Voluson Performance 16
Voluson Performance 18

Basic Service Manual

English (English)

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Document number: 5997771
Revision 2
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GE HealthCare

CE 0197

Revision History

Revision	Date	Reason for change
Revision 1	November 2024	Preliminary Release
Revision 2	March 2025	Commercial Release

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Chapter 1

Introduction

This chapter describes important issues related to safely servicing the Voluson Performance 16/ Voluson Performance 18 ultrasound system. The service provider must read and understand all the information presented in this manual before installing or servicing this system.

Content in this chapter

*1.1 Important Precautions - - -

1.1 Important Precautions

Translation Policy

English (EN)

WARNING

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.

Français (FR)

AVERTISSEMENT

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.

Español (ES)

ADVERTENCIA

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.

Deutsch (DE)

WARNUNG

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.

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AVVERTENZA

italiano (IT)

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

Nederlands (NL)

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

Português (PT-BR)

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!

Eesti (ET)

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

Slovenščina (SL)

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.

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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

简体中文 (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.

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ПРЕДУПРЕЖДЕНИЕ

На русском языке (RU)

Данное руководство по обслуживанию доступно только на английском языке.

- 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

Polski (PL)

Niniejszy podręcznik serwisowy jest dostępny wyłącznie w języku angielskim.

- 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.

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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 (TR)

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 oversættelsesydelserne.
- 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.

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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 încercaţi să efectuaţi lucrări de service asupra echipamentului, în afară de cazul când aţi consultat acest manual de service şi l-aţi înţeles.
- 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 poštujete ovo upozorenje, može doći do ozljede servisera, 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.

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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)

คู่มือซ่อมบำรุงนี้มีเฉพาะภาษาอังกฤษเท่านั้น

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

BRĪDINĀJUMS

Latviski (LV)

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.

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UPOZORENJE

Srpski (SR)

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 servisera, operatera ili pacijenta uzrokovanog električnim udarom, mehaničkim i drugim opasnostima.

CẢNH BÁO

Tiếng Việt (VI)

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

Қазақ тілінде (KK)

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

Tagalog (TL)

Available lamang sa Ingles ang Manwal ng Serbisyong 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.

VIÐVÖRUN

Íslenska (IS)

Þessi þjónustuhandbók er aðeins fáanleg á ensku.

- Ef þjónustuaðili viðskiptavinar þarf annað tungumál en ensku er það á ábyrgð viðskiptavinarins að veita þýðingarþjónustu.
- Ekki reyna að þjónusta búnaðinn nema þessir þjónustuhandbækur hafi verið skoðaðir og skilið.
- Ef ekki er gætt að þessari viðvörun getur það valdið meiðslum á þjónustuaðila, stjórnanda eða sjúklingi vegna raflosts, vélrænni hættu eða annarri hættu.

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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 HealthCare 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 HealthCare personnel. In performing all electrical work on these products, GE HealthCare will use its own specially trained field engineers. All of GE HealthCare's electrical work on these products will comply with the requirements of the applicable electrical codes.

The purchaser of GE HealthCare equipment shall only utilize qualified personnel (i.e., GE HealthCare'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 Ultrasound Korea, Ltd.
	9, Sunhwan-ro 214beon-gil, Jungwon-gu
	Seongnam-si, Gyeonggi-do, Republic of Korea
	Attn.: "Service Documentation"

GE HealthCare 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 (ex. disposable, cut resistant 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 recude the risk of injury.



Warning

Ware all PPE including gloves are indicated in the chemical Material Safety Data sheet (MSDS)

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 GE HealthCare.

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1.3 Purpose of this Service Manual

This Service Manual is valid for Voluson Performance 16/ Voluson Performance 18 ultrasound systems.

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 HealthCare'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
Chapter 1 - Introduction	Contains a content summary and warnings.
Chapter 2 - Site Preparation	Contains pre-installation requirements.
Chapter 3 - Voluson Performance 16/ Voluson Performance 18 Setup	Contains setup and installation procedures.
Chapter 4 - Functional Checks	Contains functional checks that are recommended as part of the installation, or as required during servicing and care and maintenance.
Chapter 5 - Components and Functions (Theory)	Contains block diagrams and functional explanations of the electronics.
Chapter 6 - Alignment and Calibration	Contains instructions on how to make available adjustments.
Chapter 7 - Diagnostics/Troubleshooting	Provides procedures for running diagnostic or related routines.
Chapter 8 - Replacement Procedures	Provides disassembly procedures and reassembly procedures for all Field Replaceable Units (FRU) and Customer Replaceable Units (CRU).
Chapter 9 - Renewal Parts	Contains a complete list of field replaceable parts.
Chapter 10 - Care and Maintenance	Provides care and 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 Models covered by this Manual

Table 1-2: Voluson Performance 16/ Voluson Performance 18 - model designations

Part Number	Description	-
H43532LS	Voluson Performance 16	
H43532LR	Voluson Performance 18	

Note *In the context of this manual, the Voluson Performance 16/ Voluson Performance 18 system refers to any member of the Voluson Performance 16/ Voluson Performance 18 series.*

1.3.2 System History - Hardware and Software Versions

This manual applies to:

Voluson Performance 16/ Voluson Performance 18

- with Serial Number VPX800001 ~ (Voluson Performance 18) / VPX600001 ~ (Voluson Performance 16)
- with Software version SPC410 Ext.X Rev.A

1.3.3 Typical Users of the "Basic" Service Manual

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

1.3.4 Purpose of Operator Manual(s)

Any Operator Manuals and/or Instructions for Use (IfU) should be fully read and understood before operating the Voluson Performance 16/ Voluson Performance 18 system and also kept near the system for quick reference.

The electronical versions are available via the Help function (**F1** key) on Voluson Performance 16/ Voluson Performance 18 control console. For more information and detailed description refer to *Section 3.7.5.5 "How to change Language of Instruction for Use" on page 3-66*.

1.4 Important Conventions

Content in this chapter

1.4.1 Conventions used in this Manual - - -



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.



