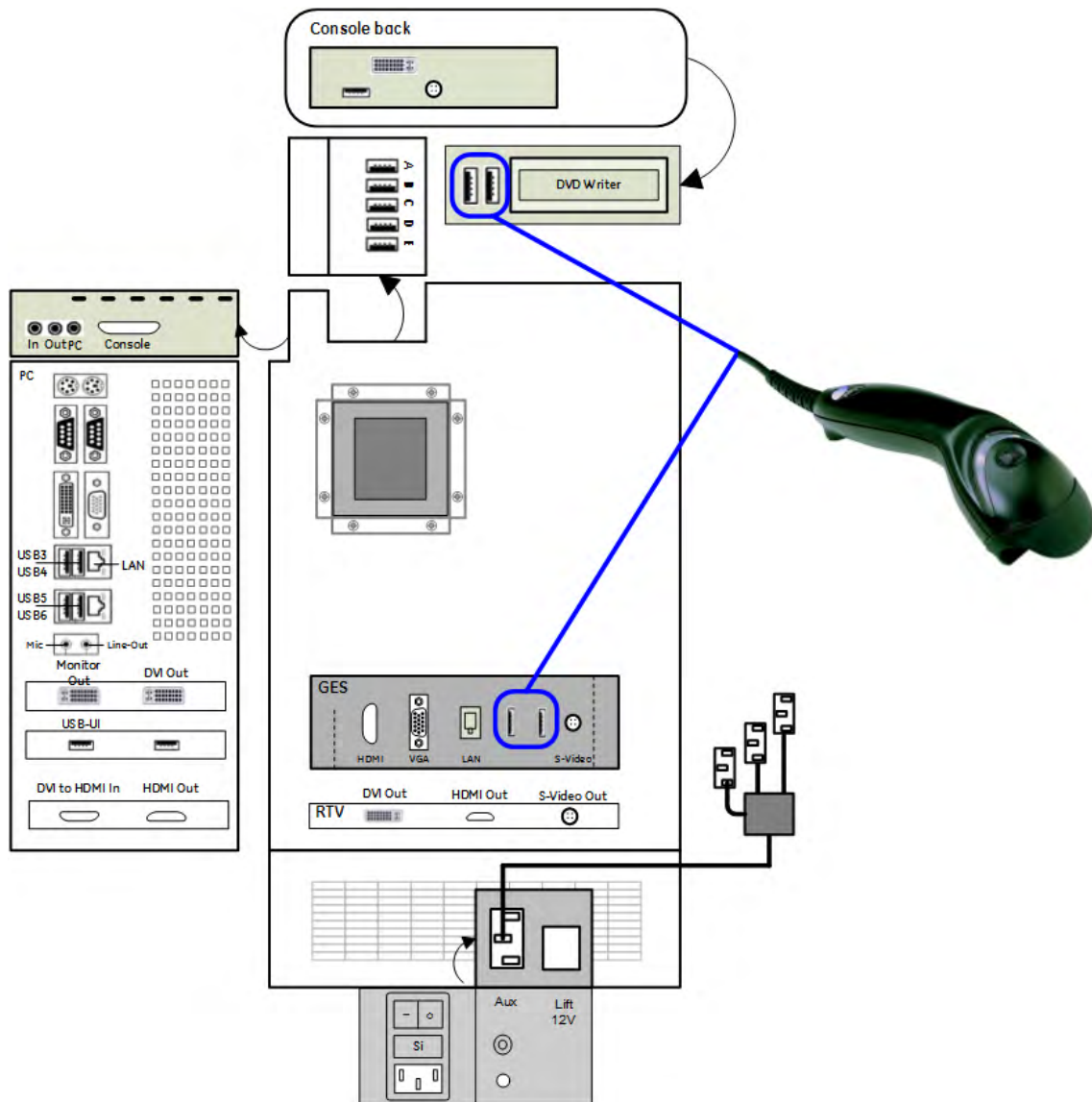


Figure 3-24 Connection Scheme - Barcode Scanner

3.5.12 Connecting the ECG-preamplifier

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

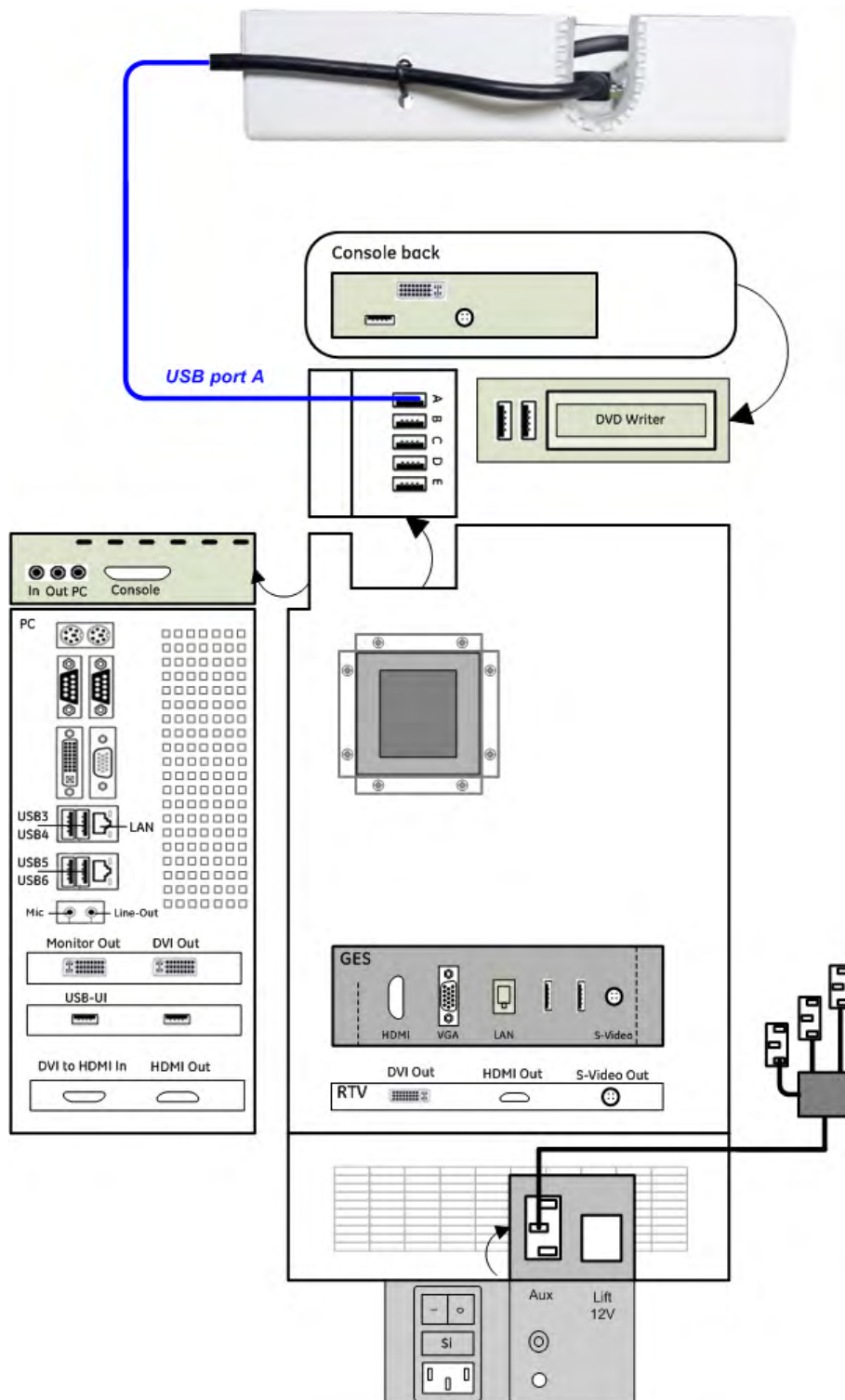


Figure 3-25 Connection Scheme - ECG-preamplifier

3.5.13 Connecting an USB Flash Memory Stick

Note *Before connecting an USB device, please read [Section 3.5.15 "General Remarks when using external USB-Devices"](#) on page 3-35 .*

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 3.5.15.2 "External USB-Devices - Disconnection"](#) on page 3-35 .

3.5.14 Connecting an external USB Hard disk

Note *Before connecting an USB device, please read [Section 3.5.15 "General Remarks when using external USB-Devices"](#) on page 3-35 .*

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 3.5.15.2 "External USB-Devices - Disconnection"](#) on page 3-35 .

3.5.15 General Remarks 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!

3.5.15.1 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.*

3.5.15.2 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 3-26 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.

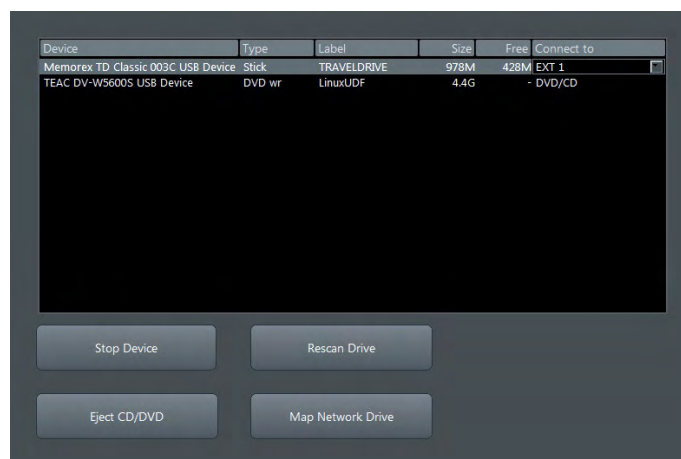


Figure 3-26 Connect USB and Network Drives

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

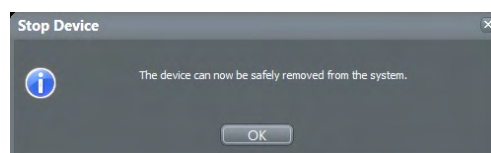


Figure 3-27 Device can now be safely removed

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

3.6 Printer Installation

Note For connection schemes see [Section 3.5 "Connection of Auxiliary Devices" on page 3-14](#).

Content in this section

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Note The Network Color Laser printer and the Bluetooth printer connection set **MUST NOT** be installed by the user! For 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, IEC 62353 or other relevant standard.



EC330 (BT18) only:

If the **Whitelisting** option is available and activated in *System Setup - Administration*, a password login window might appear during the installation procedure.

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 3.5.3 on page 3-17](#).
3. Verify correct printer settings; see [Section 3.6.5 "Adjustment of Printer Settings" on page 3-38](#).
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 3-41](#).

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 3.5.4 on page 3-19](#).
3. Verify correct printer settings; see [Section 3.6.5 "Adjustment of Printer Settings" on page 3-38](#).
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 3-41](#).

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 3-17 on page 3-25](#).
3. When all cables are connected, press the Power ON button on the printer.
4. Power ON/Boot up the Voluson E-Series system as described in [Section 3.4.1 on page 3-9](#).
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 3-41](#).
6. Verify correct printer settings; see [Section 3.6.5 "Adjustment of Printer Settings" on page 3-38](#).
7. Assign the printer as Report Printer, see [Section 3.6.6.1 "Report Printer Selection" on page 3-41](#).

3.6.4 Printer Installation manually

EC330 (BT18) only:



If the **Whitelisting** option is available and activated in *System Setup - Administration*, a password login window might appear during the installation 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 **Connectivity** and then click the **Peripherals** tab.

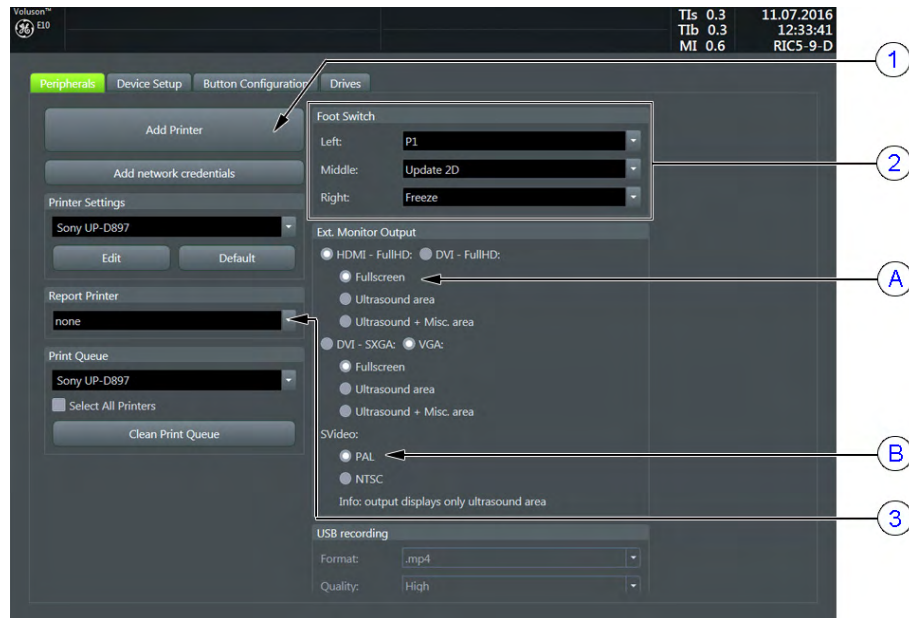


Figure 3-28 Setup - Connectivity - PERIPHERALS page

- | | | | |
|---|-----------------------------------|---|---------------------------|
| 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 3-38](#).
 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 3-41](#).

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.

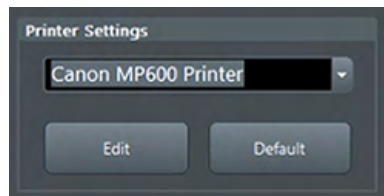


Figure 3-29 select desired printer

- ["UP-D897 / UP-D898MD Printer - Settings" on page 3-38](#)
- ["UP-D25MD Printer Settings" on page 3-39](#)



Warning

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

3.6.5.1 UP-D897 / UP-D898MD Printer - Settings

1. Call up the "Printer Preferences"; see [Section 3.6.5 "Adjustment of Printer Settings" on page 3-38](#).
2. Select the **Layout** page and select:
 - Paper: **960x1280**
 - Orientation: **Portrait**
 - Interpolation Method: **Bilinear**

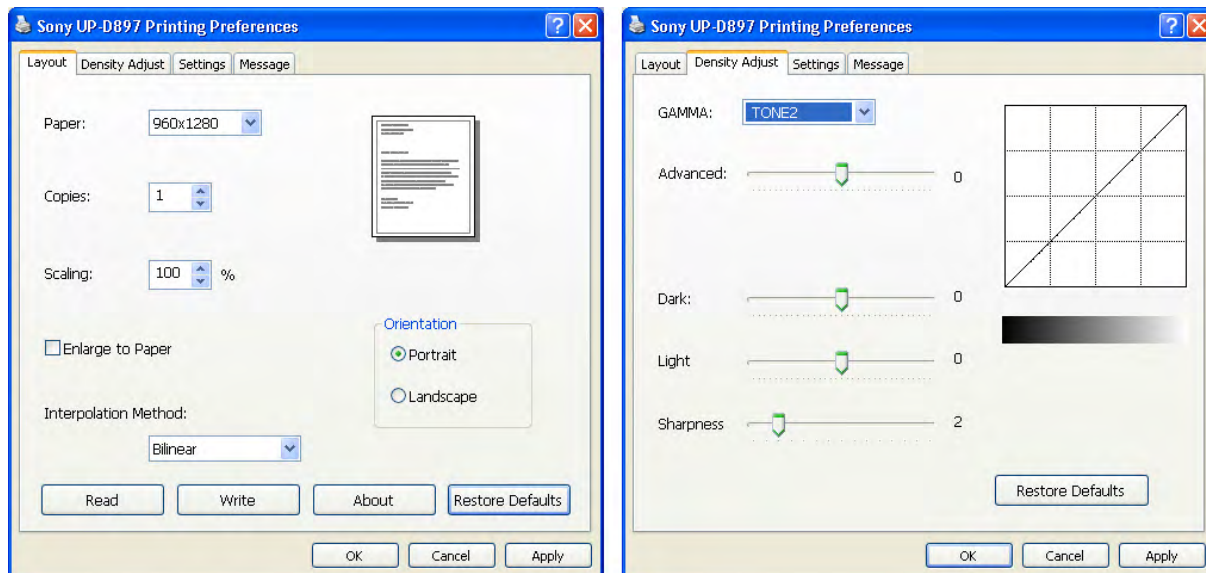


Figure 3-30 Layout / Density Adjust page

3. Select the **Density Adjust** page and select:
 - Gamma: **TONE2**
 - Advanced = **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 3-41](#).

3.6.5.2 UP-D25MD Printer Settings

1. Call up the "Printer Preferences"; see [Section 3.6.5 "Adjustment of Printer Settings" on page 3-38](#).
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

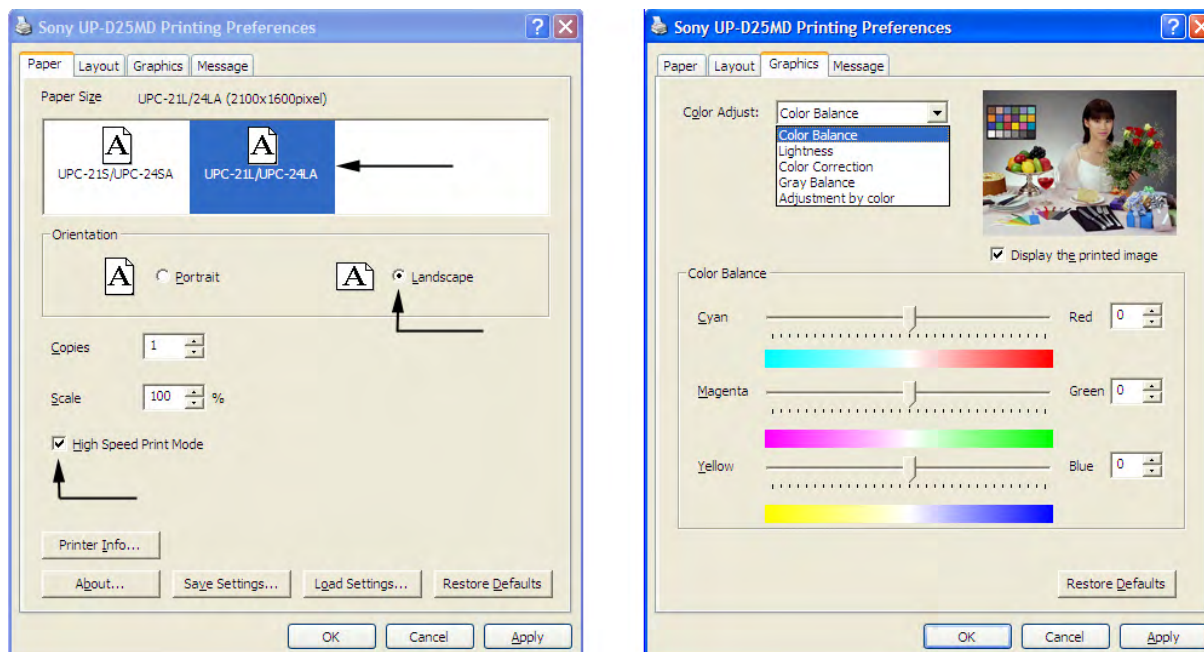


Figure 3-31 Paper / Graphics page

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

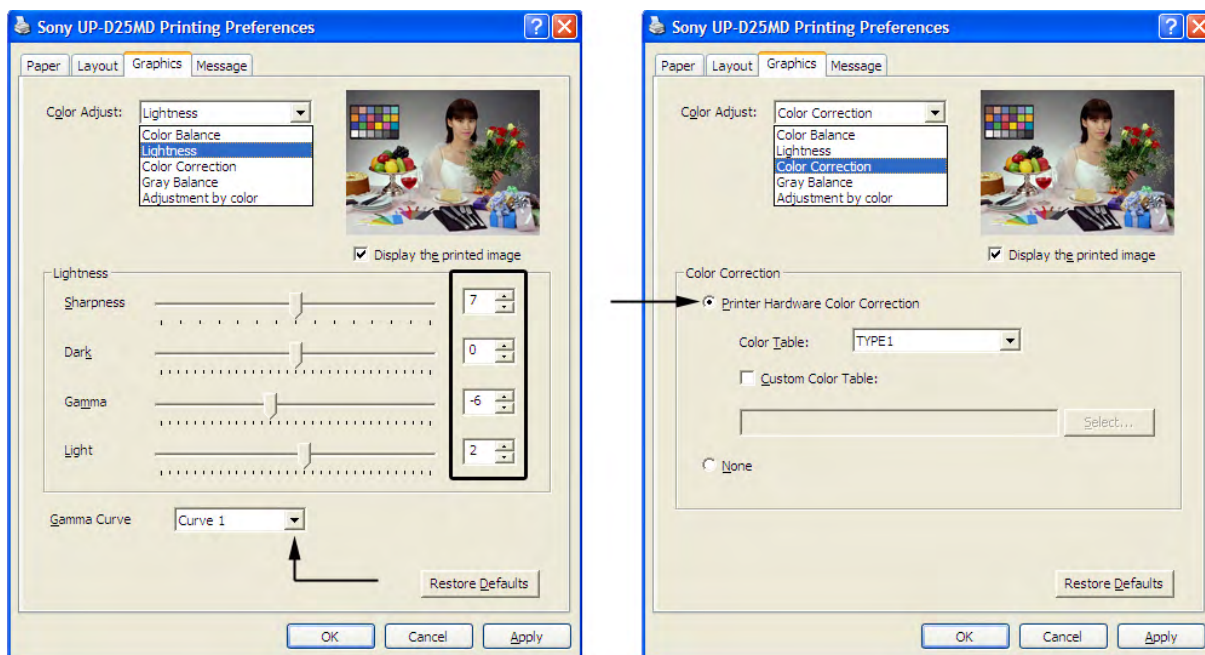


Figure 3-32 Graphic page (Lightness / Color Correction)

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

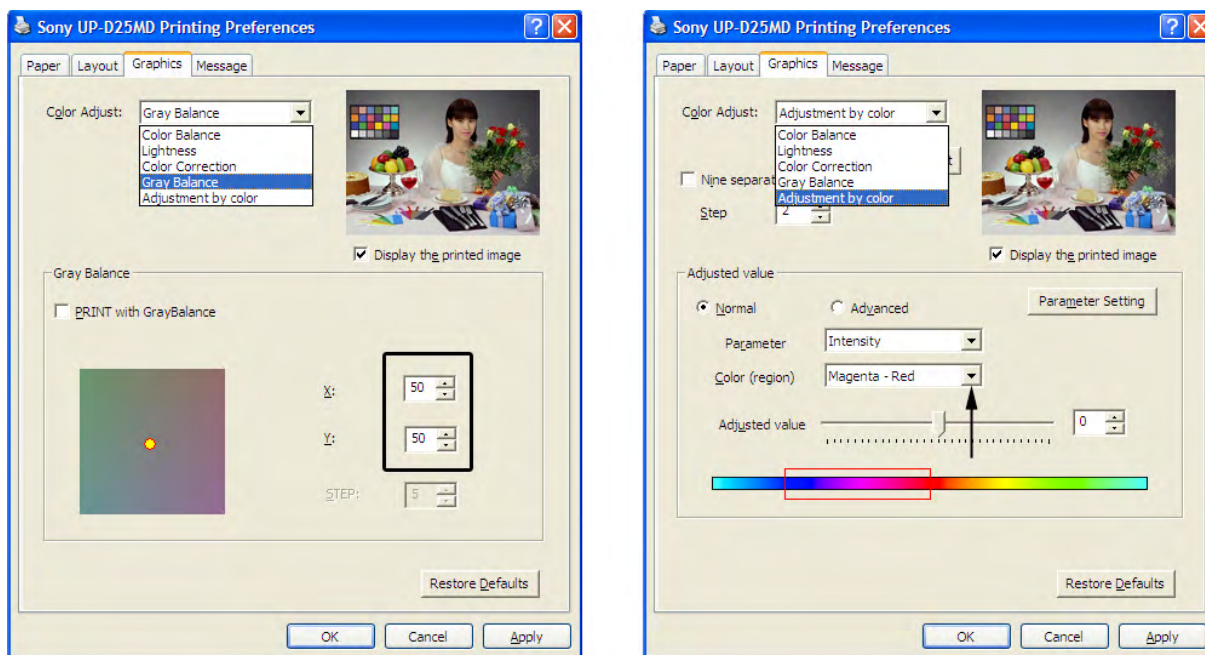


Figure 3-33 Graphic page (Gray Balance / Adjustment by Color)

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 3-41.

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.

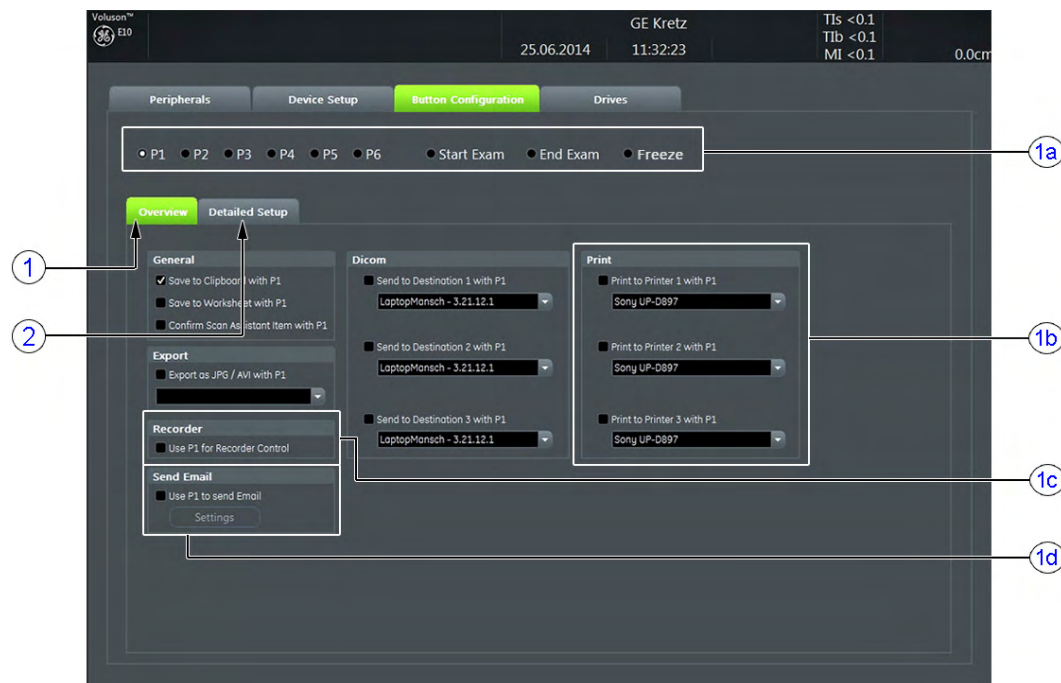


Figure 3-34 Setup - Connectivity - BUTTON CONFIGURATION page (Overview)

1	Overview	2	Detailed Setup
1a	Configure buttons		
1b	Select Printer		
1c	Recorder Control		
1d	Select P? 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 3-28 on page 3-37](#).*

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 3-28 on page 3-37](#).
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

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.

Modifications of system setup parameters and settings are supported by 7 major groups. Each major group contains diverse dialog pages and sub windows.



Please observe that the displayed screens may slightly differ from images shown in this manual. The availability of some functions or features depend on the BT-version of your Voluson E-Series system.

General Settings

- **General:** Date, Time, Clinic Name, (EUM) Language, Screen saver, etc.
- **Authentication:** access setting (password protection) to authentication functions
- **Details:** Doppler 2D Refresh, Zoom options, Menu Brightness, Trackball Speed, 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 8-16](#).
- **Disk Encryption:** enables an encryption to secure all Patient Data, Patient Images and corresponding measurements
- **Whitelisting:** prevents the system from installing unwanted software

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 (Small Backup), 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
- **Button Configuration:** adjust assignment of buttons
- **SonoAVC:** adjustment of follicle parameters

Note

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

Content in this section

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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 display System Manuals (eDOC)



1. Insert the eDOC DVD into the drive.
2. Press the **Utilities** key on the control console.
3. In the "Utilities" menu touch the **eDOC** button to open the index file from the DVD.

Note

If the eDOC DVD is not inserted, a message to insert the DVD appears.

3.7.1.3 How to enter Date and Time

1. Invoke System Setup as described in [Section 3.7.1.1 on page 3-43](#).
2. On the right side of the screen select **General Settings** and then click the **General** tab.

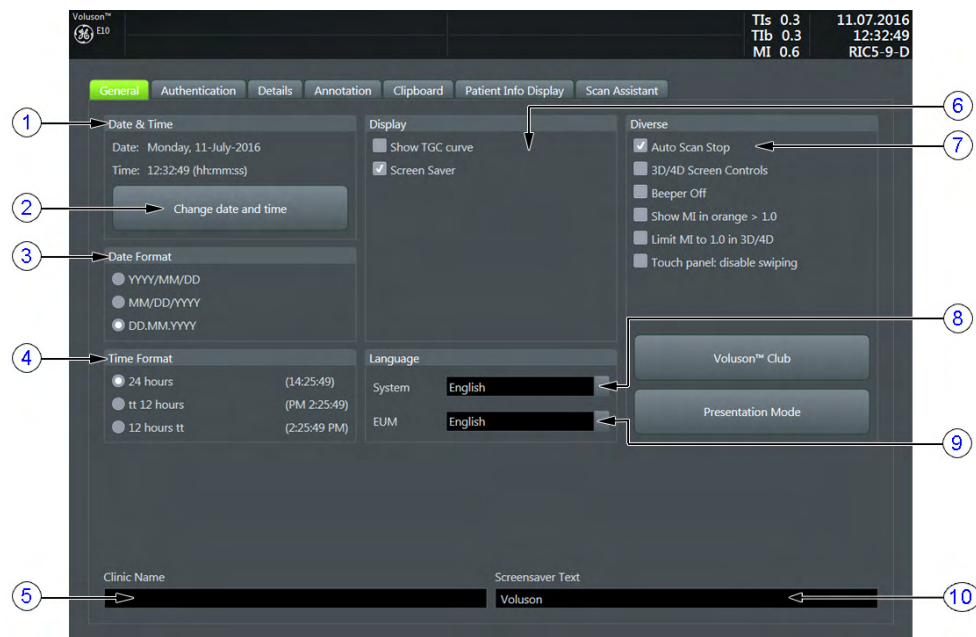


Figure 3-35 Setup - General Settings - GENERAL page

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. Select the "Time Format" (only one can be active).
6. Close the Service page with **Save&Exit**.

3.7.1.4 How to enter Clinic Name

1. Invoke System Setup as described in [Section 3.7.1.1 on page 3-43](#).
2. On the right side of the screen select **General Settings** and then click the **General** 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.

3.7.1.5 How to change Language and/or EUM Language

1. Invoke System Setup as described in [Section 3.7.1.1 on page 3-43](#).
2. On the right side of the screen select **General Settings** and then click the **General** 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.

3.7.1.6 How to change Video Norm

1. Invoke System Setup as described in [Section 3.7.1.1 on page 3-43](#).
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 3-28 on page 3-37](#).
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 3-43](#).
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 3-28 on page 3-37](#).
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 3-43](#).
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 3-28 on page 3-37](#).
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 6-5](#)

3.7.1.10 How to configure InSite

see [Section 3.13.8 "InSite Configuration" on page 3-70](#)

3.7.1.11 How to execute Additional Software Installation (ASI)

1. Invoke System Setup as described in [Section 3.7.1.1 on page 3-43](#).
2. On the right side of the screen select **Administration** and then click the **Service** tab.
3. Enter the password « she » and click **Accept**.



Entering a password is no more required at systems with software version EC330 (BT18).

4. Click the **ASI** button.

The software parts to be installed depend on the contents of the System DVD that is used.

3.7.1.12 How to activate User Login Authentication

1. Invoke System Setup as described in [Section 3.7.1.1 on page 3-43](#).
2. On the right side of the screen select **General Settings** and then click the **Authentication** tab.
3. Check mark **Activate User Login**.

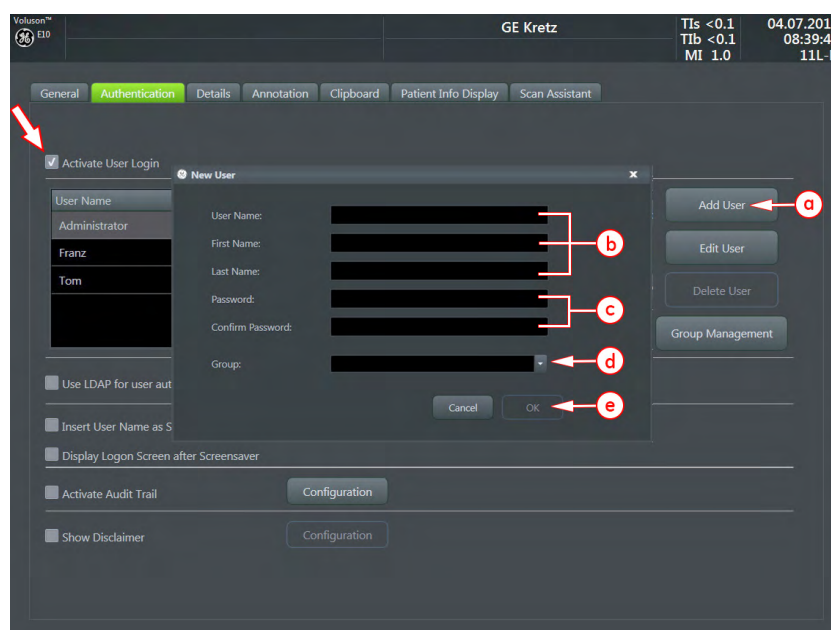


Figure 3-36 System Setup - Administration - Authentication

- a. Click **Add User**. A dialog appears.
- b. Enter the **User Name**, the **First Name** and the **Last Name**.
- c. Enter a **Password** and **Confirm Password**.

Note A valid 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 !@#\$%^*().

- d. Select a **Group** the user belong to.
 - e. Confirm with **OK** to save User Login Authentication.
4. Close the Service page with **Save&Exit** and restart the system.

The system login window appears as soon as the system is started or a current user logs off. The correct User Name and Password has to be entered to login. If the correct password/user name combination is entered, it is also possible to change the password. The **Emergency** button enables emergency mode with restricted access.

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

3.7.1.13 How to perform Full Disk Encryption

Disk Encryption enables an encryption to secure all Patient Data, Patient Images and corresponding measurements.



Caution

Without the Encryption Password or Recovery Key it will not be possible to access the Ultrasound device including emergency mode, scanning, patient information, images, or local archive. GE has no access to this information or the ability to undo encryption in the event that the Encryption Password and Recovery Key are lost. The security and safety of the Encryption Password and Recovery Key is solely the user's responsibility.

Note Disk Encryption is an option and might not be available in all countries. If the option is not set, the tab **Disk Encryption** is not available in System Setup - Administration.

Content in this section

3.7.1.13.1 Disk Encryption Workflow	3-47
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3.7.1.13.1 Disk Encryption Workflow

1. Invoke System Setup as described in [Section 3.7.1.1 on page 3-43](#).
2. On the right side of the screen select **Administration** and then click the **Disk Encryption** tab.

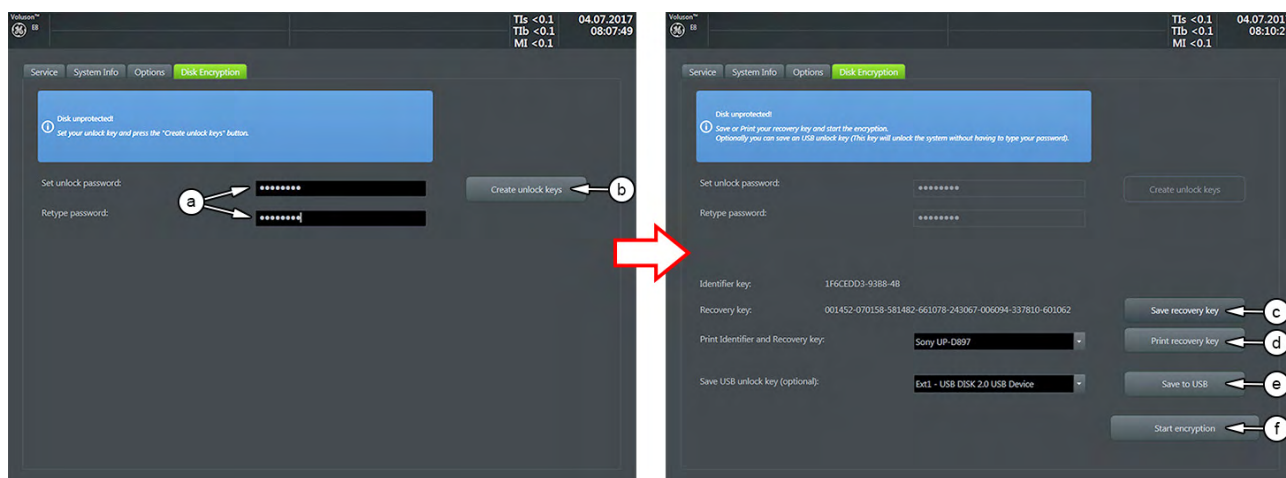


Figure 3-37 System Setup - Administration - Disk Encryption

3. Start Encryption.
 - a. **Set unlock password** and **Retype password**.

Note The entered password is not visible and has a minimum of 8 characters.

- b. Click **Create unlock keys**.
Identifier and Recovery key as well as an USB unlock key is automatically created by the system.
- c. **Save recovery key** to an external or network device.
- d. Choose connected printer from the pull down-menu and click **Print recovery key**.
- e. If desired, click the **Save to USB** button to save the USB unlock key to a connected USB device.
- f. Click the **Start encryption** button.

Note The process of enabling encryption of the patient data will take a considerable amount of time (one to several hours).

- g. Confirm the dialogs with **Yes** and **OK** to start encryption.
A progress bar is displayed during disk encryption process.

Note The system should not be used while encryption process is ongoing.

3.7.1.13.2 Unlock an encrypted Disk

If patient data stored on the internal HDDs D:\ partition are encrypted (protected), following dialog window appears as soon as the system is started.



Figure 3-38 unlock screen at encrypted disk

The system has to be unlocked by one of the following possibilities:

- Enter the previously defined user **Password** (minimum of 8 characters) and click **Unlock**.
- Click the **Recovery key** button, enter the key into the displayed dialog and click **Unlock**.
- Connect the **USB device with unlock key** and click **Unlock**.



If the USB device with unlock key is connected to your Voluson E-Series, the system is automatically unlocked during boot up.

3.7.1.13.3 Decrypt Disk

1. Invoke System Setup as described in [Section 3.7.1.1 on page 3-43](#).
2. On the right side of the screen select **Administration** and then click the **Service** tab.
3. Enter the password « she » and click **Accept**.
4. Click the **Decrypt Disk** button.

Note *Security of patient data on the system will be reduced when encryption is turned off. Decryption will take a considerable amount of time (one to several hours).*

5. Confirm the dialogs with **Yes** and **OK** to start encryption.
A progress bar is displayed during decryption process.

Note *The system should not be used while decryption process is ongoing.*

3.7.1.14 How to protect the system by Whitelisting

Note *Whitelisting is an option and might not be available in all countries. If the option "Advanced Security Features" is not set, the tab **Whitelisting** is not available in System Setup - Administration.*

1. Invoke System Setup as described in [Section 3.7.1.1 on page 3-43](#).
2. On the right side of the screen select **Administration** and then click the **Whitelisting** tab.

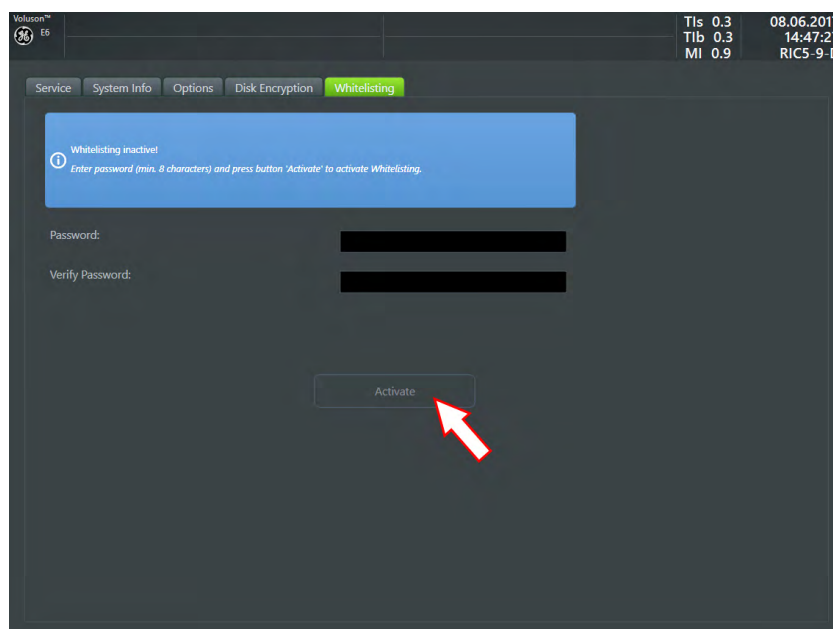


Figure 3-39 System Setup - Administration - Whitelisting

3. Enter **Password** and **Verify Password**.

Note *The entered password is not visible and has a minimum of 8 characters.*

4. Click **Activate**.
5. Close the Service page with **Save&Exit** and restart the system.

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	Table 9-10
		UP-D898MD		
Digital Color Printer	SONY	UP-D25MD	USB-Port	Table 9-10
Color Deskjet Printer	Hewlett Packard (HP)	HP Officejet 100	USB-Port or Bluetooth	Table 9-10
Color Laser Printer (Network)	Hewlett Packard (HP)	HP LaserJet M451	USB-Port	Table 9-10
		HP LaserJet M452dn		
		HP LaserJet M452nw	USB-Port or Wi-Fi Direct	
Bluetooth Adapter	Delock	Delock	USB-Port	Table 9-10
ECG Preamplifier	NORAV	MAN30	USB-Port	Table 9-11
USB Flash Memory device	SanDisk	Cruzer Micro	USB-Port	Table 9-11
Gigabit Network Isolator	Baaske Medical	MI 1005 Medical Isolator	USB-Port	Table 9-11
Cellular Modem	CEP AG	HT910-G	USB-Port	Table 9-11
Wireless Adapter (WLAN)	Netgear	WG111v3 (obsolete)	USB-Port	Table 9-11
		A6210		
Barcode Scanner	Honeywell	Eclipse 5145	USB-Port	Table 9-11
Footswitch	Whanam	FSU3000G	USB-Port	Table 9-12
Isolation Transformer	Noratel	IMED, 300WR 3 rd Edition	-	Table 9-12
UPS (Uninterruptible Power Supply)	Tripp Lite	SMART1200XLHG ³	-	Table 9-12
		SMX1200XLHG ⁴	-	
Power Filter	TNC	-	-	Table 9-12
32" Secondary Patient Monitor (USA and EU)	NEC	MultiSync V323-2	HDMI / VGA	-
32" Secondary Patient Monitor (US version)	SONY	KDL-32EX523	HDMI / VGA	obsolete
40" Secondary Patient Monitor (European version)	SONY	FWD-40W600P	HDMI / VGA	obsolete



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.

³ for 100-130V AC countries

⁴ for 220-240V AC countries

3.9 External I/O Connectors

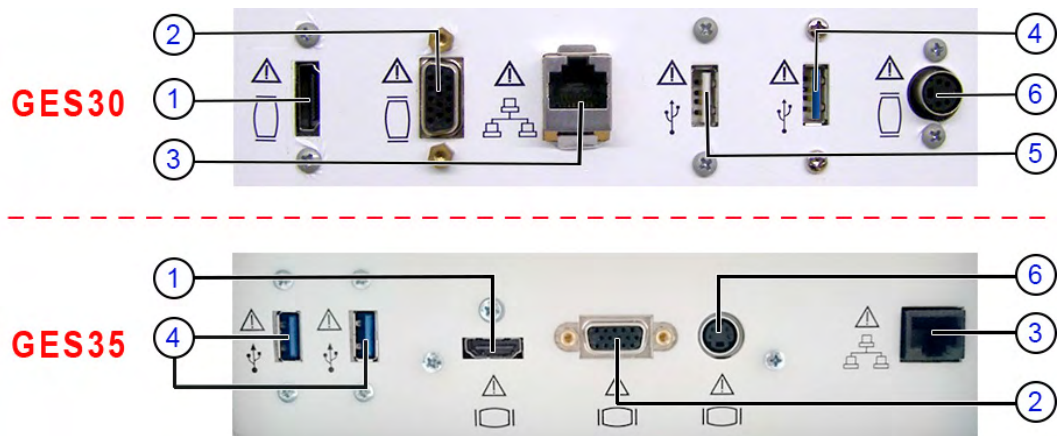


Figure 3-40 External I/O connectors - on rear of system (GES)

Item	Connector Name	Table Number	Description
1	HDMI OUT	Table 3-7	Connector for external monitor
2	VGA OUT	Table 3-8	Connector for external monitor
3	Network	Table 3-9	GES30: DICOM input/output, twisted pair RJ-45 10/100 megabit/s GES35: DICOM input/output, twisted pair RJ-45 10/100/1000 megabit/s
4	USB	Table 3-11	USB 3.0 port
5	USB	Table 3-10	USB 2.0 port (GES30 only)
6	S-Video OUT	Table 3-12	S-Video OUT connector, PAL/NTSC (depending on system setup)



Figure 3-41 External I/O connectors - next to DVD drive

Item	Connector Name	Table Number	Description
1	USB	Table 3-10	USB 2.0 port (RTT/RTH6x)
2		Table 3-11	USB 3.0 port (RTH50)

How to identify User Interface components RTH6x and RTH50

The color of the USB ports for external use (beside the DVD drive) enable quick differentiation between RTH6x and RTH50.



Figure 3-42 RTH6x => "white" USB2.0 ports / RTH50 => "blue" USB3.0 ports

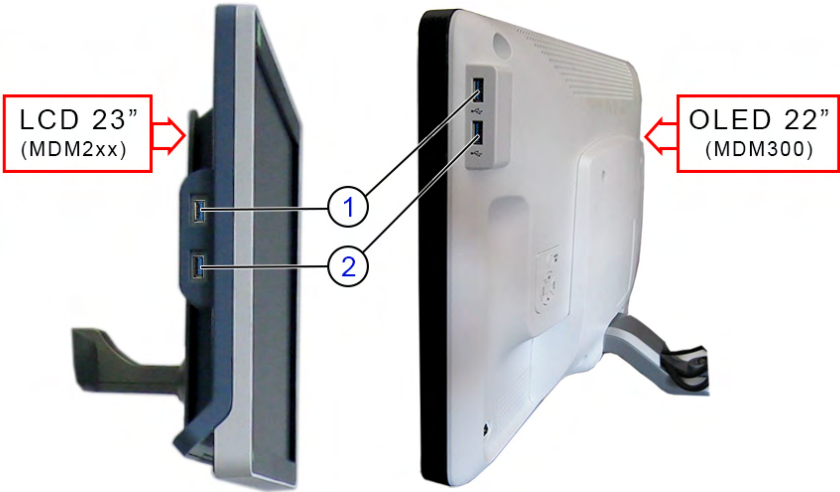


Figure 3-43 External I/O connectors - on the left/right side of the Monitor

Item	Connector Name	Table Number	Description
1	USB	Table 3-11	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 (port 2.0)	5 m	shielded; USB2.0 or higher
USB cable (port 3.0)	2m	shielded; USB3.0 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	shielded
Power cable	4 m	unshielded
PE cable	10 m	unshielded

3.10 Available Probes

See [Section 9.12 "Probes" on page 9-49](#), 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 3-42](#)

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 3-57](#).
- 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 3-57](#).
- Voluson E-Series and DICOM server in a network; see [Section 3.12.1.5 on page 3-57](#).

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 3-56](#)).

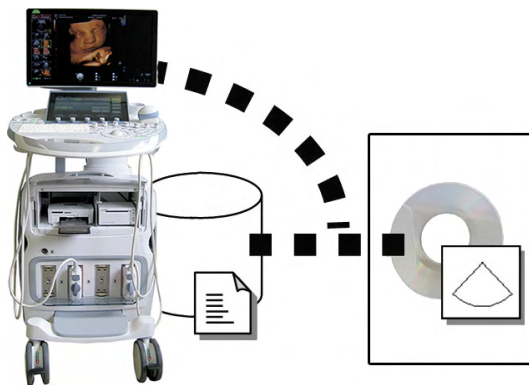
Patient information can include demographic data and images, as well as reports and Measurement and Analysis (M&A) data. A dataflow is a set of pre-configured services. Selecting a dataflow will automatically customize the ultrasound system to work according to the services associated with this dataflow.

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.

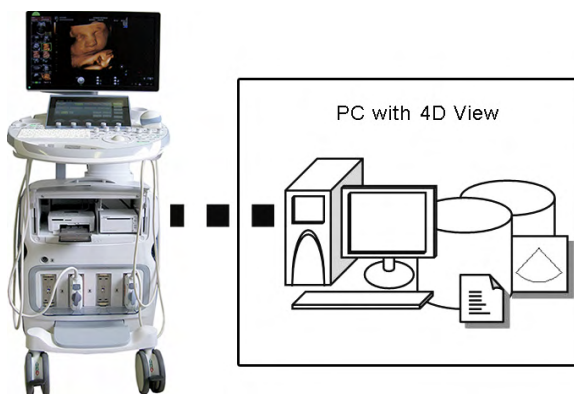
3.12.1.2 Dataflow Examples



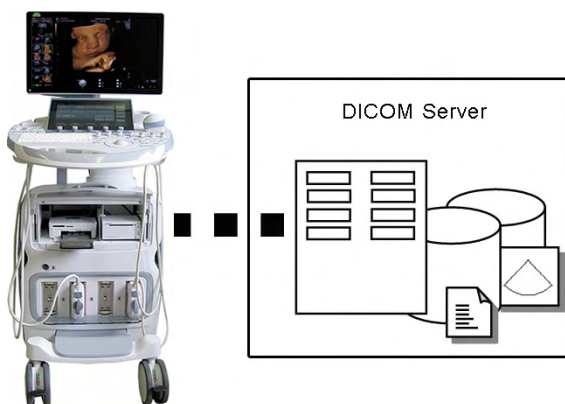
The local database is used for patient archiving. Images are stored to internal hard drive.



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

3.13.1 TCP/IP Configuration	3-58
3.13.2 Wireless Network Configuration	3-59
3.13.3 How to Setup the Cellular Modem	3-64
3.13.4 How to Setup E-mail	3-66
3.13.5 How to Setup E-mail to MMS Service	3-67
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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**.