Hot Surface Hazard

Indicates that the marked item can be hot and should not be touched without taking care.



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 Performance 16/ Voluson Performance 18 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 1-3: 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
				

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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.

Table 1-4: Product Labels and Icons

LABEL/SYMBOL	PURPOSE/MEANING	LOCATION
Rating Plate	Manufacturer's name and address Model and Serial numbers Electrical ratings	Rear bottom side of the control panel Elevation arm cover
	Manufacturer's name and address	Rating Plate (Rear bottom side of the control panel/Rear console cover)
	Date of manufacture	Rating Plate (Rear bottom side of the control panel/Rear console cover)
	Serial number	Rating Plate (Rear bottom side of the control panel/Rear console cover)
	Brand and model (reference number)	Rating Plate (Rear bottom side of the control panel/Rear console cover)
	Every system has a unique marking for identification, the Unique Device Identification (UDI) Label. The UDI label consists of a series off (alpha-) numeric characters and barcode which uniquely identify the Voluson Performance system as a medical device manufactured by GE Healthcare	Rating Plate (Rear bottom side of the control panel/Rear console cover) On plug of each probe
	CE Conformity mark according to Medical Device Regulation (MDR) 2017/745. **0197**: Identification number of notified body TÜV Rheinland Product Service.	Rating Plate (Rear bottom side of the control panel/Rear console cover)
	“Tested and production monitored by TÜV Product Service NRTL with respect to ELECTRICAL SHOCK, FIRE and MECHANICAL HAZARDS only in accordance with AAMI/UL 60601-1 and CAN/CSA C22.2 NO.601.1.”	Rating Plate (Rear bottom side of the control panel/Rear console cover)
IP Code (IPX 0) IP Code (IPX 7) IP Code (IP 44) IP Code (IPX8)	Indicates the degree of protection provided by the enclosure per IEC 60529.	Footswitch Probes Console Vscan air charger
	Equipment Type BF (man in box, symbol IEC 60417-5333) indicates BF Type equipment having even more electrical isolation than standard Type B equipment because it is intended for intimate patient contact.	Multi caution label on rear side of system
	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
	Insulted patient applied part (Type CF)	Type CF probe Rating plate
"DANGER - Risk of explosion used in ..."	The system is not designed for use with flammable anesthetic gases.	Indicated in the Service Manual

LABEL/SYMBOL	PURPOSE/MEANING	LOCATION
	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.	Multi caution label on rear side of 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.	Multi caution label on rear side of system
	“Read and understand all Instructions for Use” This symbol advises the reader to consult the accompanying documents (operator manual or other instructions).	Multi caution label on rear side of system Rear side of the monitor in the "Home" menu
	Electronic Instructions for Use - To indicate on product or product packaging that relevant information for use of the product is available in electronic form rather than, or in addition to, printed paper form.	Multi caution label on rear side of system
	Pinch point Watch your hands and fingers when adjusting the monitor. Keep hands clear of openings.	Multi caution label on rear side of system Rear side of the monitor
Rx Only	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.	Multi caution label on rear side of system
	Waste Electrical and Electronic Equipment (WEEE) Disposal. This symbol indicates that waste electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of your equipment.	Multi caution label on rear side of system
	"Caution - Consult accompanying documents” This symbol is used to advise the reader to consult accompanying documents for important safety-related information such as cautions and pre-cautions that cannot be presented on the device itself.	various
	"Caution/Warning - Dangerous electric voltage" (lightning flash with arrowhead) is used to indicate electric shock hazards. Unplug the main plug before opening the system!	various
	Operating LED - Do not stare into the light beam of the LED.	Rear side of the control panel
	Caution - Hot Surface Indicates that the marked items can be hot and should not be touched without taking care.	at Metal Plate that covers
	**Warning** Pinch Point - Keep away fingers, hand, … from the mechanics of the braking gear.	mechanics of the braking gear
	"Mains OFF" Indicates the power off position of the mains power switch.	Rear of system at mains switch
	"On/Off” or “Standby" **CAUTION: This Power switch DOES NOT ISOLATE Mains Supply**	**ON/OFF** Standby button on Left side of the control panel
	"Mains ON" Indicates the power on position of the mains power switch.	Rear of system at mains switch
	"Protective Earth" Indicates the protective earth (grounding) terminal.	Chassis inside of the system rear side Insdie of the control panel

LABEL/SYMBOL	PURPOSE/MEANING	LOCATION
	"Equipotential" indicates the terminal to be used for connecting equipotential conductors when interconnecting (grounding) with other equipment.	Rear of system at mains switch
	These symbols indicate that at least one of the six hazardous substances of the China RoHS Labeling Standard is above is above the RoHS limitation. The number inside the circle is referred to as the Environmental Friendly Use Period (EFUP). It indicates the number of years that the product, under normal use, will remain harmless to health of numans or the environment. EFUP = 10 for Short Use Products EFUP = 20 for Medium Use Products	Multi caution label on rear side of system Rear side of the monitor
	Product was refurbished / manufactured by GE Ultrasound Korea, Ltd..	rear of system
	This symbol indicates that the device is a Medical Device.	Rear bottom side of the control panel Rear console cover
	MR Unsafe is known to pose hazards in all MRI environment	Multi caution label on rear side of the system

1.5 Safety Considerations

Content in this chapter

1.5.1 Introduction - - -



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.



Caution

Use extreme caution as long as the Voluson Performance 16/ Voluson Performance 18 is un-stable, not resting on all four caster wheels.



Caution

Because of the limited access to cabinets and equipment in the field, placing people in awkward positions, GE HealthCare 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.



Caution

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

1.5.3 Mechanical Safety

Moving the system on plains	Moving the system on inclines
	

Caution

The Voluson Performance 16/ Voluson Performance 18 weighs approximately 64kg (141.1lbs) and Voluson Performance 16 weighs approximately 60kg (132.3lbs) without peripherals.

Be careful when moving the system. Two people are required when moving the Voluson Performance 16/ Voluson Performance 18 system on inclines or lifting more than 16 kg (35 lbs).



- Always lower the control panel to its minimum height, center it, and lock it in its parked position.
- Secure the monitor and accessories for transport.
- Lock the monitor arm and flap down the monitor to its lowest.
- Use the front handle to move the system.
- Remove all obstacles.
- Carefully move the system forward at a slow pace.
- Avoid collisions with walls or door frames.
- Always place the system on level ground and engage the caster brakes.
- Do not attempt to move the system with the brakes engaged.
- When navigating inclines, move the system forward or backward. Do not move the system sideways or diagonally.

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



Caution

Use protective glasses during drilling, filing smooth surfaces, and during all other work where eyes need protection.



Caution

Use protective gloves when working with sharp edges or when directed to wear PPE during a removal/replacement procedure.



Caution

Use safety shoes when doing work where there is any chance of foot injury.



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:

- *Place the probes in their carrying cases.*
- *DO NOT use the control console as an anchor point.*
- *Secure the system with straps and lock the caster wheels (brake).*
- *Ensure that the Voluson Performance 16/ Voluson Performance 18 system is firmly secured while inside the vehicle.*
- *Drive cautiously to prevent vibration damage.*

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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 Performance 16/ Voluson Performance 18 system to the wrong voltage level will most likely destroy it.

1.5.4.2 Probes

All probes for Voluson Performance 16/ Voluson Performance 18 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 Performance 16/ Voluson Performance 18 Instructions for Use 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 Ultrasound Korea, Ltd.! The Voluson Performance 16/ Voluson Performance 18 ultrasound system is an extremely sensitive and complex medical system. Any unauthorized peripherals may cause system failure or damage.



Warning

There is an increased risk of electric shock due to increased leakage current when connecting devices not explicitly recognized by the system manufacturer GE Ultrasound Korea, Ltd. to the Voluson Performance 16/ Voluson Performance 18 ultrasound system.

Voluson Performance 16/ Voluson Performance 18 systems are equipped with an isolation transformer to provide the required separation from AC mains.

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 must 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 must comply with IEC xxx standards* and is battery operated or connected to a medical grade Class II AC/DC supply.

Note *The Ethernet LAN input and output (I/O) connector is provided with a built-in galvanic isolation according to IEC60601 (i.e., 1500 V AC). All other input and output (I/O) connections do not provide a built-in galvanic isolation (USB, DVI, HDMI, VGA, S-Video, …).*

* IEC xxx stands for standards such as:

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

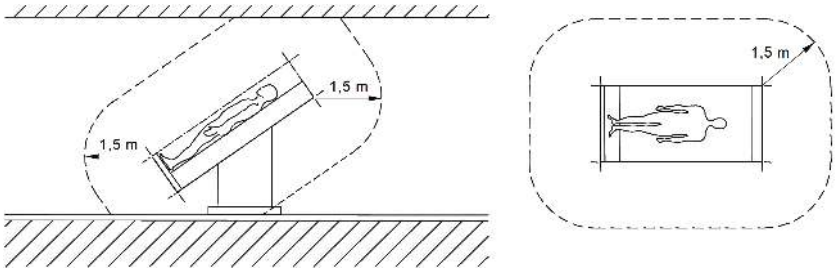
Note ***The system integrator*** *(any person connecting the medical device to other devices)* ***is responsible that connections are safe.*** *If in doubt, consult the technical service department or your local representative.*

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 12V DC supply provided for the electrical safety of the system.

Caution

Auxiliary equipment with connection to AC Mains 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 - Voluson Performance 16/ Voluson Performance 18 Setup*

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 Performance 16/ Voluson Performance 18 system must be firmly secured in position.*

1.6 Labels Locations

The Voluson Performance 16/ Voluson Performance 18 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 Performance 16/ Voluson Performance 18 ultrasound system, refer to Section 1.4.3 on page 1-16 and Chapter 2 in the Instructions for Use of your system.*



Figure 1-1: Labeling (On rear side of the system)

1.6.1 Identification and Rating Plate

The Identification and Rating Plate is located on the rear of the Voluson Performance 16/ Voluson Performance 18 system.

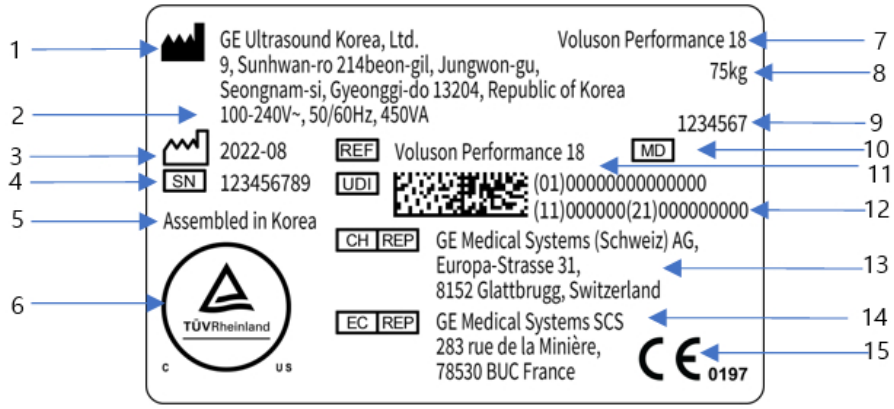


Figure 1-2: Labeling (on rear of Voluson Performance system)

1	Manufacturer	6	NRTL mark	11	Brand and model name
2	System voltage setting, Frequency, power consumption	7	Product name	12	UDI (barcode and characters)
3	Manufacturing date	8	Safety working load	13	Swiss authorized representative
4	System Serial Number	9	Console part no.	14	EU authorized representative
5	Country	10	Medical device	15	CE conformity mark

1.6.2 Multi Caution Label

The multi caution label is located on the rear of the Voluson Performance 16/ Voluson Performance 18