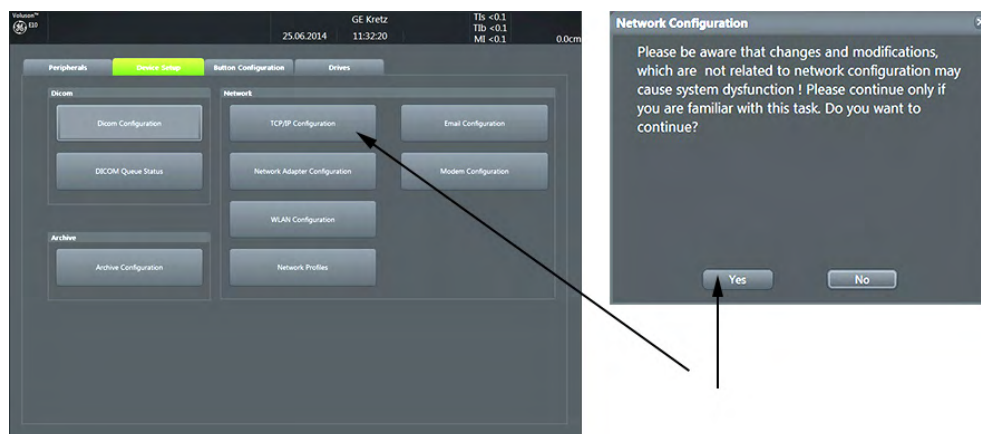


Figure 3-44 Configuration

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

Note *This example shows fictional numbers!*

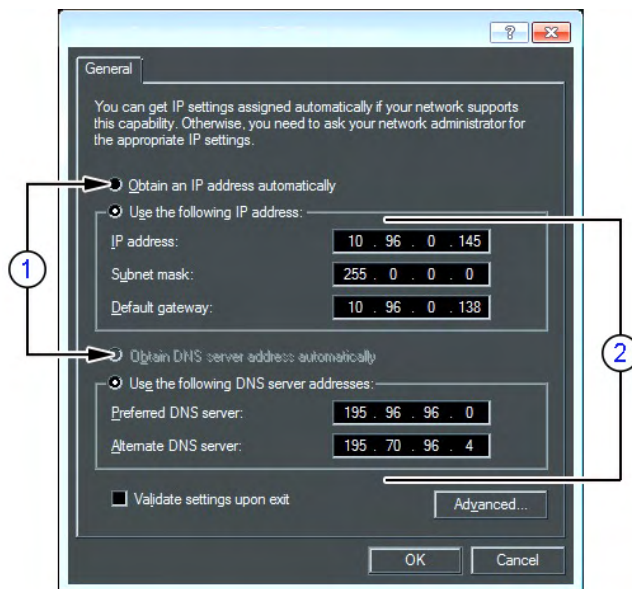


Figure 3-45 Internet Protocol (TCP/IP)

- 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

3.13.2.1 Connecting to the WLAN	3-59
3.13.2.2 Disconnecting from the WLAN	3-59
3.13.2.3 Adding a WLAN Profile	3-60
3.13.2.4 Refreshing a WLAN Network	3-60
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3.13.2.8 Available WLAN Channels	3-62
3.13.2.9 Monitoring the WLAN	3-62
3.13.2.10 WLAN Diagnostic	3-63
3.13.2.11 Repairing the WLAN	3-63

3.13.2.1 Connecting to the WLAN

1. Connect the Wireless Network adapter as described in [Section 3.5.8 on page 3-28](#).
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 3-44 on page 3-58](#).
6. The Wireless Network Configuration tool with available Wireless Networks appear.

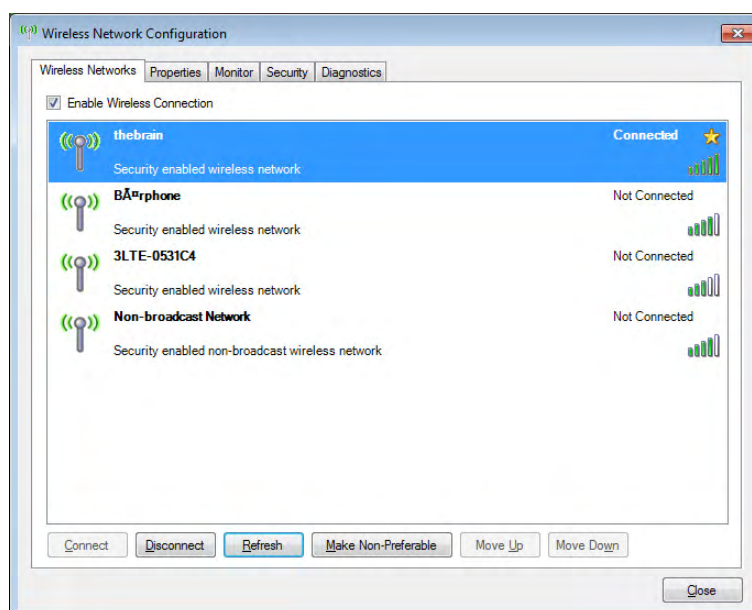


Figure 3-46 Wireless Networks - Connect

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 3-44 on page 3-58](#).
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 3-44 on page 3-58](#).
4. The Wireless Network Configuration tool with available Wireless Networks appear.
5. Select the **Security** tab and then click **Add**.

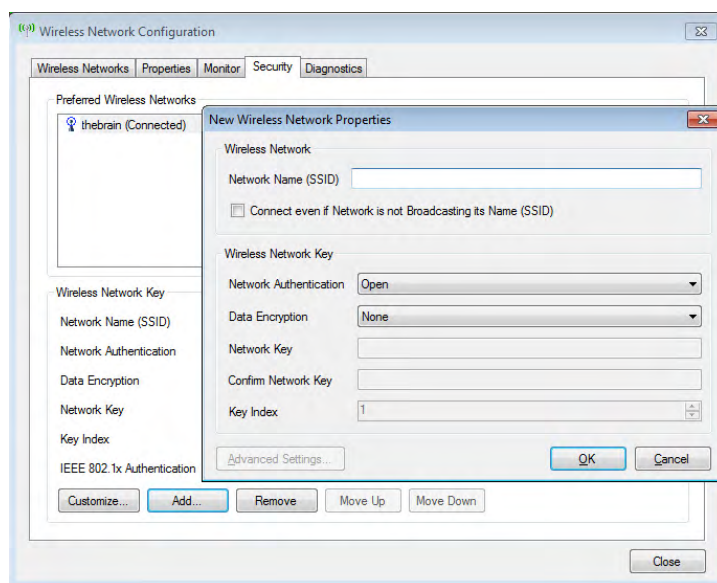


Figure 3-47 Security - Add

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 PSK⁵ 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 3-44 on page 3-58](#).
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 3-44 on page 3-58](#).
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.

⁵ **WPA(2) PSK = WiFi Protected Access** using one **Pre-Shared Key** *Note:* PSK is also referred to as "Personal" encryption standard.

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 3-44 on page 3-58](#).
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 3-44 on page 3-58](#).
4. The Wireless Network Configuration tool with available Wireless Networks appear.
5. Select the **Security** tab and then click **Customize**.

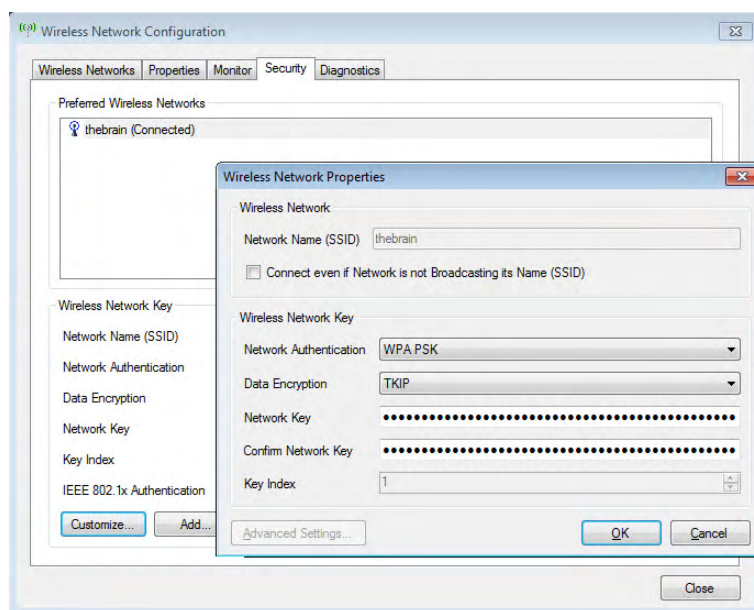


Figure 3-48 Security - Customize

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 PSK⁶ or WPA2 PSK)
 - Data Encryption
 - Network Key
 - Key Index
7. After you have filled in all the required information, click **OK**.

⁶ **WPA(2) PSK = WiFi Protected Access** using one **Pre-Shared Key** Note: PSK is also referred to as "Personal" encryption standard.

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 3-44 on page 3-58](#).
4. The Wireless Network Configuration tool with available Wireless Networks appear.
5. Select the **Properties** tab.

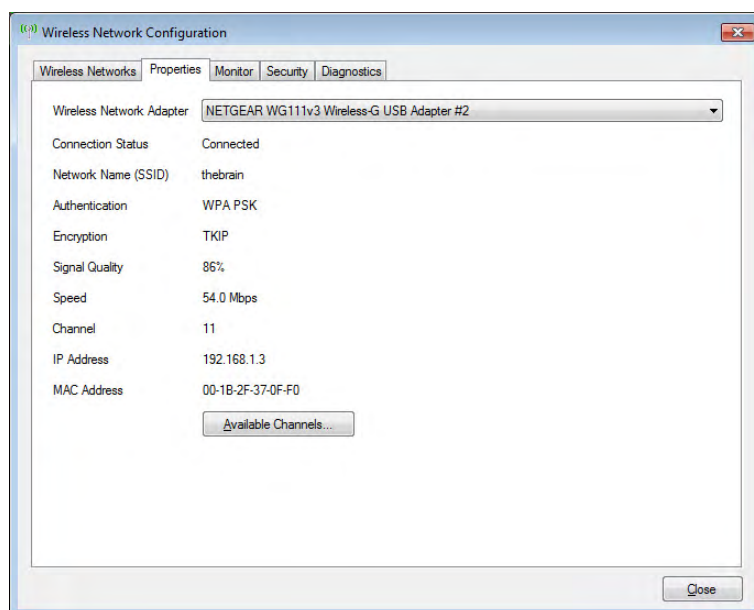


Figure 3-49 Properties

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 3-44 on page 3-58](#).
4. The Wireless Network Configuration tool with available Wireless Networks appear.
5. Select the **Monitor** tab.

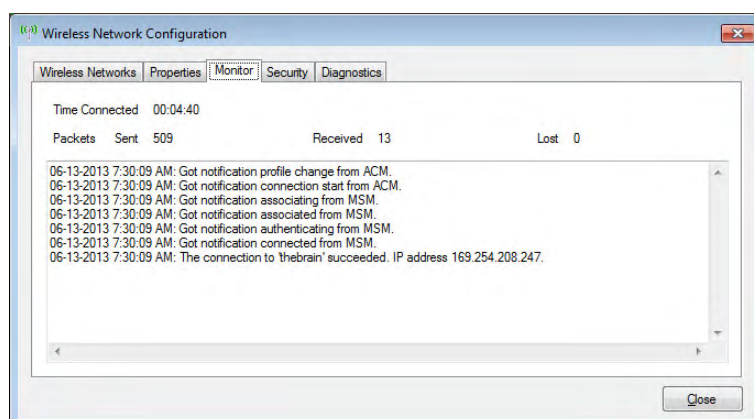


Figure 3-50 Monitor

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 3-44 on page 3-58](#).
4. The Wireless Network Configuration tool with available Wireless Networks appear.
5. Select the **Diagnostics** tab and then click **Run Diagnostics**.

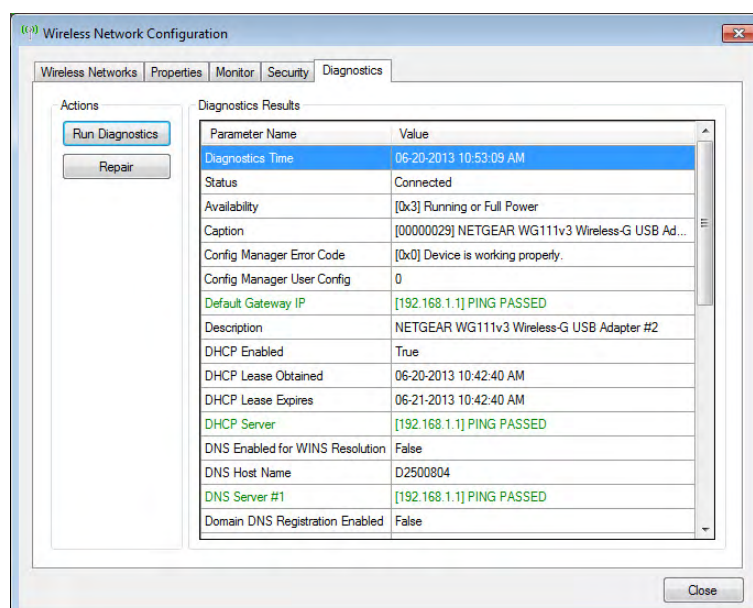


Figure 3-51 Run Diagnostics

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 3-44 on page 3-58](#).
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 3.5.7 on page 3-26](#).
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 3-44 on page 3-58](#).
The Modem Configuration screen appear.

Figure 3-52 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 3-66](#).
15. If it is desired to use also MMS, adjust settings as described in [Section 3.13.5 on page 3-67](#).
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 3-41](#) 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 3-68](#).

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 3-44 on page 3-58](#).
- The Email Configuration screen appear.

Figure 3-53 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 3-67](#).
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 3-68](#).

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 3-44 on page 3-58](#).
5. In the Email Configuration screen check box "Use Email to MMS Service" and then click on **Settings**.

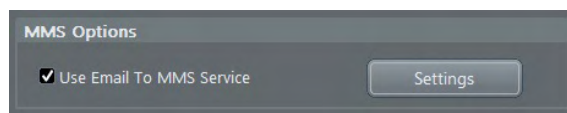


Figure 3-54 check box

The Email to MMS Service Settings window appear.

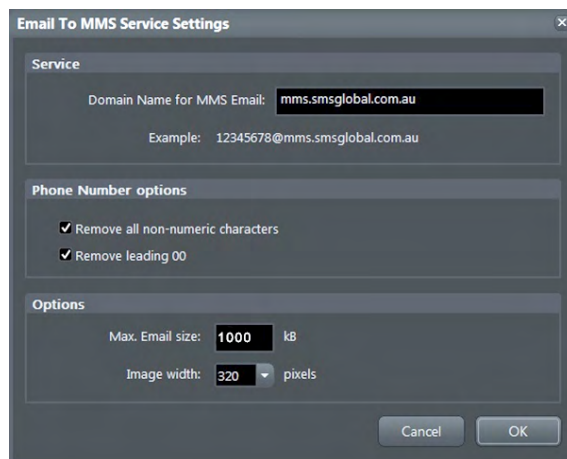


Figure 3-55 Email to MMS Service Settings

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 3-68](#).

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.

The screenshot shows the 'Patient ID' screen with the following fields:

- Patient ID: 1083351
- Last Name: MUSTERFRAU
- First Name: SUSI
- Middle Name:
- DOB [mm/dd/yyyy]: 05/01/1993
- Age: 21 Y
- Sex: female

The 'Patient's Email address and Phone number' dialog box is open, showing:

- Patient Name: MUSTERFRAU SUSI
- Email Address: susi.musterfrau@gmail.com
- Phone Number: 004913800000
- Send image via: Email & MMS
- Email Options:
 - Email send mode: anonymized
 - Send as: JPG
 - Cine SE / ES: [checkbox]
 - Size: Original
 - Quality: High
- MMS Options:
 - MMS send mode: anonymized

Numbered callouts indicate the following steps:

1. Click the **@** icon.
2. Enter patient's information and adjust Email/MMS Options.
3. Store your configuration with click on **OK**.

Figure 3-56 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.

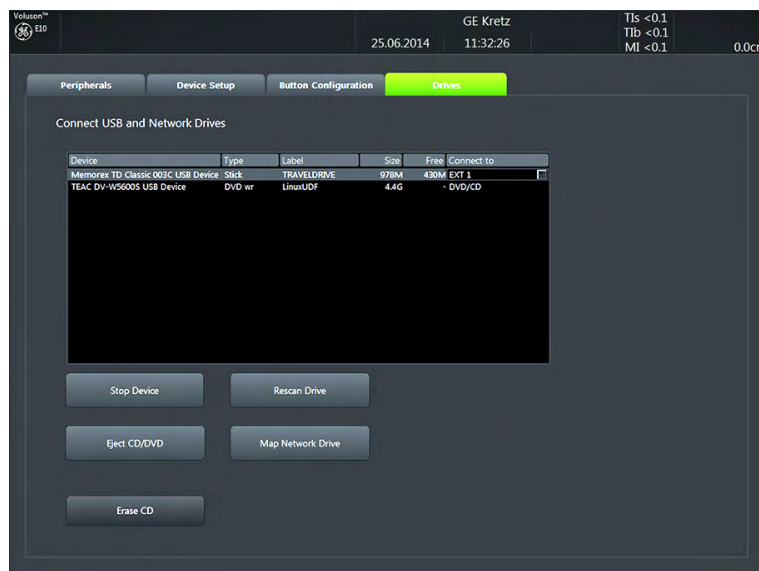


Figure 3-57 Setup - Connectivity - DRIVES page

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.

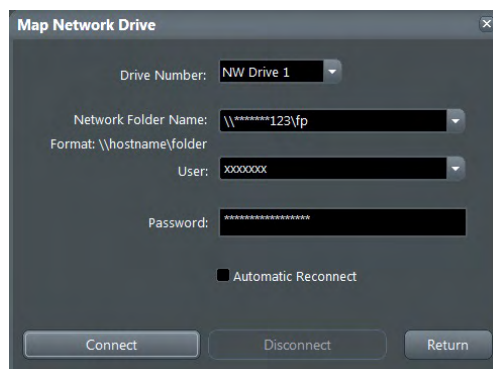


Figure 3-58 Map Network Drive

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 Configuration

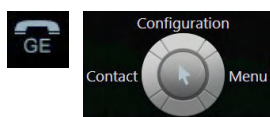
Prerequisites for InSite Setup

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

At EC330 (BT18) systems the trackball functions are displayed in the trackball status area of the screen.



For fast access to the Configuration page move the cursor to the InSite link (**GE** icon at the right bottom of the display screen) and then press the **upper trackball key**.

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 "Service Platform - Access and Security" on page 5-48](#).

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

Note

This example shows fictional numbers!

Figure 3-59 Common Service Desktop - Configuration

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 the system.
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 3-71](#) .

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 link (GE icon) at the right bottom of the display screen and press the left trackball key (= left-click). The "Contact GE" form is displayed.
2. Ensure that Connection is "Checked Out" **(1)**.

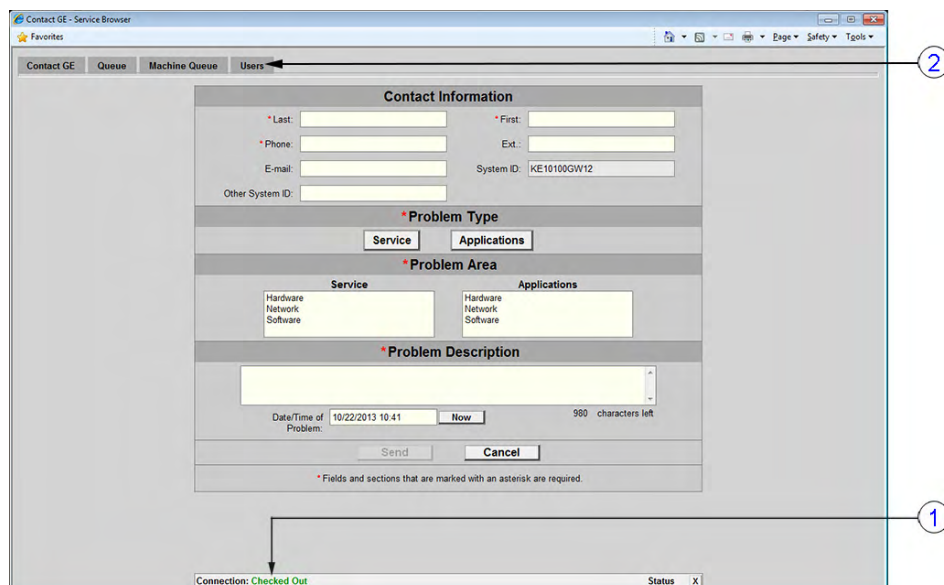


Figure 3-60 Contact GE

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

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

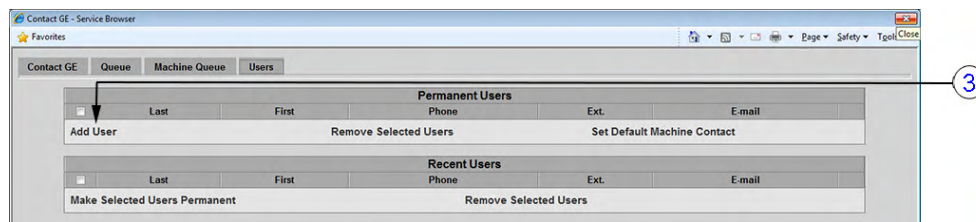


Figure 3-61 Add User

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

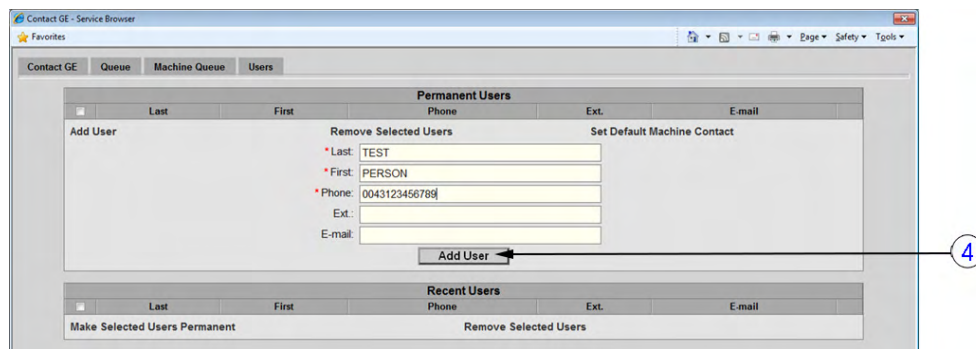


Figure 3-62 confirm with Add User

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

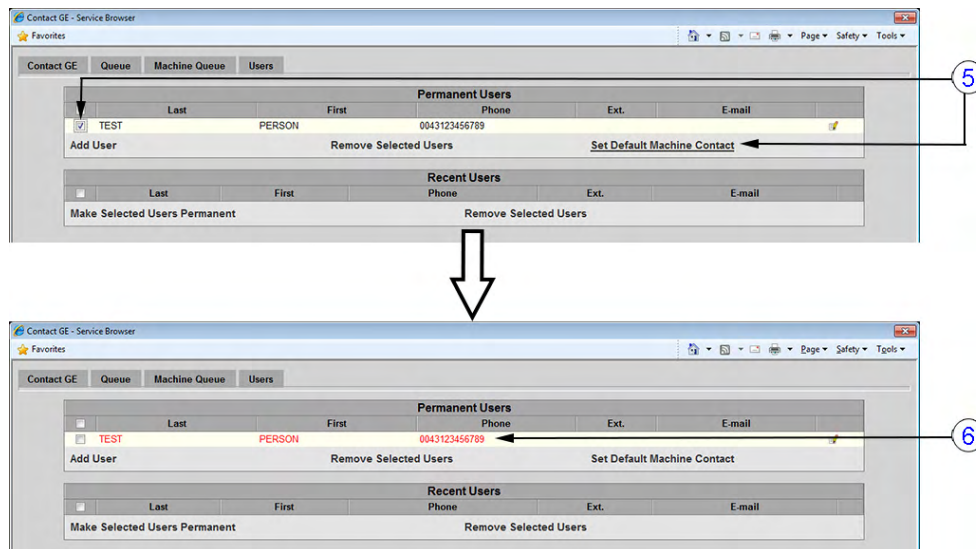


Figure 3-63 set User as Default

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

7. Close the window.

3.14 Connectivity Setup Worksheet

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Figure 3-64 Site System Information

Voluson E __					
Host Name	<input style="width: 100px;" type="text"/>	Local Port	<input style="width: 50px;" type="text"/>		
AE Title	<input style="width: 150px;" type="text"/>	IP Address	<input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/>		
		Net Mask	<input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/>		
ROUTING INFORMATION					
	Destination IP Addresses		GATEWAY IP Addresses		
		Default	<input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/>		
ROUTER1	<input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/>		<input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/>		
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ROUTER3	<input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/>		<input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/>		
DICOM APPLICATION INFORMATION					
	NAME	MAKE/REVISION	AE TITLE	IP ADDRESSES	PORT
Store 1	<input style="width: 100px;" type="text"/>	<input style="width: 100px;" type="text"/>	<input style="width: 100px;" type="text"/>	<input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/>	<input style="width: 30px;" type="text"/>
Store 2	<input style="width: 100px;" type="text"/>	<input style="width: 100px;" type="text"/>	<input style="width: 100px;" type="text"/>	<input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/>	<input style="width: 30px;" type="text"/>
Store 3D_1	<input style="width: 100px;" type="text"/>	<input style="width: 100px;" type="text"/>	<input style="width: 100px;" type="text"/>	<input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/>	<input style="width: 30px;" type="text"/>
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Print	<input style="width: 100px;" type="text"/>	<input style="width: 100px;" type="text"/>	<input style="width: 100px;" type="text"/>	<input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/>	<input style="width: 30px;" type="text"/>
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Storage Commit	<input style="width: 100px;" type="text"/>	<input style="width: 100px;" type="text"/>	<input style="width: 100px;" type="text"/>	<input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/> . <input style="width: 30px;" type="text"/>	<input style="width: 30px;" type="text"/>
MPPS	<input style="width: 100px;" type="text"/>	<input style="width: 100px;" type="text"/>	<input style="width: 100px;" type="text"/>	<input style="width: 30px;" type="text"/> . <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 3-65 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		REV	SERIAL	
SHIPMENT		OCP		BS	ORD		
		DISTRICT		CUSTOMER NO.		DATE (MO-DA-YR)	
		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	
SYSTEM I.D.		FDA	MODEL		REV	SERIAL	
INSTALLATION		OCP		BS	ORD		EMPLOYEE NO.
		DISTRICT		ROOM		DATE (MO-DA-YR)	
		CUSTOMER NO.					
		DESTINATION NAME AND ADDRESS					
		ZIP CODE					

Figure 3-66 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

- 4.1 Required Equipments ----- 4-2*
- 4.2 General Procedure ----- 4-2*
- 4.3 Functional Checks ----- 4-7*
- 4.4 Backup and Restore Database, Preset Configurations and Images ----- 4-10*
- 4.5 Software Configuration Checks ----- 4-23*
- 4.6 Peripheral Checks ----- 4-24*
- 4.7 Mechanical Function Checks ----- 4-25*
- 4.8 Site Log ----- 4-26*

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 9-44](#) .*

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 9-49](#) for an overview. Usually you should check all the probes used on the system

4.2 General Procedure



Caution

The system requires all covers. Do not operate the Voluson E-Series system unless 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.



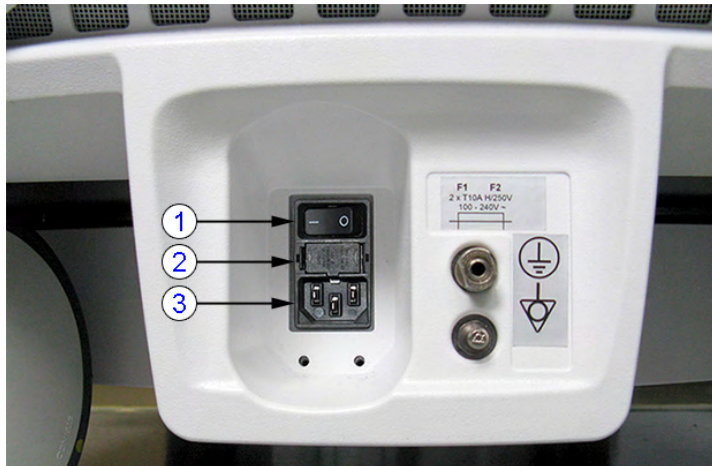
Lockout/Tagout Requirements (For USA only).

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.

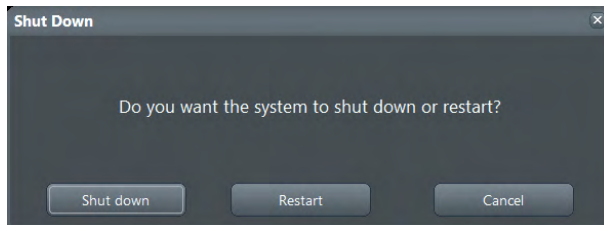


Figure 4-3 Shutdown dialog

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.

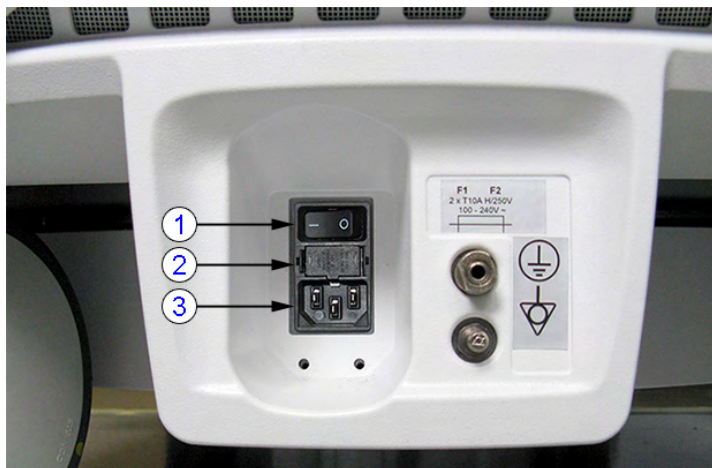


Figure 4-4 Circuit Breaker at rear of system

- 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	alphanumeric keyboard and F1 key (to invoke EUM)
7	Freeze / Run key	14	ON/OFF Standby power button

4.2.3.2 Touch Panel

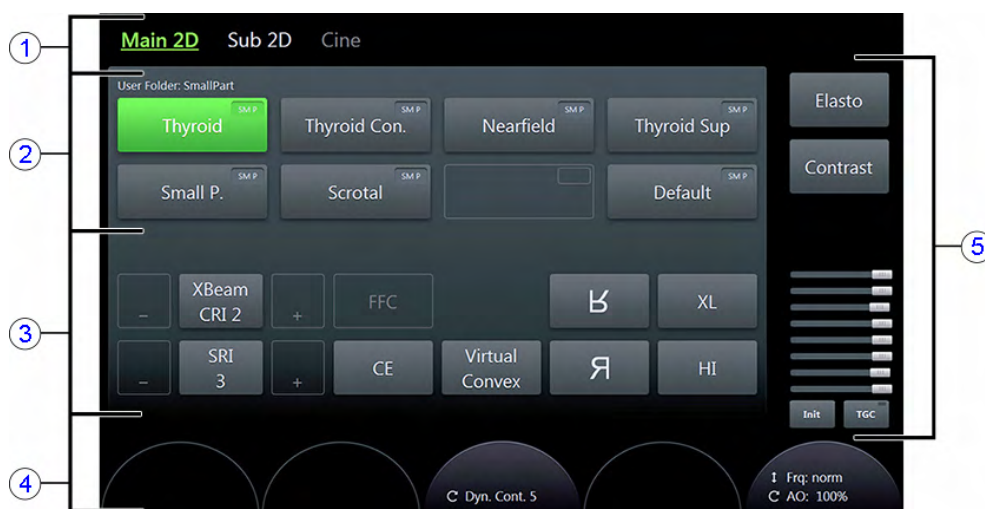


Figure 4-6 Touch Panel - Main Menu

- 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.

4.3 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 4-20](#).

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.

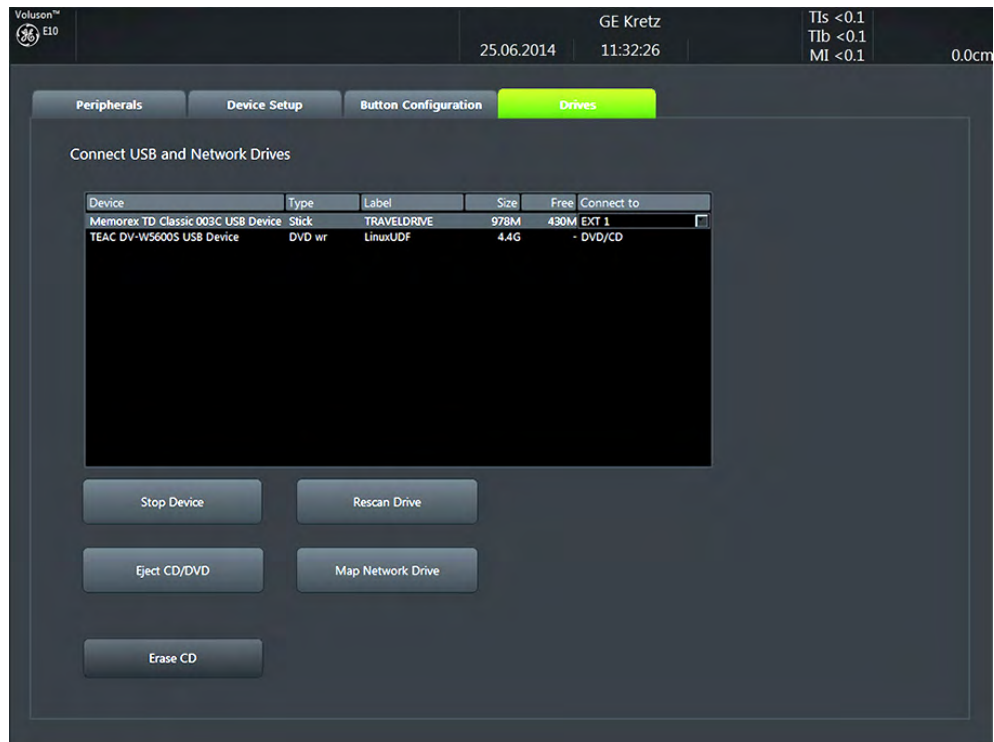


Figure 4-7 Setup - Connectivity - DRIVES page

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

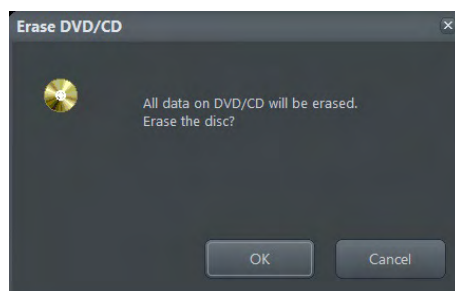


Figure 4-8 Erase DVD/CD Window

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 4-15) and the Image Archive (Section 4.4.6 on page 4-20) 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.

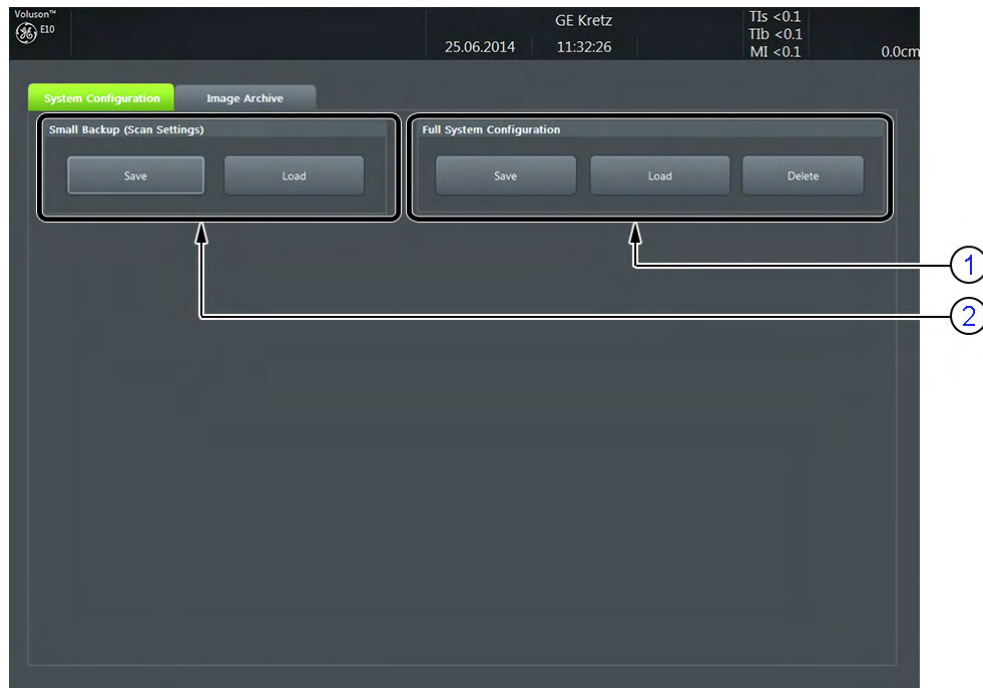


Figure 4-9 Setup - Backup - SYSTEM CONFIGURATION page

- | | |
|---|------------------------------|
| 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 4-11*
 - *"Load Small Backup (Scan Settings)" on page 4-12*
2. **Full System Configuration**
 - *"Save Full System Configuration (Full Backup)" on page 4-15*
 - *"Load Full System Configuration (Full Backup)" on page 4-17*
 - *"Delete Full System Configuration (Full Backup)" on page 4-19*

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 3-69*.
- 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 3.5.15 "General Remarks when using external USB-Devices" on page 3-35*.

4.4.1 Save Small Backup (Scan Settings)

The Image/Scan Settings contain:

- 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.

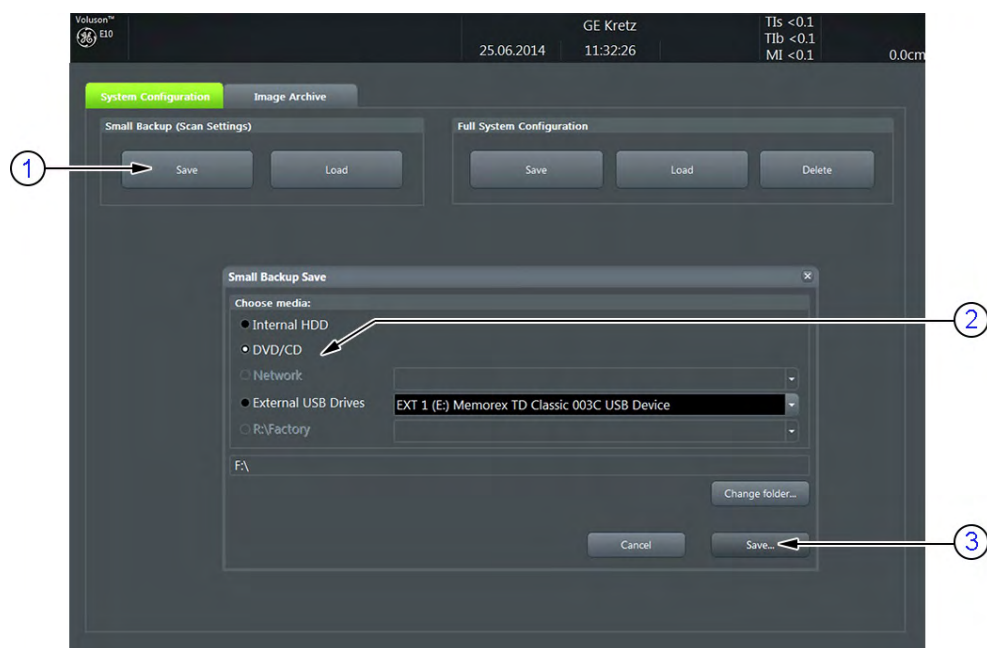


Figure 4-10 Save window

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.

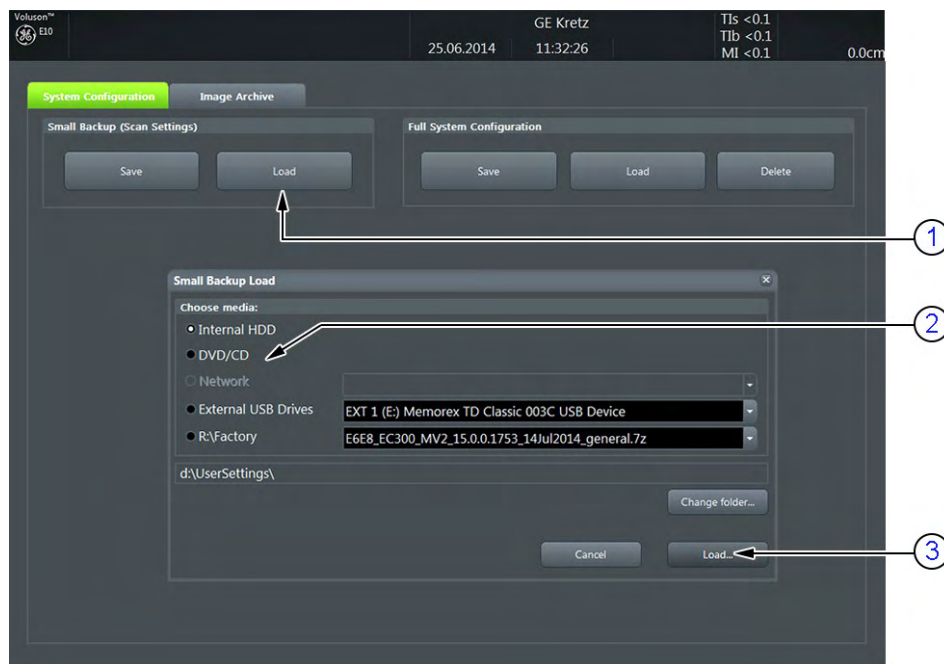


Figure 4-11 Load window

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 4-13
 - "Load only parts of the "Complete Backup"" on page 4-14

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 4-12 .
2. Select the "Complete Backup" (1) (see figure below) and click the [>>] button (2) to copy it into the Load Data field.

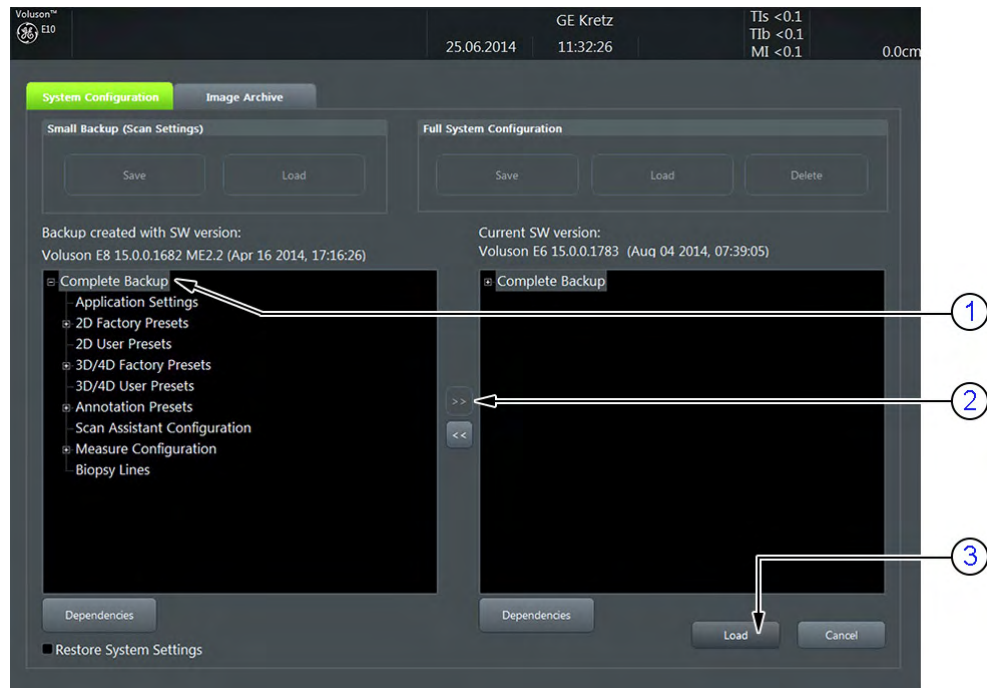


Figure 4-12 Load Backup Data

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 4-12.
2. Click the **[+]** sign next to "Complete Backup" (1) to open the content tree.

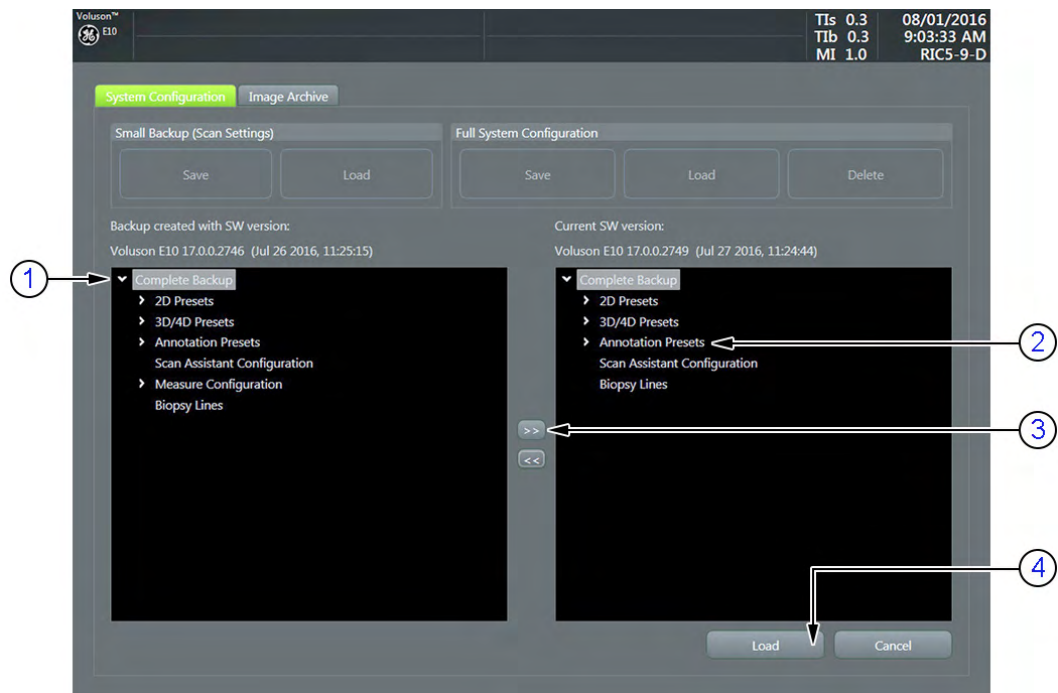


Figure 4-13 Load settings

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 Presets, gray curves etc.)
- System Settings (general "Setup" settings such as Language, Time/Date format, Button configuration, Annotation settings, Biopsy lines, Peripheral data, Video Norm, Archive configuration, etc.)
- Measure Configuration (user specific measure setup settings)
- User Authentication Data (User Authentication Configuration (user names, group names), LDAP configuration, audit trail configuration,...)
- Patient Archive (database containing patient demographic exam data and measurements) - **no images**
- V830 Settings (Options resp. Permanent Key that is specific for enabled software options and Demo Key)
- Image Transfer Configuration (DICOM configuration e.g., DICOM servers, AE Title, Station Name, etc.)
- Network Configuration (Network settings: IP address, Network Profiles, e-mail configuration, network printer, network drives, 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).

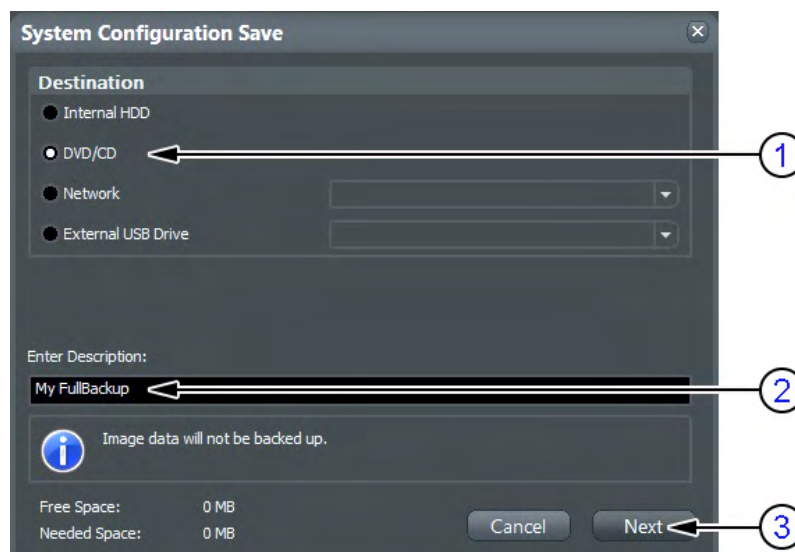


Figure 4-14 System Configuration Save

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 4-20](#).

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

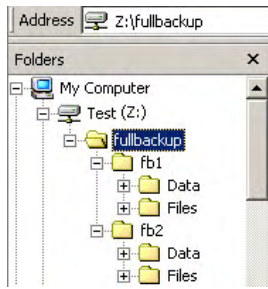
After copying the data, the Voluson E-Series reboots and the application starts again.

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 3-69](#).

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**.

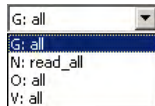
The directory structure of the full backup data is as follows:



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 3.5.15 "General Remarks when using external USB-Devices" on page 3-35](#).

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 4-15](#).

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 (e.g., 15.x.x -> 16.x.x -> 17.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).

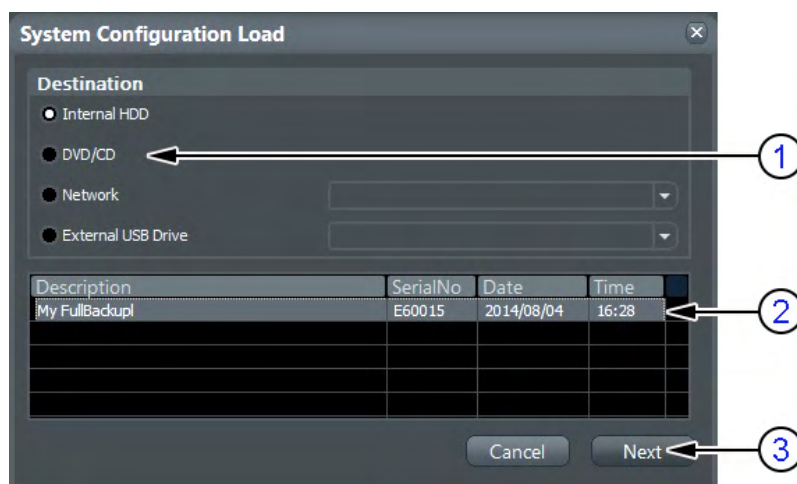


Figure 4-16 System Configuration Load

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.

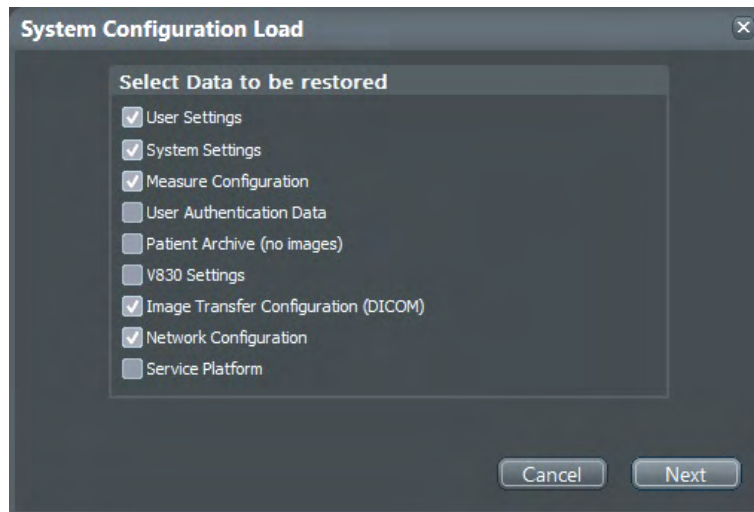


Figure 4-17 Select data to be restored

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 4-15](#).

Note

When *User Authentication Data* is checked, a dialog asking for the system administration password appears. Enter the correct password and click **OK**. Select **Cancel** to close the dialog. (The *User Authentication Data* check box becomes unchecked.)

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!

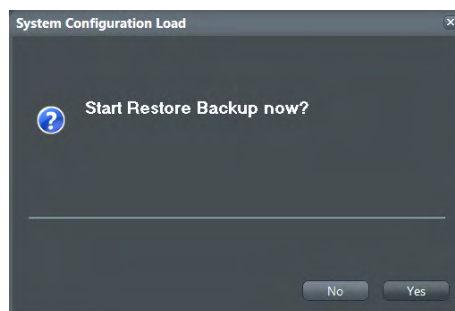


Figure 4-18 Start Restore Backup now?

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

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).