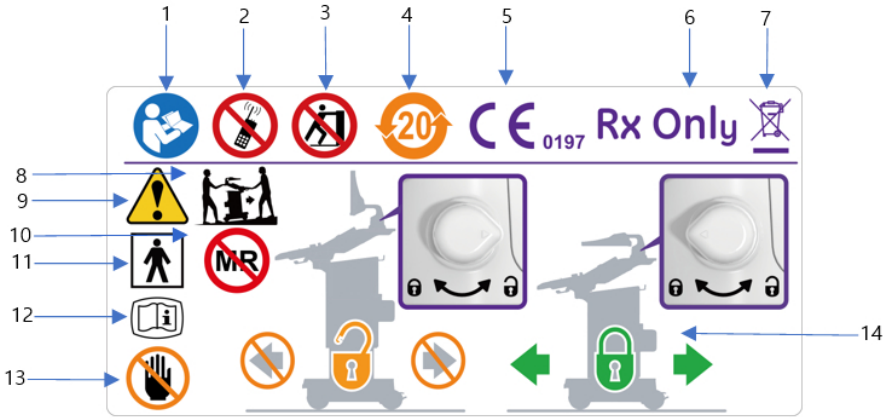


Figure 1-3: Mulit Caution Label for Voluson Performance 16/ Voluson Performance 18

1	Symbol "Follow instructions for use"	6	Rx Only mark	11	Symbol "insulated patient applied part"
2	Symbol "Do not use the following devices near this system"	7	WEEE disposal symbol	12	Symbol "e-IFU"
3	Symbol "Pushing prohibited"	8	2 person move the system in inclined floor	13	Symbol "Watch your hands and fingers"
4	Symbol "RoHS mark"	9	Symbol "Caution"	14	Transportation position instruction
5	CE mark	10	Symbol "MR unsafe"		

1.6.3 Gender Caution Label

The Gender Caution Label is located on the rear of the Voluson Performance 16/ Voluson Performance 18 system (Required for India, China and Korea)

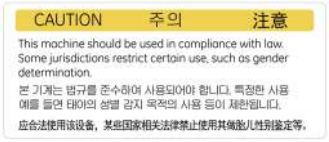


Figure 1-4: Gender Caution Label

1.6.4 Package Environment Label

Package Environmental Label is located on the package outsleeve of the Voluson Performance 16/ Voluson Performance 18 system.



Figure 1-5: Package Environmental Label

1.7 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 equipment. Use extreme caution when handling, testing and adjusting.



Warning

If the covers are removed from an operating Voluson Performance 16/ Voluson Performance 18 system, some metal surfaces may be warm enough to pose a potential heat hazard if touched, even while in shutdown mode.



Warning

Do not use the equipment in oxygen rich environment (>25%) or in the presence of inflammable gases (e.g., anesthetic gases).



Warning

Do not substitute parts or modify the system. Because of the danger of introducing additional hazards, ONLY install GE Ultrasound Korea, Ltd. approved parts. DO NOT perform any unauthorized modification of the system.

1.8 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 the Voluson Performance 16/ Voluson Performance 18 system:





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 Performance 16/ Voluson Performance 18 system.
4. Maintain control of the Voluson Performance 16/ Voluson Performance 18 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.

1.9 Returning/Shipping System, Probes and Repair Parts

When returning or shipping the Voluson Performance 16/ Voluson Performance 18 system in the original packaging:

- the control console must be centered and locked
- system must be lowered to its minimum height with monitor flapped down

Note *For detailed description see Section 6.2.1 on page 6-3.*

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

GE HealthCare policy states that body fluids must be properly removed from any part or equipment prior to shipment. GE HealthCare 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 Performance 16/ Voluson Performance 18 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 HealthCare is not responsible for the loss of this data.

If PHI (Patient Healthcare Information) data needs to be sent to GE HealthCare employees for service purposes, GE HealthCare 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.

For brief repacking instructions refer to *Section 8.1.1 on page 8-4*.

1.10 EMC, EMI and ESD

1.10.1 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 of 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 Instructions for Use of the Voluson Performance 16/ Voluson Performance 18 ultrasound system.

1.10.2 Compliance

The Voluson Performance 16/ Voluson Performance 18 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 to achieve full EMC performance.*

1.10.3 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 ESD connection point located on the rear of the system (nearby the power connector).
2. Follow general guidelines for handling of electrostatic sensitive equipment.



Warning: Risk of electrical shock! The ultrasound 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.



Warning: Hot Surface Hazard

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

1.11 Customer Assistance

1.11.1 Contact Information

If the system does not work as indicated in this Service Manual or in the Instructions for Use, or if you require additional assistance, please contact the local distributor or appropriate support resource, as listed below.

Note *Collect vital system information (see: Section 7.1 on page 7-2) before you call:*

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

Table 1-5: phone numbers for customer assistance

Location	Phone Number	
USA GE Medical Systems Ultrasound Service Engineering 9900 Innovation Drive (RP-2123) Wauwatosa, WI 53226, USA	Service	Tel: 1-800-437-1171
	Service Parts	Tel: 1-800-558-2040
	Online Center	Tel: 1-800-321-7937
	Application Support	Tel: 1-800-682-5327
		Tel: 1-262-542-5698
Canada	Service	Tel: 1-800-668-0732
	Application Support	Tel: 1-262-524-5698
Latin America	Service	Tel: +1-262-524-5300
	Application Support	Tel: +1-262-542-5698
Europe GE Healthcare GmbH Peter-Müller-Straße 24-26 40468 Düsseldorf Germany	Support Hotline	Tel: +49 (0) 211 73744789
		Tel: +33 1 3083 1300
		Fax: +49 211 73744685
EGM	Saudi Arabia Service Center	Tel: (+966) 800 429 2222
	UAE Service Center	Tel: +971 800 3646
Africa	Algeria Service Center	Tel: +213 2179 1212
Asia (Singapore) GE Ultrasound Asia Service Department - Ultrasound 298 Tiong Bahru Road #15-01/06 Central Placa Singapore 168730	Service Department	Tel: +65 6291-8528
		Fax: +65 6291-7006
Japan	Online Center	Tel: +81 42-846-9011
		Fax + 81 42-648-2905
China	Technical Support	Tel: +(86) 400-812-8188
		Tel: +(86) 800-810-8188
India	Technical Support	Tel: 1800-425-8025 Tel: 1800-425-7255 Tel: 1800-102-7750
Korea	Technical Support	Tel: +(82) 1544-6119

Location	Phone Number	
Australia / New Zealand	Service Support	Tel: +(61) 1-800-659-465

1.11.2 System Manufacturer

Table 1-6: system manufacturer

Manufacturer	Telephone
GE Ultrasound Korea, Ltd. 9, Sunhwan-ro 214beon-gil, Jungwon-gu Seongnam-si, Gyeonggi-do, 13204 Republic of Korea	+82 (0) 31-740-6436

Chapter 2

Site Preparation

This chapter provides the information required to plan and prepare for the installation of a Voluson Performance 16/ Voluson Performance 18 system. Included are descriptions of the facility and electrical needs to be met by the purchaser.

Content in this chapter

2.1 General Requirements - - -

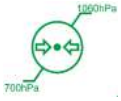
2.1 General Requirements

2.1.1 Environmental requirements

Table 2-1: environmental requirements

Operating Temperature	Operating Humidity	Heat Dissipation	Storage Temperature	Storage Humidity
18 to 30°C (64 to 86°F)	30 to 80% RH non-condensing	1370 BTU/hour	-10 to 50°C (14 to 122°F)	10 to 90% RH non-condensing

Table 2-2: Environmental storage and shipping conditions - labels on package

Symbol	Definition	Symbol	Definition	Symbol	Definition
	DO NOT USE HOOK		TOP, UPRIGHT- Transportation and storage		FRAGILE, Handle with care
	KEEP DRY (Protection from moisture)		Thermal management		Humidity Control
	Range of air pressure		DO NOT STACK		Recycled paper 30% used



Caution

If the system has been in storage, 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: *"System Acclimation Time" on page 3-2*).

2.1.1.1 Cooling

The cooling requirement for a system is max. 2217 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/h 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 Ultrasound Korea, Ltd. 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.

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 Performance 16/ Voluson Performance 18

Table 2-3: electrical specifications for Voluson Performance 16/ Voluson Performance 18

Voltage	Tolerances	Power Consumption	Frequency
100V - 240V AC	± 10%	max. 450 VA including all options	50, 60 Hz (± 1 Hz)

2.1.2.2 Inrush Current

During power on, an inrush circuit prevents the current from increasing above the stated values. Refer to the table below for inrush currents at various main voltages.

Table 2-4: Inrush Current at different mains voltages

Voltage	Inrush Current
90 VAC	40A max.
120 VAC	40A max.
120 VAC with UPS (SMART1200XLHG -AGSM1200PSR3HG series)	45A max.
230 VAC	40A max.
230 VAC with UPS (SMX1200XLHG - AGSM6834 series)	75A max.
264 VAC	50A max.

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 Performance 16/ Voluson Performance 18 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 Cable

If the arrives without a power cable, or with the wrong cable, you must contact your GE HealthCare 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 Performance 16/ Voluson Performance 18 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
- RFID access
- ID card readers

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

Table 2-5: 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 a 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 HealthCare-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 cause 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	+18º to +30º C (+64°F to +86°F)	-10º to +50º C (+14°F to +122°F)	-10º to +50º 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.



Caution

Have two people available to deliver and unpack the Voluson Performance 16/ Voluson Performance 18 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 Performance 16/ Voluson Performance 18

Physical dimensions and weight (without peripherals) of the Voluson Performance 16/ Voluson Performance 18 system are summarized in *#unique_65/unique_65_Connect_42_T_SC400_dimensions*.

Note *Physical dimensions (especially height and depth) depend on control console and monitor positioning.*

For more details see Section 5.10.3 "Control panel Positioning(This section only applies to Voluson Performance 18)" on page 5-39.

Table 2-6: Physical dimensions and weight of Voluson Performance 18

Height	Width	Depth	Weight
Transport position: 1165mm / 45.8 inch Operating min : 1380mm / 54.3 inch Operating max: 1580mm / 62.2 inch	495mm / 19.5inch (Monitor width) 420mm / 16.5inch(Base width)	710mm / 28 inch	Approx.. 64kg / 141.1lbs. without accessories Full configured approx. 75kg / 165.3 lbs

Table 2-7: Physical dimensions and weight of Voluson Performance 16

Height	Width	Depth	Weight
Transport position: 1185mm / 46.7 inch Operating : 1400mm / 55.1 inch	495mm / 19.5inch (Monitor width) 420mm / 16.5inch(Base width)	710mm / 28 inch	Approx.. 60kg / 132.3lbs. without accessories Full configured approx. 71kg / 156.5 lbs

2.1.6.2 Acoustic Noise Output

≤65.0 dBA (measured at 0.3 meters away from Ultrasound system in Maximum working mode for 3 hours)

2.1.6.3 Electrical Specifications

Refer to: *Section 2.1.2.1 "Voluson Power Requirements Voluson Performance 16/ Voluson Performance 18" on page 2-3*.

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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 *Section 2.2.1 Purchaser Responsibilities*) to verify that all needed steps have been taken.