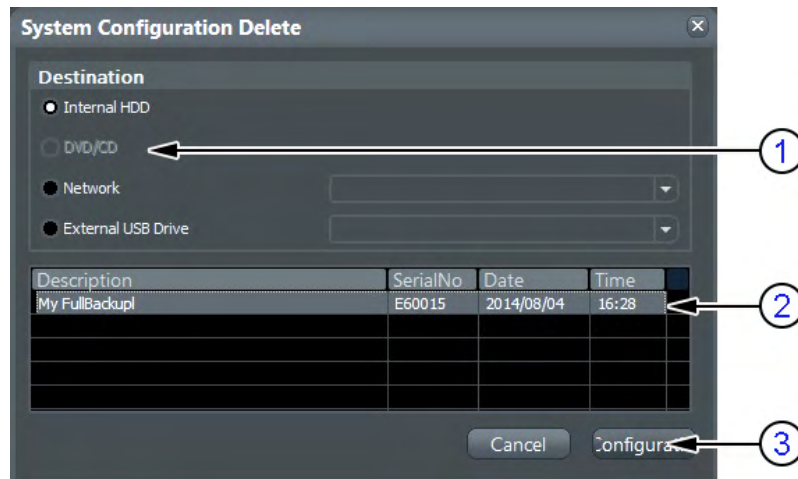


Figure 4-19 System Configuration Delete

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 4-15) and the Image Archive (Section 4.4.6 on page 4-20) 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.

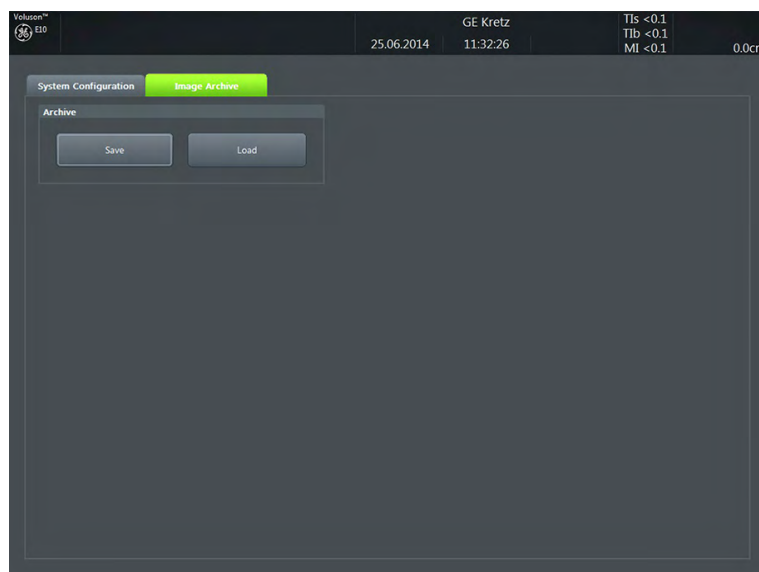


Figure 4-20 Setup - Backup - IMAGE ARCHIVE page

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

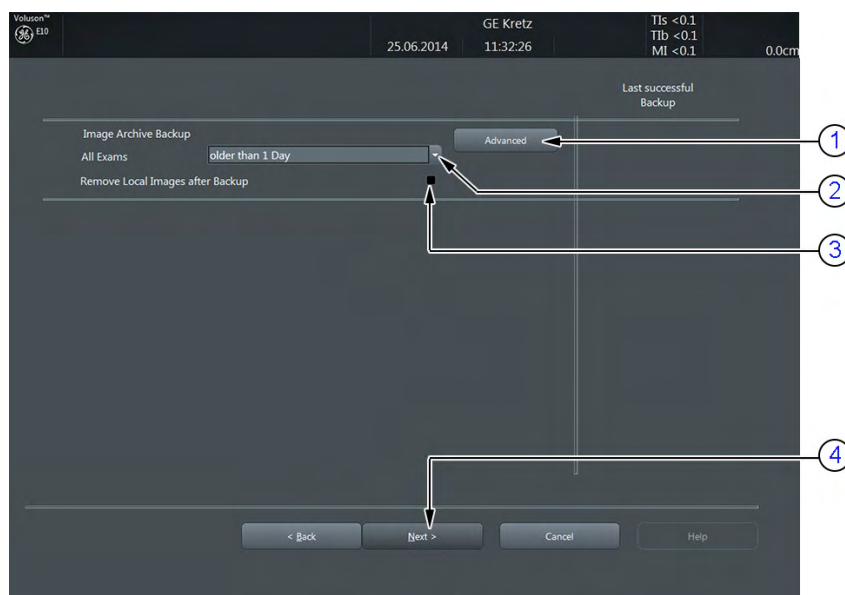


Figure 4-21 Image Archive Save - preparations

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 4-20), 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).

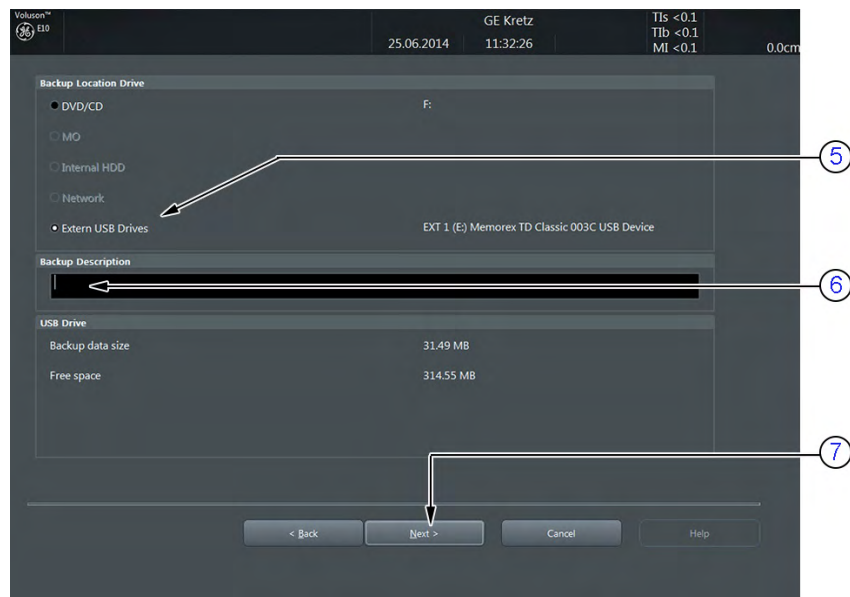


Figure 4-22 Image Archive Save - choose destination

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 4-15](#).

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.

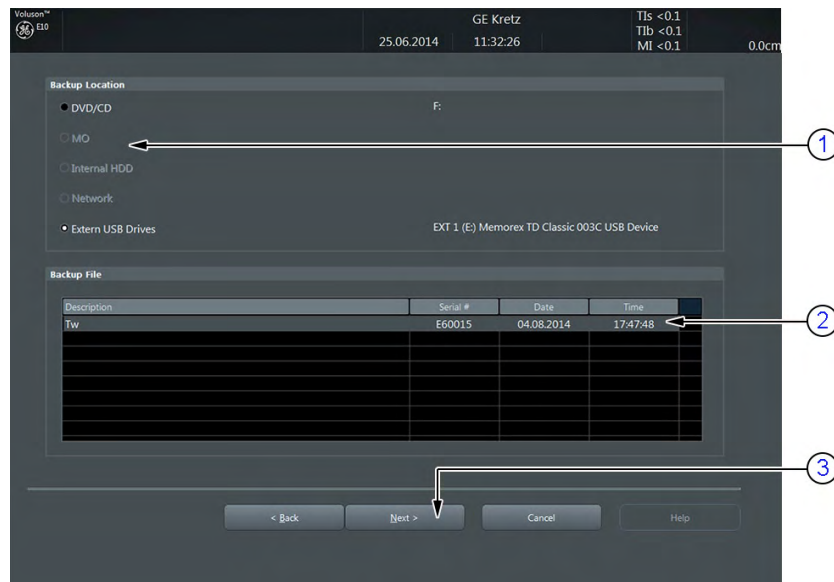


Figure 4-23 Image Archive Load - choose destination

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.

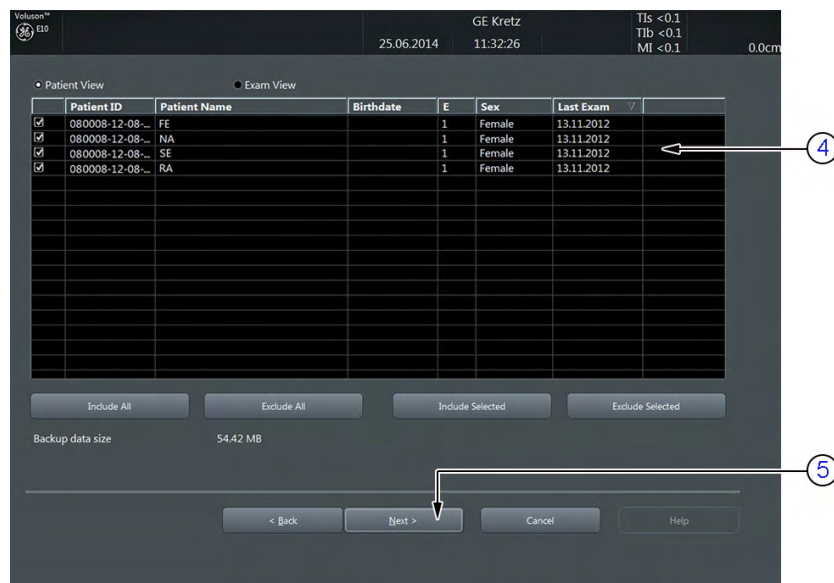


Figure 4-24 select image archive data to be restored

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 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.

Note *Almost all **settings have to be assigned as desired and required by the customer**. After completion, return the equipment to the customer and **ensure acceptance**.*

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

General Settings

Step	Page + Task	Expected Result(s)
1	General: Check Date and Time setting	Date and Time are correct
2	General: Check that Clinic Name is correct	Clinic Name (location) is correct
3	General: Check Language settings	desired System / EUM Language is displayed

Assign all (further) settings as desired and required by the customer.

Administration

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

Connectivity

Step	Page + Task	Expected Result(s)
1	Peripherals: Check the Video Norm standard as described in Section 3.7.1.6 on page 3-45 .	setting assigned as required for the country
2	Device Setup: Check DICOM, Archive and Network configuration nodes (e.g., TCP/IP, WLAN, EMAIL, etc.)	settings assigned as desired and required by the customer

Assign all (further) settings as desired and required by the customer.

Backup

not applicable

Imaging Pesets

Assign all (further) settings as desired and required by the customer.

Biopsy

not applicable

Measure

Assign all (further) settings as desired and required by the customer.

4.6 Peripheral Checks

Check that peripherals work as described below:

Table 4-1 Peripheral Checks

Step	Page + Task	Expected Result(s)
1	Press the Freeze key.	Stop image acquisition.
2	Press the remote key (P1 , P2 , P3 , P4 , P5 or P6), 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 (P1 , P2 , P3 , P4 , P5 or P6), which is assigned to the color printer.	The image displayed on the screen is printed on the Color printer.
4	Press the remote key (P1 , P2 , P3 , P4 , P5 or P6), which is assigned to recorder control.	Recording starts/stops.

Verify basic operations of further auxiliary devices.

4.6.1 ECG Check Out

Connect the ECG preamplifier and check:

Table 4-2 Peripheral Checks

Step	Page + Task	Expected Result(s)
1	Press the Utilities key on the control console and then touch the ECG 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



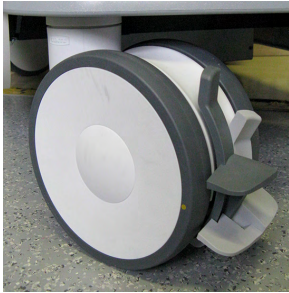
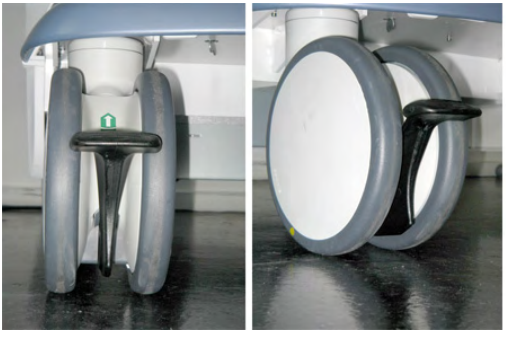





The control console can be rotated, translated and adjusted in height (**electronically** only).

Note For further details refer to [Section 5.10.3 on page 5-46](#) 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 4-3 Brakes and Direction (Swivel) Lock

Step	Task			Expected Result(s)
	Caster "Steinco"		Caster universal "Tente"	
1				swivel lock engaged
2				brakes and swivel lock released
3				brakes and swivel lock engaged (=full lock)

4.8 Site Log

Table 4-4 Voluson E-Series - Site Log (Paper Documentation)

[illegible]

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

5.1 General information - - - - -	5-2
5.2 FrontEnd Processor - - - - -	5-23
5.3 BackEnd Processor - - - - -	5-25
5.4 Internal I/O - - - - -	5-27
5.5 Control Console (User Interface) - - - - -	5-35
5.6 Monitor - - - - -	5-39
5.7 External I/O - - - - -	5-40
5.8 Peripherals - - - - -	5-42
5.9 Power Distribution - - - - -	5-44
5.10 Mechanical Descriptions - - - - -	5-45
5.11 Air Flow Control - - - - -	5-47
5.12 Service Platform - - - - -	5-48
5.13 Common Service Desktop (CSD) - - - - -	5-49
5.14 Service Page - - - - -	5-50
5.15 Boot Screen Functions - - - - -	5-53

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.

- EC300/EC310 (BT15/BT16): any 3 probes may be connected at the same time (+ 1 pencil CW probe)
- EC320/EC330 (BT17/BT18): any 4 probes may be connected at the same time

Content in this section

5.1.1 Description of Operating Modes ----- 5-6

5.1.2 Block diagram Voluson E-Series ----- 5-9

5.1.3 Data Flow Control Description ----- 5-10

5.1.4 Description of Software Options ----- 5-12

5.1.5 Description of Hardware Options ----- 5-21

5.1.6 Data Location ----- 5-22



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)

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

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

- Integrated FrontEnd (uses advanced ASIC and FGPA 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: [Section 5.2 on page 5-23](#)
- BackEnd processor: [Section 5.3 on page 5-25](#)
- Control Console (User interface); System I/O with hard keys, Touch Panel and EL-Display: [Section 5.5 on page 5-35](#)
- Monitor: [Section 5.6 on page 5-39](#)
- External I/O: [Section 5.7 on page 5-40](#)
- Peripherals: [Section 5.8 on page 5-42](#)
- Power supply and Isolation transformer for the peripherals, [Section 5.9 on page 5-44](#)
- System mechanical chassis: trolley to keep all major components, [Section 5.10 on page 5-45](#)

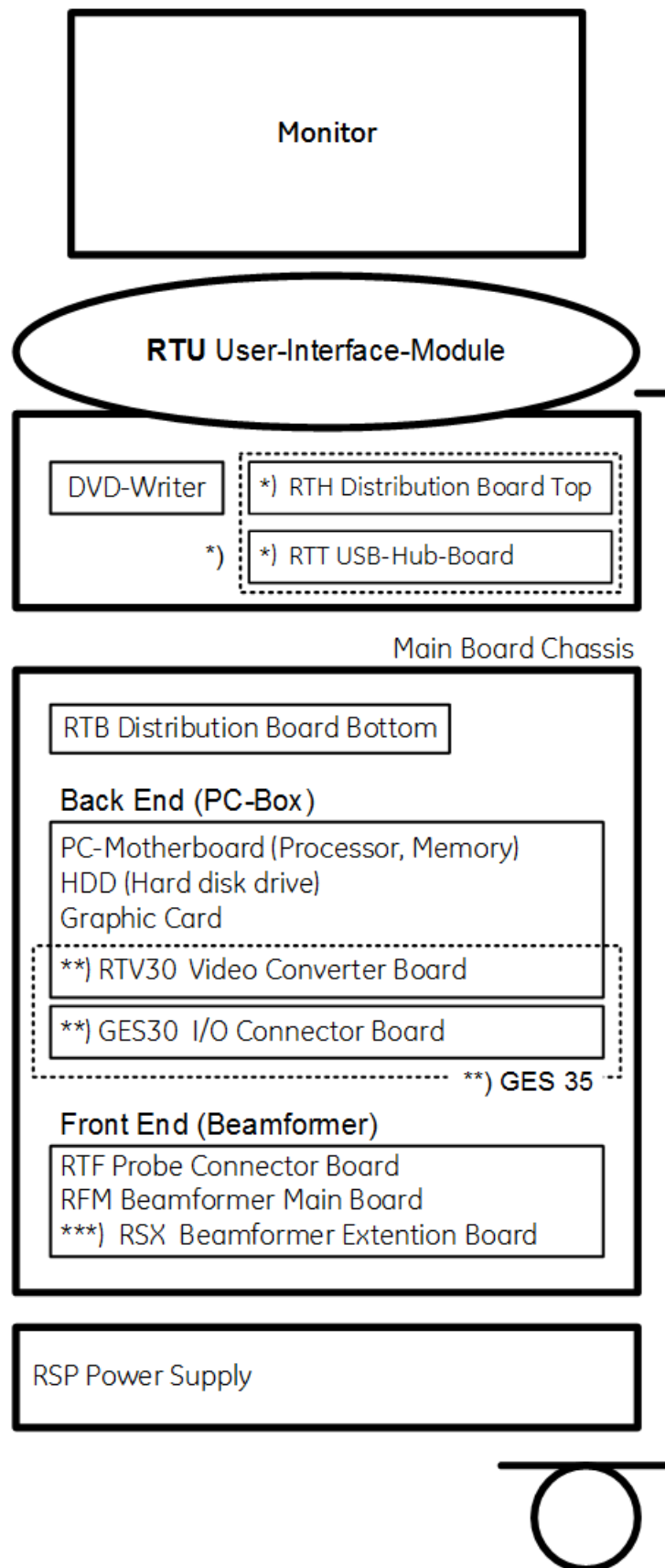


Figure 5-2 Basic Block diagram of Voluson E-Series

Note

*) there are **2 variants**: RTT/RTH6x (2 boards) or RTH50 only (1 board)

) there are **2 variants: GES30/RTV30 (2 boards) or GES35 only (1 board)

***) EC320 (BT17) and EC330 (BT18) do not have RSX Extension board

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 5.1.4.7 "Coded Contrast Imaging" on page 5-16](#).

5.1.1.1.5 Elastography (optional)

For details see: [Section 5.1.4.8 "Elastography" on page 5-16](#).

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.

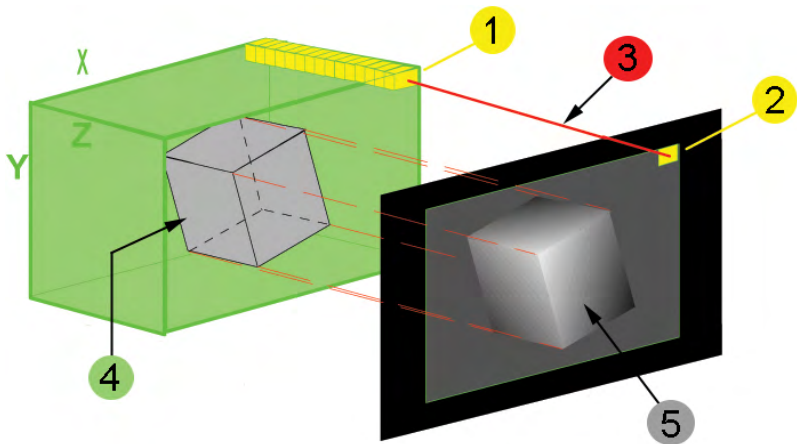


Figure 5-3 Principle: Volume Rendering

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

5.1.2 Block diagram Voluson E-Series

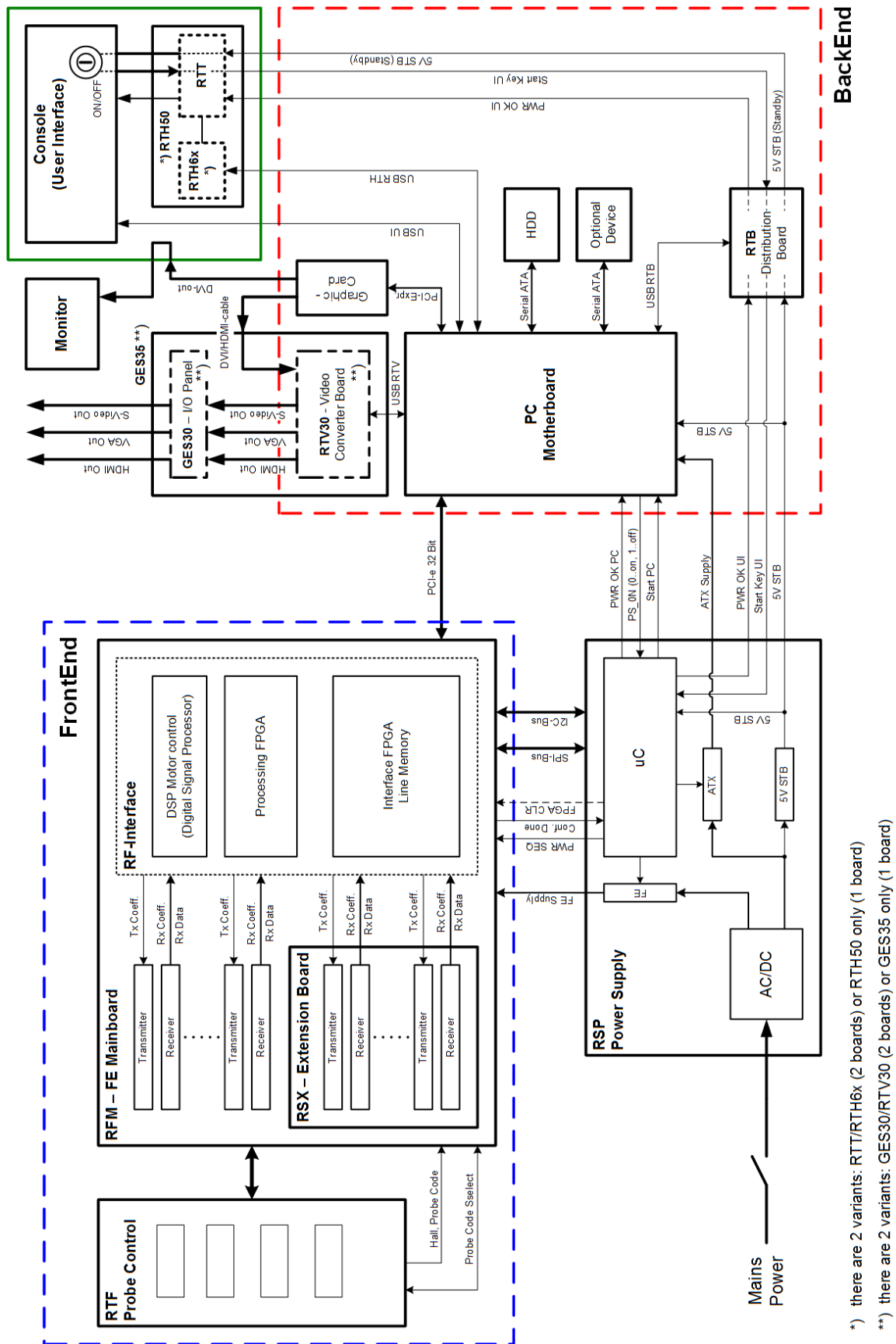


Figure 5-4 Voluson E-Series - Block diagram

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](#) , 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 one 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 (purchasable) 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.

For an overview of available options, refer to:

- EC300/EC310 (BT15/BT16): [Table 5-1 on page 5-13](#)
- EC320/EC330 (BT17/BT18): [Table 5-2 on page 5-14](#)

Table 5-1 Software Options at EC300/EC310 (BT15/BT16)

			BT15 (EC300)			BT16 (EC310)		
HCat #	Software Option	Description	VE6	VE8	VE10	VE6	VE8	VE10
H48681FM	Advanced 4D (incl. Real time 4D, RT-4D Biopsy, VCI "Basic" and TUI),	<i>Advanced 4D</i>	X	X	X	X	X	X
H48691KK	HD/live	<i>HDlive</i>	1)	S*	-	1)	S*	-
H48691XZ	HD/live Silhouette	<i>HDlive Silhouette</i>	-	1)	S*	-	1)	S*
H48681FN	VOCAL II	<i>VOCAL II - Virtual Organ Computer-aided Analysis</i>	1)	1)	1)	1)	1)	1)
H48681FP	Advanced VCI (VCI OmniView)	<i>Advanced VCI</i>	2)	2)	2)	2)	2)	2)
H48681FT	Contrast Imaging	<i>Coded Contrast Imaging</i>	X	X	X	X	X	X
H48681FW	Sono VCAD <i>heart</i>	<i>SonoVCAD heart - Computer Assisted Heart Diagnosis</i>	1)	-	-	1)	-	-
H48681FX	SonoAVC	<i>SonoAVC - Sono Automated Volume Count</i>	1)	1)	1)	1)	1)	1)
H48681FY	SonoVCAD <i>labor</i>	<i>SonoVCAD labor</i>	1)	1)	1)	1)	1)	1)
H48681FZ	Anatomical M-Mode	<i>Anatomical M-Mode (AMM)</i>	X	X	X	X	X	X
H48681GD	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)	-	2)	2)
H48681FS	STIC "Basic"	<i>STIC "Basic" (Spatio-Temporal Image Correlation)</i>	2)	-	-	2)	-	-
H48681GB	Elastography (incl. Elastography Analysis)	<i>Elastography</i>	X	X	X	X	X	X
H48681TK	V-SRI	<i>V-SRI Advanced - Speckle Reduction Imaging</i>	-	-	3)	-	-	3)
H48691YA	eM6C - E4D Activation (incl. eSTIC)	<i>eM6C - E4D Activation (Advanced Features for Electronic 4D Matrix-Probe)</i>	-	-	X	-	-	X
H48691NZ	CW-Doppler	<i>CW - Continuous Wave Doppler</i>	X	X	X	X	X	X
H48691XF	SW DVR	<i>SW DVR - Software Digital Video Recording</i>	X	X	X	X	X	X
H48691KG	RLS Option	Russian Language Support	X	X	X	X	X	X

Legend:

X Optional Feature (separately purchasable)

- not available

S Standard Feature, S* can be used in 3D-Mode, but **for 4D-Modes the option "Advanced 4D" has to be active** as well1) this 3D/4D option can be used in 3D-Mode, but **for 4D-Modes the option "Advanced 4D" has to be active** as well2) 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-D

4) Optional Feature, requires software version EC320 Ext.4 (17.0.4) or higher

R restricted, not yet released in all countries

Table 5-2 Software Options at EC320/EC330 (BT17/BT18)

HCat #	Software Option	Description	BT17 (EC320)			BT18 (EC330)		
			VE6	VE8	VE10	VE6	VE8	VE10
H48681FM	Advanced 4D (incl. Real time 4D, RT-4D Biopsy, VCI "Basic" and TUI)	<i>Advanced 4D</i>	X	X	X	X	X	X
H48691XZ	HD <i>live</i> Silhouette and Studio	<i>HDlive Silhouette</i> and <i>HDlive Studio</i>	-	1)	S*	-	-	-
H48701WU	HD <i>live</i> Silhouette	<i>HDlive Silhouette</i>	-	-	-	1)	S*	S*
H48701WW	HD <i>live</i> Studio	<i>HDlive Studio</i>	-	-	-	-	1)	S*
H48681FN	VOCAL II	<i>VOCAL II - Virtual Organ Computer-aided Analysis</i>	1)	1)	1)	1)	1)	1)
H48681FP	Advanced VCI (VCI OmniView)	<i>Advanced VCI</i>	2)	2)	2)	2)	2)	2)
H48681FT	Contrast Imaging	<i>Coded Contrast Imaging</i>	X	X	X	X	X	X
H48681FW	Sono VCAD <i>heart</i>	<i>SonoVCAD heart - Computer Assisted Heart Diagnosis</i>	1)	-	-	1)	-	-
H48681FX	SonoAVC	<i>SonoAVC - Sono Automated Volume Count</i>	1)	1)	1)	1)	1)	1)
H48681FY	SonoVCAD <i>labor</i>	<i>SonoVCAD labor</i>	1)	1)	1)	1)	1)	1)
H48681FZ	Anatomical M-Mode	<i>Anatomical M-Mode (AMM)</i>	X	X	X	X	X	X
H48681GD	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)	-	2)	2)
H48681FS	STIC "Basic"	<i>STIC "Basic" (Spatio-Temporal Image Correlation)</i>	2)	-	-	2)	-	-
H48681GB	Elastography (incl. Elastography Analysis)	<i>Elastography</i>	X	X	X	X	X	X
H48681TK	V-SRI	<i>V-SRI Advanced - Speckle Reduction Imaging</i>	-	-	3)	-	-	3)
H48701WS	SonoMetrium	<i>SonoMetrium</i>	-	-	-	X	X	X
H48691YA	eM6C - E4D Activation (incl. eSTIC)	<i>eM6C - E4D Activation (Advanced Features for Electronic 4D Matrix-Probe)</i>	-	-	X	-	-	X
H48691NZ	CW-Doppler	<i>CW - Continuous Wave Doppler</i>	X	X	X	X	X	X
H48691XF	SW DVR	<i>SW DVR - Software Digital Video Recording</i>	X	X	X	-	-	-
H48701WR	DVD and USB Recorder	<i>DVD and USB Recorder</i>	-	-	-	X	X	X
H48710UX	Disk Encryption (LTD)	<i>Disk Encryption</i>	4)	4)	4)	-	-	-
H48701WM	Advanced Security Features (incl. Disk Encryption and Whitelisting)	<i>Advanced Security Features</i>	-	-	-	X	X	X
H48691KG	RLS Option	Russian Language Support	X	X	X	X	X	X
-	IOTA LR2	<i>IOTA (International Ovarian Tumor Analysis)</i>	R	R	R	R	R	R
H48701WP	IOTA Simple Rules	<i>IOTA (International Ovarian Tumor Analysis)</i>	-	-	-	X	X	X

Legend:

X Optional Feature (separately purchasable)

- not available

S Standard Feature, S* can be used in 3D-Mode, but for 4D-Modes the option "Advanced 4D" has to be active as well

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-D

4) Optional Feature, requires software version EC320 Ext.4 (17.0.4) or higher

R restricted, not yet released in all countries

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 center 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.

5.1.4.4 HDlive Studio

HDlive Studio offers three independent light sources with three different light types (directional, point, spot) and contains a special render function to visualize the amniotic fluid. The "Light Menu" enables the user to switch the different light sources on/off, to select light types, change positions of the light sources and to define and use complete sets of adjustments with preset buttons.

The light source positions are indicated with the help of a graphical icon situated in the right lower corner of the rendered 3D or 4D image.

5.1.4.5 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.

5.1.4.6 Advanced VCI

5.1.4.6.1 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.

5.1.4.7 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.

5.1.4.8 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.

5.1.4.8.1 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.

5.1.4.9 SonoVCAD heart - Computer Assisted Heart Diagnosis

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).*

5.1.4.10 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.

5.1.4.11 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.

5.1.4.12 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

5.1.4.13 Advanced STIC (Spatio-Temporal Image Correlation)

5.1.4.13.1 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 +color 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).*

5.1.4.13.2 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

5.1.4.13.3 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

5.1.4.14 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.

5.1.4.15 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 systems with probe RM6C, RIC5-9-D and RIC6-12-D.*

5.1.4.16 SonoMetrium

SonoMetrium allows automated detection and display of a rendered Uterine C-plane and thereby 3D analysis of the endometrial cavity in application Gyn.



This option is only available for Voluson E-Series systems with software version EC330 (BT18).

5.1.4.17 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.*

5.1.4.17.1 eSTIC

The intended use and workflow of the eSTIC acquisition mode is the same as the standard STIC mode but with the advantage of a faster acquisition time.

Note *"eSTIC" is only available with probe eM6C.*

5.1.4.18 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.

Note *Additional hardware is required at EC300/EC310 (BT15/BT16) system!*

5.1.4.19 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.

5.1.4.20 DVD and USB Recorder

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.



This option is only available for Voluson E-Series systems with software version EC330 (BT18).

5.1.4.21 Disk Encryption

Disk Encryption enables an encryption to secure all Patient Data, Patient Images and corresponding measurements. A password, an USB storage device with unlock key, or the recovery key is required to unlock the device during the boot-up process.

Note *Any data stored on internal HDDs D:\ partition is encrypted by using BitLocker configured with AES 256-bits key length.*



Caution

Without the Encryption Password or Recovery Key it will not be possible to access the Ultrasound device including emergency mode, scanning, patient information, images, or local archive. GE has no access to this information or the ability to undo encryption in the event that the Encryption Password and Recovery Key are lost. The security and safety of the Encryption Password and Recovery Key is solely the user's responsibility.

Note *The "Disk Encryption" option is only available for Voluson E-Series systems with software version EC320 (BT17, requires Ext.4 or higher). At Voluson E-Series systems with software version EC330 (BT18), Disk Encryption is part of the [Advanced Security Features](#) option.*

Note *A Voluson E-Series systems without the option but with encrypted disk is ununlockable.*

5.1.4.22 Advanced Security Features

The "Advanced Security Features" option consists of two vulnerability protection features:

- ["Disk Encryption" on page 5-20](#)
- ["Whitelisting" on page 5-20](#)

5.1.4.22.1 Whitelisting

Whitelisting prevents the Voluson E-Series system from installing unwanted software. It monitors all applications/services if they are known and accepted (white-listed). Any application/service that is not known on the system creates an error message on the screen.



"Whitelisting" is only available for Voluson E-Series systems with software version EC330 (BT18). It is part of the [Advanced Security Features](#) option.

5.1.4.23 IOTA (International Ovarian Tumor Analysis)



Caution

The IOTA model (LR2 or Simple Rules) should not be used without an independent clinical evaluation and is not intended to be a screening test or to determine whether a patient should proceed to surgery. Incorrect use of the IOTA model carries the risk of unnecessary testing, surgery, and/or delayed diagnosis.

If more than one IOTA option (i.e., IOTA LR2, IOTA Simple Rules) is available, it is possible to configure the measure setup which worksheet is displayed.

IOTA LR2

The IOTA (International Ovarian Tumor Analysis) LR2 Worksheet contains an ovary measurement tool for women with adnexal tumors that have been selected to undergo surgery. The LR2 model is based on published literature and has been tested only on the stated population. The literature states that the LR2 model can help to estimate the probability of an adnexal mass of being malignant. The IOTA group has evaluated other ways including an LR1 model in addition to the LR2 model.

Note *IOTA states that use outside of the intended population can overestimate risk. Users are expected to study the literature and reach their own professional conclusions regarding the clinical utility of the tool. The model cannot replace experience in ultrasonography and cannot compensate for poor quality ultrasound equipment.*

The IOTA mathematical logistic regression model, LR2 is stated in literature as described in the Advanced Reference Manual (H48701UU).

General Electric is passing on this IOTA LR2 worksheet for your convenience based on published literature of one group, but makes no representation of its effectiveness in your practice. This calculation is not to be used as the primary driver in diagnostic decision making on the probability of malignancy. It is secondary information for a physician to use based on recent literature.

IOTA Simple Rules

Simple rules algorithm for ovarian tumor risk evaluation in addition to already cleared LR2 model.

The IOTA Simple Rules Worksheet contains a preoperative classification system for ovarian tumors consisting of five features typical for benign tumors (B-features) and five features typical for malignant tumors (M-features).



The "IOTA Simple Rules" option is only available for Voluson E-Series systems with software version EC330 (BT18).

5.1.5 Description of Hardware Options

Table 5-3 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.

5.1.5.2 ECG Preamplifier

MAN (internal, digital version)

For details see [Section 5.8.4 "ECG-preamplifier \(MAN - optional\)" on page 5-43](#).

5.1.5.3 Wireless Network Adapter (WLAN - Wireless Local Area Network)

For details see [Section 5.8.5 "Wireless Network Adapter" on page 5-43](#).

5.1.5.4 Scan/Freeze Footswitch

For details see [Section 5.8.6 "Footswitch" on page 5-43](#).

5.1.5.5 Cellular Modem

For details see [Section 5.8.7 "Cellular Modem" on page 5-43](#).

5.1.6 Data Location

The Voluson E-Series Hard disk drive (HDD) is divided into 4 partitions:

C: System partition:

- Operating System (Windows 7 at EC300-EC320, Windows 10 at EC330) 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:

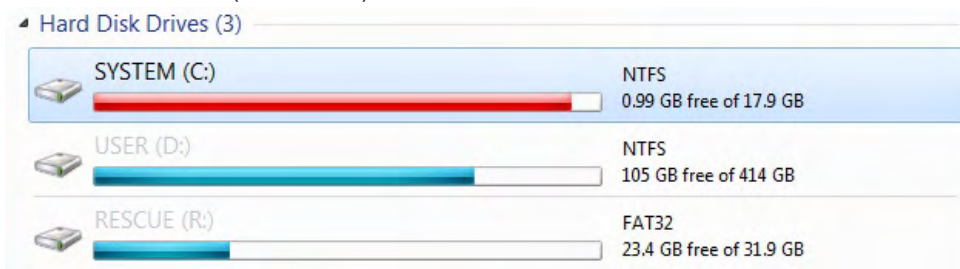
- Factory Images of C: Partition for System recovery after HDD (Windows) crash
- Printer Drivers

LINUX partition: (not visible in Windows)

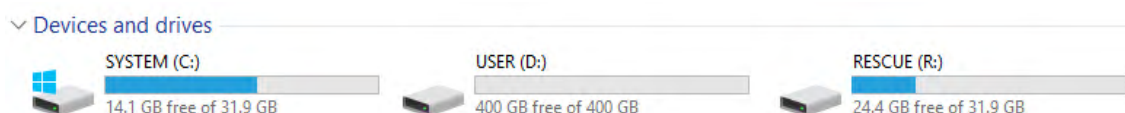
- Linux operating system for rescue functionality

Distribution of partitions at 500 Gbyte HDD

Windows 7 at EC300-EC320 (BT15-BT17):



Windows 10 at EC330 (BT18):



5.2 FrontEnd Processor

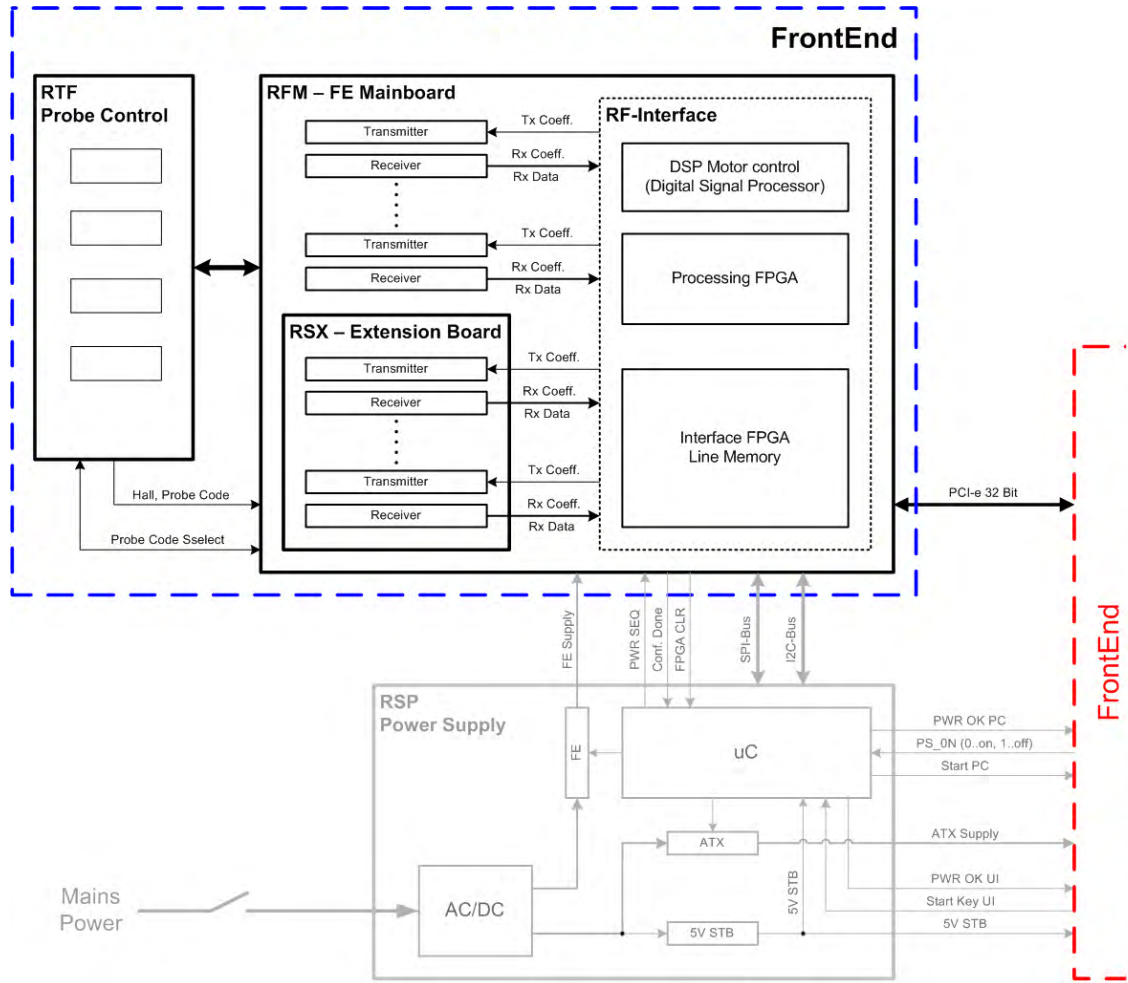


Figure 5-5 FrontEnd - Block diagram

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5.2.2 RSE - Pencil Probe Board (optional)	5-24
5.2.3 RFM - (RF-Interface & Beamformer) FE Mainboard	5-24
5.2.4 RSX - (Beamformer Receiver/Transmitter) Extension Board	5-24

5.2.1 RTF - Probe Control Board

Switches the Probe Connectors and recognizes Probes

- Probe Connectors:
 - EC300/EC310 (BT15/BT16):
 - * 1 CW Pencil-Probe Connector (RSE-board)
 - * 3 Probe Connectors 408pin
 - * 1 Dummy-Probe Connector 408pin
 - EC320/EC330 (BT17/BT18):
 - * 4 Probe Connectors 408pin
- Probe Select Relays
- Probe Recognition

5.2.2 RSE - Pencil Probe Board (optional)



This board is not applicable at BT17 (EC320, 17.x.x) and BT18 (EC330, 18.x.x) systems.

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

- EC300/EC310 (BT15/BT16):

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.
- EC320/EC330 (BT17/BT18):

The FrontEnd Mainboard supports Tx/Rx for 192/256 channels. It does not need RSX Extension board.

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



This board is not applicable at BT17 (EC320, 17.x.x) and BT18 (EC330, 18.x.x) systems.

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

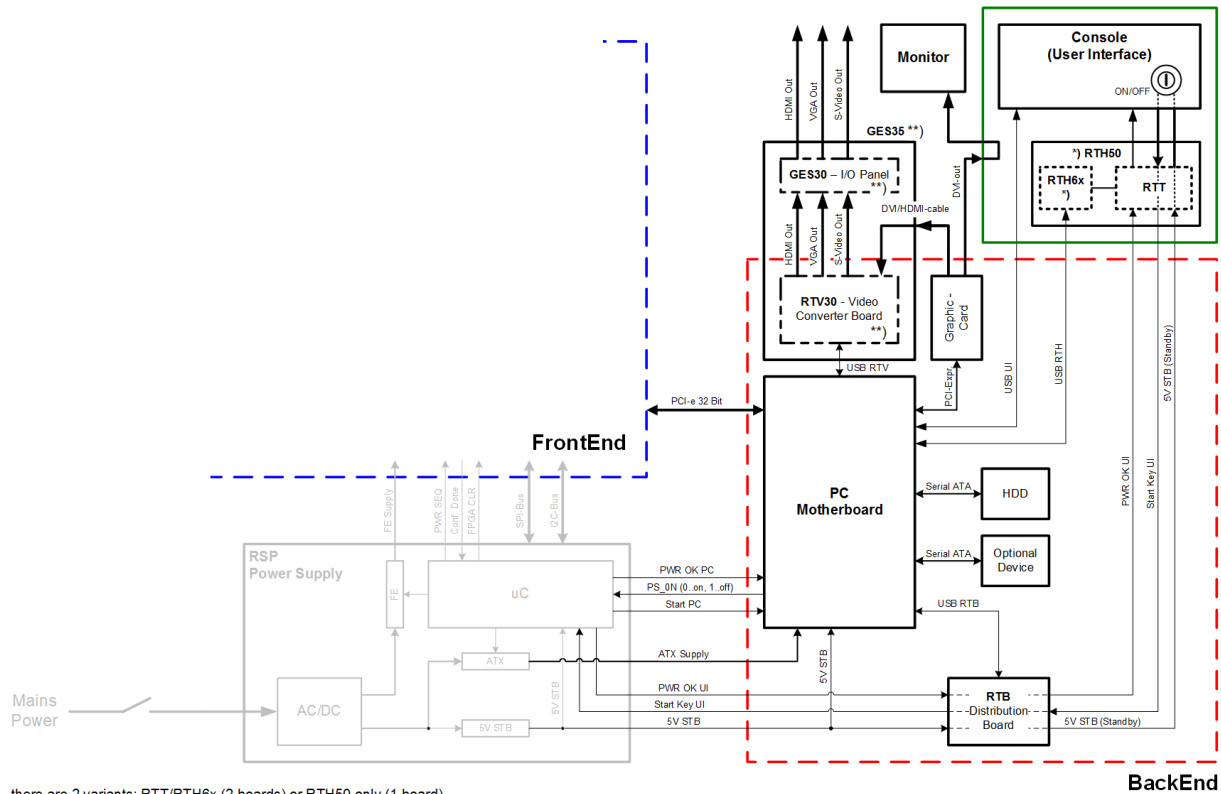


Figure 5-6 BackEnd - Block diagram

Content in this section

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5.3.1 PC-Motherboard

Built in or external Components:

- On Board VGA and Graphic Card
- LAN
- USB 2.0
- USB 3.0
- Sound
- CPU: 3.1 GHz at 4 cores

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 5-22](#)

5.3.3 Graphic Card

Graphic Card which supplies RTV (Video manager) board with digital 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 Video signal information coming from the Graphic Card to the DVI respectively HDMI connectors. Converts DVI/HDMI inputs to S-Video output(s).