Table 2-8: Voluson Performance 16/ Voluson Performance 18 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 HealthCare 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: *Section 2.2.2 Required Facility Needs on page 2-8*), 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 Performance 16/ Voluson Performance 18 has outlets for on-board peripherals inside.*

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 3-96* 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 HealthCare equipment must utilize only qualified personnel to perform servicing on the equipment.*

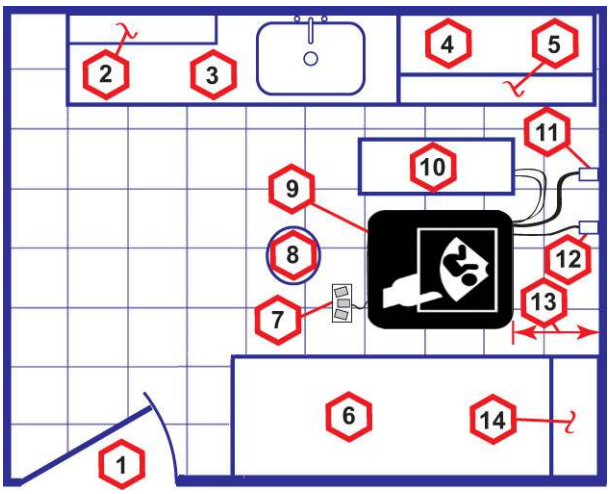


Figure 2-1: recommended Floor Plan 4.3 m x 5.2 m (14 by 17 foot)

1	door – at least 76 cm (2.5 foot / 30 inches)	8	stool
2	film viewer	9	ultrasound system
3	countertop, 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

DICOM®[1] (**D**igital **I**maging and **Co**mmunications in **M**edicine) 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 Performance 16/ Voluson Performance 18 ultrasound system to work with other network connections, the network administrator must provide some necessary information.

Use the *Figure 3-95 on page 3-100* to record required information that must include:

- Voluson Performance 16/ Voluson Performance 18 Details: DICOM network details for the Voluson Performance 16/ Voluson Performance 18 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 Performance 16/ Voluson Performance 18 Instructions for Use.*

[1] DICOM is the registered trademark of the National Electrical Manufacturers Association for its standards publications relating to digital communications of medical information.

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Chapter 3

Voluson Performance 16/ Voluson Performance 18 Setup

This chapter contains information needed to setup the Voluson Performance 16/ Voluson Performance 18 ultrasound system. Included are procedures to receive, unpack and configure the equipment. A worksheet is provided (see: Section 3.14 on page 3-100) to help ensure that all the required information is available, prior to setup the system.

Content in this chapter

*3.1 Setup Reminders - - -

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 Service Platform (RSvP Agent Configuration)	0.5 hours	

3.1.2 Installation Cautions/Warnings



Caution

Since the Voluson Performance 18 weighs approximately 64 kg (141.1 lbs.) and Voluson Performance 16 weighs approximately 60kg (132.3lbs) without peripherals, two people are required to unpack the package.



Warning

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

Only qualified service personnel should carry out servicing and troubleshooting.



Caution

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

3.1.2.1 System Acclimation Time

After being transported, the Voluson Performance 16/ Voluson Performance 18 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

3.1.2.2 Brake Pedal Operation



Caution

If the wheel brakes are engaged, release brake pedals to disengage the lock before moving the system.

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

Connectors and plugs of any kind (AC Mains, DC-voltage supply, signal input/signal output (SIP/SOP) connectors, internal power/signal connectors, …) must always be firmly connected, i.e. the connector/plug must be completely pushed into the socket, to ensure good electrical contact.

When available, devices for connector/plug securing must be engaged.



Caution: The Voluson Performance 16/ Voluson Performance 18 requires all covers!

Do not operate this system unless all board covers and frame panels are securely in place, to ensure safe operation, optimal system performance and cooling. When covers are removed, EMC and EMI compliance might be compromised.

For service procedures where the operation of the system is necessary with board covers or frame panels removed, ensure that there are no EMI sensitive devices in the vicinity of the system. If in doubt, relocate the system to a different environment where no EMI sensitive devices are in the vicinity.



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: Instructions for Use

The User Manual(s) should be fully read and understood before operating the Voluson Performance 16/ Voluson Performance 18. Keep manuals near the system for reference.



Caution: Acoustic Output hazard

Although the ultrasound energy transmitted from the Voluson Performance 16/ Voluson Performance 18 ultrasound system is within FDA limitations, avoid unnecessary exposure. Ultrasound energy can produce heat and mechanical damage.

3.2 Receiving and Unpacking the System

Note *Please read this section carefully before unpacking the Voluson Performance 16/ Voluson Performance 18 ultrasound system and its (optional) peripherals.*

The Voluson Performance 16/ Voluson Performance 18 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)!

Caution

Have two people available to deliver and unpack the Voluson Performance 16/ Voluson Performance 18 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 3-3: shipping cardboard -dimensions and weight

Description	Height	Width	Depth	Weight*
Voluson Performance 16/ Voluson Performance 18 including peripherals and accessories (when packed in original packaging)	1495mm / 58.8 inch	665mm / 26.3 inch	885mm / 34.8 inch	98kg / 216 lbs

*The weight is approximate and may vary depending on thee provided 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.

Note *The tilt indicator must not turn red.*

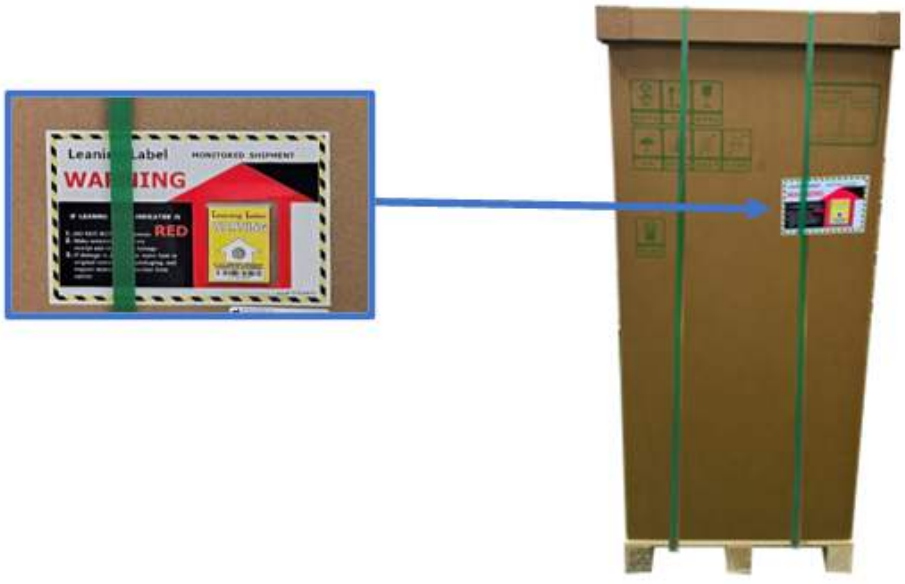


Figure 3-1: shipping cardboard

Unpacking procedure

Unpack the Voluson Performance 16/ Voluson Performance 18 ultrasound system and its (optional) peripherals and accessories according to the provided unpacking instruction.