- DVI to HDMI input (RTV30) respectively HDMI to HDMI input (RTV35) connection to Graphic Card
- DVI output (RTV30) respectively VGA output (RTV35) for external device (only RGB signals used)
- HDMI output for external device
- S-Video output 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

- the currently installed PC Motherboard
- the BT-version (BT15, BT16, BT17 or BT18)

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

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5.4.1 Internal I/O Voluson E-Series (BT15): ADVANTECH + RTT/RTH6x

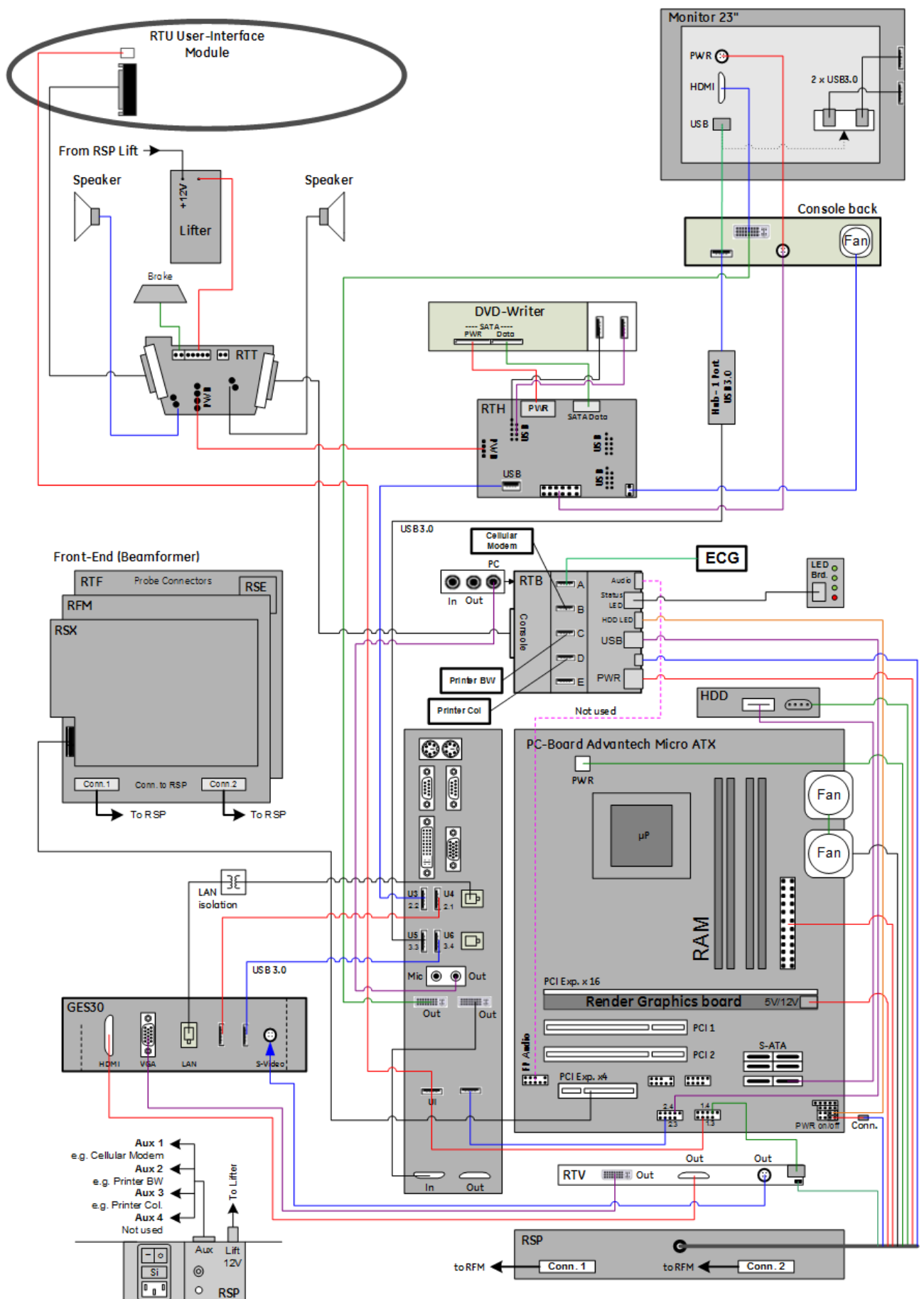


Figure 5-7 Internal I/O Voluson E-Series BT15 (EC300): PC-Motherboard Micro-ATX ADVANTECH + RTT/RTH6x

5.4.2 Internal I/O Voluson E-Series (BT15 / BT16): ADVANTECH + RTH50

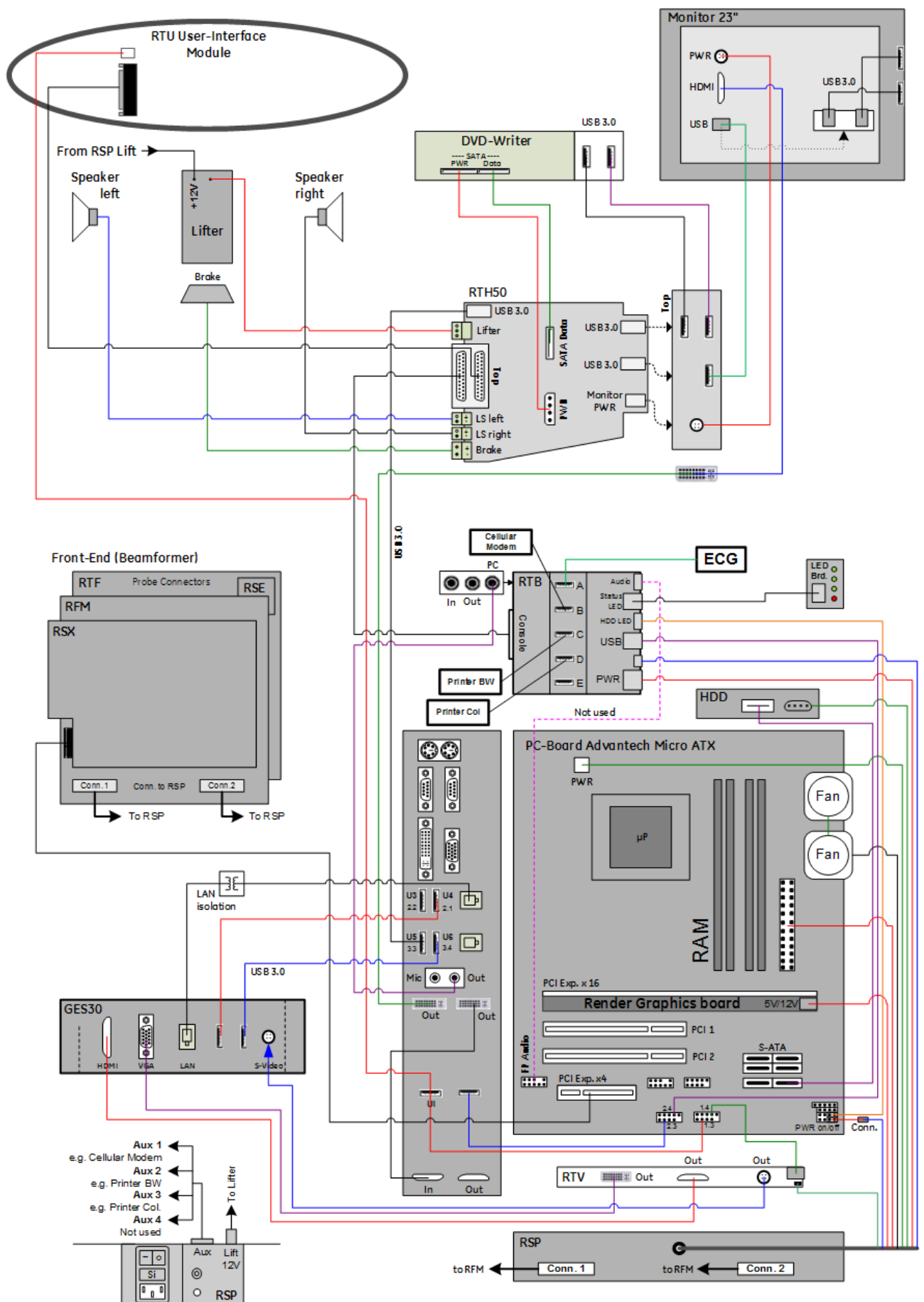


Figure 5-8 Internal I/O Voluson E-Series BT15/BT16 (EC300/EC310): PC-Motherboard Micro-ATX ADVANTECH + RTH50

5.4.3 Internal I/O Voluson E-Series (BT15): KONTRON + RTT/RTH6x

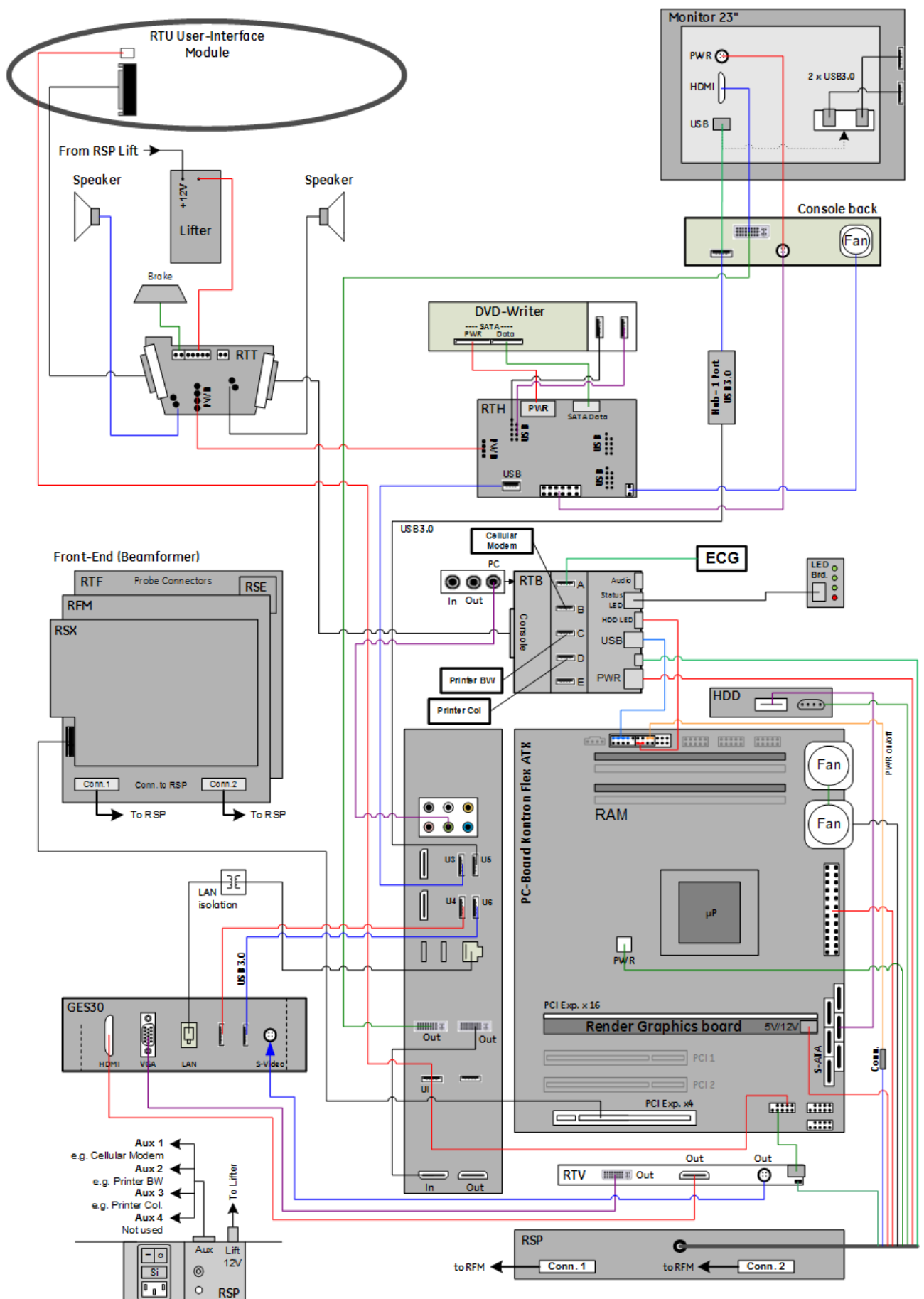


Figure 5-9 Internal I/O Voluson E-Series BT15 (EC300): PC-Motherboard Flex-ATX KONTRON + RTT/RTH6x

5.4.4 Internal I/O Voluson E-Series (BT15 / BT16): KONTRON + RTH50

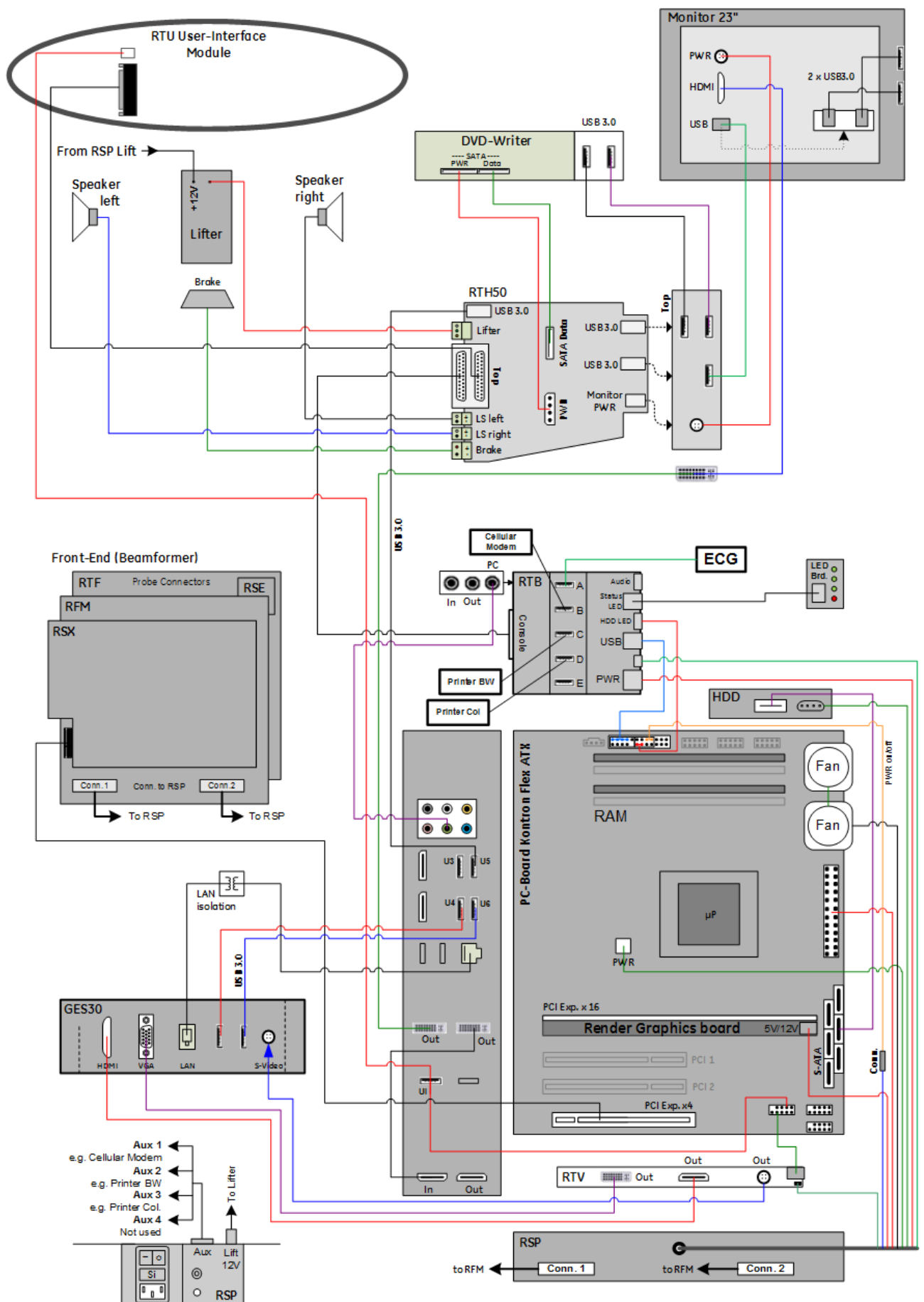


Figure 5-10 Internal I/O Voluson E-Series BT15/BT16 (EC300/EC310): PC-Motherboard Flex-ATX KONTRON + RTH50

5.4.5 Internal I/O Voluson E-Series (BT17): ADVANTECH Micro-ATX

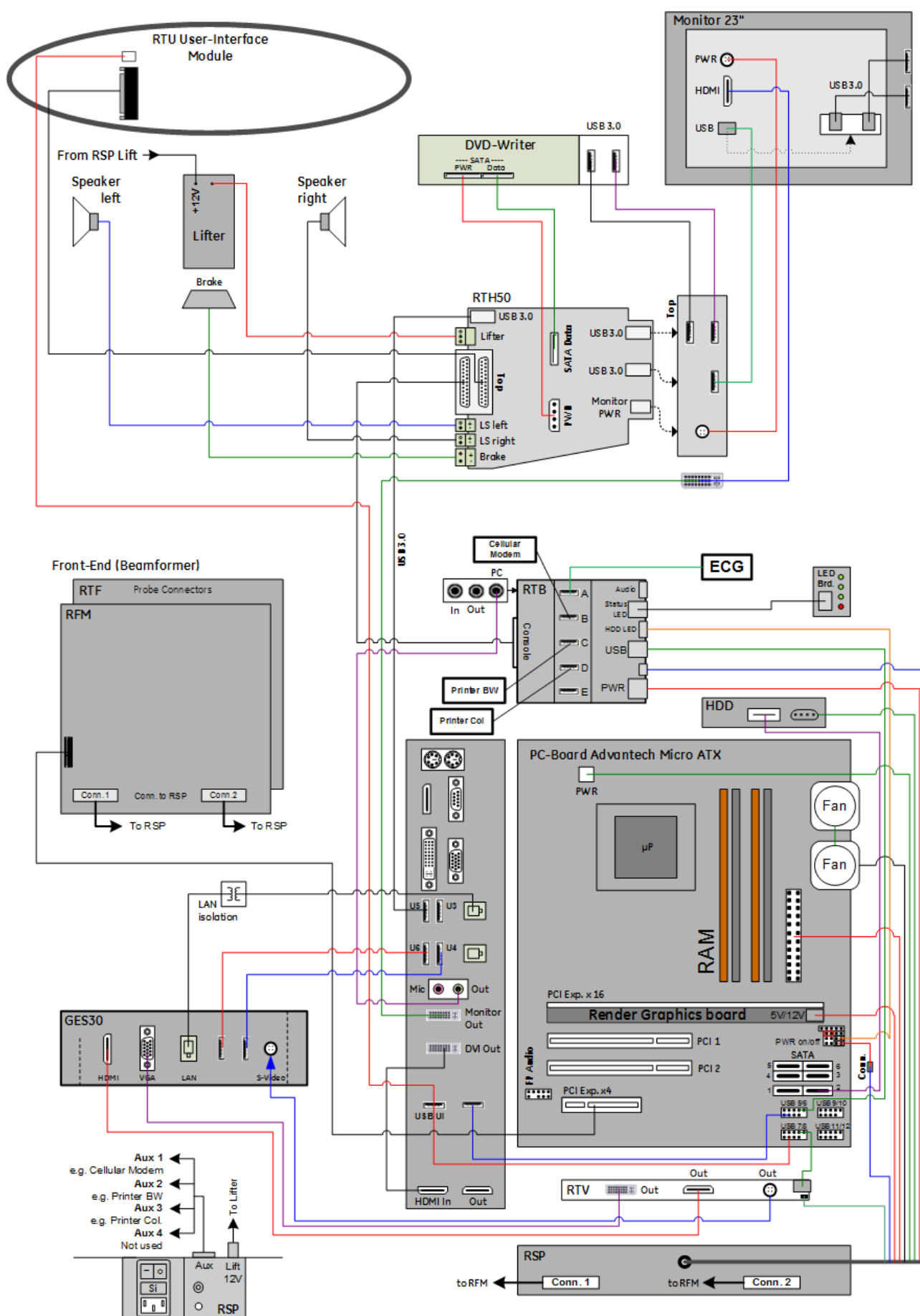


Figure 5-11 Internal I/O Voluson E-Series BT17 (EC320): PC-Motherboard ADVANTECH Micro-ATX

5.4.6 Internal I/O Voluson E-Series (BT18): ADVANTECH Micro-ATX

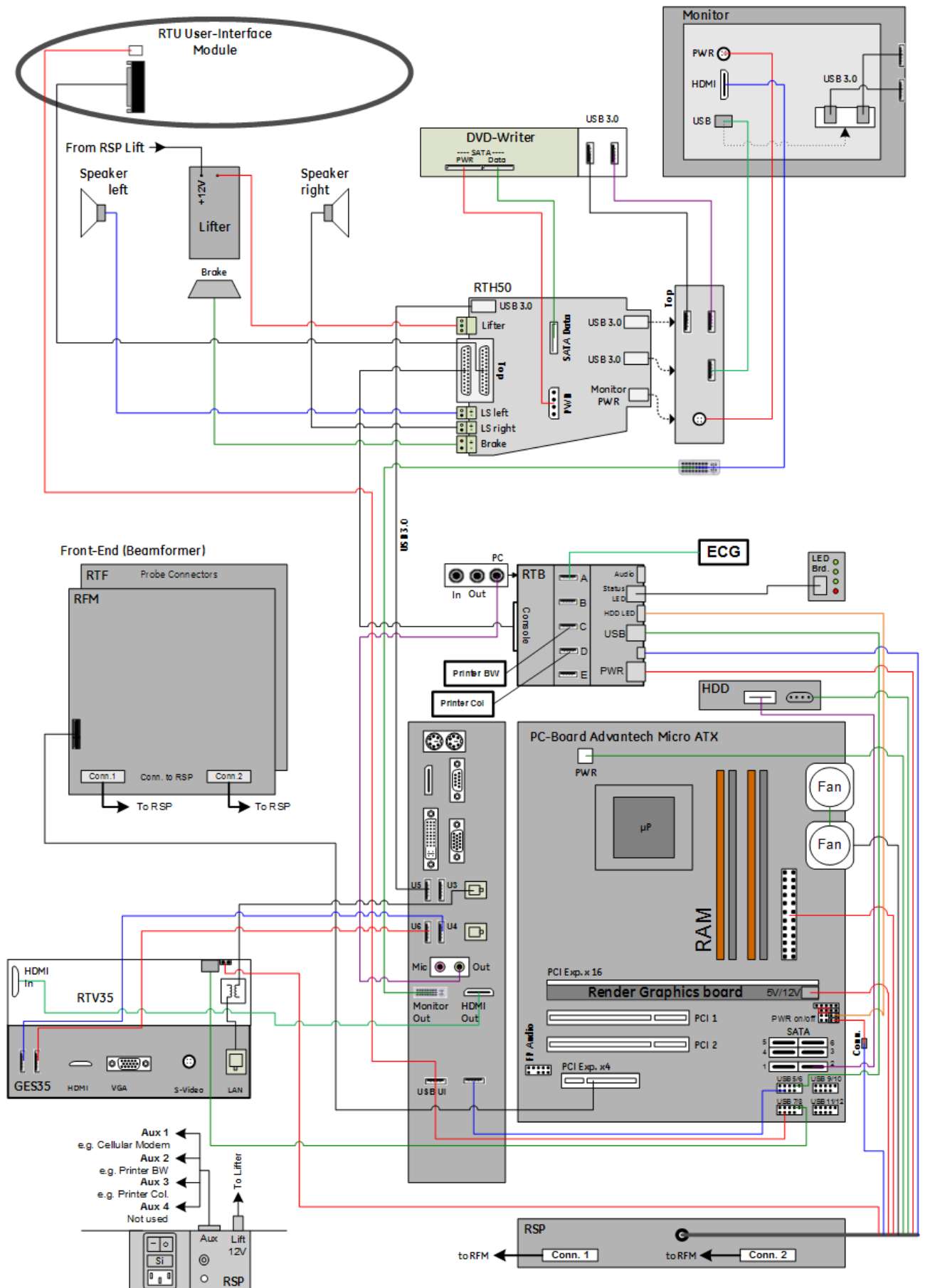


Figure 5-12 Internal I/O Voluson E-Series BT18 (EC330): PC-Motherboard ADVANTECH Micro-ATX

5.4.7 Internal I/O Voluson E-Series (BT18): KONTRON Micro-ATX

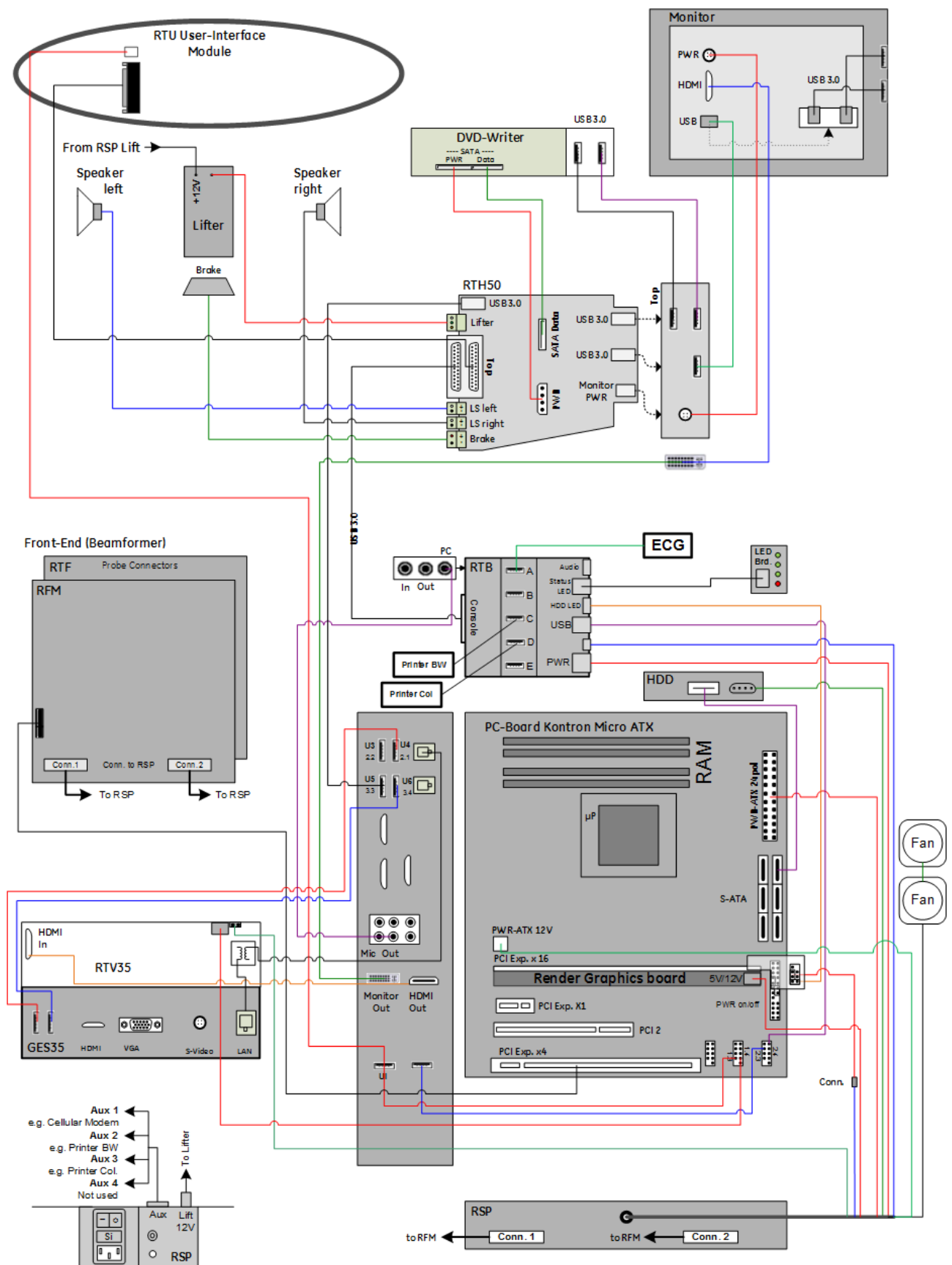


Figure 5-13 Internal I/O Voluson E-Series BT18 (EC330): PC-Motherboard KONTRON Micro-ATX

5.5 Control Console (User Interface)

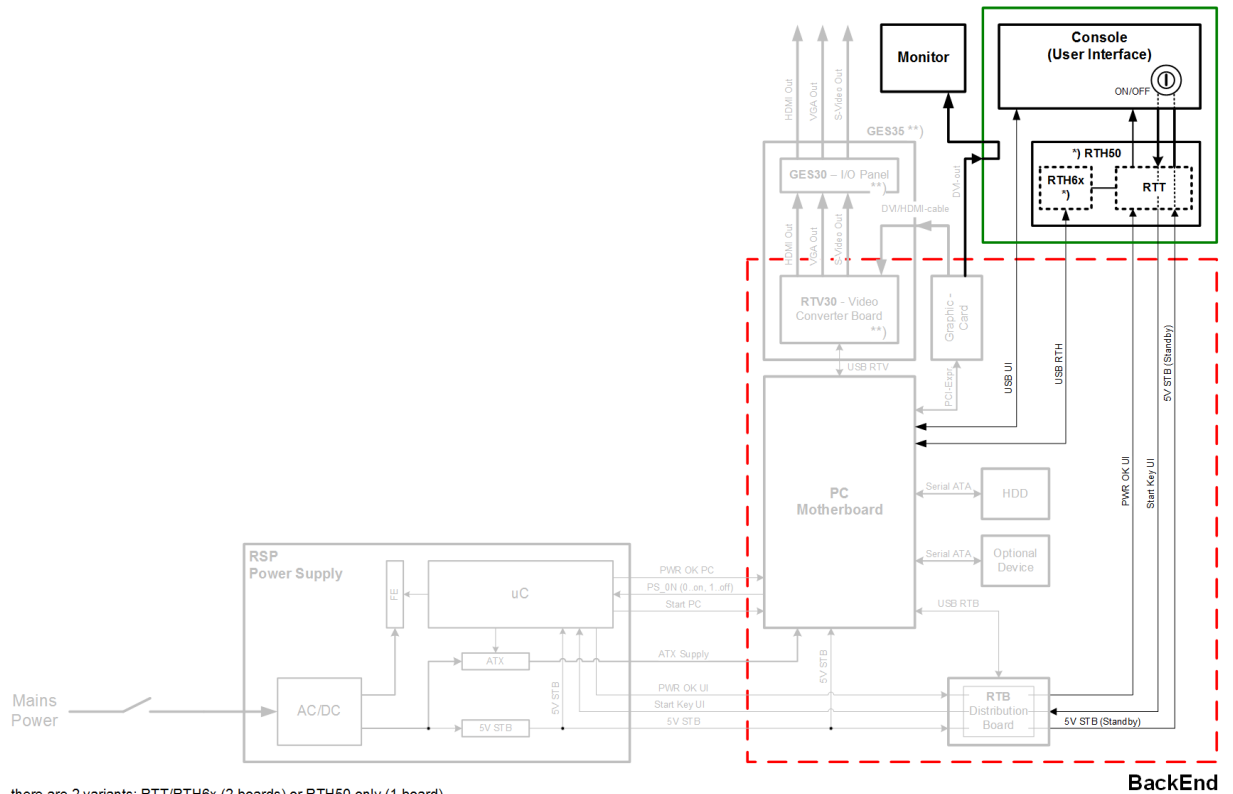


Figure 5-14 Control Console (User Interface) - Block diagram

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 Video converter with USB2.0 High Speed Interface
 - projected capacitive touch screen
- Console module:
 - 7 port USB 2.0 Hub controller
 - Controls (Encoder/Joycoder) with integrated rotary/push/flip function
 - 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
 - LED to illuminate probe port connectors
- 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

Content in this section

<i>5.5.1.1 RTH6x Function</i>	<i>5-36</i>
<i>5.5.1.2 RTH50 Function</i>	<i>5-36</i>

5.5.1.1 RTH6x Function

- 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 SATA Converter for DVD Drive
- 2 USB Ports not used
- Power distribution for Monitor
- Feed through for DC-Power for the DVD Drive and Fan

5.5.1.2 RTH50 Function

- USB3.0 Interface, Board is connected to PC via USB cable
- 4 port USB3.0 Hub
- 2 USB3.0 Ports for external use
- 1 USB2.0 to SATA Converter for DVD Drive
- 1 USB3.0 Port to Monitor
- 1 USB3.0 only Port not used below Monitor Connector Plate
- Power distribution for Monitor
- Feed through for DC-Power for the DVD Drive
- Signal switching for UI Brake and Lift
- Feed through for DC-Power (12V_ATX, 5V_ATX, 5VSB) and Signals (PWR_On, Start_Key, Speaker, Lifter control, UI_Brake)

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 warmer⁷

⁷ reserved for the future

5.5.3 Control Console (UI)

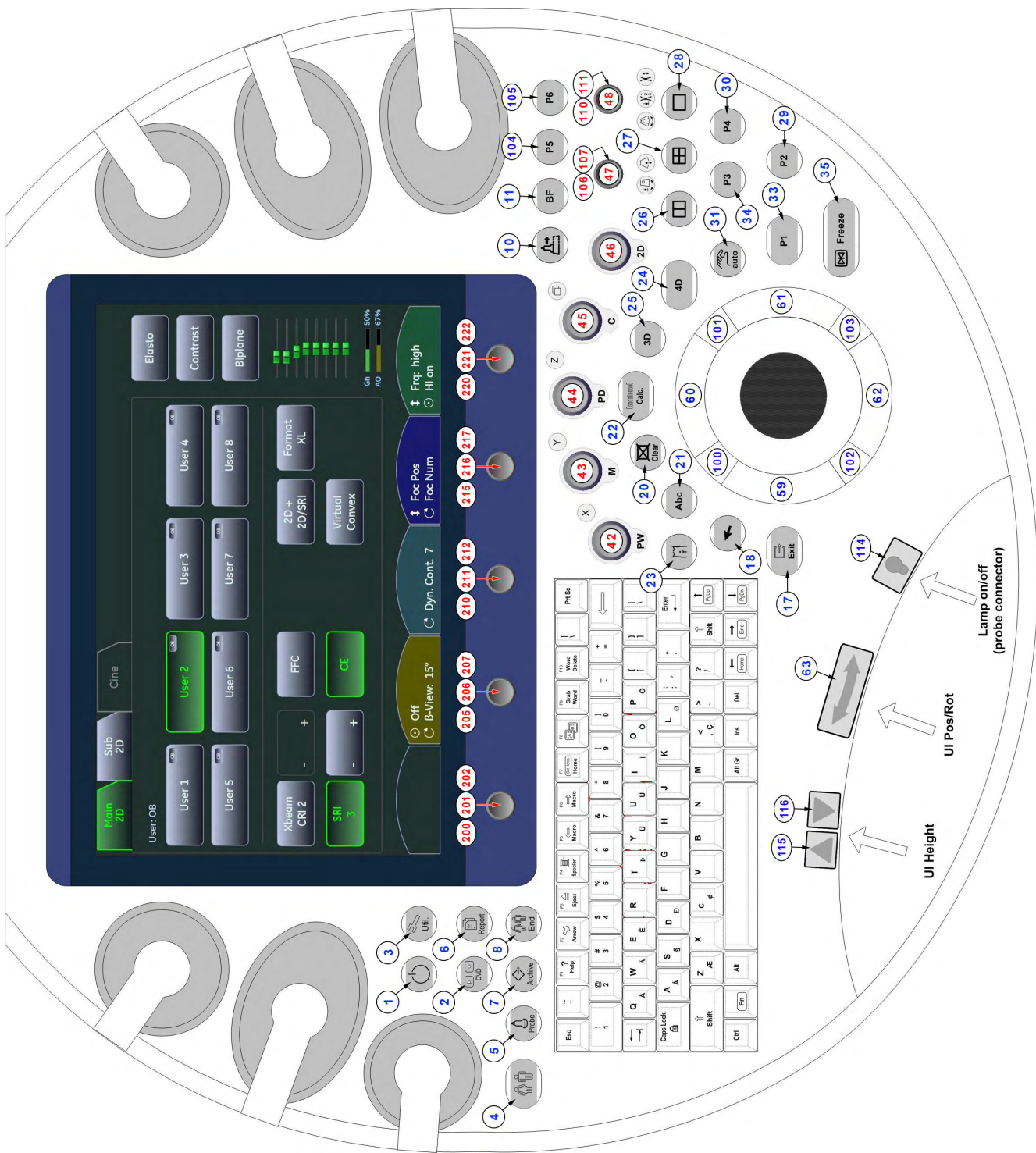


Figure 5-15 Voluson E-Series - Control Console

Table 5-4 Voluson E-Series - key codes

key code	Description	Functionality
1	Power/Standby ON/OFF	ON/OFF Standby button of the system
2	DVD	opens the DVD menu
3	Utilities	opens the Utilities menu
4	Patient Data (PID)	opens the Patient data entry menu
5	Probe	opens the Probe program menu

key code	Description	Functionality
6	Report	opens the Patient report page
7	Archive (Review)	opens the Patient archive and/or exam review mode
8	End Exam	stores patient and measurement data and clears all temporary data
10	Acquisition Mode XTD	invokes XTD-View (Extended View) function
11	Acquisition Mode BF	invokes B-Flow function
17	Exit	Exit current menu
18	Trackball pointer	displays a pointer (arrow or hand shaped cursor)
20	Clear	removes graphics, measurements and annotations
21	ABC (Text)	activates the annotation function in order to add comments to an image
22	Measure / Calc	opens the Measurement and Calculations menu
23	Bodymark	activates the annotation function in order to add body patterns to an image
24	Acquisition Mode 4D	invokes Real Time 4D Mode (continuous volume sweep)
25	Acquisition Mode 3D	invokes 3D Volume Mode
26	Format Dual	Dual-Screen format (vertical distribution)
27	Format Quad	Quad-Screen format
28	Format Single	Single-Screen format
29	P2	programmable key
30	P4	programmable key
31	Auto	Automatic Optimization (optimizes the image based upon the actual BMode image data)
33	P1	programmable key
34	P3	programmable key
35	Freeze	Read/Write (Freeze/Run)
42	Encoder PW-Mode	Pulsed Wave Doppler on/off (push), Gain (rotate) rotation about X-axis in Volume Mode
43	Encoder M-Mode	Motion Mode on/off (push), Gain (rotate) rotation about Y-axis in Volume Mode
44	Encoder PD-Mode	Power Doppler on/off (push), Gain (rotate) rotation about Z-axis in Volume Mode
45	Encoder C-Mode	Color Flow Mode on/off (push), Gain (rotate) movement along Z-axis in Volume Mode
46	Encoder 2D-Mode	2D-Mode (B-Mode) on/off (push), Gain (rotate)
47	Joycoder Zoom	Zoom Box on/off (push), Zoom Size (rotate)
48	Joycoder Focus	Focal Zones (push), B-Image Angle (rotate)
59	Trackball button left	left trackball key (function depends on currently selected mode)
60	Trackball button top	top trackball key (function depends on currently selected mode)
61	Trackball button right	right trackball key (function depends on currently selected mode)
62	Trackball button bottom	bottom trackball key (function depends on currently selected mode)
63	UI Brake (Movement)	Locks and releases the horizontal movement of the user interface
100	Trackball button 1	function depends on currently selected mode
101	Trackball button 2	function depends on currently selected mode

key code	Description	Functionality
102	Trackball button 3	function depends on currently selected mode
103	Trackball button 4	function depends on currently selected mode
104	P5	programmable key
105	P6	programmable key
106	Joycoder Depth - UP	B-Image Depth up (flip)
107	Joycoder Depth - DOWN	B-Image Depth down (flip)
110	Joycoder Focus - UP	Focal Depth up (flip)
111	Joycoder Focus - DOWN	Focal Depth down (flip)
114	Light (Lamp)	Activates lamp (light)
115	Lift UP	Height adjustment (lift up) of the user interface
116	Lift DOWN	Height adjustment (lift down) of the user interface
200	Joycoder Display 1 - UP	Touch Panel rotary / push / flip control (function depends on currently selected mode)
201	Joycoder Display 1 - PUSH	
202	Joycoder Display 1 - DOWN	
205	Joycoder Display 2 - UP	Touch Panel rotary / push / flip control (function depends on currently selected mode)
206	Joycoder Display 2 - PUSH	
207	Joycoder Display 2 - DOWN	
210	Joycoder Display 3 - UP	Touch Panel rotary / push / flip control (function depends on currently selected mode)
211	Joycoder Display 3 - PUSH	
212	Joycoder Display 3 - DOWN	
215	Joycoder Display 4 - UP	Touch Panel rotary / push / flip control (function depends on currently selected mode)
216	Joycoder Display 4 - PUSH	
217	Joycoder Display 4 - DOWN	
220	Joycoder Display 5 - UP	Touch Panel rotary / push / flip control (function depends on currently selected mode)
221	Joycoder Display 5 - PUSH	
222	Joycoder Display 5 - DOWN	

5.6 Monitor

For further details see [Section 6.2.2 "Loading the Default Monitor Settings" on page 6-3](#)

5.7 External I/O

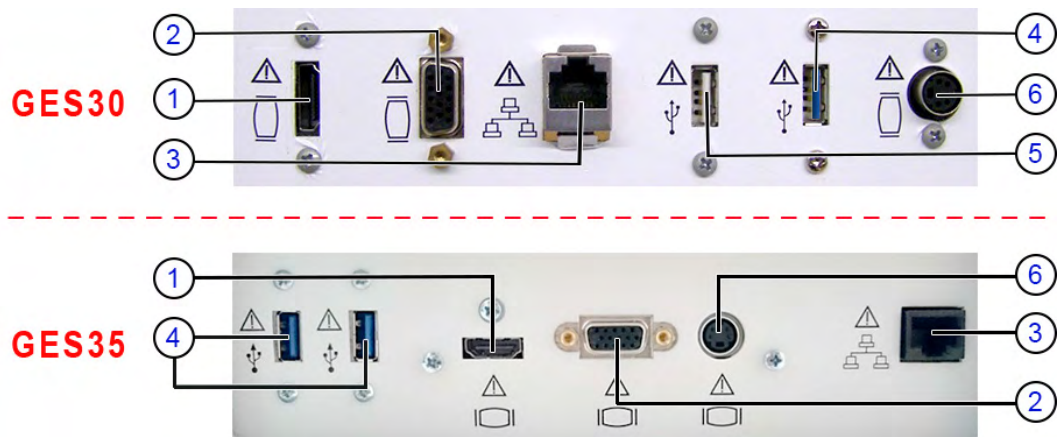


Figure 5-16 External I/O connectors - on rear of system (GES)

Item	Connector Name	Description
1	HDMI OUT	Connector for external monitor
2	VGA OUT	Connector for external monitor
3	Network	GES30: DICOM input/output, twisted pair RJ-45 10/100 megabit/s GES35: DICOM input/output, twisted pair RJ-45 10/100/1000 megabit/s
4	USB	USB 3.0 port
5	USB	USB 2.0 port (GES30 only)
6	S-Video OUT	S-Video OUT connector, PAL/NTSC (depending on system setup)



Figure 5-17 External I/O connectors - next to DVD drive

Item	Connector Name	Description
1	USB	USB 2.0 port (RTT/RTH6x)
2		USB 3.0 port (RTH50)

How to identify User Interface components RTH6x and RTH50

The color of the USB ports for external use (beside the DVD drive) enable quick differentiation between RTH6x and RTH50.



Figure 5-18 RTH6x => "white" USB2.0 ports / RTH50 => "blue" USB3.0 ports

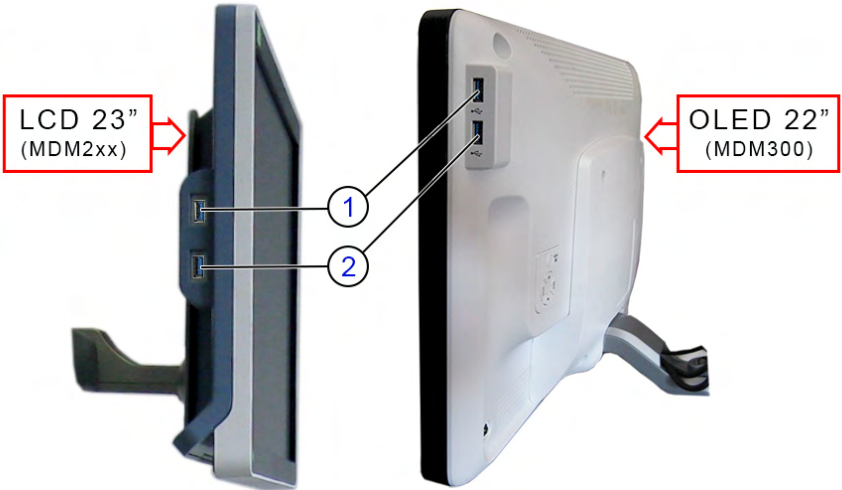


Figure 5-19 External I/O connectors - on the left/right side of the Monitor

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 3-50](#) .

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.

Network Color Laser Printer

The Network Color Laser Printer is used to print out reports and exams, but in some cases also ultrasound images. The printer can either be connected directly to the Voluson E-Series system, or to work within the network environment (usually the hospital network).

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 SW-DVR (**SoftWare Digital Video Recording**) function is optional at EC300-EC320 (BT15-BT17) systems and enables video recording to DVD media or USB devices.

Media supported for data burning	Media supported for video recording
<ul style="list-style-type: none">• DVD+R• DVD-R• DVD-RW• DVD+RW• CD-R• CD-RW	<ul style="list-style-type: none">• DVD+R• DVD-R• DVD-RW• DVD+RW• all Dual Layer formats• USB stick or external USB HDD drive (FAT32 or NTFS system)

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.*

DVD and USB Recorder

The DVD and USB Recorder function is optional at EC330 (BT18) systems and enables video recording to DVD media or USB devices.

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 3.5.8 "Connecting the Wireless Network Adapter" on page 3-28](#).

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 3-45](#).

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 3-64](#).

5.9 Power Distribution

5.9.1 RSP - Power Supply Module

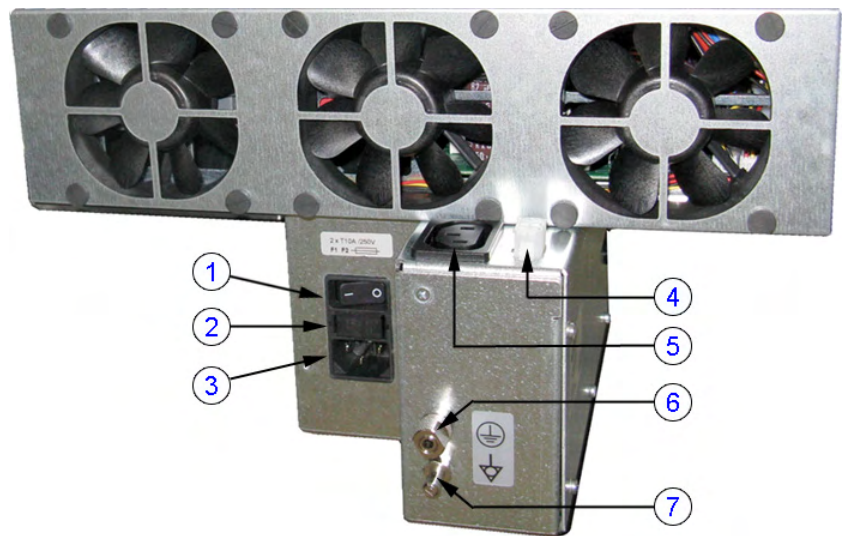


Figure 5-20 Power Supply Module - RSP

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

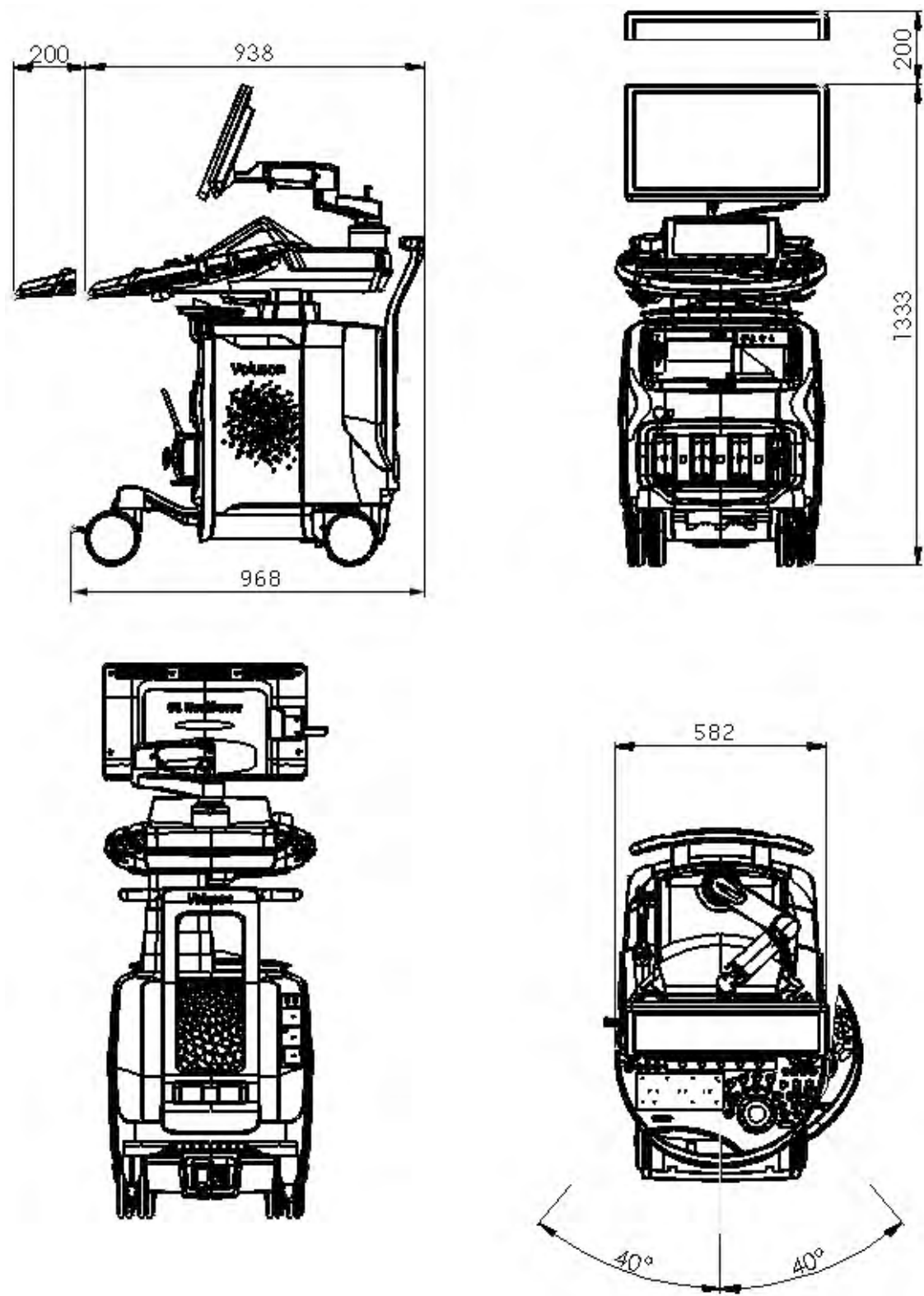


Figure 5-21 Physical Dimensions

5.10.2 LCD Monitor

The Voluson E-Series system has a free adjustable LCD Flat panel monitor in relation to the user interface.

Monitor Arm MTD20 (DAEIL)	Monitor Arm (Ergotron)
<ul style="list-style-type: none"> tilt: + 40° / - 90° rotate: +/- 90° 	<ul style="list-style-type: none"> tilt: + 30° / - 75° 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°

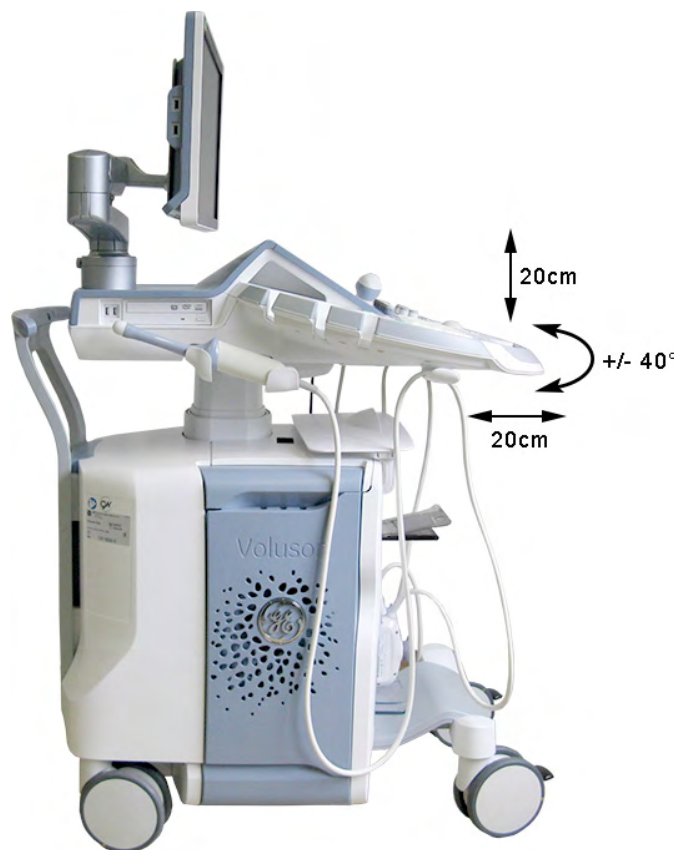


Figure 5-22 adjustable control console

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.



Caution

Make sure that nothing would be jammed while moving!

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).

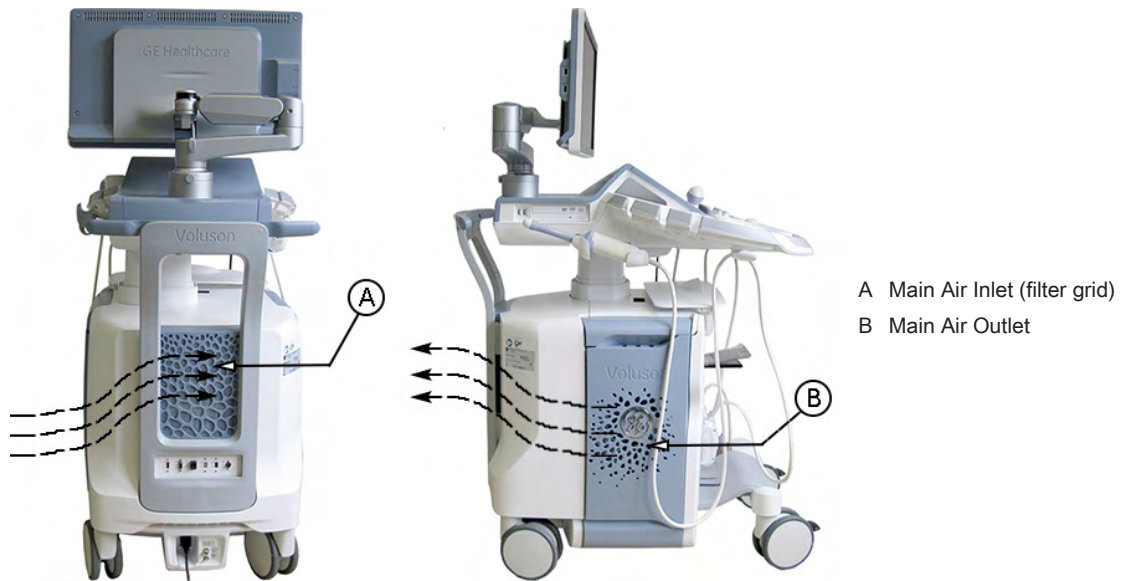


Figure 5-23 Main Air Inlet/Outlet at Voluson E-Series

5.12 Service Platform

5.12.1 Introduction

InSite 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 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 7-3 on page 7-13](#).

5.12.2 Service Platform - Access and 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 5-27 on page 5-50](#)).
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**.

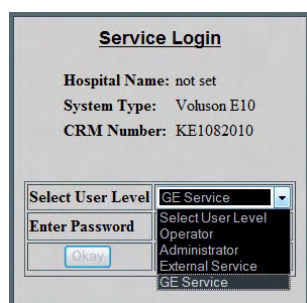


Figure 5-24 Service Login

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 Configuration"](#) on page 3-70 .*

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.

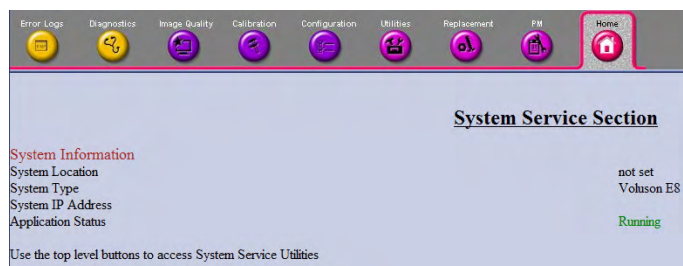


Figure 5-25 Common Service Desktop - Home

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 Service Page - Access and 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 Page 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 5-27 on page 5-50](#)).