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

It is recommended to keep and store the shipping crate 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 in 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 crate is damaged, please inform the GE Ultrasound Korea, Ltd. sales representative immediately.*

For brief repacking instructions refer to *Section 8.1.1 "Repacking the System" on page 8-4*

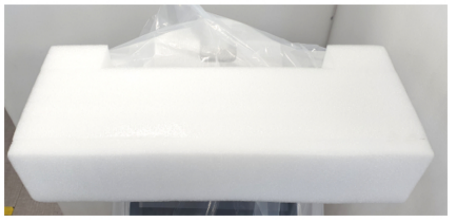
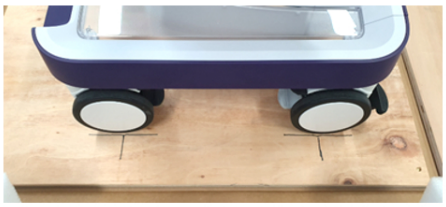
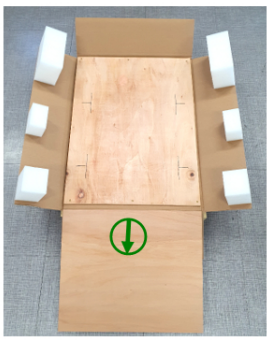
The envolope with delivery address, packing list and invoice is located on the front panel of the create. Check whether delivery is complete (according to packing list) and check visual damage.



Figure 3-2: envelope at fron panel of the crate

Table 3-4: Unpacking procedure

Step	Task
1.	Cut the straps arounding the create
2.	Remove the HARDENED TOP COVER. 
3.	Remove 3 P-joints to remove the OUTSLEEVE.  

Step	Task
4.	Remove the OPTION BOX. 
5.	Carefully remove foam packing materials and plastic bag from both the monitor and the system.  
6.	Unlock the casters, and then use the inclined plane on the bottom of the box assembly to carefully slide the system out of the box. .  

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3.2.1 Moving/Lifting the System

Note *For important safety considerations see Section 1.5.3 "Mechanical Safety" on page 1-21.*

Moving the System



1. Preparation

   Ensure all peripheral devices are firmly fixed within the system or transport them separately.

2. Lower the system to its minimum height, lock the monitor arm and flap down the monitor. Refer to *Section 6.2.1 on page 6-3*.

3. When moving the system, use the front handle only.

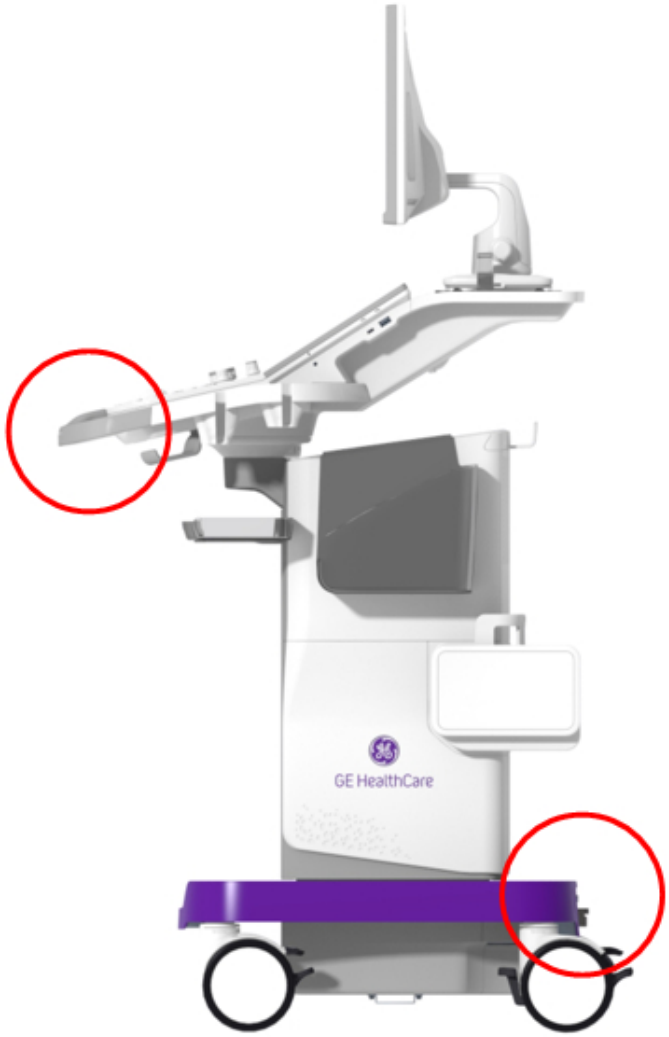


Caution

- Move the system forward or backward when going up or down inclines. Do not move the system sideways or diagonally.
- Two people are required when moving the system on inclines.

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Lifting the Sytem



1 Preparation
   - Disconnect all probes and transport them separately.
   - Disconnect the ECG kit including cable (if applicable) and transport it separately.
   - Ensure all peripheral devices are firmly fixed within the system or transport them separately.

2 Lower the system to its minimum height, lock the monitor arm and flap down the monitor. Refer to *Section 6.2.1 on page 6-3*.