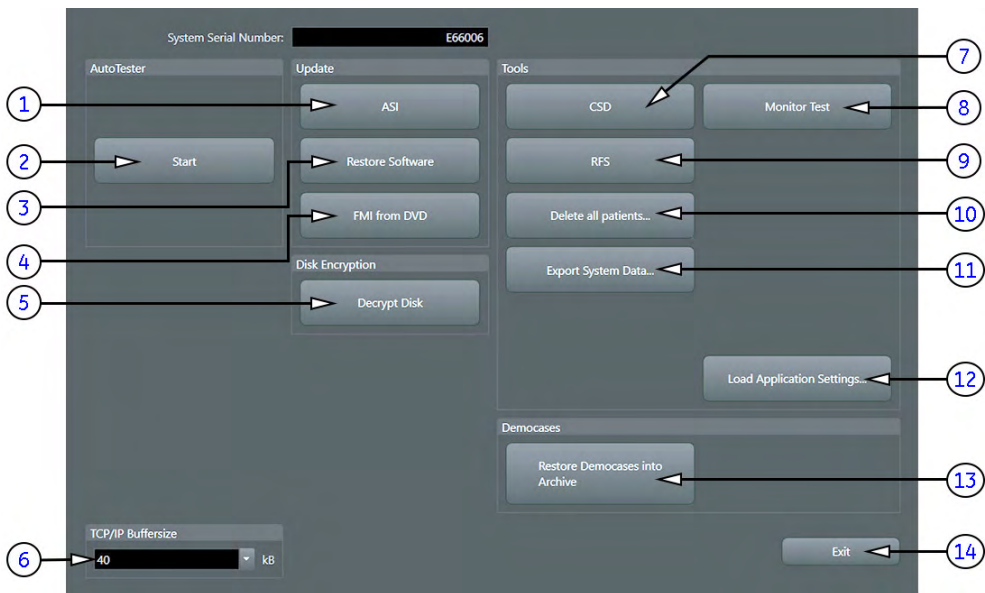


Figure 5-26 Service Tools page

1	Additional Software Installation	6	TCP/IP Buffersize	11	Export System Data
2	Auto Tester	7	Common Service Desktop	12	Load Application Settings
3	Restore Software	8	Monitor Test	13	Restore Democases into Archive
4	FMI from DVD	9	Request for Service	14	Exit
5	Decrypt Disk	10	Delete all Patients		



Please observe that the displayed screens may slightly differ from images shown in this manual. The availability of some functions or features depend on the BT-version of your Voluson E-Series system.

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 Additional Software Installation (ASI)

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.

5.14.3.3 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 5.15.3 on page 5-53](#).*

5.14.3.4 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.*

5.14.3.5 Decrypt Disk

Note *Security of patient data on the system will be reduced when encryption is turned off. Decryption will take a considerable amount of time (one to several hours).*

5.14.3.6 TCP/IP Buffersize

The TCP/IP Buffersize selects the amount of buffer memory used for DICOM transfers (both directions).

5.14.3.7 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.

5.14.3.8 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](#).

5.14.3.9 Delete all Patients

1. Click the **Delete all Patients...** button.
Following WARNING message appears on the screen.

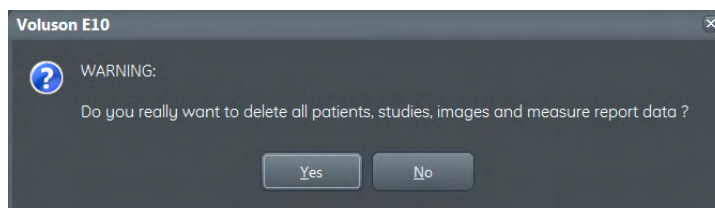


Figure 5-27 Warning message



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!**

5.14.3.10 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](#).

5.14.3.11 Keyboard Layout

To change the keyboard layout to different languages. Operation see: [Section 6.4 "Modification of Keyboard Layout" on page 6-5](#).

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 8-24](#).*

5.14.3.12 Monitor Test

Select the **Monitor Test** button to perform color calibration. Operation see: [Section 6.2.3 "Monitor Test" on page 6-3](#).

5.14.3.13 Restore Democases into Archive

The democases (stored on the rescue partition of the HDD) are added to the internal archive.

5.14.3.14 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 **Load Application Settings** on the “Service Tools” page (see [Figure 5-27 on page 5-50](#)).
2. Choose the media and then click **Load**.

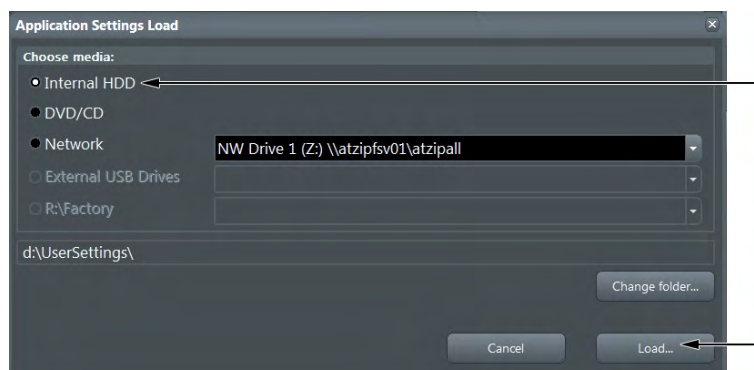


Figure 5-28 Application Settings Load

- 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

Following LINUX supported functions are available as soon as the “Boot Screen” appears:

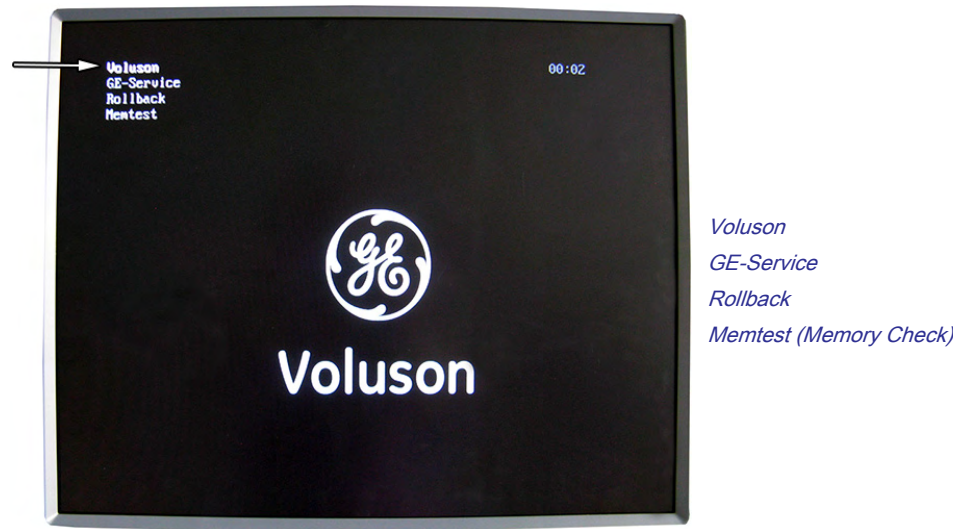



Figure 5-29 Boot screen

Content in this section	
5.15.1 Voluson	5-53
5.15.2 GE-Service	5-53
5.15.3 Rollback	5-53
5.15.4 Memtest (Memory Check)	5-54

 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 Voluson

The System will boot-up in windows. The Ultrasound Application is started. For details see [Section 3.4.1.1](#) "During a normal boot, you may observe" on page 3-11 .

5.15.2 GE-Service

This function MUST NOT be used by the customer!

5.15.3 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 5-30 on page 5-53](#)), 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**.

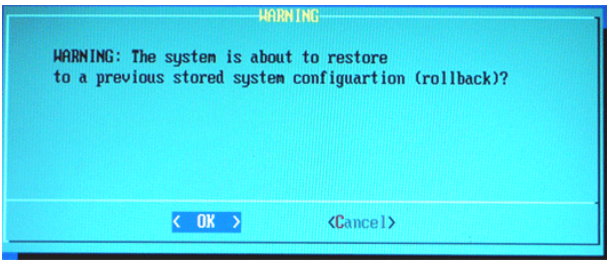


Figure 5-30 Warning message

After performing the rollback, the system reboots. The Ultrasound Application is started and finally the 2D screen is displayed on the monitor.

5.15.4 Memtest (Memory Check)

1. Turn system OFF and then back ON.
2. As soon as the “Boot Screen” appears (see: *Figure 5-30 on page 5-53*), 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 starts automatically and takes about 2.5 hours. If there are errors they will be listed.

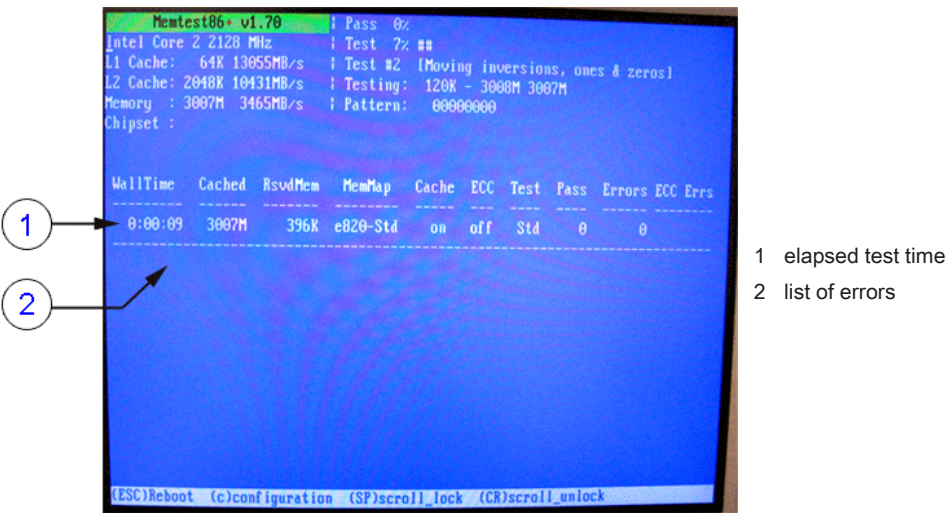


Figure 5-31 Memory check in LINUX

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.

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

6.1 Regulatory - - - - -	6-2
6.2 LCD Monitor Adjustment - - - - -	6-2
6.3 Control Console Positioning - - - - -	6-4
6.4 Modification of Keyboard Layout - - - - -	6-5

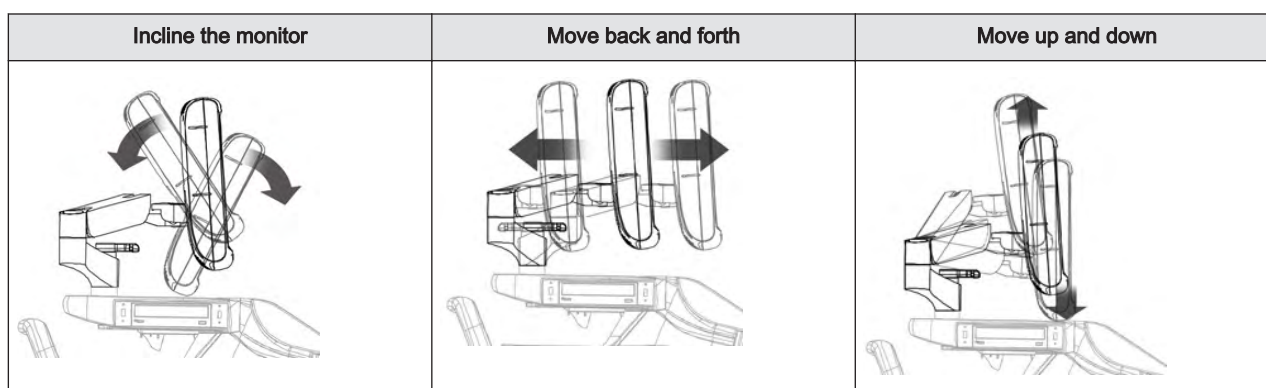
6.1 Regulatory

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

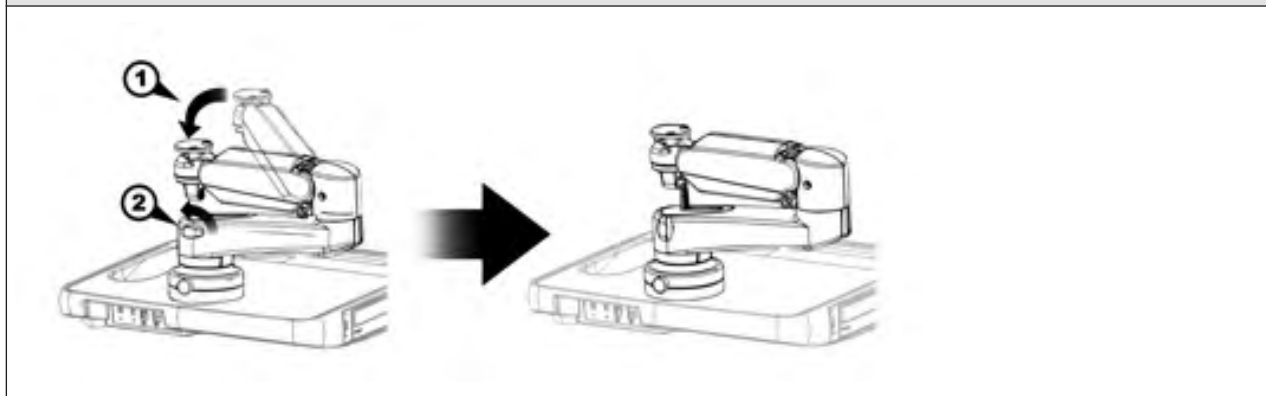
The Voluson E-Series system has a free adjustable LCD Flat panel monitor in relation to the user interface.

Monitor Arm MTD20 (DAEIL)	Monitor Arm (Ergotron)
<ul style="list-style-type: none"> tilt: + 40° / - 90° rotate: +/- 90° 	<ul style="list-style-type: none"> tilt: + 30° / - 75° rotate: +/- 90°



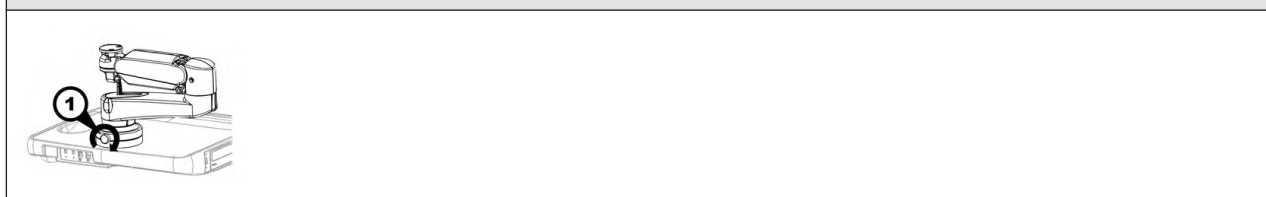
Lock Height Adjustment

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.

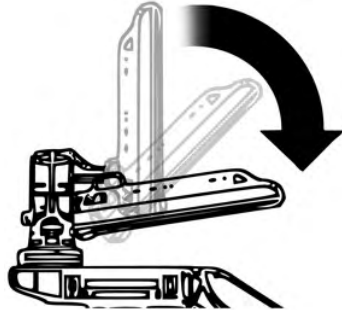


Figure 6-1 incline the monitor

The system can now be safely transported. Nevertheless be careful when transporting or moving the device.

6.2.2 Loading the 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".

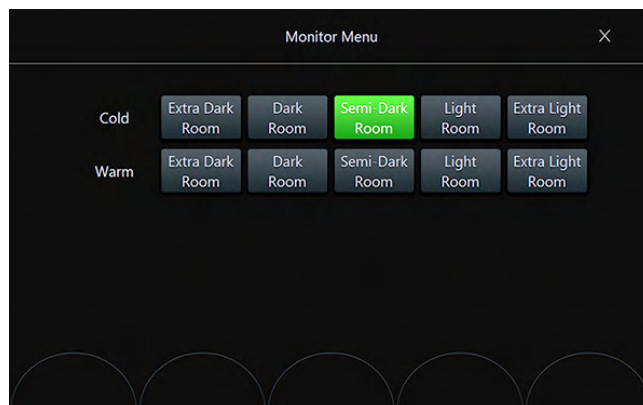


Figure 6-2 Monitor Menu

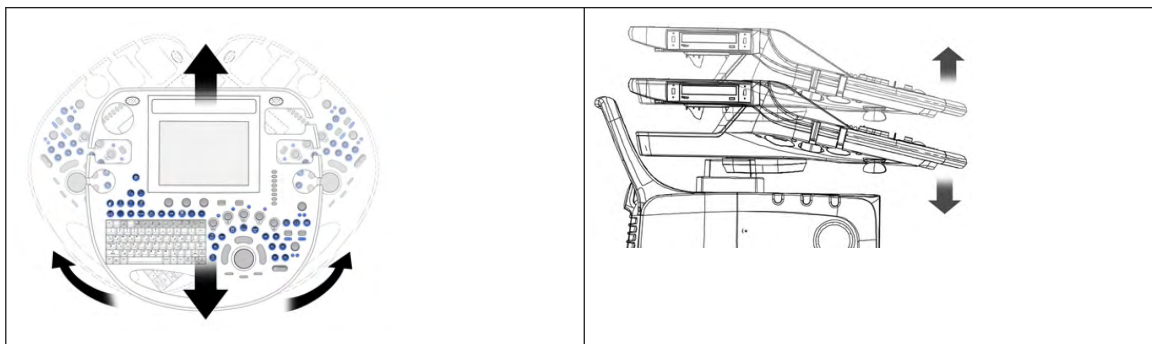
3. Touch the **Semi-Dark Room** button to load default monitor settings for your system.

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 5-27 on page 5-50](#)).
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 **Lift UP / Lift DOWN** 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

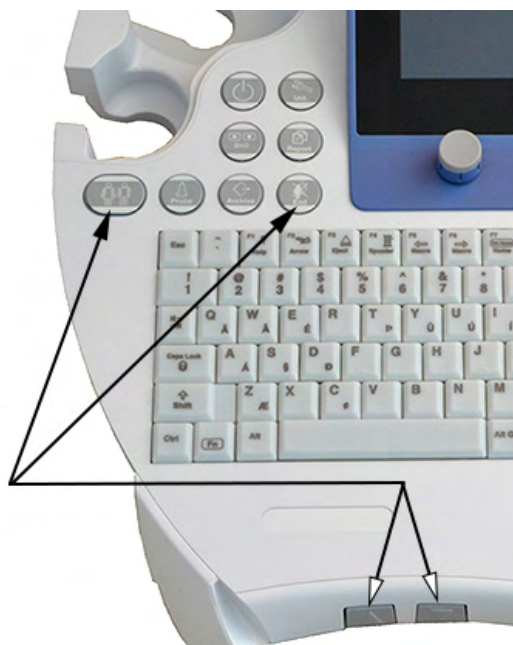


Figure 6-4 keys to lower/lift the control console

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](#)).

6.4 Modification of Keyboard Layout



Modification of the Keyboard Layout is no more possible at systems with operating system Windows 10 (software version EC330, BT18).

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 8-24](#).

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 5-27 on page 5-50](#)).

- Click on the **Keyboard Layout** button.



Keyboard Layout Modification procedure depends on the operating system (Windows 7 or Windows 10).

Procedure at Windows 7 (EC300-EC320)

- Select the input language from the pull-down menu.

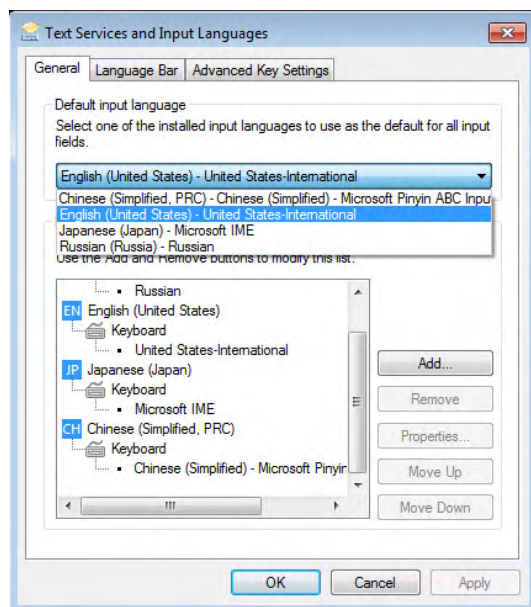


Figure 6-5 input language

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**.

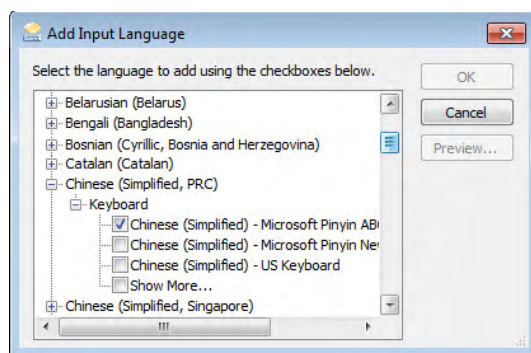


Figure 6-6 add input language

- If not already done, select the default input language from the pull-down menu. The corresponding keyboard layout is changed accordingly.
- Click on **Apply** and then close the window with **OK**.
- Close the Service page with **Save&Exit** and restart the system.
- Reenter "Keyboard Layout". This time **Remove** unused language(s).
- 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

7.1 Collect vital System Information -----	7-2
7.2 Request for Service (RFS) -----	7-5
7.3 Check Point Voltages -----	7-7
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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](#) .*

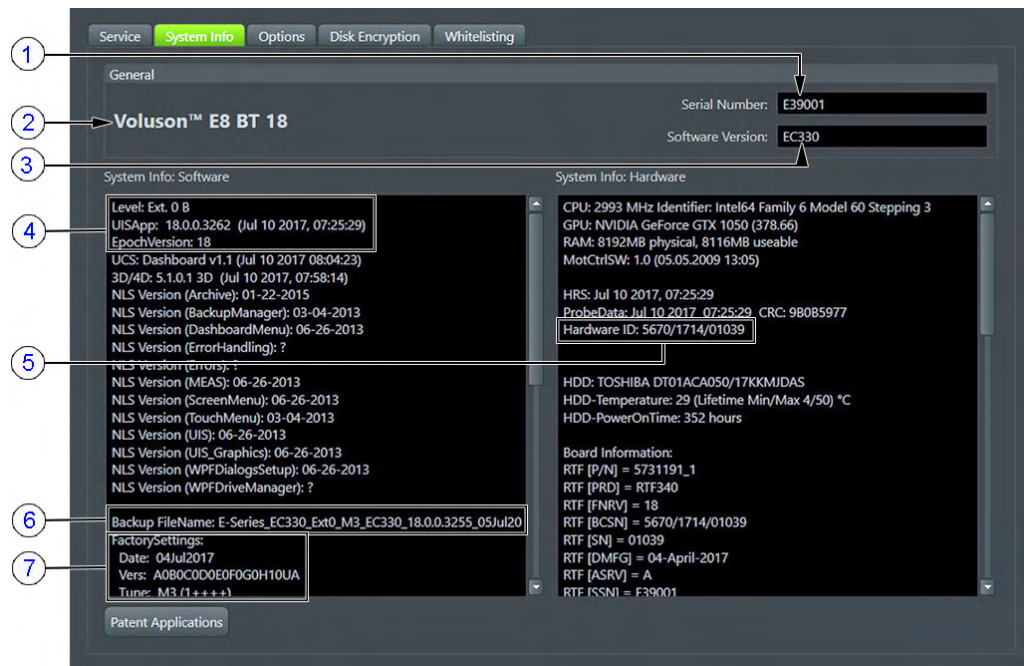


Figure 7-1 System Setup - Administration - SYSTEM INFO page

Note Move the scroll bars downwards to view additional information about the installed software/hardware.

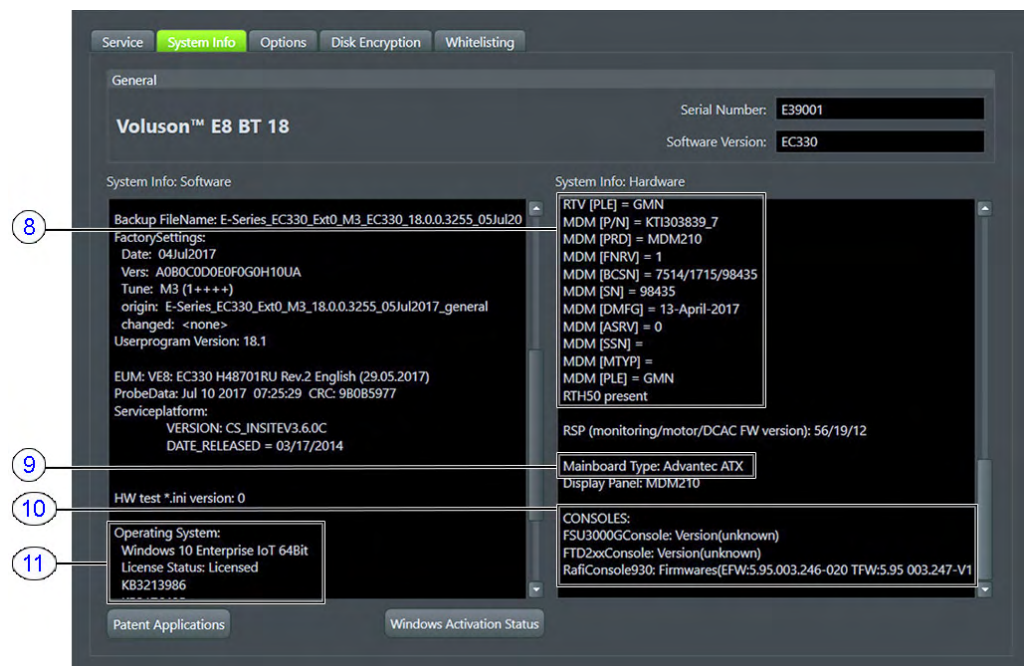


Figure 7-1 System Setup - Administration - SYSTEM INFO page

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
5	Hardware ID	11	Operating System and its License Status
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.

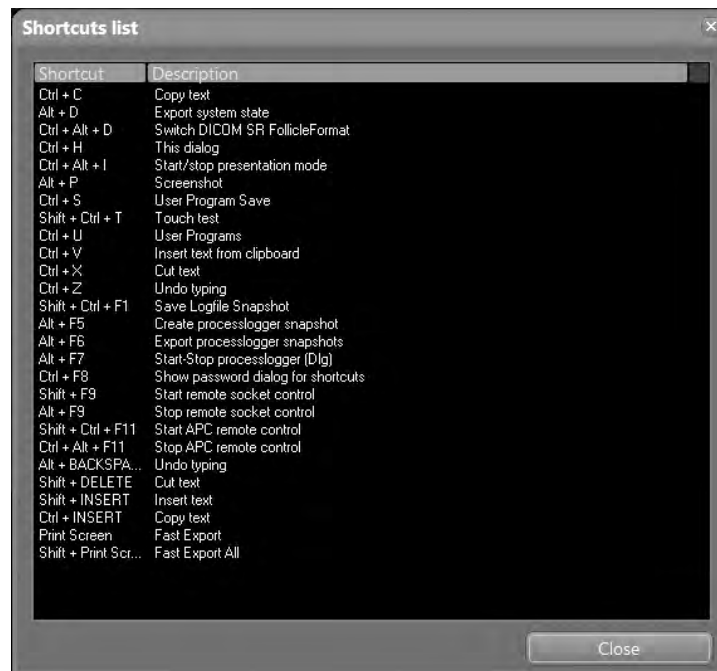


Figure 7-2 Shortcuts list (Ctrl + H)

Table 7-1 list of shortcuts + description of what they do

Shortcut	Description	Shortcut	Description
Ctrl + C	copy text	Alt + F6	export process logger snapshots (to USB Drive, CD or network share)
Alt + D	export system state (Full Backup and Dump files) to D:\export	Alt + F7	start/stop process logger
Ctrl+ Alt + D	Factory use ONLY! This function is not intended for the user.	Ctrl + F8	Factory use ONLY! This function is not intended for the user.
Ctrl + H	shortcuts list (see: Figure 7-2 above)	Shift + F9	start remote socket control
Ctrl + Alt + I	start/stop presentation mode	Alt + F9	stop remote socket control
Alt + P	stores screenshot on D:\export	Shift + Ctrl + F11	Factory use ONLY! This function is not intended for the user.
Ctrl + S	User Program save	Ctrl + Alt + F11	Factory use ONLY! This function is not intended for the user.
Shift + Ctrl + T	Touch test	Alt + Backspace	undo typing
Ctrl + U	User Programs	Shift + Delete	cut text
Ctrl + V	paste, insert text from clipboard	Shift + Insert	insert text (paste)
Ctrl + X	cut text	Ctrl + Insert	copy text
Ctrl + Z	undo typing	Print Screen	Fast Export
Shift + Ctrl + F1	save Logfile snapshot	Shift + Print Screen	Fast Export all
Alt + F5	create process logger snapshot		

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 Configuration" on page 3-70](#).*

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 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 5-27 on page 5-50](#)).
 5. Click the **Service Tools** button to display the Service Tools window.
 6. Click the **RFS** button and fill out the displayed form. (Enter detailed problem description.)

The screenshot shows the 'Contact GE - Service Browser' window. The 'Contact Information' section includes fields for Last Name (TEST), First Name (PERSON), Phone (004376823800), Ext., E-mail, System ID (KE10100GW12), and Other System ID. The 'Problem Type' section has buttons for 'Service' and 'Applications'. The 'Problem Area' section has two columns: 'Service' (Hardware, Network, Software) and 'Applications' (Hardware, Network, Software). The 'Problem Description' section has a text area with 'Make Center Test!', a date/time field (10/22/2013 10:41), a 'Now' button, and a character count (980 characters left). There are 'Send' and 'Cancel' buttons. At the bottom, a status bar shows 'Connection: Checked Out' and 'Status X'. A circled '1' points to the 'Connection: Checked Out' status.

Figure 7-3 Contact GE - Request for Service

Note *Connection must be checked out! (1)*

7. Click the **Send** button to send the problem description to GE Service/Application representatives.

A request confirmation screen is displayed.

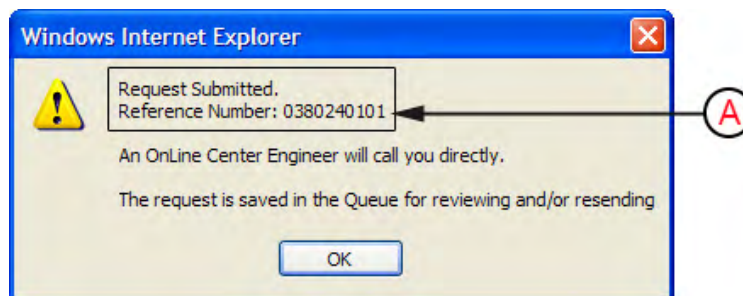


Figure 7-4 Request submitted

8. 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!

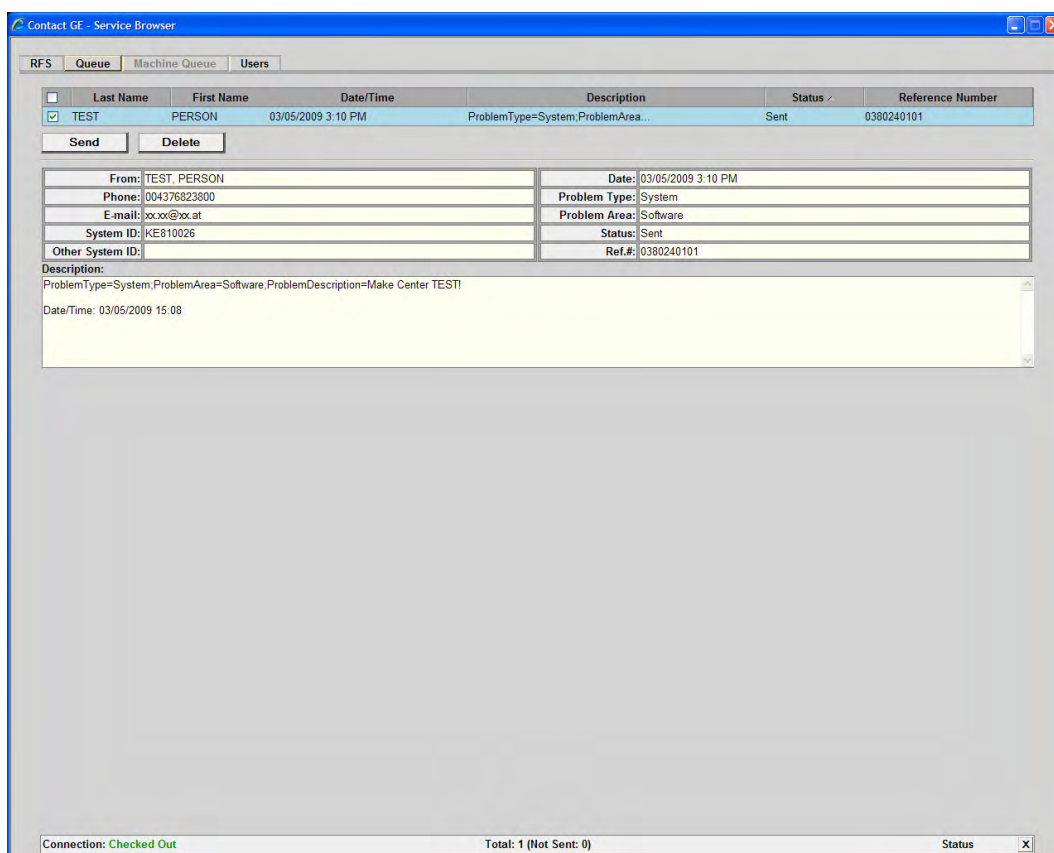







Figure 7-5 Contact GE - Queue

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:

	Orange	System in standby mode.
	Green	System in normal operation mode.
	blinking Orange <=> Green	FPGA_CONF_DONE = low IF-FPGA not initialized -> probably FrontEnd (RFM board) or Power Supply (RSP) issue
	NO light	System is switched OFF (circuit breaker)
	NO light	probably Power Supply (RSP) defect

7.3.2 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 signaling the status of the Power Supply (RSP).

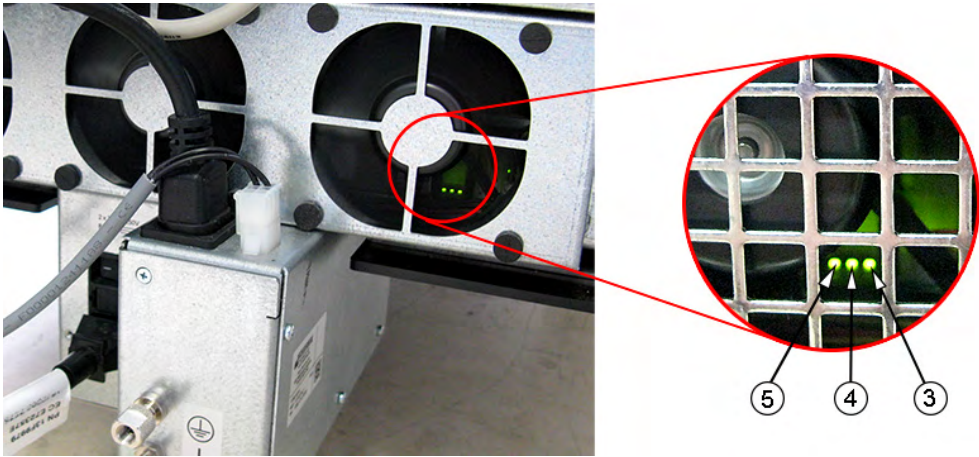


Figure 7-6 check green LEDs inside RSP

LED 3	Off: 12V_FE off On: 12V_FE on
LED 4	Off: FPGA_CONF_DONE = low On: FPGA_CONF_DONE = high
LED 5	Off: ATX supply off On: ATX supply on

7.3.3 Boot Up Diagnostic Status LEDs

Boot up diagnostic LEDs behind the right side door should help to diagnose system issues easier.

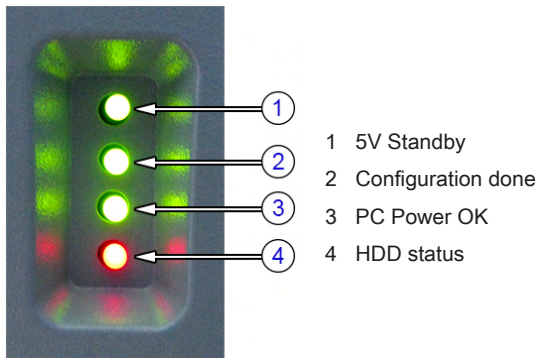


Figure 7-7 LEDs behind right side door

Table 7-2 Status LED's Overview

	ON	OFF
5V Standby (green)	<ul style="list-style-type: none"> 5V Standby voltage available from Power supply (RSP) If in parallel the ON/OFF button of the console is dark then the line up to the Console is interrupted (RSP -> RTB -> RTT -> RTU). 	<ul style="list-style-type: none"> 5V Standby voltage not available No mains voltage, mains power cable not connected System is switched off (circuit breaker off) Power supply (RSP) defective
Configuration done (green)	<ul style="list-style-type: none"> Configuration of the FrontEnd was successful 	<ul style="list-style-type: none"> FrontEnd FPGA was not initialized correctly -> probably issue with RFM-Board In this state the ON/OFF button of the console is blinking (orange <-> green) Further boot up is continued without FrontEnd hardware.
PC Power OK (green)	<ul style="list-style-type: none"> PC was started, ATX supply voltages are switched on (the PC has got ATX-Power) 	<ul style="list-style-type: none"> PC was not started correctly RSP could not send „Start PC“ Signal, PC did not send „PS_ON“ signal All cables/connectors between Power supply (RSP) and PC should be checked BackEnd (PC-Board) or Power supply (RSP) could be defective
HDD Status (red)	<ul style="list-style-type: none"> Access to the hard disk (normally blinking) useful to observe hard disk activities 	<ul style="list-style-type: none"> No access to the hard disk Depending on the status of the system software hang-ups can be confirmed

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/CD 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.*

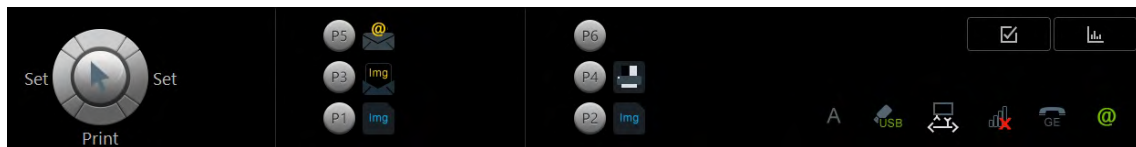


Figure 7-8 summary of keys configuration

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.

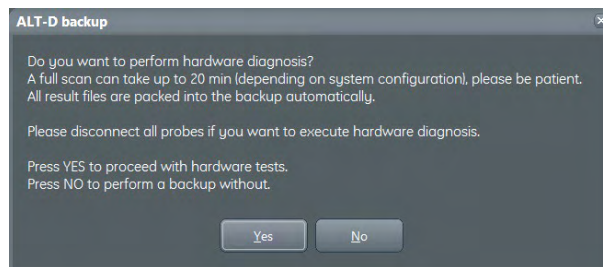


Figure 7-9 "Alt-D" backup

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**.

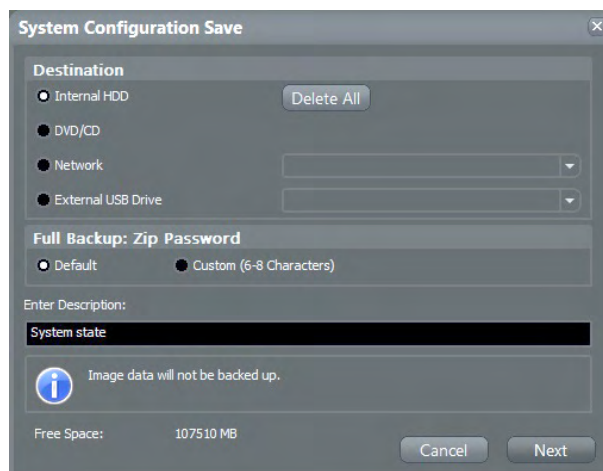


Figure 7-10 System Configuration Save

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 5-27 on page 5-50](#)).
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.

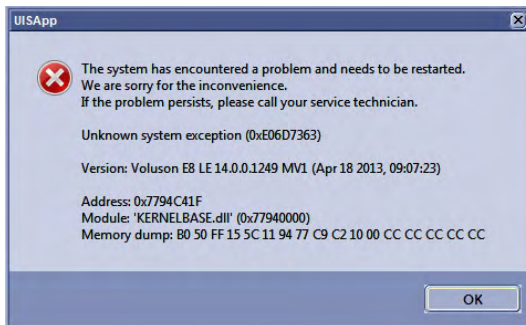


Figure 7-11 system has encountered a problem

After clicking on **OK** the system reboots automatically.

7.5 Remote Access to the Service Platform

Content in this section	
7.5.1 General	7-12
7.5.2 How the Customer enables/disables Disruptive Mode and VCO	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.

When Voluson E-Series systems can be serviced remotely, service costs are minimized, and customers benefit from decreased costs and decreased downtime for their systems.

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 Configuration" on page 3-70](#) .*

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 link (**GE** icon at the right bottom of the display screen).
3. Press the **right trackball key** (= right-click).
4. Select **Connect Clinical Lifeline** (see: [Figure 7-12 below](#)). This activates “Disruptive Mode” and “VCO” for the application OLC to quickly assist the customer.

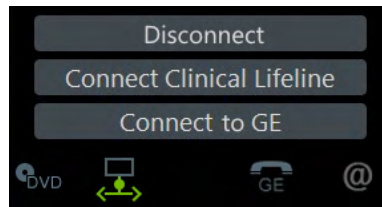


Figure 7-12 Connect Clinical Lifeline

5. Select **Cancel** respectively **Disconnect** to turn OFF “Disruptive Mode” and “VCO”.

Note

Visual information about GE remote status is shown in the status area on the right bottom of the screen. At EC330 (BT18) systems the trackball functions are displayed in the trackball status area of the screen.

	Gray = Idle State	Remote access is inactive.
		<p>EC330 only: Move the cursor over the GE icon to show trackball functions</p> <ul style="list-style-type: none"> • Contact: Section 7.2 "Request for Service (RFS)" on page 7-5 • Configuration: Section 3.13.8 "InSite Configuration" on page 3-70 • Menu: Displays the Remote Access (Disruptive Mode) menu
	Yellow = Access pending	Remote Access connection is active, but Disruptive Mode and Virtual Console Observation (VCO) is not yet enabled.
	Red = 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.
	Gray + envelope	New Software Update Package is available for download and installation. Operation see Section 8.2.3 on page 8-10 .

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.

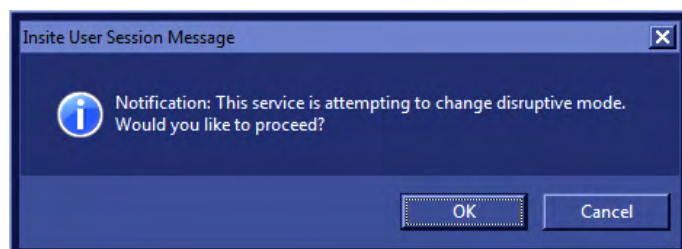


Figure 7-13 Insite User Session Message

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 5-49* , 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

7.6.1 Error Logs	7-14
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7.6.1 Error Logs

When the **Error Logs** page is selected, different log viewing options are available.

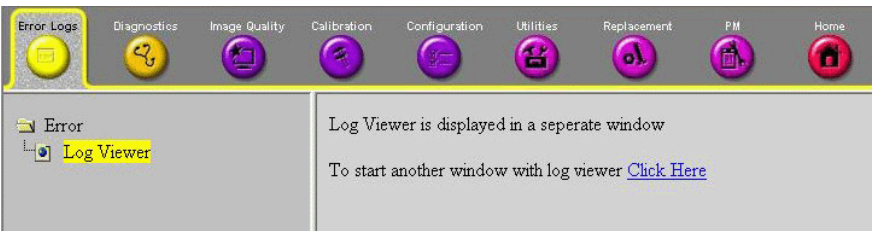


Figure 7-15 Common Service Desktop - Error Logs

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

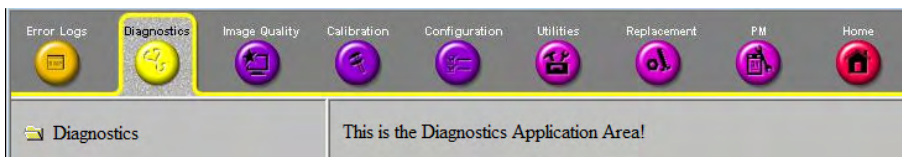


Figure 7-16 Common Service Desktop - Diagnostics

Note *This page is not populated in this version.*

7.6.3 Image Quality

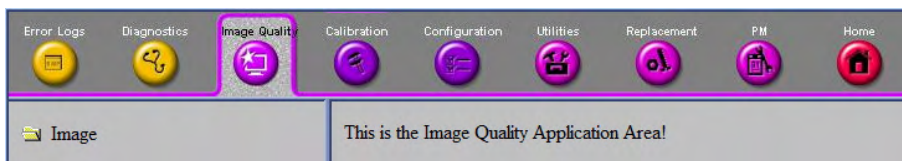


Figure 7-17 Common Service Desktop - Image Quality

Note *This page is not populated in this version.*

7.6.4 Calibration

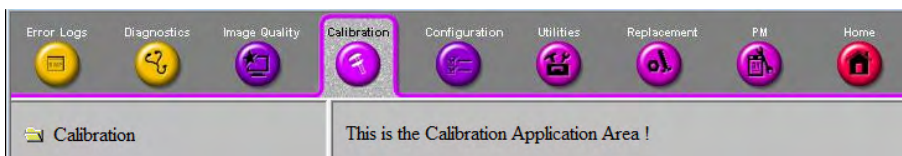


Figure 7-18 Common Service Desktop - Calibration

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.



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 Configuration" on page 3-70](#) .*

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.

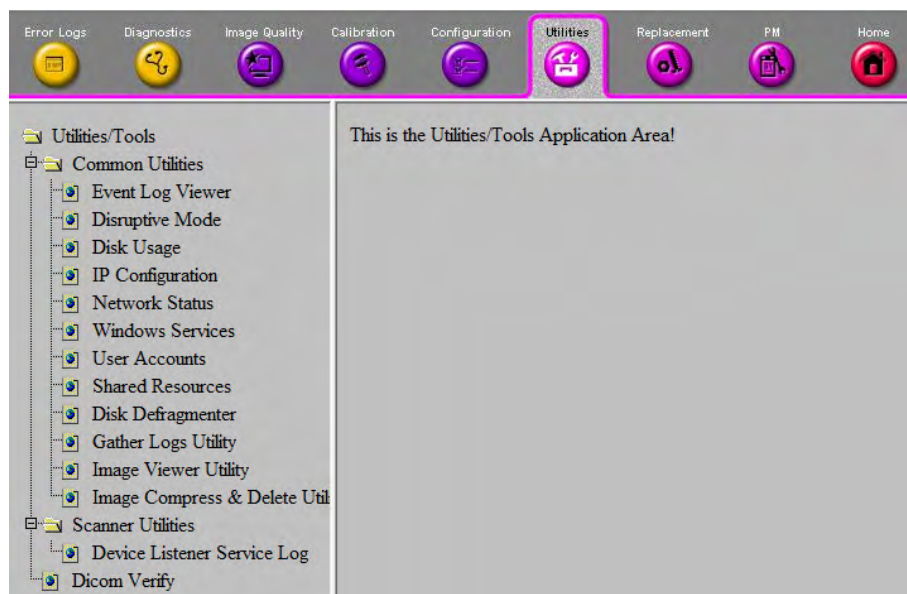


Figure 7-20 Common Service Desktop - Utilities

Content in this section

7.6.6.1 Common Utilities	7-16
7.6.6.2 Scanner Utilities	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.

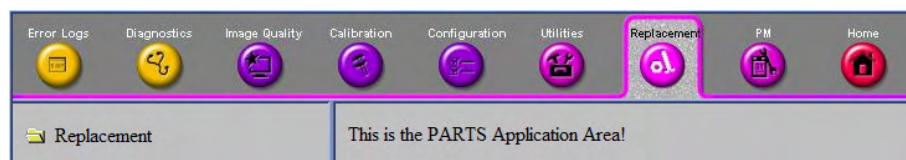
7.6.7 Replacement

Figure 7-21 Common Service Desktop - Replacement

Note *This page is not populated in this version.*

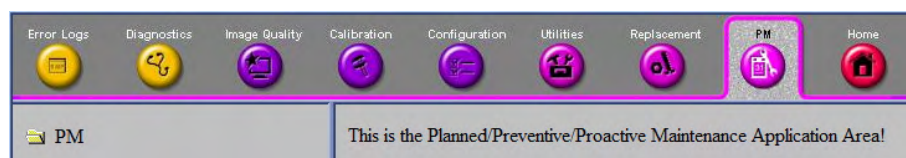
7.6.8 PM

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 5-27 on page 5-50](#)).
5. Activate the “Auto Tester” program by clicking **Start**. The following message box appears.

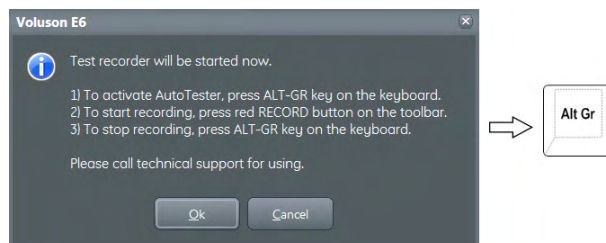


Figure 7-23 Autotester activation

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.

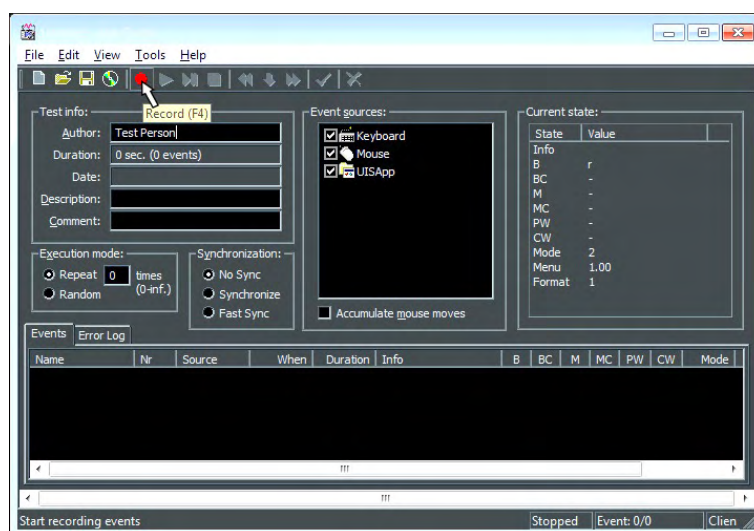
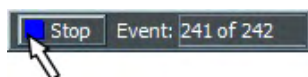


Figure 7-24 Autotester record

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.

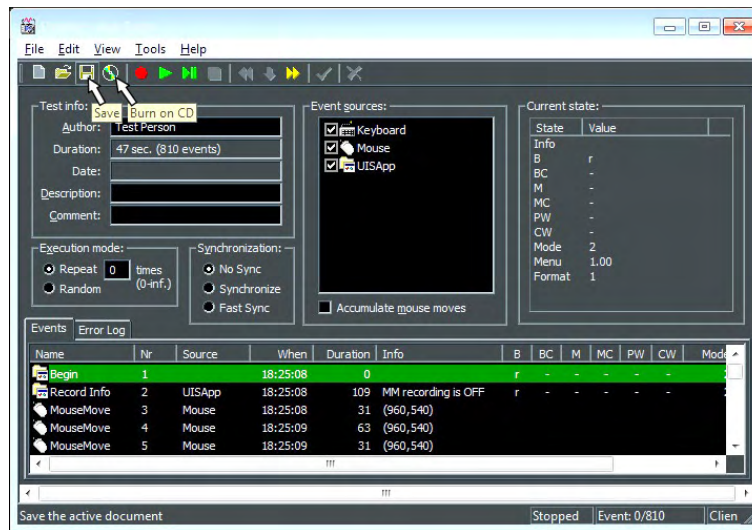


Figure 7-25 Autotester finished

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 Troubleshooting Trees, Instructions and Tech Tips

Content in this section

7.8.1 System does not boot up -----	7-21
7.8.2 Noise disturbs the Image -----	7-22
7.8.3 Trackball Malfunction -----	7-25
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7.8.5 Monitor Troubleshooting -----	7-27
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7.8.8 Activate Windows - Network Connectivity Issues -----	7-32
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7.8.1 System does not boot up

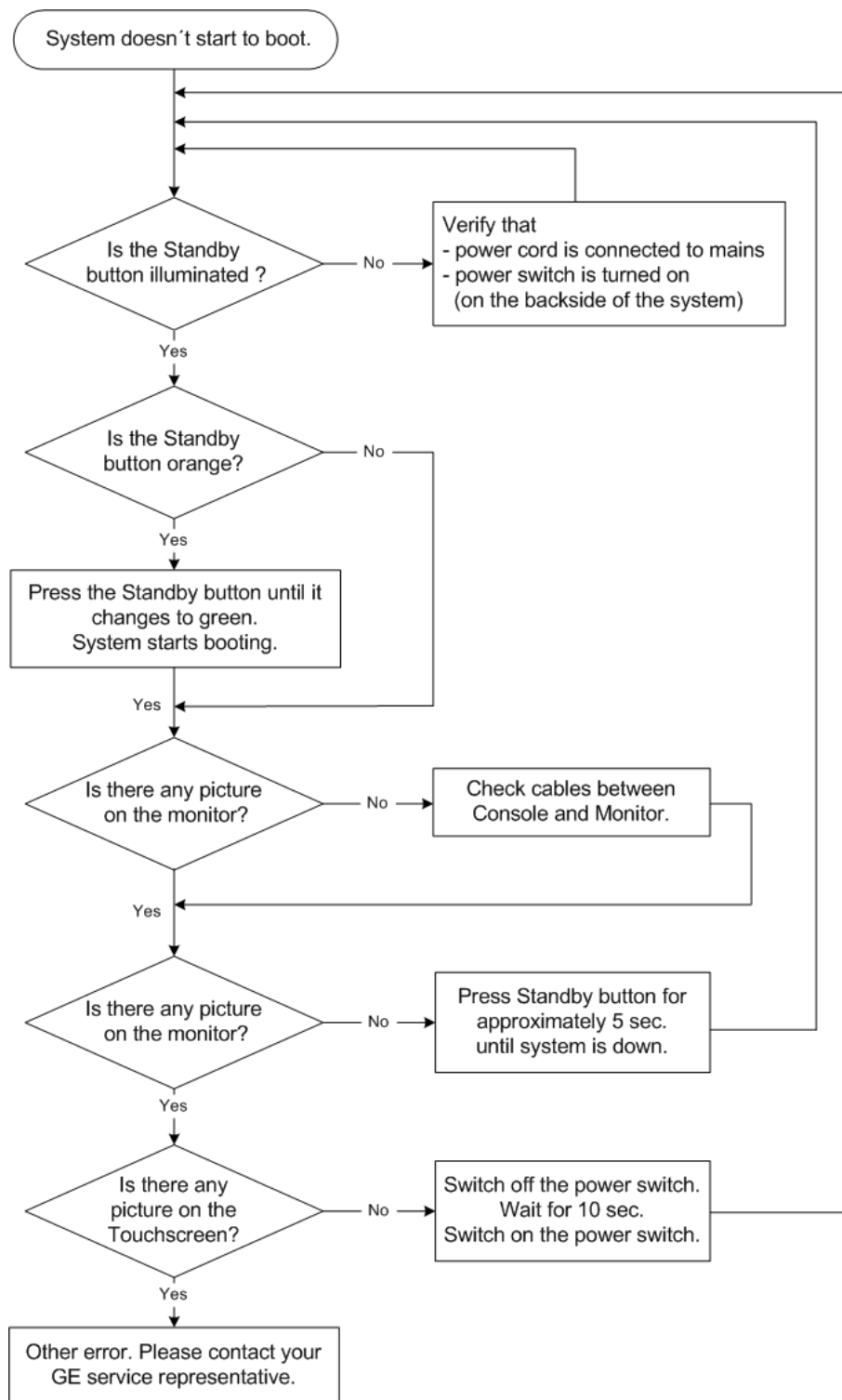


Figure 7-26 System does not start to boot up - Troubleshooting

7.8.2 Noise disturbs the Image

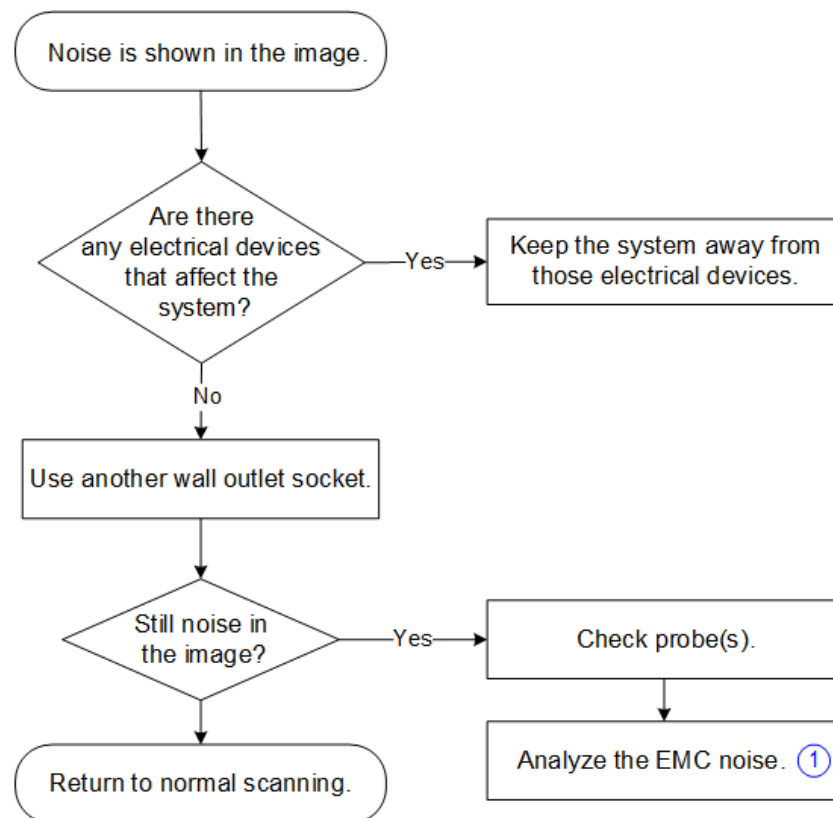


Figure 7-27 Noise disturbs the Image - Troubleshooting

1 Section 7.8.2.1 "How to analyze the EMC noise" on page 7-23

7.8.2.1 How to analyze the EMC noise

1. Switch on the Voluson E-Series system and choose settings which show EMC noise in the ultrasound image. Typically the ultrasound probe must be contacted (hold in hand/apply to body) to observe EMC noise.
2. Disconnect one by one all cords that are connected to the Voluson E-Series system like LAN/Ethernet, VGA, DVI, S-Video, USB, ... on the ultrasound system-side and observe the EMC noise.
3. If EMC noise is still present after disconnecting all cables, then use the stand-alone Power Filter (H48701EL) to power the Voluson E-Series system. Connect the Power Filter between AC mains and the Voluson E-Series system.

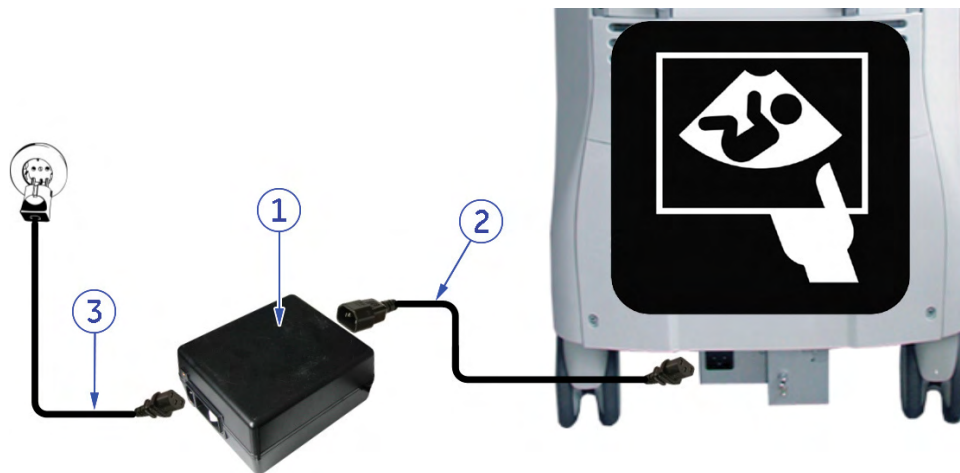


Figure 7-28 Power Filter - Connection Scheme

Note

Make sure, that:

- the Power Filter (1) is located behind (not under) the Voluson E-Series system.
- the Power Filter (1) is not close to any metallic devices.
- the AC mains power cable (3) is not located near/under the Voluson E-Series system.
- the AC mains power cable (3) is not located close to the short 1m Power Extension cord (2).

4. Switch on the Voluson E-Series system.
5. Activate the ultrasound probe and choose settings which show EMC noise in the ultrasound image to check for EMC noise (EMC noise should be absent). If EMC noise is still present – then check again for any other conducting connections to the Voluson E-Series; perform step 2.) again.
6. Connect one by one other cords to the Voluson E-Series system like LAN/Ethernet, VGA, DVI, S-Video, USB, ... and check for EMC noise.

If a stand-alone UPS (Uninterruptible Power Supply) is available to power the Voluson E-Series

Connect the UPS between AC mains and the Voluson E-Series system in the same manner as shown in [Figure 7-28](#), - instead of the stand-alone Power Filter.

1. Switch on the Voluson E-Series system.
2. Activate the ultrasound probe and choose settings which show EMC noise in the ultrasound image to check for EMC noise (EMC noise should be visible).
3. Disconnect one by one all cords that are connected to the Voluson E-Series system like LAN/Ethernet, VGA, DVI, S-Video, USB, ... on the ultrasound system-side and observe the EMC noise.
4. If EMC noise is still present after disconnecting all cables, then disconnect the AC mains power cord that supplies the UPS from the wall outlet socket.
If EMC noise is absent, then it is confirmed that the EMC noise source is in the power line of the wall outlet socket.
5. If EMC noise is still present – then check again for any other conducting connections to the Voluson E-Series; perform step 3.) again.
6. Connect one by one other cords to the Voluson E-Series system like LAN/Ethernet, VGA, DVI, S-Video, USB, ... and check for EMC noise.

For reducing EMC noise consider following options

- use WLAN instead of LAN-cable
- use wireless video transmitter instead of VGA-cable, DVI-cable, S-Video-cable, ...

If EMC noise does not depend on whether the ultrasound probe is contacted

When the EMC noise does not depend on whether the ultrasound probe is contacted (hold in hand/apply to body), then do the following:

1. Hold the ultrasound probe only at the cable and change the orientation of the ultrasound probe.
2. If the EMC noise changes by changing the orientation of the ultrasound probe then the EMC noise is caused by a magnetic field in the room/building.

In such situations the Power Filter (H48701EL) cannot reduce the EMC noise.

7.8.3 Trackball Malfunction

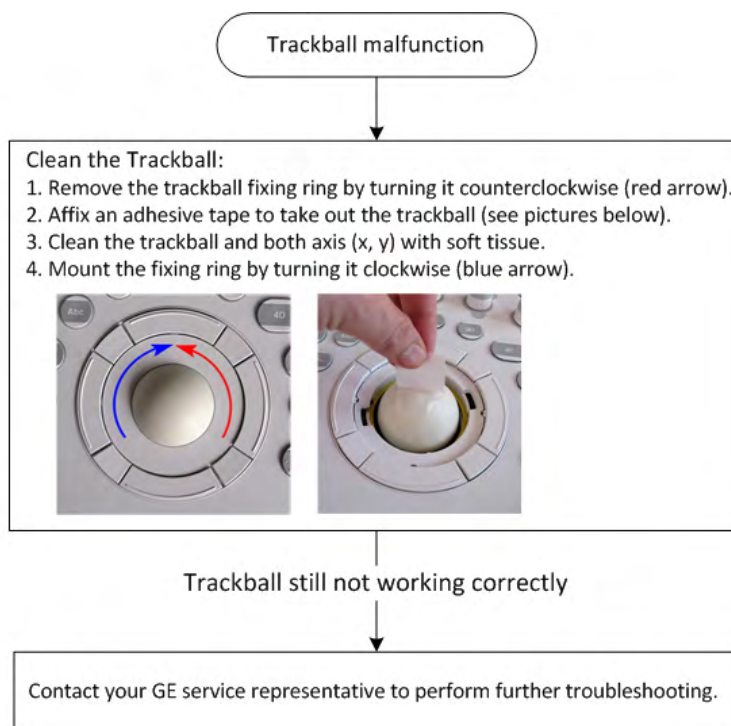


Figure 7-29 Trackball Malfunction



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.

7.8.4 Printer Malfunction

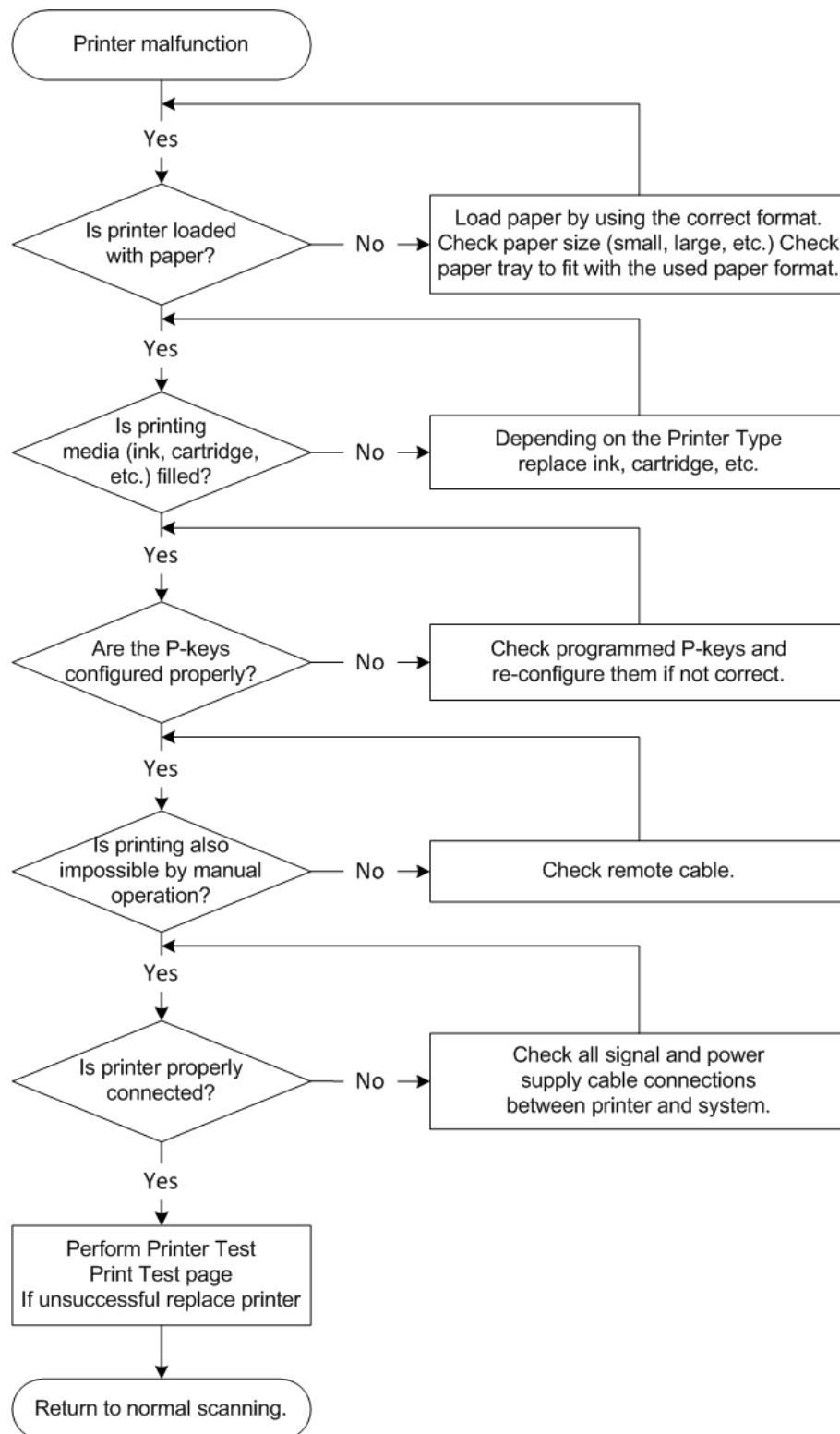


Figure 7-30 Printer Malfunction

7.8.5 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](#).

7.8.6 DVD/CD-Drive Tests

Content in this section

- 7.8.6.1 Export images from "Local Archive" to DVD/CD+R/RW ----- 7-28
 7.8.6.2 Record Spectral Doppler display ----- 7-30

7.8.6.1 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

- Click on **Export**.
- If not already selected, choose "DVD/CD" resp. "DVD Rec" from the pull-down menu.
- Enter "File name".
- Select any Voluson Format (*.4dv) from the pull-down menu.
- Click the **Save** button.

After successful export, perform an import of images

- On the right side of the screen select **Import**.
- Choose "DVD/CD" resp. "DVD Rec" from the "Source" pull-down menu.
- Select the folder where the file was stored and the file name.
- 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.

7.8.6.2 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.

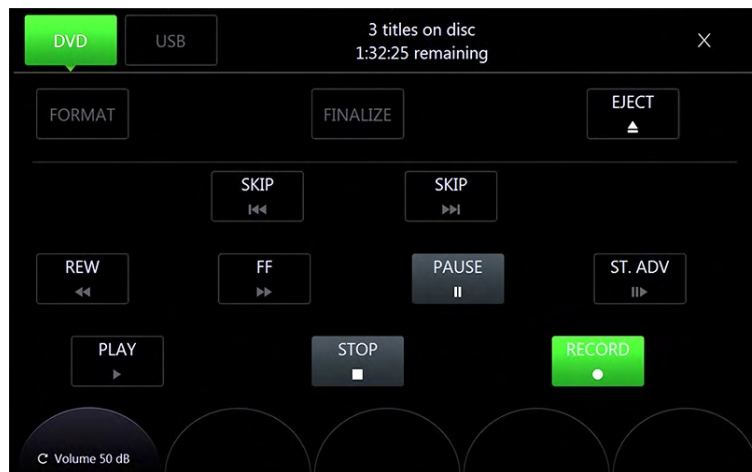




Figure 7-33 Remote Control menu

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).

7.8.7 Network Troubleshooting

7.8.7.1 No Connection to the Network at all


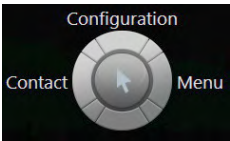



	Gray = Cable disconnected or no network signal on a connected cable.
	Green = Cable connected to a network. Does not imply proper network settings.

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.

7.8.7.2 GE remote service connection

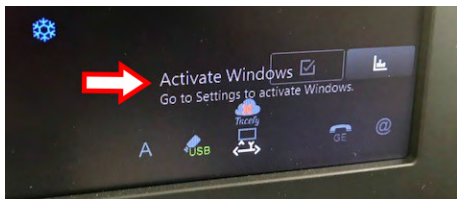
Note

Visual information about GE remote status is shown in the status area on the right bottom of the screen. At EC330 (BT18) systems the trackball functions are displayed in the trackball status area of the screen.

	Gray = Idle State	Remote access is inactive.
		<p>EC330 only: Move the cursor over the GE icon to show trackball functions</p> <ul style="list-style-type: none"> • Contact: Section 7.2 "Request for Service (RFS)" on page 7-5 • Configuration: Section 3.13.8 "InSite Configuration" on page 3-70 • Menu: Displays the Remote Access (Disruptive Mode) menu
	Yellow = Access pending	Remote Access connection is active, but Disruptive Mode and Virtual Console Observation (VCO) is not yet enabled.
	Red = 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.
	Gray + envelope	New Software Update Package is available for download and installation. Operation see Section 8.2.3 on page 8-10 .

7.8.8 Activate Windows - Network Connectivity Issues

Issue: In case of network connectivity issues, it may not be possible to activate your Windows operating system on the Voluson E-Series systems. Monitor screen display: **Activate Windows. Go to Settings to activate Windows.**



Note: When present, the "Activate Windows" message will not impact system performance in any way.

Cause: Activation servers of Microsoft are not reachable.

Solution:

1. Check Operating System License Status in **Utilities - Setup - Administration - System Info** tab.
 - a. **Licensed** -> Windows is properly activated.
 - b. **Notification** -> Windows is not activated. Proceed with troubleshooting steps.

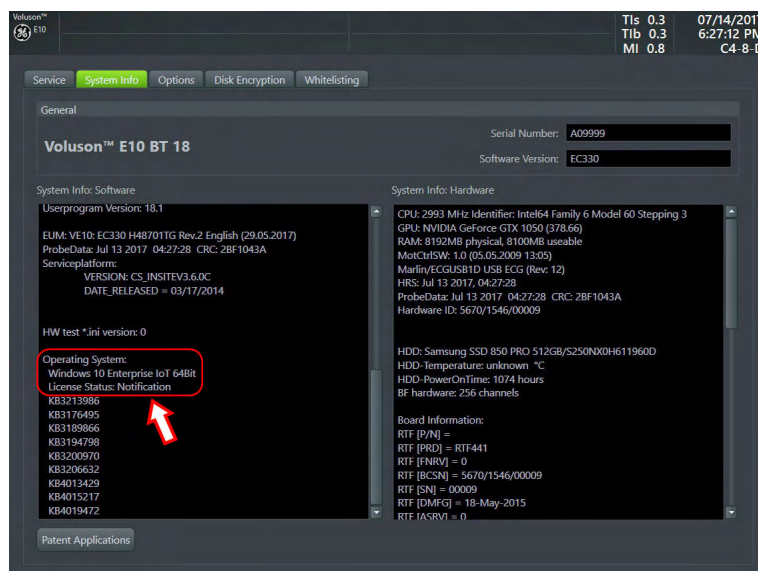


Figure 7-34 Licence Status: NOTIFICATION => Windows is not activated

2. Make sure that the Voluson E-Series system is connected to the internet.
3. Contact your local IT department to make sure that inside your local network infrastructure activation servers of Microsoft are reachable. If needed, contact your GE service technician for further support.

7.8.9 Tech Tips

Content in this section

7.8.9.1 Storing SonoView images to Voluson E-Series systems ----- 7-33

7.8.9.1 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.

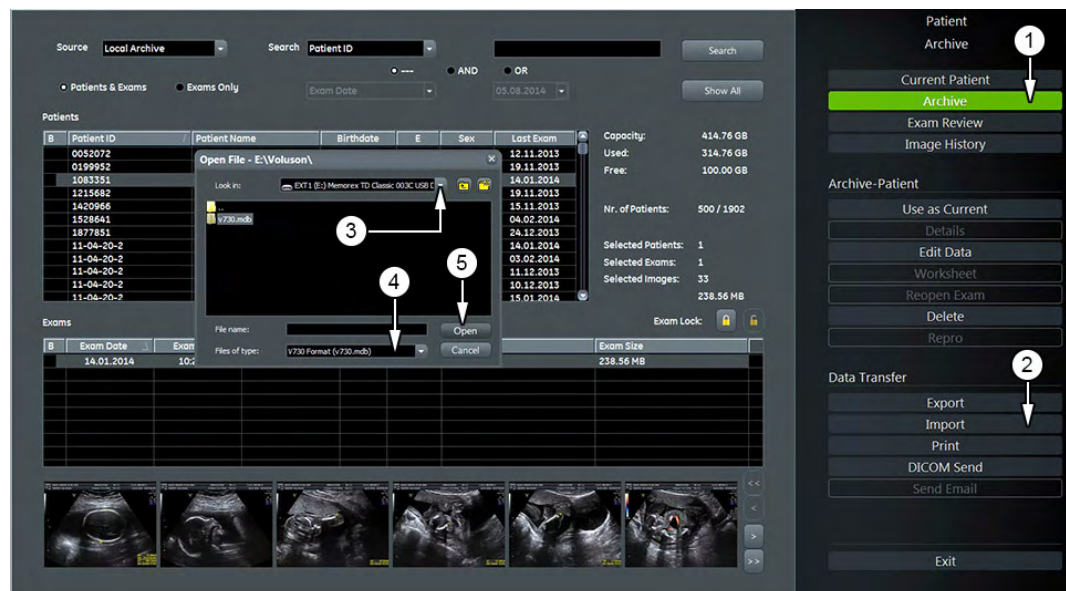


Figure 7-35 Patient Archive -ARCHIVE

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

<i>8.1 Returning/Shipping System, Probes and Repair Parts</i>	<i>8-2</i>
<i>8.2 System Software - Installation/Upgrade procedure</i>	<i>8-3</i>
<i>8.3 Software and Functional Checks after Installation/Upgrade procedure</i>	<i>8-14</i>
<i>8.4 Image Settings Only - Loading Procedure</i>	<i>8-15</i>
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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

Introduction

There are two possibilities to update the system software:

1. via the *FMI from DVD* button in the System Setup **Service** page
 - Software parts to be upgraded (e.g., Ultrasound Application Software, Service Software, EUM, MS patches, etc.) and installation time depend on contents of the used System DVD.
 - If the currently installed software has to be upgraded to a newer version, a new software specific "Permanent key" is required. Please contact your local distributor or GE service representative.
2. by downloading and installing a *Software Update Package* via active InSite connection
 - Software parts to be upgraded (e.g., Ultrasound Application Software, Service Software, EUM, MS patches, etc.) and installation time depend on contents of the SW update package.
 - **PRECONDITION:** InSite connection has to be configured and checked out. Operation see: *Section 3.13.8 "InSite Configuration" on page 3-70*.



Caution

Disconnecting ALL external USB devices (except DVD drive) is NECESSARY. **Re-installation of any previously attached printer has to be done after the upgrade procedure.**

Note

Installing the Bluetooth Printer and its connection set is NOT possible by the user.

Manpower

One person ~ 1 hour (depends on contents of System DVD resp. SW update package, 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.

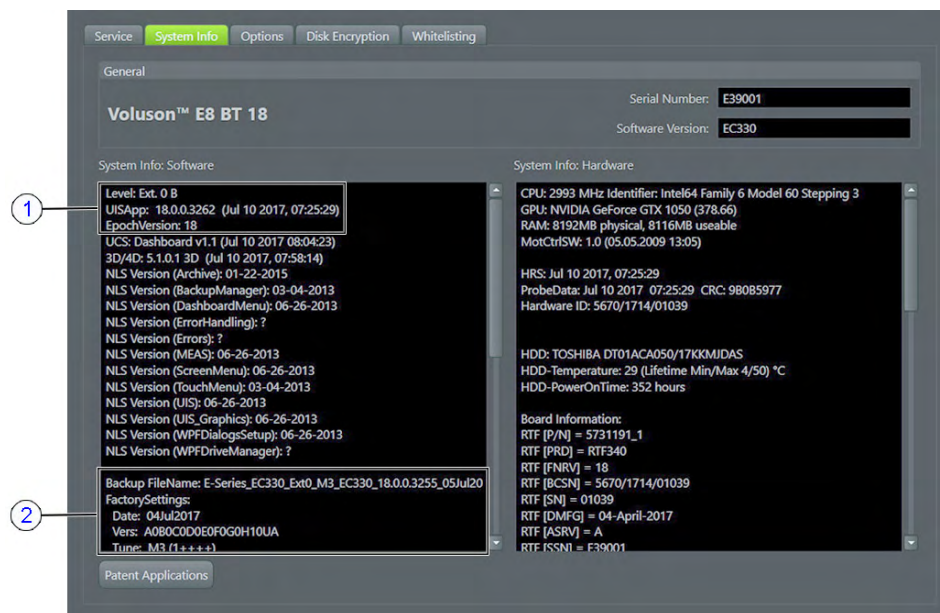


Figure 8-1 Version check: System Setup - Administration - System Info page

- 1 currently installed Ultrasound **Application Software version**
- 2 Date of Factory Settings

5. Select the **Option** tab to see which options are currently installed. Please print out the options page or write down the state of the options (P = permanent, I = inactive).

Note

It is not necessary to note the Permanent Key; it is the state of the option that matters.

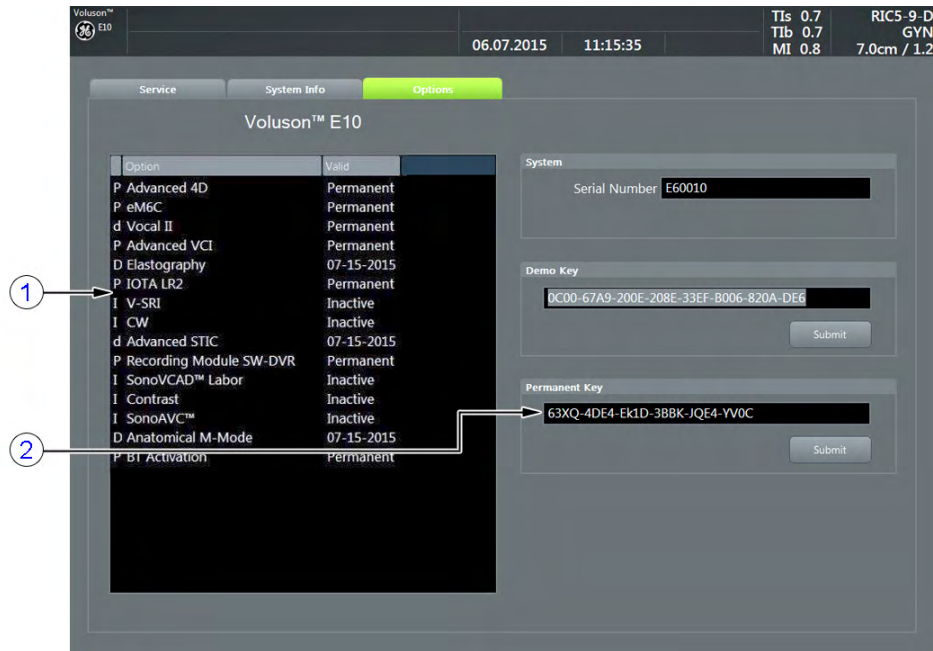


Figure 8-2 System Setup - Administration - Options page

- 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)
d = deactivated (Option is inactive)
- 2 Permanent Key

Note

*If the currently installed software has to be upgraded to a newer version, and the system is 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 5.14.3.3 “FMI from DVD” on page 5-51](#).

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. Enter the password « she » and click **Accept**.

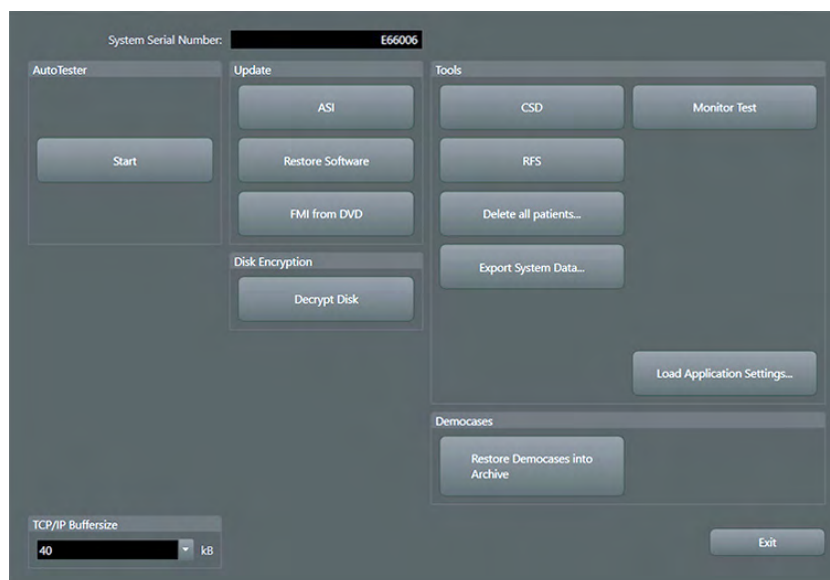


Figure 8-3 Service Tools

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**.

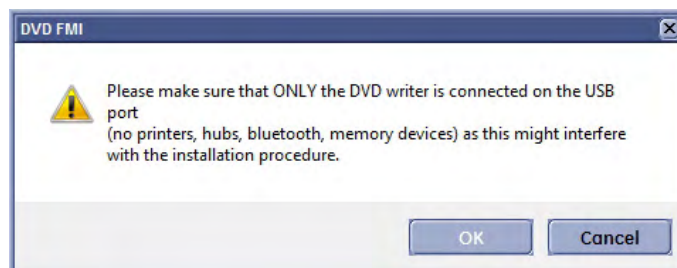


Figure 8-4 Verify that USB devices are disconnected, then click OK

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**.

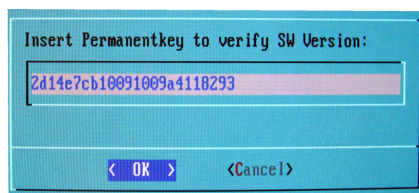


Figure 8-5 enter Permanent key

If the entered Permanent key is correct, following window appears, confirm with **Enter**.

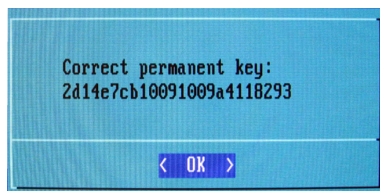


Figure 8-6 confirm key

At EC310 the format of the Permanent key has been changed.



New Format from **EC310** onwards:

e.g., **63XQ-4DE4-EK1D-A3CFT-JQ0C-YSFF**

Characters are **case sensitive** !!

Hyphens (-) must be entered. They are self-created.

Previous Format still valid until **EC300**:

e.g., **02148EBCA0069003EF6F980F**

Characters are not case sensitive.

13. Check disk is performed automatically - restart.

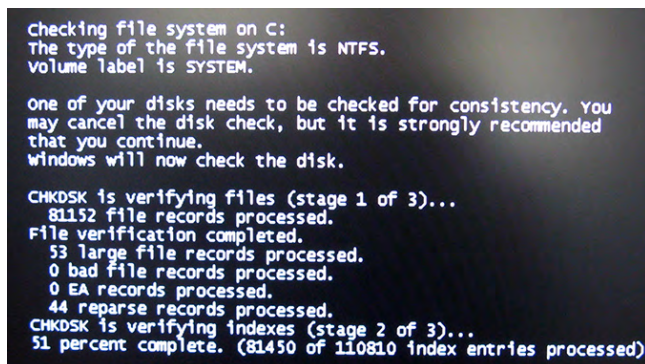


Figure 8-7 Check disk is performed automatically

14. 3 dots (one after the other) appear on the screen.

15. Booting auto



Figure 8-8 Boot screen - auto

16. Updating will take some time

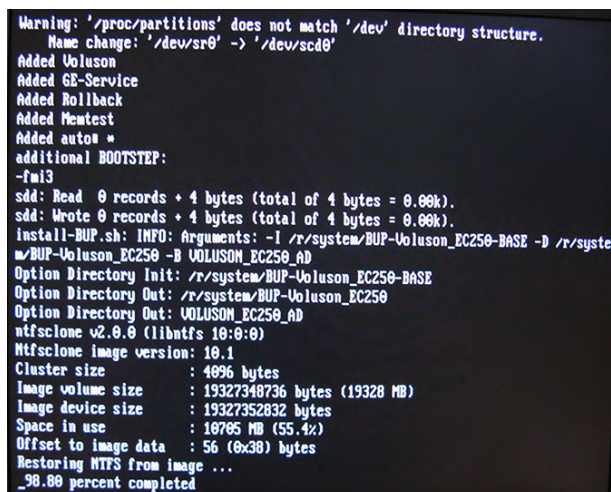


Figure 8-9 Please wait ...

17. Please wait until all processes are finished (100 percent completed).
18. 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!***

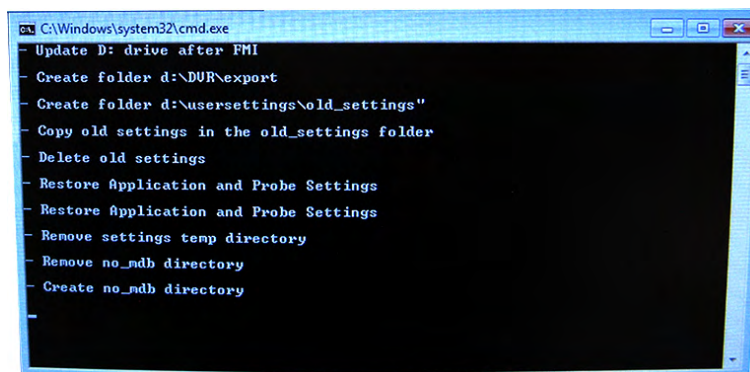


Figure 8-10 automatic processes are running

19. Please wait until all processes are finished. Finally the 2D screen is displayed on the monitor.
20. Remove the System DVD from the DVD/CD+R/RW Drive drive.

21. 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.

22. Reconnect the external devices, install all the printers and adjust the printer settings as described in [Section 3.6 "Printer Installation" on page 3-36](#).
23. Check and match Printer Remote Control selection in the *Setup - Connectivity - Button Configuration* page.
24. Confirm date and time setting in the *Setup - General Settings - General* page.
25. Perform Software and Functional checks as described in [Section 8.3 on page 8-14](#).

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 3-71](#).

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. Remove any CD/DVD from the DVD drive.
2. Perform Preparations as described in [Section 8.2.1 on page 8-4](#).
3. If not already done, disconnect all external USB devices (except DVD drive).
4. Press the **ON/OFF** Standby button on the control console.
5. In the displayed screen click **Download**.

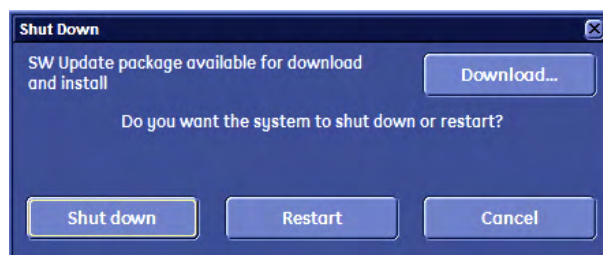


Figure 8-11 download SW update package

6. Download takes some time; please wait. (Download may be paused by means of the **Pause** button.)
7. When download is finished, click **Install**.

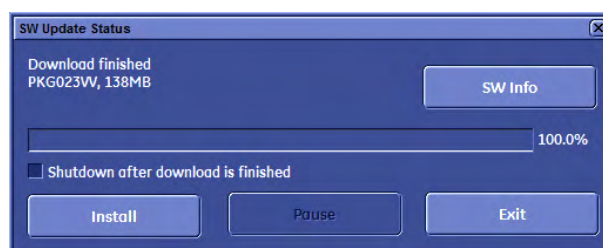
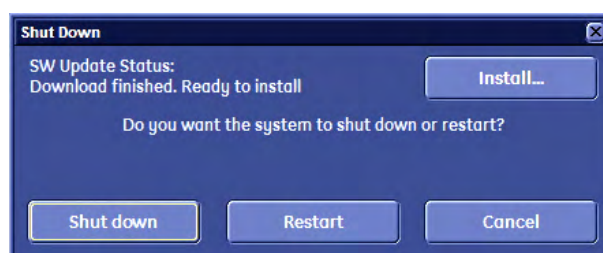


Figure 8-12 download finished - click Install

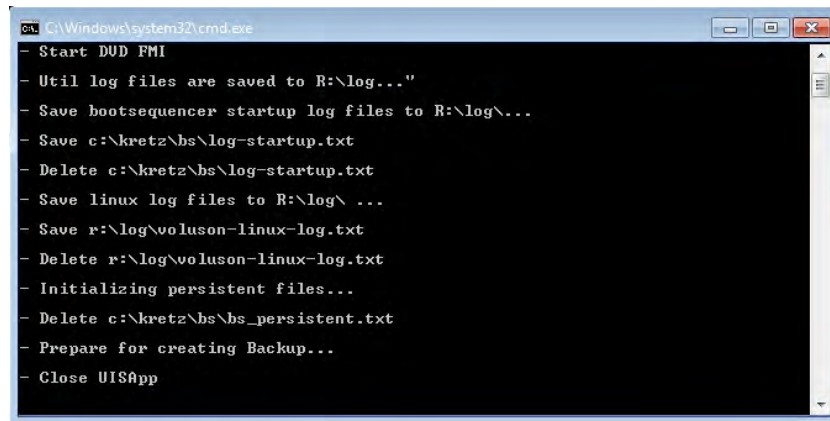
Note

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).*



8. After clicking **Install**, the SW update procedure starts.
The system saves Full Backup in silent mode on R:, then it reboots into LINUX.



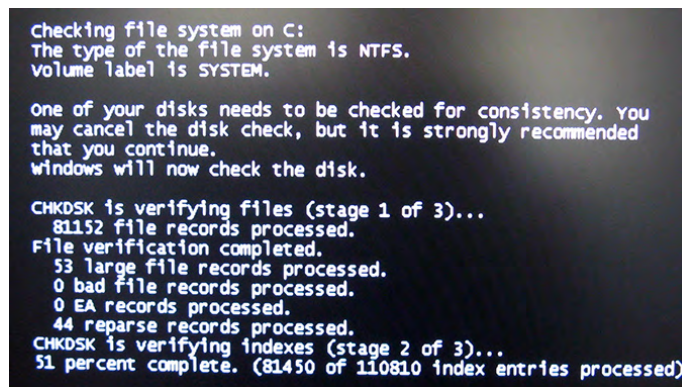
```

C:\Windows\system32\cmd.exe
- Start DUD FMI
- Util log files are saved to R:\log..."
- Save bootsequencer startup log files to R:\log\...
- Save c:\kretz\bs\log-startup.txt
- Delete c:\kretz\bs\log-startup.txt
- Save linux log files to R:\log\ ...
- Save r:\log\voluson-linux-log.txt
- Delete r:\log\voluson-linux-log.txt
- Initializing persistent files...
- Delete c:\kretz\bs\bs_persistent.txt
- Prepare for creating Backup...
- Close UISApp

```

Figure 8-13 installation in progress

9. Check disk is performed automatically - restart.



```

Checking file system on C:
The type of the file system is NTFS.
volume label is SYSTEM.

one of your disks needs to be checked for consistency. You
may cancel the disk check, but it is strongly recommended
that you continue.
windows will now check the disk.

CHKDSK is verifying files (stage 1 of 3)...
81152 file records processed.
File verification completed.
53 large file records processed.
0 bad file records processed.
0 EA records processed.
44 reparse records processed.
CHKDSK is verifying indexes (stage 2 of 3)...
51 percent complete. (81450 of 110810 index entries processed)

```

Figure 8-14 Check disk is performed automatically

A silent "Rollback" image from C:\ is stored on R:\. After executing all LINUX commands, the system reboots again.

10. 3 dots (one after the other) appear on the screen.
11. Booting **auto**



Figure 8-15 Boot screen - auto

12. 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*).

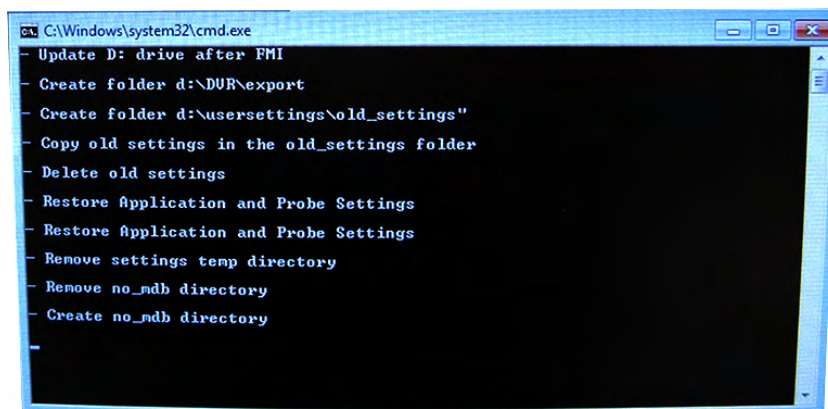
```
Warning: '/proc/partitions' does not match '/dev' directory structure.
Name change: '/dev/sr0' -> '/dev/scd0'
Added Voluson
Added GE-Service
Added Rollback
Added Memtest
Added auto *
additional BOOTSTEP:
-fmi3
sdd: Read 0 records + 4 bytes (total of 4 bytes = 0.00k).
sdd: Wrote 0 records + 4 bytes (total of 4 bytes = 0.00k).
install-BUP.sh: INFO: Arguments: -I /r/system/BUP-Voluson_EC250-BASE -D /r/syste
m/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 8-16 Please wait ...

13. Please wait until all processes are finished (100 percent completed).
14. 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 8-17 automatic processes are running

15. Please wait until all processes are finished.

Finally the 2D screen with the "New Software Verification" report is displayed on the monitor.

	OK	Failed
2D Mode	<input type="checkbox"/>	<input checked="" type="checkbox"/>
M-Mode	<input checked="" type="checkbox"/>	<input type="checkbox"/>
PW-Mode	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Color-Mode	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Print	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Measure	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Worksheet	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Annotation	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Image Store/Reload	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Archive	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Check details
(move cursor over check item)

Check that it is possible to connect to Patient Archive.

Signature Test Person

Send

Figure 8-18 New Software Verification

16. Reconnect the external devices, install all the printers and adjust the printer settings as described in [Section 3.6 "Printer Installation" on page 3-36](#).
17. Check and match Printer Remote Control selection in the *Setup - Connectivity - Button Configuration* page.
18. Confirm date and time setting in the *Setup - General Settings - General* page.
19. Perform a check of all modes and features listed. (Move the cursor over the feature name to get information how to check.)
20. When all features are **OK** enter your signature and then click **Send**; see: [Figure 8-18 above](#).

Note

If one feature gets "Failed", rollback the installation (restore the previously used system configuration). For more detailed information, see [Section 5.15.3 on page 5-53](#).

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.

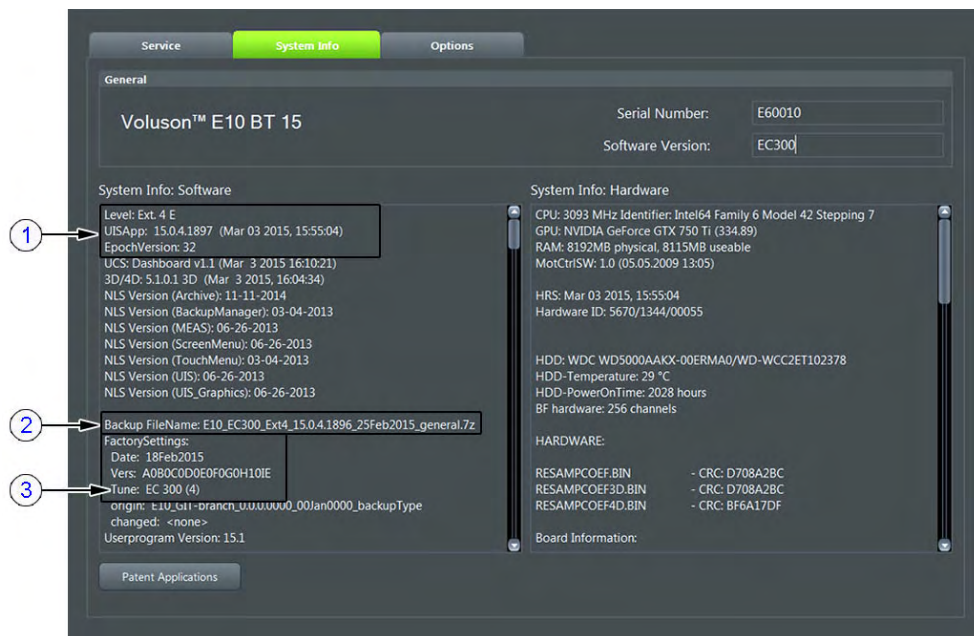


Figure 8-19 System Setup - Administration - System Info page

- | | | | |
|---|------------------------------------------------|---|--------------------------------------------|
| 1 | Ultrasound Application Software version | 3 | Tune version 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 5.14.3.14 "Load Application Settings" on page 5-52](#) .*

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:

- 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 4-12](#)

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 Presets, gray curves etc.)
- System Settings (general "Setup" settings such as Language, Time/Date format, Button configuration, Annotation settings, Biopsy lines, Peripheral data, Video Norm, Archive configuration, etc.)
- Measure Configuration (user specific measure setup settings)
- User Authentication Data (User Authentication Configuration (user names, group names), LDAP configuration, audit trail configuration,...)
- Patient Archive (database containing patient demographic exam data and measurements) - **no images**
- V830 Settings (Options resp. Permanent Key that is specific for enabled software options and Demo Key)
- Image Transfer Configuration (DICOM configuration e.g., DICOM servers, AE Title, Station Name, etc.)
- Network Configuration (Network settings: IP address, Network Profiles, e-mail configuration, network printer, network drives, computer name)
- Service Platform (state of the Service Software)

Loading Procedure

see: [Section 4.4.4 "Load Full System Configuration \(Full Backup\)" on page 4-17](#)

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 4-22](#)

8.7 Replacement or Activation of Options

Note For a list of available SW options and detailed description, refer to [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.

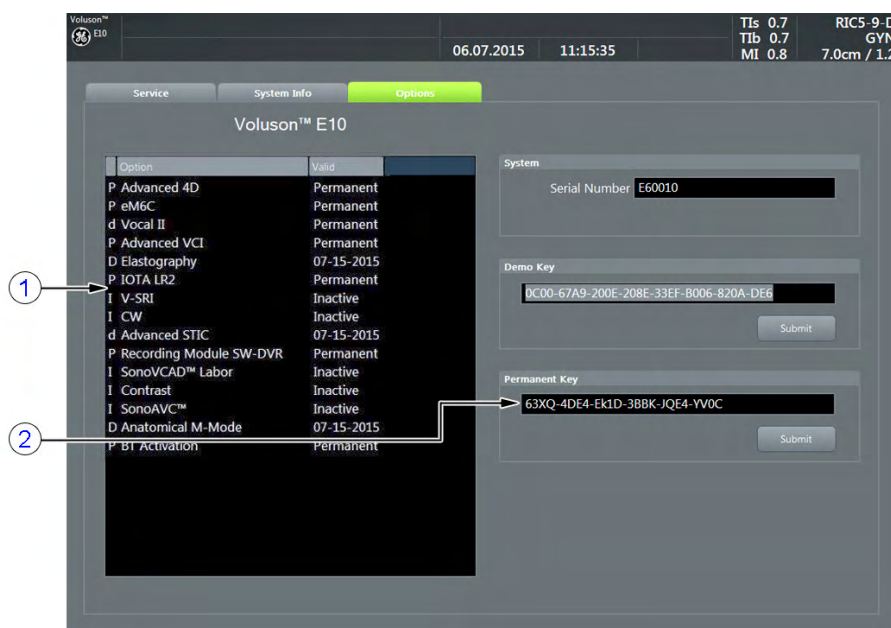


Figure 8-20 Setup - Administration - Options page (e.g., Voluson E10)

- 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)
d = deactivated (Option is inactive)

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.

At EC310 the format of the Permanent key has been changed.



New Format from **EC310** onwards:

e.g., **63XQ-4DE4-Ek1D-A3CFT-JQ0C-YSFF**

Characters are **case sensitive** !!

Hyphens (-) must not be entered. They are self-created.

Previous Format still valid until **EC300**:

e.g., **02148EBCA0069003EF6F980F**

Characters are not case sensitive.

8.8 Replacement of Covers

Content in this section

<i>8.8.1 Replacement of the Footrest Cover & Wheel Axis Cover</i>	<i>8-17</i>
<i>8.8.2 Replacement of the Front Frame</i>	<i>8-18</i>
<i>8.8.3 Replacement of the Air Filter Cover</i>	<i>8-19</i>

8.8.1 Replacement of the 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°.

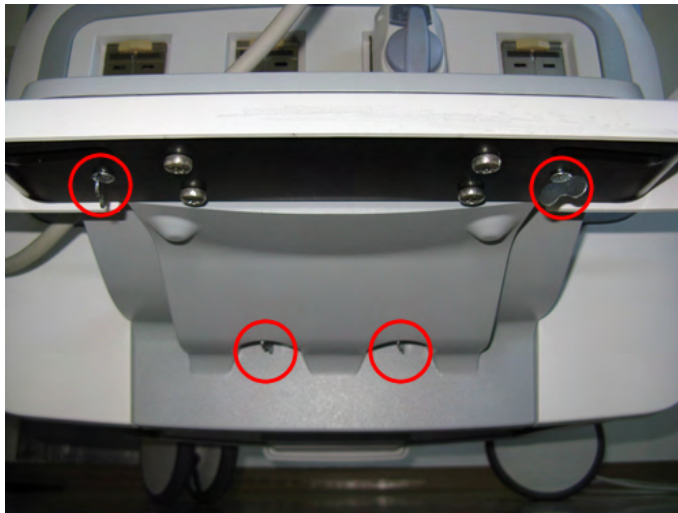


Figure 8-21 turn quick release devices 90° and remove the footrest cover

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 the Front Frame

Manpower

One person, 5 minutes

Tools

none

Preparations

1. Power Off/Shutdown the system as described in [Section 4.2.2 on page 4-4](#).

8.8.2.1 Front Frame - Removal Procedure

1. Gently remove the Voluson covering (A) and the rectangular covering strip (B).

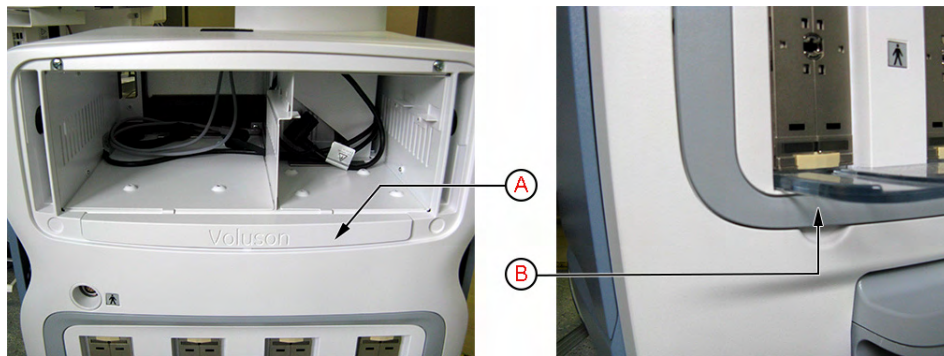


Figure 8-22 remove covering strips

8.8.2.2 Front Frame - Installation Procedure

1. Stick the rectangular covering strip and the Voluson covering back on the Front Cover.

8.8.3 Replacement of the 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](#).

8.8.3.1 Air Filter Cover - Removal Procedure

1. Pull the Air Filter Cover up.



Figure 8-23 pull the Air Filter Cover up

8.8.3.2 Air Filter Cover - Installation Procedure

1. Place the (new) Air Filter Cover on its original position.

8.8.3.3 Replacement of the Printer Flap

Manpower

One person, 1 minute

Tools

Phillips screwdriver PH1 and PH2

Preparations

1. Power Off/Shutdown the system as described in [Section 4.2.2 on page 4-4](#).

8.8.3.3.1 Printer Flap - Removal Procedure

1. Open the Side Cover Doors on both sides of the system.
2. Use a screwdriver and press the hinges inside.

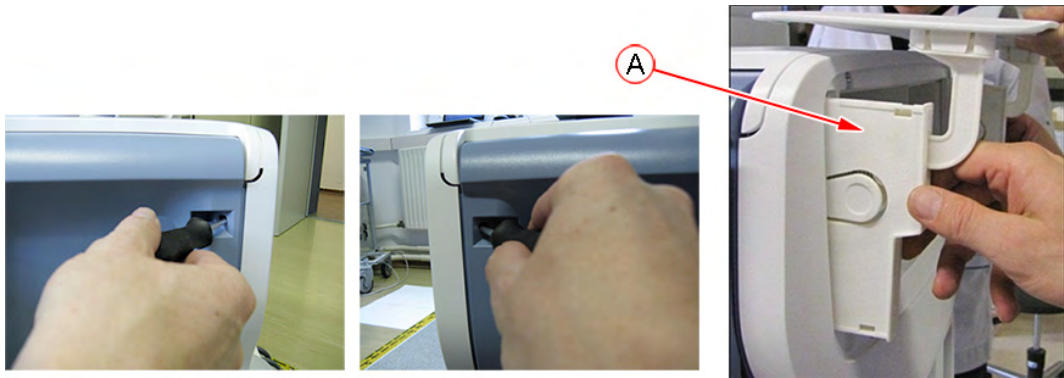


Figure 8-24 press the hinges inside with a screwdriver

3. Pull out the Printer Flap (A).

8.8.3.3.2 Printer Flap - Installation Procedure

1. Place the (new) Printer Flap on its original position.

Note *Make sure to hear the hinges snap.*

8.8.3.4 Mounting/Replacing the Printer Box

Manpower

One person, 3 minutes

Tools

Phillips screwdriver PH1 and PH2

Preparations

1. Power Off/Shutdown the system as described in [Section 4.2.2 on page 4-4](#).
2. Remove the Printer Flap as described in [Section 8.8.3.3.1 on page 8-20](#).
3. Remove the Voluson covering and rectangular covering strip (Front Frame) as described in [Section 8.8.2.1 on page 8-18](#).

8.8.3.4.1 Printer Box - Installation Procedure

1. Place the (new) Printer Box on its original position.

Note

Make sure to hear the hinges snap.



Figure 8-25 mount Printer Box

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 8-26 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.

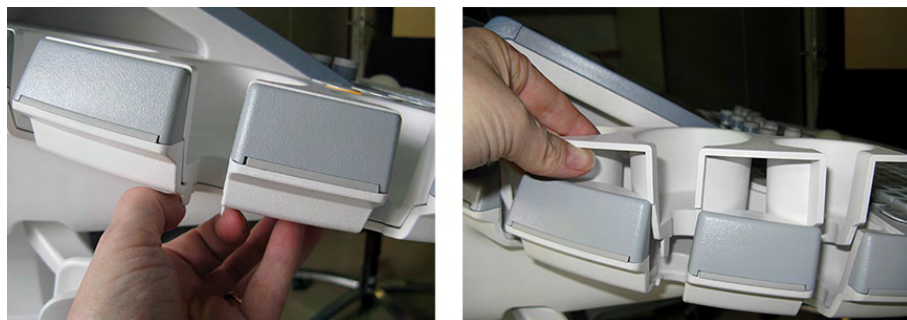


Figure 8-27 remove the probe holder

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.

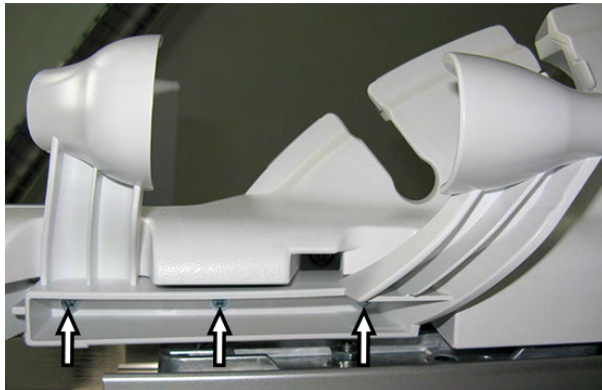


Figure 8-28 loosen screws and then remove probe holder

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).

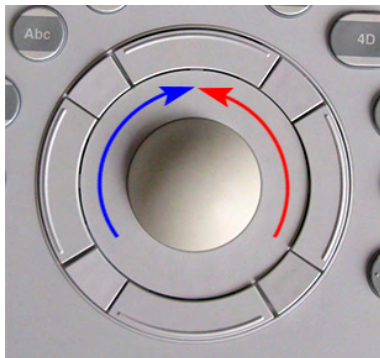


Figure 8-29 Trackball with Trackball
"fixation" ring

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 9-28](#) 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 8-30 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 6-5](#) 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 8-31 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 8-26](#)*
- *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 8-32 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.

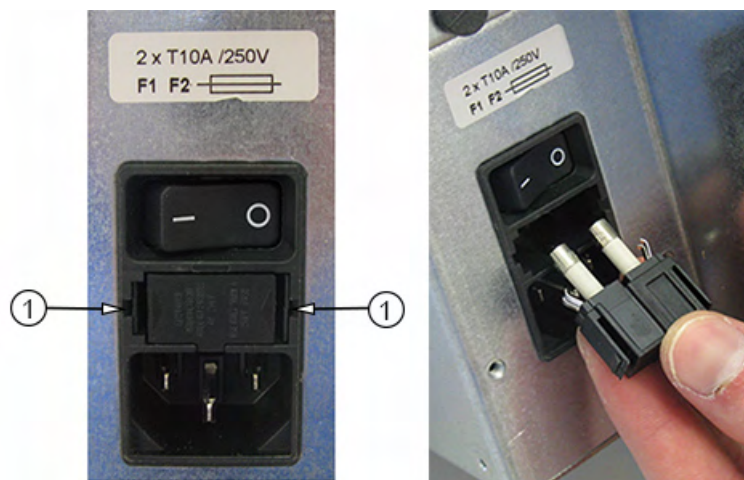


Figure 8-33 exchange fuses

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 - - - - - 8-29



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 9-42](#)).



Warning

After each installation, the leakage currents have to be measured according to IEC 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 8-34 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 8-35 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.



Figure 8-36 exchange fuses

115V (100-130V) -> 4AT
230V (220-240V) -> 2AT

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 9-42](#)).



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 3-22 on page 3-30](#).*

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.

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.*

Chapter 9

Renewal Parts

This chapter gives an overview of replacement parts available for the Voluson E-Series system.



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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9.2 Parts List Groups - - - - -	9-3
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9.4 User Interface - - - - -	9-9
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9.1 List of Abbreviations

AC	Alternating Current
ADC	Analog to Digital Converter
APM	Asset Performance Tool
ASIC	Application Specific Integrated Circuit
Assy	Assembly
BEP	BackEnd Processor
CPU	Central Processing Unit
CRU	Customer Replaceable Unit
CSD	Common Service Desktop
DAC	Digital to Analog Converter
DC	Direct Current
DSP	Digital Signal Processing
DVI	Digital Visual Interface
ePAT	Probe Assessment Tool (Probe Diagnostics)
EUM	Electronic User Manual
FE	FrontEnd
FRU	Y = Replacement part / N = Non Stock part
GGF	Beamformer Module
HDD	Hard Disk Drive
Int	Internal
I/O	Input/Output
LCD	Liquid Crystal Display
MAN	ECG Module
PCI	Peripheral Component Interconnect
PWA	Printed Wire Assembly
RAM	Random Access Memory
RFM	(RF-Interface & Beamformer) FE Mainboard
RSE	Pencil Probe Board (CW-Doppler)
RSP	Power Supply Module
RSX	(Beamformer Receiver/Transmitter) Extension Board for FE Mainboard (RFM)
RTB	Distribution Board Bottom
RTF	Probe Control Board
RTH	Distribution Board USB-Hub
RTT	Distribution Board Top
RTU	Control Console
RTV	Video Converter Board
SMBus	System Management Bus
UI	User Interface
UIS	Ultrasound Application Software
Vet	Veterinary / Animal use
WPA PSK	WiFi Protected Access Pre-Shared Key

Note: PSK is also referred to as "Personal" encryption standard.

9.2 Parts List Groups







Figure 9-1 Console Views

Table 9-1 Mechanical and user accessible parts

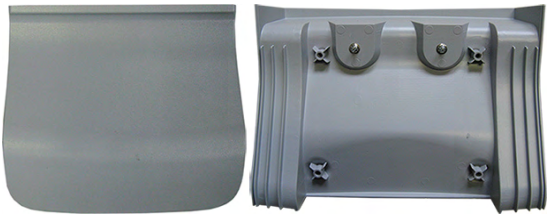


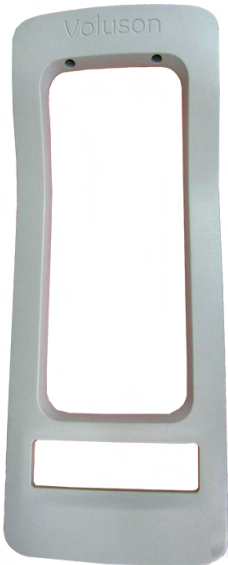

Item	Part Group Name	Description
100 -	<i>"Housing - Mechanical Hardware Parts & Covers" on page 9-4</i>	Housing Covers (except UI and Monitor), Caster Wheels, Handle
200 -	<i>"User Interface" on page 9-9</i>	Console (keyboard, trackball, display, special knobs and switches) Loudspeakers, Disk Drive, Probe holder, Console Covers, etc.
300 -	<i>"Monitor + Monitor Replacement Parts" on page 9-17</i>	Monitor + Monitor Replacement Parts
400 -	<i>"Main Power Modules" on page 9-20</i>	Power Supply Module
500 -	Main Board Module - <i>"FrontEnd (US-Part) Components" on page 9-21</i> - <i>"BackEnd (PC-Part) Components" on page 9-24</i>	. Ultrasound (FrontEnd) Components PC-Part (BackEnd) Components
600 -	<i>"Options and Upgrades" on page 9-28</i>	Software Options and Upgrades
700 -	<i>"Miscellaneous Cables" on page 9-30</i>	
800 -	Optional Peripherals and Accessories - <i>"Printers" on page 9-37</i> - <i>"Drives and additional Devices" on page 9-39</i> - <i>"Optional Equipment" on page 9-42</i>	. DVD recorder and Cable Kits B/W Printer, Color Printer, DeskJet Printer USB Stick, HDD Drive, WLAN, etc. Secondary Patient Monitor, etc.
	<i>"System Manuals" on page 9-44</i>	
900 -	Probes - <i>"2D-Probes - Curved Array Probes" on page 9-49</i> - <i>"2D-Probes - Linear Array Probes" on page 9-51</i> - <i>"2D-Probes - Phased Array Probes" on page 9-52</i> - <i>"Real-Time 4D Volume Probes" on page 9-53</i> - <i>"CW-Doppler - Pencil Probes" on page 9-56</i>	
950 -	<i>"Biopsy Needle Guides" on page 9-57</i>	

9.3 Housing - Mechanical Hardware Parts & Covers




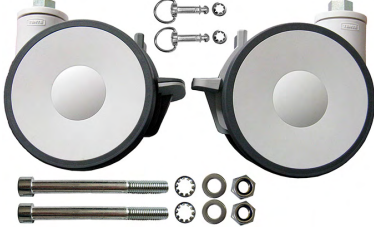

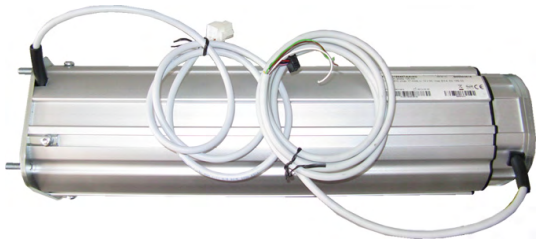
Table 9-2 Housing - Mechanical Hardware Parts & Covers

Item	Part Name	Part Number	Description	Qty	CRU	FRU
101	Top Cover	KTZ303564	Top Cover EC300 	1	N	Y
102	Side Cover incl. Door (left)	KTZ303548	Side Cover left (incl. Door for probe cables) EC300 	1	N	Y
103	Side Cover incl. Door (right)	KTZ303554	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	KTZ303559	Front Cover EC300 incl. Plug Support	1	N	Y
106	Front Cover 2	KTZ304042		1	N	Y
107	Front Frame	KTZ303557	Front Frame (Voluson covering + rectangular covering strip) EC300 	1	Y	Y
108	Printer Flap incl. Hinges	KTZ303815	Printer Flap (incl. Hinges) EC300 	1	N	Y
109	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
110	Footrest	KTZ303565	Footrest EC300 	1	Y	Y
111	Wheel Axis Cover	KTZ303567	Wheel Axis Cover EC300 	1	Y	Y
112	Back Cover	KTZ303569	Back Cover (Back Door) EC300 	1	N	Y
113	Handle Base	KTZ303568	Handle Base EC300, replaced by KTZ304045 (Handle complete) 	1	N	Y
114	Handle Bar	KTZ303570	Handle Bar EC300, replaced by KTZ304045 (Handle complete) 	1	N	Y


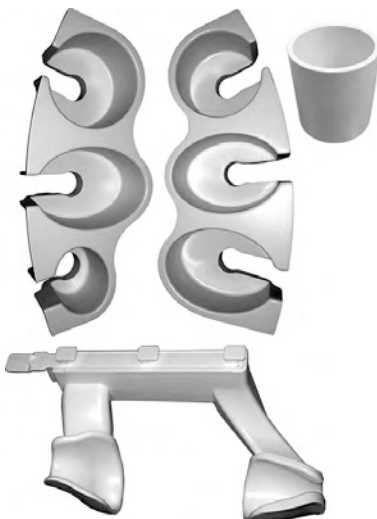


Item	Part Name	Part Number	Description	Qty	CRU	FRU
115	Handle complete EC300	KTZ304045	Handle complete (Handle Bar + Handle Base) EC300, replaces KTZ303568 + KTZ303570 	1	N	Y
116	Air Filter Cover	KTZ303826	Air Filter Cover EC300 	1	Y	Y
117	Air-Flow parts	KTZ304078	Air-Flow parts 	1	N	Y
118	Power Supply Cover	KTZ303563	Power Supply Cover EC300 	1	N	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
119	Caster front ("Steinco")	KTZ303911	Caster front (lockable, 2 pcs.) EC300 	2	N	Y
120	Caster back ("Steinco")	KTZ303912	Caster back EC300 	1	N	Y
121	Caster back, lockable ("Steinco")	KTZ303913	Caster back (lockable) EC300 	1	N	Y
122	Caster front universal ("Tente")	KTZ304057	Caster front, 2 pcs. (lockable) incl. hexagon bolts, washers, lock-nuts and quick fastener 	2	N	Y
123	Caster back universal ("Tente")	KTZ304058	Caster back, 2 pcs. (1 pcs. is lockable) incl. hexagon bolts, washers and lock-nuts 	1 / 1	N	Y
124	Lifting Column, 12V	KTZ302806	Lifting Column, 12V 	1	N	Y


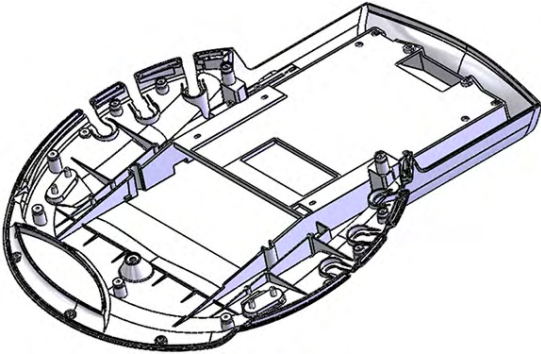


Note *DO NOT mix "Steinco" and new universal "Tente" Casters. Please identify the used Casters before ordering!*

9.4 User Interface

Table 9-3 User Interface

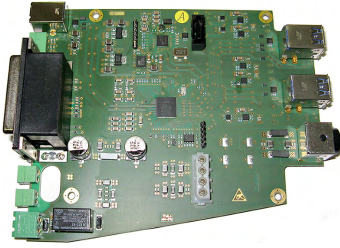

Item	Part Name	Part Number	Description	Qty	CRU	FRU
201	Cable Holder	KTZ134656	Probe Cable Holder (1 pcs.) for Voluson E-Series 	2	N	Y
202	Probe Holder Set	KTZ303933	Probe holder Set RTU100 (Probe holder inlet left/right, Gel holder inlet and holder for Endocavity probe left) 	1	Y	Y
203	Probe Holder right	KTZ304030	Probe Holder for Endocavity probe right) 	1	N	Y
204	Back Cover Set	KTZ304031	Back Cover Set RTU100  1 Monitor Plug Cover 2 Monitor Adapter Cover 3 Top Housing Cover	1	N	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
205	Bumper Set	KTZ303585	Bumper Set RTU100 	1	N	Y
206	Edge Protector Set	KTZ303934	Edge Protector Set RTU100 	1	N	Y
207	Caps Alphanumeric Keyboard	KTZ303965	Caps Alphanumeric Keyboard RTU100, English 	1	Y	Y
208	Hardkey Set RTU100	KTZ303936	Hardkey Set RTU100 	1	Y	Y
209	Hardkey Set RTU110	KTZ304070	Hardkey Set RTU110 	1	Y	Y



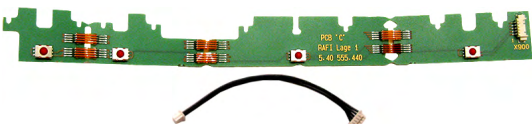
Item	Part Name	Part Number	Description	Qty	CRU	FRU
210	Caps for Encoder and Joystick	KTZ303937	Caps for Encoder and Joystick RTU100 	5/7	Y	Y
211	Bottom Housing RTU100	KTZ303583	Bottom Housing RTU100 	1	N	Y
212	RTU100 Console	KTZ303935	RTU100 Console EC300 	1	N	Y
213	RTU110 Console	KTZ304071	RTU110 Console EC320 	1	N	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
214	Top Cover RTU100	KTZ303938	Top Cover RTU100; incl. 3 Voluson logo stickers 	1	N	Y
215	Trackball Kit	KTZ303939	Trackball Kit RTU100 	1	N	Y
216	Trackball Ring	KTZ303940	Trackball Ring RTU100 (2 pcs.) 	1	Y	Y
217	Encoder Mechanic	KTZ303941	Encoder Mechanic RTU100 (5 pcs.) 	5	N	Y
218	Joycoder Mechanic	KTZ303942	Joycoder Mechanic RTU100 (7 pcs.) 	7	N	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
219	Console Cable Set	KTZ303943	Console Cable Set RTU100 	1	N	Y
220	Disk Drive3 DVD+(R)W - SATA	KTZ303258	DVD+(R)W Writer internal (no own cabinet) 	1	N	Y
221	RTH6b.Px - Distribution USB-Hub Board	KTZ304007	RTH6x - Distribution Board USB-Hub 	1	N	Y
222	RTT3.P3 - Distribution Board Top	KTZ280290	RTT3 - Distribution Board Top 	1	N	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
223	RTH50 - Distribution Board	KTZ304040	RTH50 - Distribution Board "complete" 	1	N	Y
224	USB3.0 Cable RTU100	KTZ304048	Cable USB3.0 (from RTH50 to external USB connectors beside DVD Drive at Top Console) 2 pcs. 	2	N	Y
225	USB3.0 Hub - 1 Port	KTZ304012	USB3.0 Hub (1 Port) RTU100 	1	N	Y
226	Loudspeaker Top Console	KTZ208132	Loudspeaker on User Interface (1 pcs.) 	2	N	Y
227	Fan User Interface	KTZ220645	Fan User Interface 	1	N	Y
228	Console Alphanumeric Keyboard	KTZ303944	Console Alphanumeric Keyboard RTU100 	1	N	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
229	Console Main Board	KTZ303945	Console Main Board RTU100 	1	N	Y
230	Console Sub Board	KTZ303946	Console Sub Board RTU100 	1	N	Y
231	Labels UI, VE6, VE8, VE10	KTZ304103	Labels for User Interface (Voluson logo stickers, 3 pcs. each for VE6, VE8 and VE10) 	1	Y	Y
232	Console Touchscreen complete	KTZ303947	Console Touchscreen complete RTU100 	1	N	Y
233	Console Touch with Housing	KTZ303948	Console Touch with Housing RTU100; without any electronics 	1	N	Y



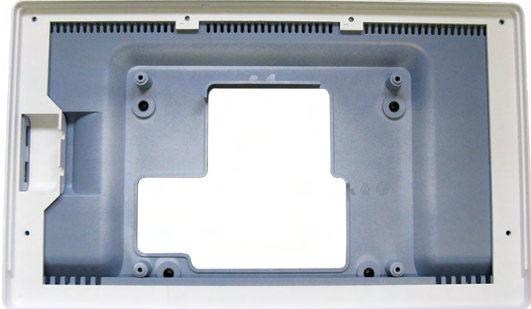

Item	Part Name	Part Number	Description	Qty	CRU	FRU
234	Display-Joycoder Board	KTZ303949	Display-Joycoder Board RTU100 	1	N	Y
235	Front Key Board	KTZ303950	Front Key Board RTU100 	1	N	Y
236	Front Key Board with cable	KTZ303966	Front Key Board with cable RTU100 	1	N	Y

9.5 Monitor + Monitor Replacement Parts





Table 9-4 Monitor + Monitor Replacement Parts

Item	Part Name	Part Number	Description	Qty	CRU	FRU
301	Monitor OLED 22" (MDM300) complete	KTZ304059	22" Color Image OLED Monitor complete 	1	N	Y
302	Monitor Back Cover Set MDM3xx ⁸	KTZ304102	Monitor Back Cover Set MDM3xx (22" OLED Monitor only) at OLED Monitor Arm MDT30 at OLED Monitor Arm Ergotron 	1	Y	Y
303	Monitor Arm (Ergotron) - 22" OLED	KTZ304101	Monitor Arm (Ergotron) for 22" OLED Monitor 	1	N	Y

⁸ Monitor Back Cover depends on the currently installed "OLED" Monitor Arm type (MDT30 or Ergotron). If the Monitor Arm is replaced by the other Monitor Arm type, the Monitor Back Cover needs to be exchanged too (i.e., ordered separately, KTZ304102).



Item	Part Name	Part Number	Description	Qty	CRU	FRU
304	Monitor Arm (Daeil) MDT30 - 22" OLED	KTZ304069	MDT30 Monitor Arm (Daeil) for 22" OLED Monitor 	1	N	Y
305	Monitor Color LCD 23" (MDM200) complete	KTZ303839	23" Color Image LCD Monitor complete 	1	N	Y
306	Monitor Color LCD 23" (MDM210) complete	KTZ304047		1	N	Y
307	Monitor Housing Set	KTZ303951	Monitor Housing Set for 23" LCD Monitor 	1	N	Y
308	Monitor Back Cover Set MDM2xx ⁹	KTZ304090	Monitor Back Cover Set MDM2xx (23" LCD Monitor only) at MDT20 Monitor Arm at Ergotron Monitor Arm 	1	Y	Y

⁹ Monitor Back Cover depends on the currently installed Monitor Arm type (MDT20 or Ergotron). If the Monitor Arm is replaced by the other Monitor Arm type, the Monitor Back Cover needs to be exchanged too (i.e., ordered separately, KTZ304090).

Item	Part Name	Part Number	Description	Qty	CRU	FRU
309	Monitor Arm (Daeil) MDT20 - 23" LCD	KTZ303879	MDT20 Monitor Arm (DAEIL) with trapezoidal mounting plate for 23" LCD Monitor 	1	N	Y
310	Monitor Arm (Ergotron) - 23" LCD	KTZ304089	Monitor Arm (Ergotron) for 23" LCD Monitor 	1	N	Y
311	Monitor Cable Set MDT20	KTZ303952	MDT20 Monitor Cable Set for 23" LCD Monitor (1x Cable USB3.0, 1x Cable DVI to HDMI, 1x Mini DIN Monitor Power Cable) 	1	N	Y
312	Monitor Cable USB3.0 MDT20	KTZ304034	MDT20 Monitor Cable USB3.0 (2 pcs.) 	2	N	Y

9.6 Main Power Modules

Table 9-5 Main Power Modules

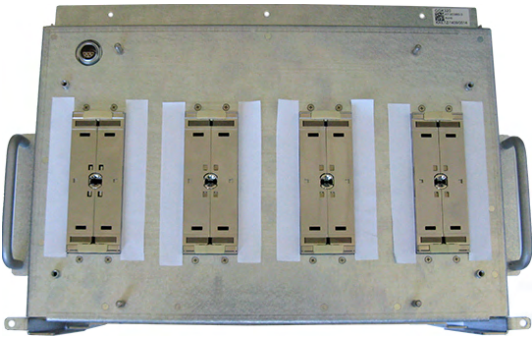
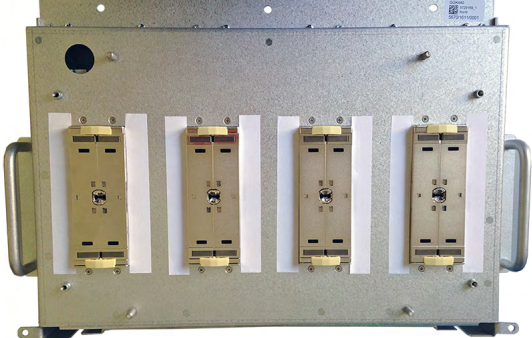
Item	Part Name	Part Number	Description	Qty	CRU	FRU
401	RSP3-3c - Power Supply EC300	KTZ303892	Power Supply Module (RSP) 	1	N	Y
403	Fuse Set	KTZ280043	Fuses for Power Supply (T1.25A, T1.6A, T10A and T15A; 10 pcs. each = 40) 	-	Y	Y

9.7 Main Board Module

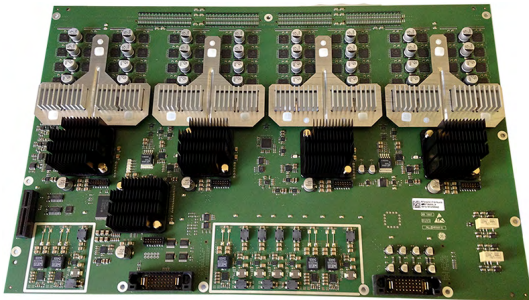
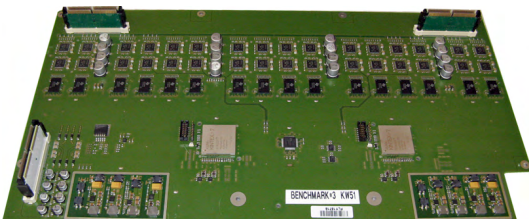
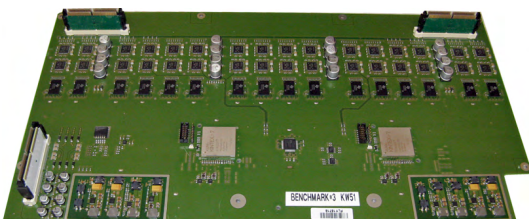
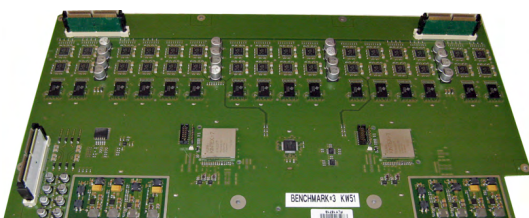
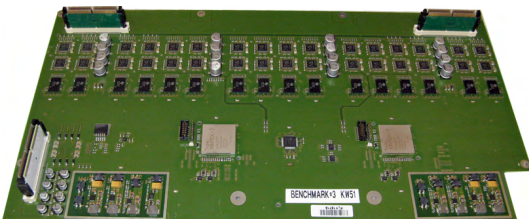
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9.7.1 FrontEnd (US-Part) Components	9-21
9.7.2 BackEnd (PC-Part) Components	9-24

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	KTZ303953	Probe Control Assembly (Voluson E6 only) 	1	N	Y
502	RTF200-EC300 Probe Control Board	KTZ303954	Probe Control Assembly (Voluson E8 only) 	1	N	Y
503	RTF300-EC300 Probe Control Board	KTZ303955	Probe Control Assembly (Voluson E10, compatible to all versions) 	1	N	Y
504	RTF340-EC320 Probe Control Board	KTZ304072	Probe Control Assembly (Voluson E6 and Voluson E8) 	1	N	Y

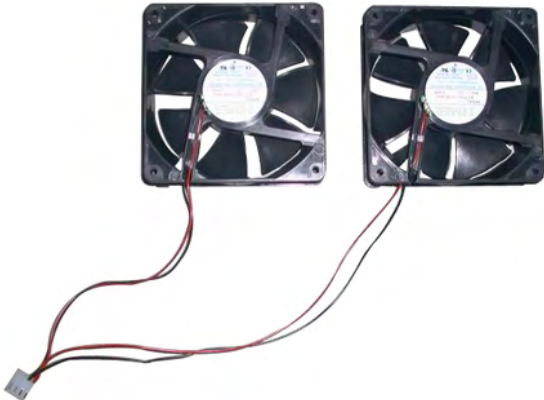


Item	Part Name	Part Number	Description	Qty	CRU	FRU
505	RTF441-EC320 Probe Control Board	KTZ304082	Probe Control Assembly (compatible to all versions 	1	N	Y
506	RSE10 Pencil Probe Board	KTZ302856	Pencil Probe Board 	1	N	Y
507	RFM201 FE-Mainboard without MUX	KTZ303916	FE-Mainboard; without MUX 	1	N	Y
508	RFM221 FE-Mainboard + CW-steerable; without MUX	KTZ303915	FE-Mainboard + CW-steerable; without MUX 	1	N	Y
509	RFM323-EC320 FE-Mainboard without MUX	KTZ304073	FE-Mainboard + CW-steerable without MUX, Voluson E6 and Voluson E8 	1	N	Y


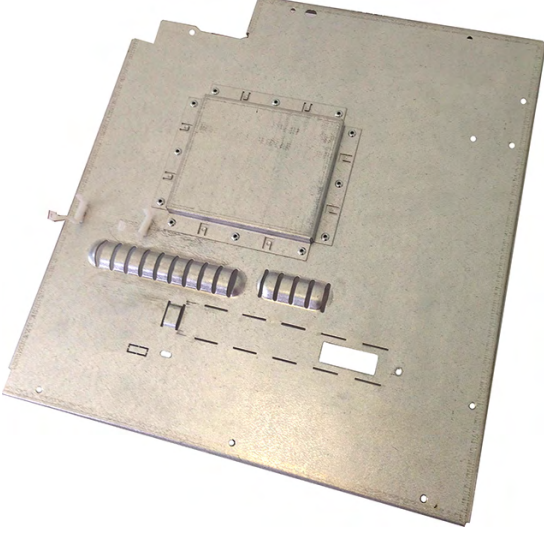

Item	Part Name	Part Number	Description	Qty	CRU	FRU
510	RFM423-EC320 FE-Mainboard without MUX	KTZ304074	FE-Mainboard + CW-steerable without MUX, compatible to all versions 	1	N	Y
511	RSX10 - Extension Board for RFM	KTZ303250	Extension Board for FE-Mainboard RFM 	1	N	Y
512	RSX110 - Extension Board for RFM	KTZ303759	Extension Board for FE-Mainboard RFM (Voluson E6 only) 	1	N	Y
513	RSX20 - Extension Board for RFM + CW-steerable	KTZ303054	Extension Board for FE-Mainboard RFM + CW-steerable 	1	N	Y
514	RSX120 - Extension Board for RFM + CW-steerable	KTZ303760	Extension Board for FE-Mainboard RFM + CW-steerable (Voluson E6 only) 	1	N	Y

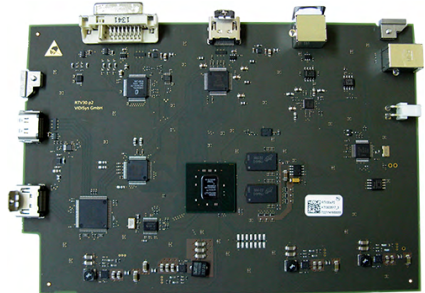
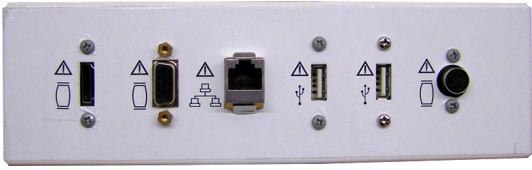
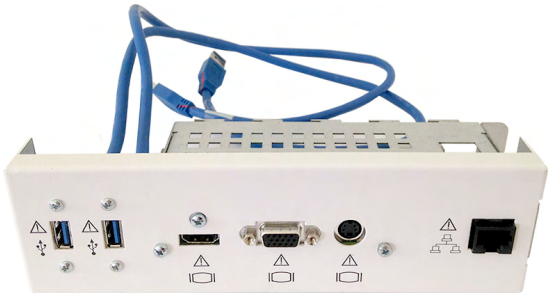
9.7.2 BackEnd (PC-Part) Components

Table 9-7 BackEnd (PC-Part) Components

Item	Part Name	Part Number	Description	Qty	CRU	FRU
551	Graphic Card 5 EC300, GTX750	KTZ304029	Graphic Card for PC-Motherboard 	1	N	Y
552	Graphic Card 6, EC320 GTX950	KTZ304076	Graphic Card for PC-Motherboard 	1	N	Y
553	Graphic Card 7 EC3x0, GTX1050	KTZ304106	Graphic Card for PC-Motherboard 	1	N	Y
554	Battery Lithium CR2032 (3V)	KTZ208791	Lithium Battery CR2032 (3V) for PC-Motherboard 	1	N	Y
555	Hard Disk Drive (HDD)	KTZ302446	Hard disk drive SATA 500 Gbyte (Western Digital or Hitachi) System/Boot DVD (see: Table 9-8 on page 9-28) is required 	1	N	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
556	Fan Set (2 fan) for PC - BackEnd	KTZ134698	Fan for PC-box (2 fan) - BackEnd 	1	N	Y
557	Back End Processor (BEP) Kit, EC300 (BT15/BT16), incl. housing and cables	KTZ303830	Kit contains ATX Motherboard "ADVANTECH", CPU cooler, RAM, Fan(s), housing + internal cables premounted 	1	N	Y
558	Back End Processor (BEP) Kit, EC320 (BT17), incl. housing and cables	KTZ304075	Kit contains ATX Motherboard "ADVANTECH", CPU cooler, RAM, Fan(s), housing + internal cables premounted 	1	N	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
559	Back End Processor (BEP) Kit, EC330 (BT18), incl. housing and cables	KTZ304107	Kit contains Motherboard, CPU cooler, RAM, Fan(s), housing + internal cables premounted 	1	N	Y
560	PC-Cover plate for GES35	KTZ304108	PC-Cover plate for GES35 (I/O panel and Video Converter Board) 	1	N	Y
561	RTB50.P1 - Distribution Board Bottom	KTZ303930	Distribution Board Bottom 	1	N	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
562	RTV30 - Video Management Board	KTZ303517	<p>Video Management Board</p> 	1	N	Y
563	GES30 - External I/O Connection Panel	KTZ303754	<p>External Rear Panel incl. VGA, USB, Network and S-Video cables to the Voluson E-Series system (internal)</p> 	1	N	Y
564	GES35 - I/O Panel and Video Converter Board (RTV35)	KTZ304105	<p>External I/O Panel and Video Converter Board (RTV35) incl. HDMI, VGA, USB, Network and S-Video connector</p> 	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 EC330 (BT18 - Ext.0, 18.0.0)	KTZ304119	bootable DVD for System HDD recovery <u>Contents:</u> SP with newest MS patches, Linux rescue partition, System C: Image (Windows 10), UISApp, Backup, EUM, Database Repair Tool, etc. <u>Note:</u> Refer to SN79009 , which is the best source for the latest revision.	1	Y	Y
602	System/Boot DVD EC320 (BT17 - Ext.4, 17.0.4)	KTZ304109	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. <u>Note:</u> Refer to SN79009 , which is the best source for the latest revision.	1	Y	Y
	System/Boot DVD EC320 (BT17 - Ext.3, 17.0.3)	KTZ304100				
	System/Boot DVD EC320 (BT17 - Ext.2, 17.0.2)	KTZ304094				
	System/Boot DVD EC320 (BT17 - Ext.1, 17.0.1)	KTZ304092				
	System/Boot DVD EC320 (BT17 - Ext.0, 17.0.0)	KTZ304091				
603	System/Boot DVD EC310 (BT16 - Ext.2, 16.0.3)	KTZ304095	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. <u>Note:</u> Refer to SN79009 , which is the best source for the latest revision.	1	Y	Y
	System/Boot DVD EC310 (BT16 - Ext.2, 16.0.2)	KTZ304084				
	System/Boot DVD EC310 (BT16 - Ext.1, 16.0.1)	KTZ304066				
	System/Boot DVD EC310 (BT16 - Ext.0, 16.0.0)	KTZ304064				
604	System/Boot DVD EC300 (BT15 - Ext.6, 15.0.6)	KTZ304085	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. <u>Note:</u> Refer to SN79009 , which is the best source for the latest revision.	1	Y	Y
	System/Boot DVD EC300 (BT15 - Ext.5, 15.0.5)	KTZ304067				
	System/Boot DVD EC300 (BT15 - Ext.4, 15.0.4)	KTZ304056				
	System/Boot DVD EC300 (BT15 - Ext.3, 15.0.3)	KTZ304050				
	System/Boot DVD EC300 (BT15 - Ext.2, 15.0.2)	KTZ304049				
	System/Boot DVD EC300 (BT15 - Ext.1, 15.0.1)	KTZ304039				
605	Upgrade Kit: Voluson E-Series BT15 to BT16	H48691ZG	BT16 Upgrade kit (incl. System DVD, System Manuals, etc.)	-	N	N
606	Upgrade Kit: Voluson E-Series BT15 to BT17	H48701MS	BT17 Upgrade kit (incl. Hardware components, System DVD, System Manuals, etc.)	-	N	N
607	Upgrade Kit: Voluson E-Series BT16 to BT17	H48701GW	BT17 Upgrade kit (incl. Hardware components, System DVD, System Manuals, etc.)	-	N	N
608	Upgrade Kit: Voluson E-Series BT17 to BT18	H48701WC	BT18 Upgrade kit (incl. Hardware components, System DVD, System Manuals, etc.)	-	N	N
609	Upgrade Kit: Voluson E10 OLED Monitor	H48701EC	OLED Monitor Upgrade kit (incl. Monitor OLED 22" MDM300, Monitor Arm for OLED, Upgrade Manual)	-	N	N
610	CW Doppler (SW)	H48691NZ	encrypted Software Option string (password)	-	N	N
611	Advanced 4D	H48681FM	encrypted Software Option string (password)	-	N	N

Item	Part Name	Part Number	Description	Qty	CRU	FRU
612	VOCAL II - Volume Calculation	H48681FN	encrypted Software Option string (password)	-	N	N
613	Advanced VCI - Volume Contrast Imaging	H48681FP	encrypted Software Option string (password)	-	N	N
614	STIC "Basic" - Spatio-Temporal Image Correlation	H48681FS	encrypted Software Option string (password)	-	N	N
615	Coded Contrast Imaging - Contrast Media	H48681FT	encrypted Software Option string (password)	-	N	N
616	SonoVCAD - Heart	H48681FW	encrypted Software Option string (password)	-	N	N
617	SonoAVC - Sono Automated Volume Count	H48681FX	encrypted Software Option string (password)	-	N	N
618	SonoVCAD labor	H48681FY	encrypted Software Option string (password)	-	N	N
619	Anatomical M-Mode	H48681FZ	encrypted Software Option string (password)	-	N	N
620	Advanced STIC * - Spatio-Temporal Image Correlation	H48681GD	encrypted Software Option string (password)	-	N	N
621	Elastography	H48681GB	encrypted Software Option string (password)	-	N	N
622	V-SRI	H48681TK	encrypted Software Option string (password)	-	N	N
623	HD <i>Live</i> (Europe and Latin America only)	H48691KK	encrypted Software Option string (password)	-	N	N
624	HD <i>Live</i> Silhouette (BT15-BT17)	H48691XZ	encrypted Software Option string (password)	-	N	N
625	HD <i>Live</i> Silhouette	H48701WU	encrypted Software Option string (password)	-	N	N
626	HD <i>Live</i> Studio	H48701WW	encrypted Software Option string (password)	-	N	N
627	SonoMetrium	H48701WS	encrypted Software Option string (password)	-	N	N
628	IOTA Simple Rules	H48701WP	encrypted Software Option string (password)	-	N	N
629	eM6C (Electronic 4D Probe) E4D Advanced Features	H48691YA	encrypted Software Option string (password)	-	N	N
630	Full Disk Encryption	H48701UX	encrypted Software Option string (password)	-	N	N
631	Advanced Security Features	H48701WM	encrypted Software Option string (password)	-	N	N
632	SW DVR (Software Digital Video Recorder)	H48691XF	encrypted Software Option string (password)	-	N	N
633	DVD and USB Recorder	H48701WR	encrypted Software Option string (password)	-	N	N
634	RLS Option (Russian Language Support)	H48691KG	encrypted Software Option string (password)	-	N	N
635	4D View Package (PC software)	H48691KL	encrypted Software Option string (password)	-	N	N
636	Swedish Key Cap Kit	KTZ303956	kit includes special native language keys	-	Y	Y
637	Danish Key Cap Kit	KTZ303957	kit includes special native language keys	-	Y	Y
638	Norwegian Key Cap Kit	KTZ303958	kit includes special native language keys	-	Y	Y
639	Finnish Key Cap Kit	KTZ303959	kit includes special native language keys	-	Y	Y
640	Spanish Key Cap Kit	KTZ303960	kit includes special native language keys	-	Y	Y
641	French Key Cap Kit	KTZ303961	kit includes special native language keys	-	Y	Y
642	German Key Cap Kit	KTZ303962	kit includes special native language keys	-	Y	Y
643	Italian Key Cap Kit	KTZ303963	kit includes special native language keys	-	Y	Y
644	Russian Key Cap Kit	KTZ303964	kit includes special native language keys	-	Y	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
645	Swiss Key Cap Kit	KTZ304060	kit includes special native language keys	-	Y	Y
646	South Slavic Key Cap Kit	KTZ304086	kit includes special native language keys	-	Y	Y

Note A sales order has to be obtained for item 605 - 635!


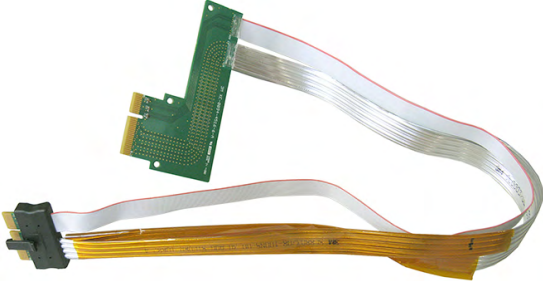

Software Options (item 602 - 618): Once the order has been processed, the option string can be either entered by the customer, FE or Applications support.

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

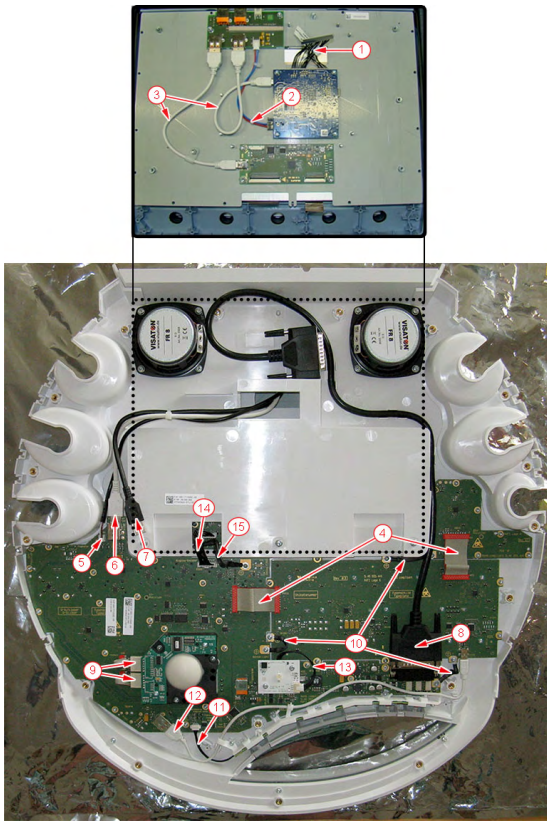

Item	Part Name	Part Number	Description	Qty	CRU	FRU
701	SATA Data Cable for HD-Drive	KTZ300244	SATA Data Cable for HD-Drive 	1	N	Y
702	PCI-E Connection Cable (FEP - BEP)	KTZ303121	PCI-E Connection from FrontEnd to BackEnd Cable 	1	N	Y
703	Cable Stereo Jack - Cinch RoHS	KTZ280285	Cable from PC-Sound-StereoJack to DVD Shelf 	2	N	Y

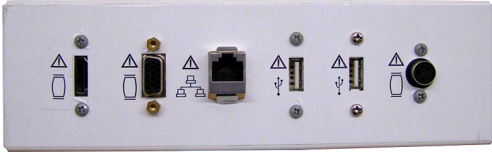

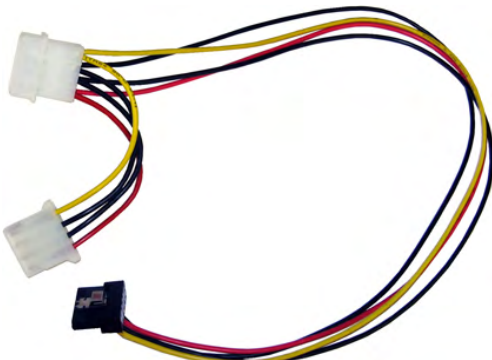


Item	Part Name	Part Number	Description	Qty	CRU	FRU
704	KVX1 Network Cable - RoHS	KTZ280284	Network Cable from external rear panel (GES) to the Voluson E-Series (internal) rear panel 	1	N	Y
705	Cable DVI (M) to HDMI (M)	KTZ303895	Cable DVI (M) to HDMI (M), 30 cm 	1	N	Y
706	Cable HDMI (M) to HDMI (M)	KTZ304110	Cable HDMI (M) to HDMI (M) 	1	N	Y
707	Monitor Cable Set MDT20	KTZ303952	MDT20 Monitor Cable Set for 23" LCD Monitor (1x Cable USB3.0, 1x Cable DVI to HDMI, 1x Mini DIN Monitor Power Cable) 	1	N	Y
708	Monitor Cable USB3.0 MDT20	KTZ304034	MDT20 Monitor Cable USB3.0 (2 pcs.) 	2	N	Y



Item	Part Name	Part Number	Description	Qty	CRU	FRU
709	Power Cord - Europe 230V	KTZ220388	Power Cord Europe 230V/240V used at Mains Input Connector C14 (10A type) 	-	Y	Y
710	Power Cord - USA (Hops. grade)	KTZ220389	Power Cord USA Hospital Grade used at Mains Input Connector C14 (10A type) 	-	Y	Y
711	Power Cord - Japan (Hops. grade)	KTZ220390	Power Cord Japan Hospital Grade used at Mains Input Connector C14 (10A type) 	-	Y	Y
712	Power Cord - China	KTZ220391	Power Cord China used at Mains Input Connector C14 (10A type) 	-	Y	Y
713	Power Cord - Australia	KTZ220392	Power Cord Australia used at Mains Input Connector C14 (10A type) 	-	Y	Y
714	Power Cord - India RoHS	KTZ220289	Power Cord India used at Mains Input Connector C14 (10A type) 	-	Y	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
715	Power Cord - United Kingdom (UK)	KTZ220476	Power Cord United Kingdom (UK) 240V used at Mains Input Connector C14 (10A type) 	-	Y	Y
716	Power Cord - South Africa	KTZ220477	Power Cord South Africa used at Mains Input Connector C14 (10A type) 	-	Y	Y
717	Power Cord - Argentina	KTZ220478	Power Cord Argentina used at Mains Input Connector C14 (10A type) 	-	Y	Y
718	Power Cord - Israel	KTZ220479	Power Cord Israel used at Mains Input Connector C14 (10A type) 	-	Y	Y
719	Power Cord - Switzerland	KTZ220480	Power Cord Switzerland used at Mains Input Connector C14 (10A type) 	-	Y	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
720	Power Cord - Denmark	KTZ220481	Power Cord Denmark used at Mains Input Connector C14 (10A type) 2 pcs. 	-	Y	Y
721	Power Cord - Brazil	KTZ280185	Power Cord Brazil used at Mains Input Connector C14 (10A type) 	-	Y	Y
722	Power Cord - Extension	KTZ301990	Power Cord Extension for C13 connector (2m) 	-	Y	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
723	Console Cable Set RTU100	KTZ303943	<p>Console Cable Set RTU100</p>  <ol style="list-style-type: none"> 1 cable LVDS 2 cable Backplane -> Display 3 cable USB-A -> USB-mini 4 cable Main <-> Satellite 5 cable Main -> Backplane 6 cable USB-A <-> USB-B, white 7 cable USB-A <-> USB-B, black 8 cable UI main power D-SUB 9 cable Trackball 10 cable earth connection, 50mm 11 cable Frontkey <-> Main 12 cable USB Main PCB <-> AN PCB (USB) 13 cable Main -> Light 14 cable Display/Joycoder PCBA -> Main (JST PA) 15 cable earth connection, 100mm 	1	N	Y
724	USB3.0 Cable RTU100	<i>KTZ304048</i>	<p>Cable USB3.0 (from RTH50 to external USB connectors beside DVD Drive at Top Console) 2 pcs.</p> 	2	N	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
725	GES30 External I/O Connection Panel	KTZ303754	External Rear Panel incl. VGA, USB, Network and S-Video cables to the Voluson E-Series system (internal) 	1	N	Y
726	Cable Harness 3 EC3xx	KTZ304077	Cable Harness 3 (Grounding, Console, Monitor DVI, USB3.0, USB UI and USB Hub cable), cable tube, tie-wraps, etc. 	1	N	Y
727	2nd HDD Power Cable	KTZ280126	S-ATA Power Y-splitter cable for data transfer from old to new HDD 	-	N	Y
728	SATA Data Cable for DVD-Drive	KTZ303261	SATA Data cable for DVD-Drive 	1	N	Y
729	SATA Power Cable for DVD-Drive	KTZ303260	SATA Power cable for DVD-Drive <u>Note:</u> Only used when RTH6x is installed. 	1	N	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
730	USB Cable for ECG module	KTZ303296	USB cable for ECG module 	1	N	Y
731	ECG patient cable	KTZ303297	ECG patient cable, IEC Type 	-	Y	Y



9.10 Optional Peripherals and Accessories

Content in this section



9.10.1 Printers	9-37
9.10.2 Drives and additional Devices	9-39
9.10.3 Optional Equipment	9-42

9.10.1 Printers

Table 9-10 Optional Peripherals and Accessories - Printers

Item	Part Name	Part Number	Description	Qty	CRU	FRU
811	Digital BW Video Printer (e.g., Sony UP-D898MD)	KTZ220507 H48651ML	Digital B/W Video Printer, USB-Port 	-	N	Y
812	Digital Color Printer (Sony UP-D25MD)	5389822 H46831B	Digital Color Printer, A6, USB-Port 	-	N	Y




Item	Part Name	Part Number	Description	Qty	CRU	FRU
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)	<i>KTZ303932</i> <i>H48691WX</i>	Additional Printer Box for Color Printer A6, incl. mounting plates and screws 	-	N	N
815	Color Laser Printer (HP LaserJet M451)	<i>5456780</i> <i>H48701EZ</i>	Color Laser Printer for 220V systems 	-	N	Y
816	Color Laser Printer (HP LaserJet M451)	<i>5438549</i> <i>H48701FA</i>	Color Laser Printer for 110V systems 	-	N	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
817	Color Laser Printer (HP LaserJet M452dn)	066E8922	Color Laser Printer for 220V systems 	-	N	Y
	Color Laser Printer (HP LaserJet M452nw), Wi-Fi Direct	KTZ304096 H48701EZ		-	N	Y
818	Color Laser Printer (HP LaserJet M452dn)	066E8923	Color Laser Printer for 110V systems 	-	N	Y
	Color Laser Printer (HP LaserJet M452nw), Wi-Fi Direct	KTZ304097 H48701FA		-	N	Y

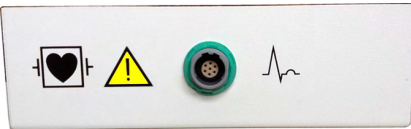

Note *Illustrations may not correspond to the actual product!*

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 	-	N	Y
822	Gigabit Network Isolator	KTZ303975 H48691RK	Gigabit Network Isolator 	-	N	Y
823	Cellular Modem	KTZ304025 H48691WL	Cellular Modem (SIM Card Connection) incl. power supply and USB cable 	-	N	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
824	USB Stick	<i>2411544</i> <i>H48651TB</i>	USB Flash Memory Stick 	-	Y	Y
825	Wireless Network Interface	<i>KTZ196269</i> <i>H48671DT</i>	Wireless Network Interface ("Netgear" WG111v3 WLAN Adapter) obsolete , please order PNo 5737413 except for systems located in Brazil and (South)Korea 	-	Y	Y
826	USB-WLAN Stick Japan	<i>KTZ280076</i> <i>H48681TR</i>	USB-WLAN Stick Japan obsolete , please order PNo 5737413 	-	Y	Y
827	USB-WLAN Adapter A6210	<i>5737413</i> <i>H44932LH</i>	USB-WLAN Adapter A6210 ("Netgear") 	-	Y	Y
828	Barcode Scanner	<i>KTZ304087</i> <i>H48701JH</i>	Barcode Scanner, USB 	-	Y	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
829	ECG-preamplifier (MAN30)	<i>KTZ304009</i> <i>H48691LN</i>	consists of ECG-preamplifier and patient connection cable 	-	N	Y
830	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 without cables, etc. 	-	Y	Y
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

Item	Part Name	Part Number	Description	Qty	CRU	FRU
836	UPS (Uninterruptible Power Supply) for 100-130V AC countries	H48691PD	<p>Medical-grade UPS protection with built-in line-interactive voltage regulation (corrects brownouts as low as 82V and overvoltages as high as 142V back to normal 120V levels).</p> 	-	-	N
837	UPS (Uninterruptible Power Supply) for 220-240V AC countries	H48691PE	<p>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).</p> 	-	-	N
838	Power Filter	KTZ304093 H48701EL	<p>Power Filter to eliminate EMC noise (filter incl. cables)</p> 	-	-	N
839	VET-Label-Kit	KTZ304117 H48701WX	<p>Labels for Veterinary systems (Veterinary Use label 1 pcs., Not for Human Use label 1 pcs., VET label 2 pcs.)</p> 	-	-	Y

Note *Illustrations may not correspond to the actual product!*

9.11 System Manuals

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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

Part Name	Part No. - Voluson E8	Part No. - Voluson E6	Part No. - Voluson E10
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
Advanced Reference Manual - English	H48691UY	H48691UY	H48691UY
Advanced Reference Manual - French	H48691XG	H48691XG	H48691XG
Advanced Acoustic Output References - English	5504378	5504378	5504379

9.11.2 System Manuals for EC310

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	H48691ZJ	H48701AZ	H48701CK
Basic User Manual - German	H48691ZK	H48701BA	H48701CL
Basic User Manual - Spanish	H48691ZL	H48701BB	H48701CM
Basic User Manual - Italian	H48691ZM	H48701BC	H48701CN
Basic User Manual - French	H48691ZN	H48701BD	H48701CP
Basic User Manual - Portuguese	H48691ZP	H48701BE	H48701CR
Basic User Manual - Danish	H48691ZS	H48701BG	H48701CT
Basic User Manual - Dutch	H48691ZT	H48701BH	H48701CU
Basic User Manual - Finnish	H48691ZU	H48701BJ	H48701CW
Basic User Manual - Greek	H48691ZW	H48701BK	H48701CX
Basic User Manual - Norwegian	H48691ZX	H48701BL	H48701CY
Basic User Manual - Polish	H48691ZY	H48701BM	H48701CZ
Basic User Manual - Russian	H48691ZZ	H48701BN	H48701DA
Basic User Manual - Swedish	H486701AA	H48701BP	H48701DB
Basic User Manual - Turkish	H48701AB	H48701BR	H48701DC
Basic User Manual - Czech	H48701AC	H48701BS	H48701DD
Basic User Manual - Hungarian	H48701AD	H48701BT	H48701DE
Basic User Manual - Latvian	H48701AE	H48701BU	H48701DF
Basic User Manual - Lithuanian	H48701AF	H48701BW	H48701DG
Basic User Manual - Estonian	H48701AG	H48701BX	H48701DH
Basic User Manual - Slovakian	H48701AH	H48701BY	H48701DJ
Basic User Manual - Romanian	H48701AJ	H48701BZ	H48701DK
Basic User Manual - Bulgarian	H48701AK	H48701CA	H48701DL
Basic User Manual - Croatian	H48701AL	H48701CB	H48701DM

Part Name	Part No. - Voluson E8	Part No. - Voluson E6	Part No. - Voluson E10
Basic User Manual - Serbian	H48701AM	H48701CC	H48701DN
Basic User Manual - Japanese	H48701AN	H48701CD	H48701DP
Basic User Manual - Korean	H48701AP	H48701CE	H48701DR
Basic User Manual - Chinese	H48701AR	H48701CF	H48701DS
Basic User Manual - Indonesian	H48701AS	H48701CG	H48701DT
Basic User Manual - Slovenian	H48701AT	H48701CH	H48701DU
Basic User Manual - Ukrainian	H48701DW	H48701DY	H48701EA
Basic User Manual - Kazakh	H48701DX	H48701DZ	H48701EB
Advanced Reference Manual - English	H48701AU	H48701AU	H48701AU
Advanced Reference Manual - French	H48701AW	H48701AW	H48701AW
Advanced Acoustic Output References - English	5661817	5661817	5661817
Advanced Acoustic Output References - French	5720757	5720757	5720757

9.11.3 System Manuals for EC320

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	H48701GR	H48701GS	H48701GP
Basic User Manual - German	H48701JK	H48701KY	H48701GY
Basic User Manual - Spanish	H48701JL	H48701KZ	H48701GZ
Basic User Manual - Italian	H48701JM	H48701LA	H48701HA
Basic User Manual - French	H48701JN	H48701LB	H48701HB
Basic User Manual - Portuguese	H48701JP	H48701LC	H48701HC
Basic User Manual - Danish	H48701JR	H48701LD	H48701HD
Basic User Manual - Dutch	H48701JS	H48701LE	H48701HE
Basic User Manual - Finnish	H48701JT	H48701LF	H48701HF
Basic User Manual - Greek	H48701JU	H48701LG	H48701HG
Basic User Manual - Norwegian	H48701JW	H48701LH	H48701HH
Basic User Manual - Polish	H48701JX	H48701LJ	H48701HJ
Basic User Manual - Russian	H48701JY	H48701LK	H48701HK
Basic User Manual - Swedish	H486701JZ	H48701LL	H48701HL
Basic User Manual - Turkish	H48701KA	H48701LM	H48701HM
Basic User Manual - Czech	H48701KB	H48701LN	H48701HN
Basic User Manual - Hungarian	H48701KC	H48701LP	H48701HP
Basic User Manual - Latvian	H48701KD	H48701LR	H48701HR
Basic User Manual - Lithuanian	H48701KE	H48701LS	H48701HS

Part Name	Part No. - Voluson E8	Part No. - Voluson E6	Part No. - Voluson E10
Basic User Manual - Estonian	H48701KF	H48701LT	H48701HT
Basic User Manual - Slovakian	H48701KG	H48701LU	H48701HU
Basic User Manual - Romanian	H48701KH	H48701LW	H48701HW
Basic User Manual - Bulgarian	H48701KJ	H48701LX	H48701HX
Basic User Manual - Croatian	H48701KL	H48701LY	H48701HY
Basic User Manual - Serbian	H48701KM	H48701LZ	H48701HZ
Basic User Manual - Japanese	H48701KN	H48701MA	H48701JA
Basic User Manual - Korean	H48701KP	H48701MB	H48701JB
Basic User Manual - Chinese	H48701KR	H48701MC	H48701JC
Basic User Manual - Indonesian	H48701KS	H48701MD	H48701JD
Basic User Manual - Slovenian	H48701KT	H48701ME	H48701JE
Basic User Manual - Ukrainian	H48701KU	H48701MF	H48701JF
Basic User Manual - Kazakh	H48701KW	H48701MG	H48701JG
Advanced Reference Manual - English	H48701MK	H48701MK	H48701MK
Advanced Reference Manual - French	H48701ML	H48701ML	H48701ML
Advanced Acoustic Output References - English	5728083	5728083	5728083
Advanced Acoustic Output References - French	5728085	5728085	5728085

9.11.4 System Manuals for EC330

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	H48701RU	H48701PA	H48701TG
Basic User Manual - German	H48701RW	H48701PB	H48701TH
Basic User Manual - Spanish	H48701RX	H48701PC	H48701TJ
Basic User Manual - Italian	H48701RY	H48701PD	H48701TK
Basic User Manual - French	H48701RZ	H48701PE	H48701TL
Basic User Manual - Portuguese	H48701SA	H48701PF	H48701TM
Basic User Manual - Danish	H48701SB	H48701PG	H48701TN
Basic User Manual - Dutch	H48701SC	H48701PH	H48701TP
Basic User Manual - Finnish	H48701SD	H48701PJ	H48701TR
Basic User Manual - Greek	H48701SE	H48701PK	H48701TS
Basic User Manual - Norwegian	H48701SF	H48701PL	H48701TT
Basic User Manual - Polish	H48701SG	H48701PM	H48701TU
Basic User Manual - Russian	H48701SH	H48701PN	H48701TW
Basic User Manual - Swedish	H486701SJ	H48701PP	H48701TX

Part Name	Part No. - Voluson E8	Part No. - Voluson E6	Part No. - Voluson E10
Basic User Manual - Turkish	H48701SK	H48701PR	H48701TY
Basic User Manual - Czech	H48701SL	H48701PS	H48701TZ
Basic User Manual - Hungarian	H48701SM	H48701PT	H48701UA
Basic User Manual - Latvian	H48701SN	H48701PU	H48701UB
Basic User Manual - Lithuanian	H48701SP	H48701PW	H48701UC
Basic User Manual - Estonian	H48701SR	H48701PX	H48701UD
Basic User Manual - Slovakian	H48701SS	H48701PY	H48701UE
Basic User Manual - Romanian	H48701ST	H48701PZ	H48701UF
Basic User Manual - Bulgarian	H48701SU	H48701RA	H48701UG
Basic User Manual - Croatian	H48701SW	H48701RB	H48701UH
Basic User Manual - Serbian	H48701SX	H48701RC	H48701UJ
Basic User Manual - Japanese	H48701SY	H48701RD	H48701UK
Basic User Manual - Korean	H48701SZ	H48701RE	H48701UL
Basic User Manual - Chinese	H48701TA	H48701RF	H48701UM
Basic User Manual - Indonesian	H48701TB	H48701RG	H48701UN
Basic User Manual - Slovenian	H48701TC	H48701RH	H48701UP
Basic User Manual - Ukrainian	H48701TD	H48701RJ	H48701UR
Basic User Manual - Kazakh	H48701TE	H48701RK	H48701US
Basic User Manual - Vietnamese	H48701TF	H48701RT	H48701UT
AIUM Statement	H48681AN	H48681AN	H48681AN
Advanced Reference Manual - English	H48701UU	H48701UU	H48701UU
Advanced Reference Manual - French	H48701UW	H48701UW	H48701UW
Advanced Acoustic Output References - English	5772975	5772975	5772975
Advanced Acoustic Output References - French	5772976	5772976	5772976

9.12 Probes




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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, Fetal Cardio 	-	Y	Y
902	C2-9-D	5499605 H40462LN	broadband curved array transducer, xx - xx MHz, xxx Elements <u>Applications:</u> Abdominal, Obstetrics, Gynecology, Fetal Cardio, Pediatrics 	-	Y	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
903	C4-8-D	5336339 H48681AS	<p>broadband curved array transducer, 2.0 - 8.0 MHz, 192 Elements <u>Applications:</u> Abdominal, Obstetrics, Gynecology, Fetal Cardio, Pediatrics</p> 	-	Y	Y
904	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	5499510 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

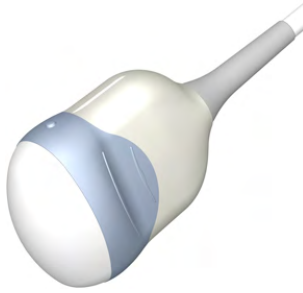

9.12.3 2D-Probes - Phased Array Probes


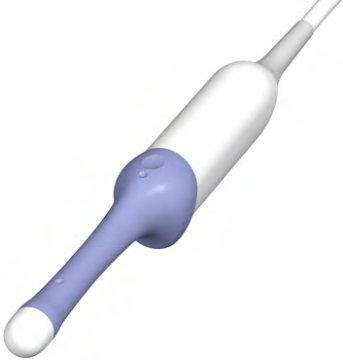
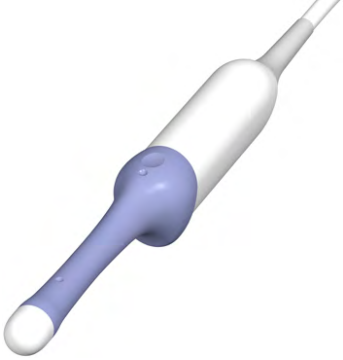
Table 9-15 2D Phased Array Transducers



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	5394804 H45302LA	broadband phased array transducer, 4.0 - 9.0 MHz, 128 Elements <u>Applications:</u> Small Parts, Cardiology, Pediatrics 	-	Y	Y
922	M5Sc-D	5446030 H44901AE	Matrix Single crystal phased array transducer, 1.5 - 4.6 MHz, 80 Elements / 3 rows (= 270) <u>Applications:</u> Obstetrics, Cardiology, Fetal Cardio, Pediatrics, Cephalic 	-	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 Note	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 <i>eM6C probes with SNo 190096KR8 onwards require software version EC300 Ext.4 (15.0.4) or higher.</i> 	-	Y	Y

Item	Part Name	Part Number	Description	Qty	CRU	FRU
934	eM6C G2*	KTZ304083 H48701ES	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
935	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
936	RIC6-12-D*	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

Item	Part Name	Part Number	Description	Qty	CRU	FRU
937	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
938	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.



The probe RNA5-9-D is not applicable at Voluson E-Series BT16 (EC310, SW 16.x.x), BT17 (EC320, SW 17.x.x) and BT18 (EC330, SW 18.x.x) systems.

9.12.5 CW-Doppler - Pencil Probes

Table 9-17 CW-Doppler - Pencil Probes

Item	Part Name	Part Number	Description	Qty	CRU	FRU
945	P2D	KTZ280051 H4830JE	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 	-	Y	Y
946	P6D	KTZ280050 H4830JG	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 	-	Y	Y










CW-Doppler Pencil Probes are not applicable at Voluson E-Series BT16 (EC310, SW 16.x.x), BT17 (EC320, SW 17.x.x) and BT18 (EC330, SW 18.x.x) systems.

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 IC5-9-D needle diameter: 16-18GA (gauge); 1.2 - 1.6 mm 	-	-	N
951	***** (reusable)	H40412LN	reusable Biopsy needle guide for probe IC5-9-D needle diameter: < 1.65 mm 	-	-	N
952	PEC63	H46721R	reusable Biopsy needle guide for probe RIC5-9-D / RIC6-12-D needle diameter: < 1.8 mm 	-	-	N
953	RIC Single-angle bracket	H48681GF	disposable Biopsy needle guide for probe RIC5-9-D / RIC6-12-D 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 RAB2-5-D 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 RAB2-5-D 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 eM6C needle diameter: 8.5FR, 14-23GA (gauge); > 0.6 mm - < 2.1 mm 	-	-	N
958	eM6C G2 Biopsy Starter Kit	H48701MP	Biopsy Starter Kit for Matrix probe eM6C G2 needle diameter: 8.5FR, 14-23GA (gauge); > 0.6 mm - < 2.1 mm 	-	-	N
959	PEC75	H46721W	reusable Biopsy needle guide for probe RSP6-16-D needle diameter: < 1 mm, 1.4 mm, 2.2 mm 	-	-	N
960	RSP Single-angle bracket	H46701AD	Non Sterile Single Angle Bracket needle guide for probe RSP6-16-D needle diameter: 8.5FR, 14-23GA (gauge); > 0.6 mm - < 2.1 mm 	-	-	N
961	PEC76	H48651DG	reusable Biopsy needle guide for probe RNA5-9-D needle diameter: < 1 mm, 1.4 mm, 2.2 mm 	-	-	N
962	RNA Single-angle bracket	H46701AF	Non Sterile Single Angle Bracket needle guide for probe RNA5-9-D needle diameter: 8.5FR, 14-23GA (gauge); > 0.6 mm - < 2.1 mm 	-	-	N

Item	Part Name	Part Number	Description	Qty	CRU	FRU
963	RAB6 Biopsy Starter Kit	H48681ML	Biopsy Starter Kit for UltraLight probe RAB6-D needle diameter: 8.5FR, 14-23GA (gauge); > 0.6 mm - < 2.1 mm 	-	-	N
964	4C Multi-angle bracket	E8385NA	Non Sterile Multi Angle Bracket needle guide starter kit for probe 4C-D needle diameter: 8.5FR, 14-23GA (gauge); > 0.6 mm - < 2.1 mm 	-	-	N
965	C1-5-D Biopsy guide	H40432LE	Non Sterile Multi Angle Bracket needle guide for probe C1-5-D needle diameter: 8.5FR, 14-23GA (gauge); > 0.6 mm - < 2.1 mm 	-	-	N
966	C2-9-D Biopsy guide	H4913BA	Non Sterile Multi Angle Bracket needle guide for probe C2-9-D needle diameter: 8.5FR, 14-23GA (gauge); > 0.6 mm - < 2.1 mm 	-	-	N
967	C4-8-D Biopsy guide	H48681AT	Non Sterile Multi Angle Bracket needle guide for probe C4-8-D needle diameter: 8.5FR, 14-23GA (gauge); > 0.6 mm - < 2.1 mm 	-	-	N
968	12L-RS Multi-angle bracket	H40432LC	Non Sterile Multi Angle Bracket needle guide for probe 11L-D needle diameter: 8.5FR, 14-23GA (gauge); > 0.6 mm - < 2.1 mm 	-	-	N

Item	Part Name	Part Number	Description	Qty	CRU	FRU
969	9L Multi-angle bracket	H4906BK	Non Sterile Multi Angle Bracket needle guide for probe 9L-D needle diameter: 8.5FR, 14-23GA (gauge); > 0.6 mm - < 2.1 mm 	-	-	N
970	ML6-15D Biopsy kit	H40432LJ	Non Sterile Multi Angle Bracket needle guide for probe ML6-15-D needle diameter: 8.5FR, 14-23GA (gauge); > 0.6 mm - < 2.1 mm 	-	-	N
971	3SP Multi-angle bracket	H46222LC	Non Sterile Multi Angle Bracket needle guide for probe 3SP-D needle diameter: 8.5FR, 14-23GA (gauge); > 0.6 mm - < 2.1 mm 	-	-	N
972	M5S-D Multi-angle bracket	H45561FC	Non Sterile Multi Angle Bracket needle guide for probe M5Sc-D needle diameter: 8.5FR, 14-23GA (gauge); > 0.6 mm - < 2.1 mm 	-	-	N

Chapter 10

Care and Maintenance

*This chapter describes **Care and Maintenance** on the Voluson E-Series system and its peripherals. These procedures are intended to **maintain the quality** of the Voluson E-Series **systems performance**. Read this chapter completely and familiarize yourself with the procedures before performing a task.*

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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 Voluson E-Series ultrasound 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. Do not operate the Voluson E-Series system unless 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 periodic 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 form should be kept in the same room or near the Voluson E-Series ultrasound 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 designee.

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 and Maintenance Tasks be performed?

The Customer Care 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. Contact GE 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. (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 Section 7.8.3 on page 7-25). 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.			•		
Ultrasound system 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 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 Section 10.4.2 on page 10-5					•	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 Maintenance

Note *Electrical leakage testing may be accomplished with any calibrated Electrical Safety Analyzer tool compliant with AAMI/ES1 1993 or IEC 60601 or AS/NZS 3551 or IEC 62353 or other relevant national regulation.*

Table 10-2 overview of supplies and equipment used for maintenance

Tools	Comments
Digital Volt Meter (DVM)	minimum 5% accuracy, 3.5 digit and 200 Ohm range required
Anti Static Kit	including anti-static mat, wrist strap, cables and conductive ground cord
Anti Static Vacuum Cleaner	•
QIQ Phantom	<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 user documentation 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	Power up	<ul style="list-style-type: none"> Turn the system power on and verify that all fans and peripherals turn on. Watch the displays during power up to verify that no warning or error messages are displayed.
3	Probes	Verify that the ultrasound system properly recognizes all probes.
4	Displays	Verify proper display on the LCD monitor and Touch Panel (when present).
5	Presets	"Full Backup" all customer presets onto appropriate media (see: Section 4.4.3 "Save Full System Configuration (Full Backup)" on page 4-15).
6	Image Archive	Backup the Image Archive onto appropriate media (see: Section 4.4.6.1 "Save Image Archive" on page 4-20).

10.4.2 Functional Checks

The functional checks take about 60 minutes to perform. Refer to the Voluson E-Series user documentation whenever necessary.

10.4.2.1 Ultrasound System Checks

Table 10-4 ultrasound system functional checks

Step	Item	Description
1	B Mode	Verify basic B Mode (2D) operation. Check the basic ultrasound system controls that affect this mode of operation.
2	M Mode	Verify basic M Mode operation. Check the basic ultrasound system controls that affect this mode of operation.
3	C Mode	Verify basic CFM Mode (Color Flow Mode) operation. Check the basic ultrasound system controls that affect this mode of operation.
4	PD Mode	Verify basic PD Mode (Power Doppler Mode) operation. Check the basic ultrasound system controls that affect this mode of operation.
5	Doppler Modes	Verify basic Doppler Mode operation (PW and CW if available). Check the basic ultrasound system controls that affect this mode of operation.
6	3D Mode	Verify basic 3D Mode operation. Check the basic ultrasound system controls that affect this mode of operation.
7	RealTime 4D Mode (optional)	Verify basic RealTime 4D Mode operation. Check the basic ultrasound 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 option's 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.
11	Touch Panel	Verify basic Touch Panel display functions.
12	Peripherals	see: Section 10.4.2.2 "Peripheral/Option Checks" on page 10-6

Note * Some software may be considered standard depending upon system model configuration.

10.4.2.2 Peripheral/Option Checks

If any peripherals or options are not part of the ultrasound system configuration, the check can be omitted. Refer to [Section 3.8 "On-board optional Peripherals" on page 3-49](#) for a list of approved peripherals.

Table 10-5 approved peripheral/hardware option functional checks

Step	Item	Description
1	Media	Verify media drive(s) read/write properly. Clean if necessary.
2	B/W Printer	Verify hardcopy output of the B/W video page printer. Clean heads and covers if necessary.
3	Color Printer	Verify hardcopy output of the Color video page printer. Clean heads and covers if necessary.
4	Color Deskjet (Bluetooth) Printer	Verify hardcopy output of the Deskjet (Bluetooth) printer. Clean heads and covers if necessary.
5	DICOM	Verify that DICOM is functioning properly. Send an image to a DICOM device.
6	Footswitch	Verify that the footswitch is functioning as programmed. Clean as necessary.
7	ECG	Verify basic operation with customer.
8	Cellular Modem	Verify basic operation.

10.4.2.3 Mains Cable Inspection

Table 10-6 mains cable inspection, as appropriate

Step	Item	Description
1	Unplug Cord	Disconnect the mains cable from the wall and ultrasound 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.

10.4.3 Physical Inspection

Table 10-7 physical checks

Step	Item	Description
1	Labeling	Verify that all ultrasound system labeling is present and in readable condition.
2	Covers	Where applicable, verify all covers are secured in place and are properly aligned with other covers. Replace any covers that are damaged.
3	Control Console and Keyboard	Inspect the control console and keyboard. Record any damaged or missing items. (Replace faulty components, as required).
4	Control Console Movement	<ul style="list-style-type: none"> Where applicable, verify ease of control console movement in all acceptable directions. Where applicable, ensure that it latches in position as required.
5	Control Console Lighting	Check proper operation of all control console.
6	LCD Monitor	Inspect the LCD Display for scratches and bad pixels. Verify proper operation of Contrast and Brightness controls. Where applicable, confirm that the LCD arm allows: <ul style="list-style-type: none"> swivelling the screen to the left and to the right folding the screen to the locked position release and adjustment backwards and forwards can be adjusted in the up/down positions <i>Note: LCD Arm movement may vary and is not applicable to all ultrasound systems.</i>
7	Monitor Light	Check for proper operation of any monitor lights, if available.
8	Cables and Connectors	Check all internal cable harnesses and connectors for wear and secure connector seating. Pay special attention to footswitch assembly and probe strain or bend reliefs.
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	Probe Holders	Where applicable, inspect the Probe Holders for cracks or damage.
11	Power and System Status Indicators	Check for proper operation of all Power and System Status Indicators.
12	External I/O	Check all connectors for damage and verify that the labeling is good.
13	Wheels and Brakes	<ul style="list-style-type: none"> 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 wheel swivel locks for proper operation.
14	Battery	Where applicable, check that the battery is not damaged, does not leak, does not emit an odor, and is not deformed or discolored. Observe all warnings and cautions for battery handling, recharging, storing, and/or disposal.

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.

Note *It is the responsibility of the user to decide which cleaning procedures are necessary to ensure a safe working environment.*

Warning



- Before cleaning the Voluson E-Series system switch it off and disconnect from AC mains.
- Electric parts must be protected from liquids that drip or seep into the system.
- Electrical contacts and connectors must not be cleaned.
- Do not use high-proof alcohol for cleaning. Only use cleaning/disinfecting agents listed in the Basic User Manual of the Voluson E-Series system.

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 cleaning agent on a soft, non-abrasive, 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. Caution: 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 cleaning agent on a soft, non-abrasive, damp cloth. Caution: DO NOT spray any liquid directly onto Voluson E-Series covers, Monitor, keyboard, etc.

10.4.5 Probe Maintenance

10.4.5.1 Probe related Checks

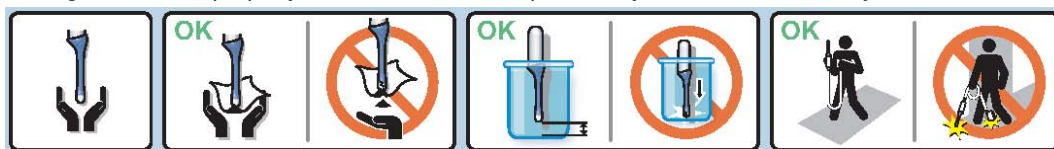
Table 10-9 probe related checks

Step	Item	Description
1	Probes	Thoroughly check the ultrasound system probe connectors and remove dust from inside the connector sockets if necessary. Visually check for bent, damaged or missing pins.
2	Probes	Verify that the ultrasound system properly recognizes all probes.
3	Probe Holder	Clean probe holders (they may need to be soaked to remove excess gel).

10.4.5.2 Basic Probe Care

The Voluson E-Series system user manuals and various probe handling cards provide 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 ultrasound system sockets before plugging in a probe.

10.4.5.3 Basic Probe Cleaning and/or Disinfection

Refer to the Basic User Manual of the Voluson E-Series system 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.



Caution

Disinfect a defective probe before you return it. Be sure to tag the probe as being disinfected.

**Caution**

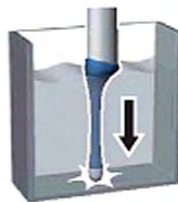
Follow the Care Card instructions supplied with each probe (inside the probe boxes) for disinfectants and gels that are compatible with the surface material of the probes.

Note

For the latest list of compatible cleaning solutions and disinfectants refer to: <http://www.gehealthcare.com/transducers>.



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!

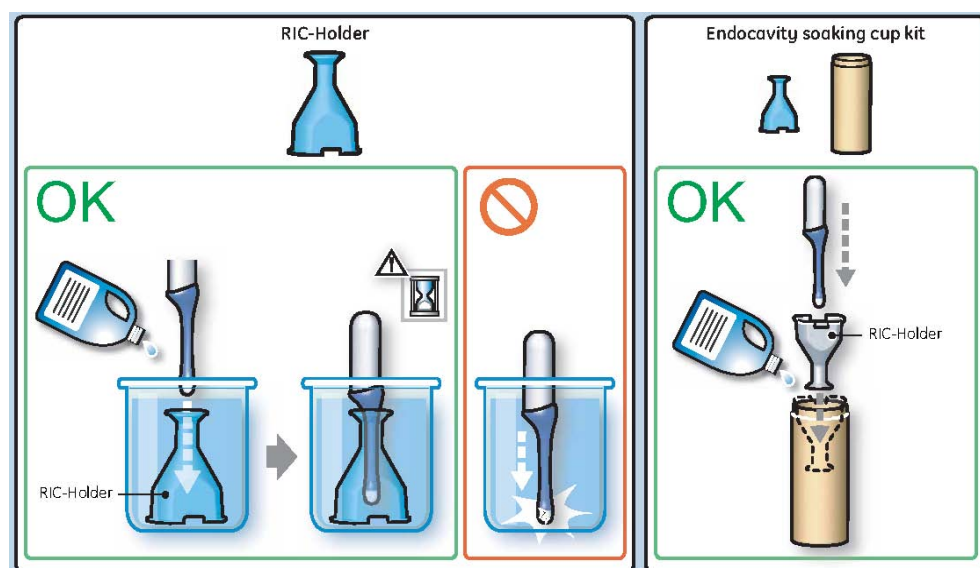
10.4.5.4 Disinfection by means of the RIC-Holder

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 Voluson E-Series system.
4. Maintain control of the Voluson E-Series system power plug.
5. Wait for at least 30 seconds for capacitors to discharge as there are no test points to verify isolation.

Ultrasound 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 Voluson E-Series 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 Voluson E-Series 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 IEC 60601 including national deviations and IEC 62353 and in some cases are lower than that specified by the standards.

Table 10-10 leakage current limits

Leakage Current Test	System Power	Grounding/PE Conductor	Limit mA	Limit μ A
Earth Leakage	On and Off	N/A	0.5	500
Chassis/Enclosure Leakage	On and Off	Closed Open	0.1 0.5	100 500
Type BF Applied Parts	On (transmit)	Closed Open	0.1 0.5	100 500
Type CF Applied Parts	On (transmit)	Closed Open	0.01 0.05	10 50
Type BF Applied Parts (sink leakage, mains voltage on applied part)	On and Off	Closed	5.0	5000
Type CF Applied Parts (sink leakage, mains voltage on applied part)	On and Off	Closed	0.05	50
<i>Values based on IEC 60601</i>				

Note

Open Grounding is also known as "Lift Ground".

Table 10-11 ISO and Mains Applied limits*





Probe Type	Measurement
BF	5.0 mA (5000 μ A)
CF	0.05 mA (50 μ A)

** **ISO and Mains Applied** refers to the sink leakage test where mains (supply) voltage is applied to the applied part to determine the amount of current that will pass (or sink) to ground if a patient is in contact with mains voltage.*

Note

Electrical leakage testing may be accomplished with any calibrated Electrical Safety Analyzer tool compliant with AAMI/ESI 1993 or IEC 60601 or AS/NZS 3551 or IEC 62353 or other relevant national regulation.

Table 10-12 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 and e-TRAX Needle Sensor.	
Type BF	Type BF Applied Part (man in the box) symbol is in accordance with IEC 60417-5333. e.g., ultrasound probes which are marked with the 'man in box' BF symbol	
Type BF Defibrillator-proof	Type BF defibrillation proof Applied Part (man in the box with paddle) symbol is in accordance with IEC 60417-5334. e.g., ECG electrodes which are marked with the 'man in box with paddle' BF symbol	
Type CF	Type CF Applied Part (heart in the box) symbol is in accordance with IEC 60417-5335. e.g., intraoperative probes for direct cardiac contact, isolated ECG connections and e-TRAX Needle Sensor, so marked with the 'heart in box' CF symbol	
Type CF Defibrillator-proof	Type CF defibrillation proof Applied Part (heart in the box with paddle) symbol is in accordance with IEC 60417-5336. e.g., intraoperative probes for direct cardiac contact, isolated ECG connections and e-TRAX Needle Sensor, so marked with the 'heart in box with paddle' 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.

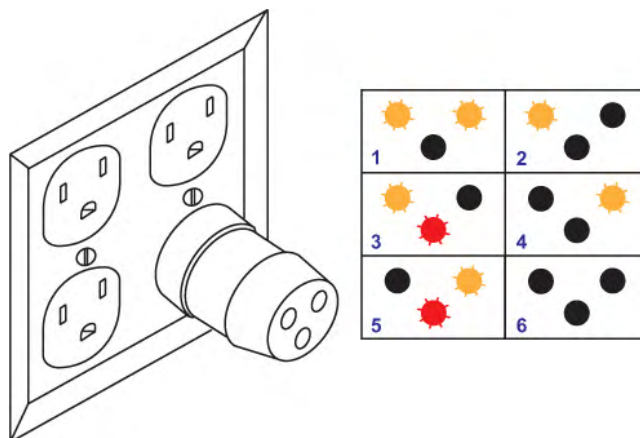


Figure 10-1 Typical Alternate Outlet Tester

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.

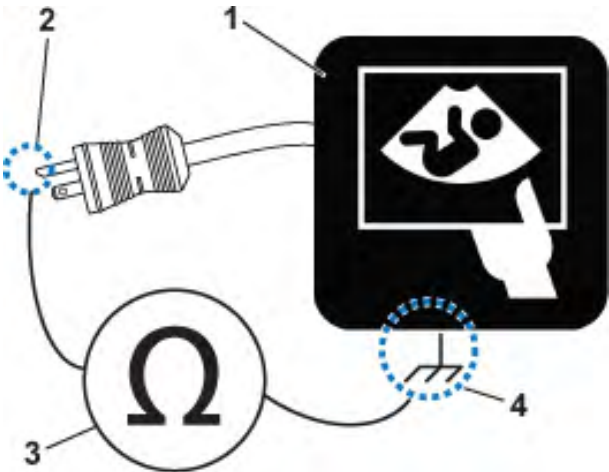


Figure 10-2 Ground Continuity Test

1	Ultrasound System	3	Ohmmeter
2	Ground Pin	4	accessible Metal Parts such as:
			<ul style="list-style-type: none">• Potential equilibrium connector• Monitor housing• Probe connector



Caution
Lacquer is an isolation barrier! Measure only on blank accessible metal parts.

10.6.5 Chassis Leakage Current Test



Warning: Electric Shock Hazard!

When the meter's ground switch is OPEN, DO NOT touch the Voluson E-Series system!



Caution: Equipment damage possibility!

Never switch the Polarity and the status of Neutral when the Voluson E-Series system is powered ON. Power off the Voluson E-Series system, allow the stored energy to bleed down, and turn the circuit breaker off BEFORE switching the "POLARITY" switch and/or the "NEUTRAL" switch on the leakage meter to avoid possible power supply damage.

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](#) , as applicable.

Record the highest reading of current.

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 10-13](#)) 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 Voluson E-Series system on and off.

Note

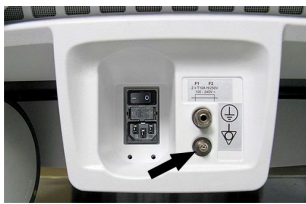
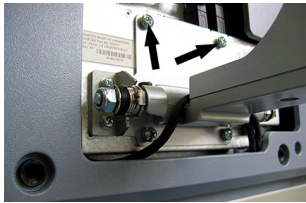
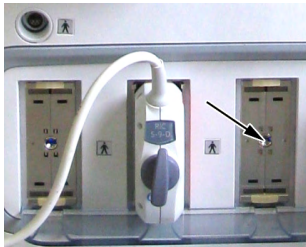
For more information, refer to the safety analyzer's user manual that will be used to perform the test.

The maximum allowable limit for chassis source leakage is shown in:

- [Table 10-10 on page 10-11](#) , as Chassis/Enclosure Leakage.

Follow the test conditions described for respective test points shown in the table below.

Table 10-13 chassis leakage current test condition

Test	Condition	Test Point (image)
1	Potential equilibrium connector (rear of system, on power supply RSP)	
2	Monitor housing (mounting screw for LCD Monitor housing, rear of monitor)	
3	Probe connector (probe mounting receptacle on front of system)	

10.6.5.3 Data Sheet for Enclosure/Chassis Leakage Current

Table 10-14 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 and keep the record of the results with other hard copies of maintenance data.

Table 10-14 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	Limit μ A	Potential equilibrium connector	Monitor housing	Probe connector	
off	closed	100				
off	open	500				
on	closed	100				
on	open	500				
off	closed (reversed polarity)	100				
off	open (reversed polarity)	500				
on	closed (reversed polarity)	100				
on	open (reversed polarity)	500				

10.6.6 Isolated Patient Lead (Source) Leakage-Lead to Ground



Caution: Equipment damage possibility!

Never switch the Polarity when the Voluson E-Series system is powered ON. Be sure to turn the Voluson E-Series 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. Measurements should be made with the ground open and closed, with power line polarity normal and reversed, and with the Voluson E-Series ultrasound system on and off.

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 Voluson E-Series 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 Voluson E-Series 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](#), 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 and keep the record of the results with other hard copies of maintenance data.

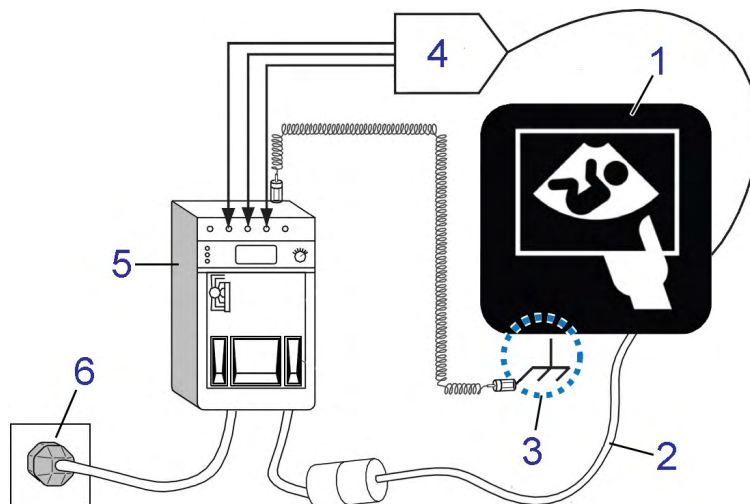


Figure 10-3 Set Up for test of Earth Leakage Current, UL60601-1/IEC60601-1

1	Voluson E-Series ultrasound system
2	Mains power cable
3	Accessible Metal Parts (chassis - non-earth ground, unprotected surface)
4	ECG patient cable
5	Electrical safety analyzer
6	AC wall outlet

10.6.7 Isolated Patient Lead (Source) Leakage-Lead to Lead

This test is also known as Patient Auxiliary Current.

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*, as applicable.

Record the highest leakage current measured.

10.6.7.1 Lead to Lead Leakage Test Record

Table 10-15 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*, as applicable.

Record all data and keep the record of the results with other hard copies of maintenance data.

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 Voluson E-Series 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 Voluson E-Series 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 10-15 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	Limit μ A	<i>RA to LA</i>	<i>LA to LL</i>	<i>LL to RA</i>	<i>(RA+LA+LL) to GND</i>
off	closed	10				
off	open	50				
on	closed	10				
on	open	50				
off	closed (reversed polarity)	10				
off	open (reversed polarity)	50				
on	closed (reversed polarity)	10				
on	open (reversed polarity)	50				

Note *Values in italics font are given as examples only.*

10.6.8 Isolated Patient Lead (Sink) Leakage-Isolation Test

Select the ALL position on the LEAD selector since the test is performed with mains applied to all ECG leads at the same time.



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 10-16 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 10-11 on page 10-11*

Record all data and keep the record of the results with other hard copies of maintenance data.

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 Voluson E-Series system and the patient leads to the analyzer.
4. Select the "Patient Lead Leakage" function on the meter.
5. Test with closed ground with the Voluson E-Series 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 Isolated Patient Lead (sink) Leakage

Unit under Test:			Date of Test:
Test Conditions			Patient Lead
System Power	Grounding/PE	Limit μ A	<i>RA+LA+LL</i>
on	closed	50	
off	closed	50	
on	closed (reversed polarity)	50	
off	closed (reversed polarity)	50	

Note

Values in italics font are given as examples only.

10.6.9 Probe (Source) 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* , as applicable for every probe.

For each combination, the probe must be active to find the worst case condition.

Record all data and keep the record of the results with other hard copies of maintenance data.

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.

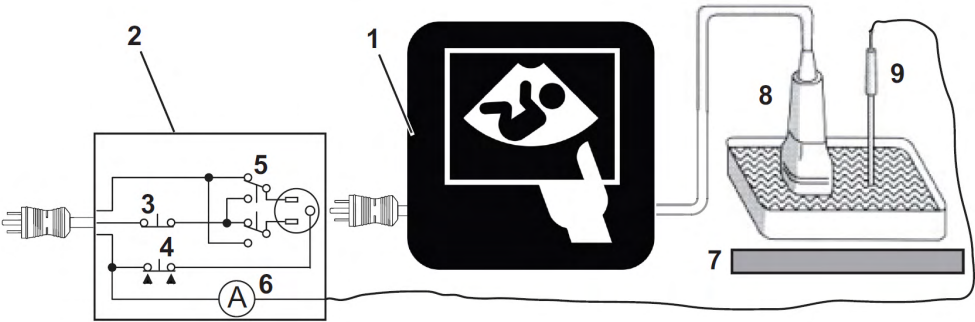


Figure 10-4 Set Up for Probe Leakage Current

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, 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.*

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.

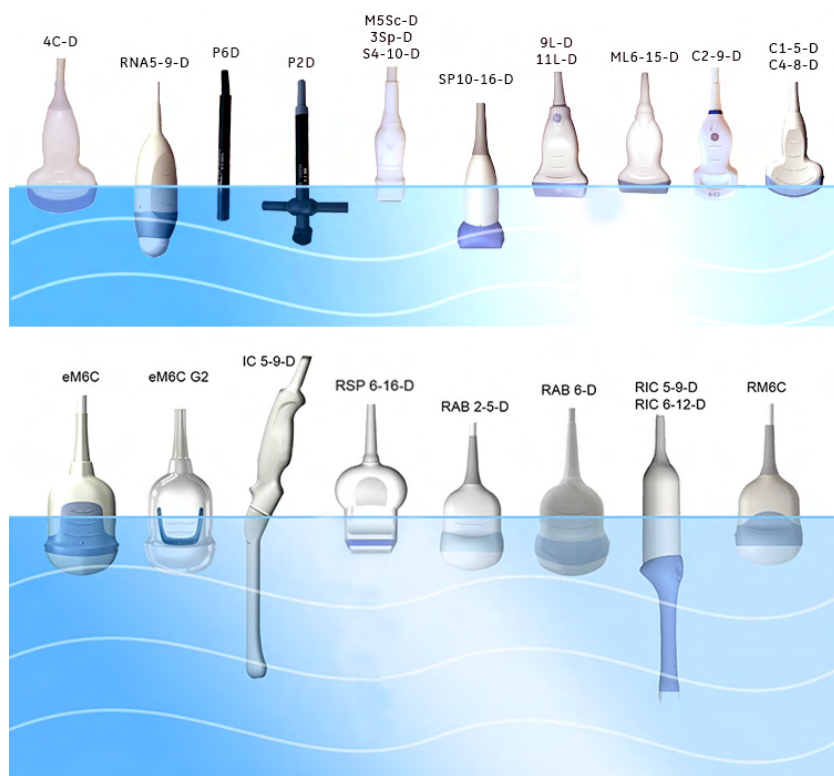
This test is also known as Patient Leakage Current.

1. Turn the Voluson E-Series system OFF.
2. Connect the Safety analyzer to an AC wall outlet.
3. Set the Safety analyzer's function switch to "Chassis" or "Enclosure Leakage".
4. Plug the Voluson E-Series system's power cord into the test meter.
5. Plug the Chassis Ground Probe (saline probe) into the test meter's "CHASSIS" connector.
6. Connect the ultrasound probe to be tested to the Voluson E-Series system.
7. Immerse the saline probe in the saline solution.
8. Immerse the Voluson E-Series probe's face (imaging area of the probe) into the saline solution.

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.



Caution: Equipment damage possibility!

Never switch the Polarity and the status of Neutral when the Voluson E-Series system is powered ON. Power off the Voluson E-Series system, allow the stored energy to bleed down, and turn the circuit breaker off BEFORE switching the "POLARITY" switch and/or the "NEUTRAL" switch on the leakage meter to avoid possible power supply damage.

9. Test opening and closing the ground with the Voluson E-Series system on and off.
 - a. Power ON the Voluson E-Series.
 - b. After the Voluson E-Series system has completed the boot process, select the probe to be tested so it is the active probe.
 - c. Depress the "LIFT GROUND" rocker switch and record the highest current reading.
 - d. Follow the test conditions and test limits described in
 - * *Table 10-10 on page 10-11*, as applicable for every probe.
 10. Record the highest current reading.
- The test passes when all readings measure less than the stated limits.

The actual location of the test probe may vary by system. Measurements should be recorded for each probe under the set of test conditions.

Record all data and keep the record of the results with other hard copies of maintenance data.

Table 10-17 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	Limit μ A	<i>4C-D</i>	<i>11L-D</i>	<i>RIC5-9-D</i>	RM6C
off	closed	100				
off	open	500				
on	closed	100				
on	open	500				
off	closed (reversed polarity)	100				
off	open (reversed polarity)	500				
on	closed (reversed polarity)	100				
on	open (reversed polarity)	500				

Note *Values in italics font are given as examples only.*

10.6.9.3 Isolated Probe (Sink) Leakage-Isolation 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.


Caution

Line voltage is applied to the ultrasound probe 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.

Measurements should be recorded for full lead combination under each set of test conditions specified in:

- *Table 10-11 on page 10-11*

Record all data and keep the record of the results with other hard copies of maintenance data.

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 ultrasound probe to be tested to the Voluson E-Series system.
4. Immerse the saline probe in the saline solution.
5. Immerse the Voluson E-Series probe's face (imaging area of the probe) into the saline solution.
6. Select the "Patient Lead Leakage" function on the meter.
7. Test with closed ground with the Voluson E-Series system on and off.

Note

For more information, refer to the safety analyzer's user manual that will be used to perform the test.

Record all data and keep the record of the results with other hard copies of maintenance data.

Table 10-18 Typical Data Format for recording Isolated Probe (sink) Leakage

Unit under Test:			Date of Test:			
Test Conditions			Probe as measured in Saline Bath			
System Power	Grounding/PE	Limit μ A	<i>4C-D</i>	<i>11L-D</i>	<i>RIC5-9-D</i>	RM6C
off	closed	5000				
on	closed	5000				
off	closed (reversed polarity)	5000				
on	closed (reversed polarity)	5000				

Note

Values in italics font are given as examples only.

10.7 When there's too much Leakage Current...

10.7.1 AC/DC fails

Where applicable, check the AC/DC adapter and its cable. Replace a new one if any portion is defective.

10.7.2 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. If reversed wiring is observed, it is the customers responsibility to have the condition corrected by qualified personnel.*

10.7.3 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.

10.7.4 Peripheral fails

Tighten all grounds. Ensure star washers are under all ground studs.

Inspect wiring for bad crimps, poor connections, or damage.

10.7.5 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.

In case of using an UPS (Uninterruptible Power Supply), perform the tests in the "Electrical Safety tests" section without using the UPS (i.e. directly connect the Voluson E-Series system to the AC wall outlet). If this leads to a pass result, the specific UPS must no longer be used.

10.7.6 New Voluson E-Series system

If the leakage current measurement tests fail on a new Voluson E-Series system and if situation can not be corrected, submit a Safety Failure Report to document the problem. Remove Voluson E-Series system from operation.

10.7.7 ECG fails

Inspect cables for damage or poor connections.

10.8 Ultrasound Equipment Quality Check

Contact your GE Service Representative to perform Equipment and Image Quality Checks.

GE Healthcare Austria GmbH & Co OG
Tiefenbach 15
4871 Zipf
Austria
www.gehealthcare.com