3 Two people are required to lift the system.

4 When lifting the system grab the front handle and the “handies” located underneath the rear base or use the straps and the front handle.



Caution

- Do not pull or lift th system only by the front handle of the user interface.
- Two people are required when moving the system on inclines.

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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 in 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 Performance 16/ Voluson Performance 18 system

✓	Step	Item	Recommended Procedure
	1	Rating Plate	Enter Serial Number: _____ (printed on rating plate, see: *Figure 1-2 on page 1-24*)
	2	System	Verify that the Voluson Performance 16/ Voluson Performance 18 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, backordered, or damaged to your GE Ultrasound Korea, Ltd. sales representative. The contact address is shown in "Contact Information" on page 1-29.*

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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 Performance 16/ Voluson Performance 18 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*.

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3.4 Completing the Setup

3.4.1 Connecting the System to a Power Source

Note *Use only the power cords, cables and plugs provided by or designated by GE Ultrasound Korea, Ltd. to connect the system to the power source.*

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 Performance 16/ Voluson Performance 18" on page 2-3* for rating information. The power cord should not, under any circumstances, be altered to a configuration rated less than that specified for the current.

Caution



Prior to connecting the Voluson Performance 16/ Voluson Performance 18 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).

Caution



Whenever disconnecting the Voluson Performance 16/ Voluson Performance 18 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 Performance 16/ Voluson Performance 18 requires all covers!



Do not operate this system unless all board covers and frame panels are securely in place, to ensure safe operation, optimal system performance and cooling. When covers are removed, EMC and EMI compliance might be compromised.

For service procedures where the operation of the system is necessary with board covers or frame panels removed, ensure that there are no EMI sensitive devices in the vicinity of the system. If in doubt, relocate the system to a different environment where no EMI sensitive devices are in the vicinity.

3.4.2 Power On / Boot Up

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



1 circuit breaker

2 fuses (2x 10A/250VAC)

3 mains power cable incl. pull-out protection

4 equipotential pin

Figure 3-3: Circuit Breaker at rear of system

Note *When AC power is applied to the system, the* **Standby/Power** *button on the control console illuminates amber, indicating that the system (including the BackEnd Processor) is in standby mode.*

4. Connect probes. (Insert the connector into a probe port and twist the probe locking handle clockwise to lock it in place.)
5. Press the **ON/OFF** standby button (see: *Figure 3-4 below*) on the control console for ~3 seconds.



Figure 3-4: ON/OFF standby button

Note *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 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

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.

3.4.2.1 During a normal boot, you may observe

1. Power is distributed to Peripherals, Control Console, Monitor, FrontEnd and BackEnd processor.

2. First the "Boot Screen" is displayed (selection **Voluson** is highlighted).



Figure 3-5: Boot screen

3. The 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 and/or icons indicating software loading procedures, are displayed on the Monitor.



Figure 3-6: 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 UCO board).
7. The hardkey panel backlight is lit.
8. As soon as the software has been loaded, the 2D screen is displayed on the Monitor.



1. If patient data stored on the internal storage device 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 3.7.5.18.2 "Unlock an encrypted Disk" on page 3-75*.
2. If ***Activate User Login*** is check marked in the *System Setup - Security - Authentication* page, a system login window appears. Please enter the proper *User Name* and *Password* and then click ***Login***.

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3.4.3 Quick Setup

The Quick Setup contains the most used settings in a guided workflow. Navigation between the 5 different pages is done with the ***Back*** and ***Next*** button. ***Save & Exit*** will save all settings and close the Quick Setup.

Operation see *Section 3.7.4 "Quick Setup" on page 3-62*.

3.4.4 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 probe receptacles as follows:

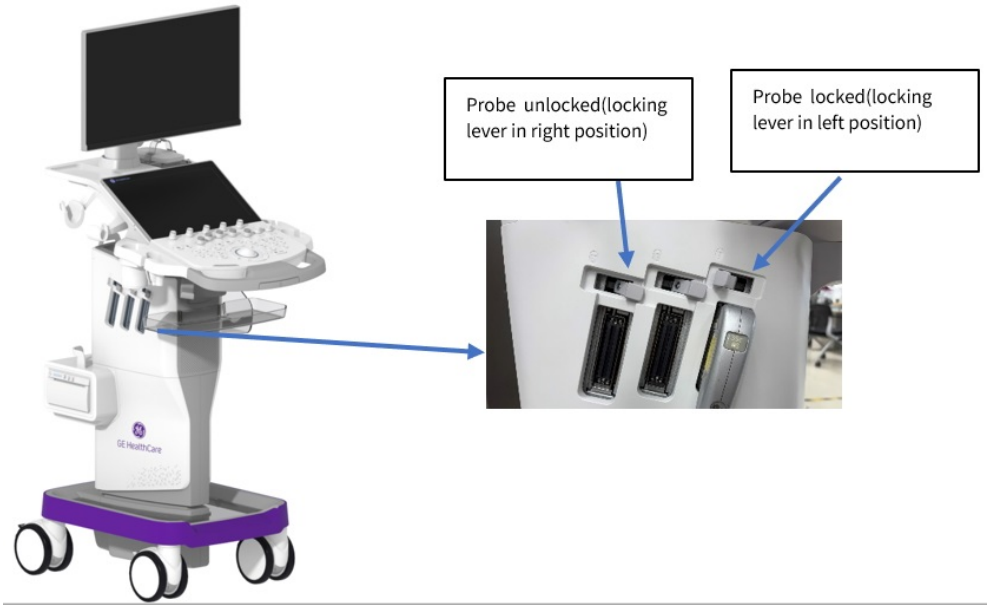


Figure 3-7: probe connection

1	probe **unlocked** (locking handle is in horizontal position)
2	probe **locked** (locking handle 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.*

3.4.5 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. Select the Home button at the Left Toolbar in the touch screen.
2. In the Home menu, select the System Setup button.
3. Press the ***ON/OFF*** Standby button on the left side of the control console.
4. Check the following dialog appears without Fast Startup checkbox.

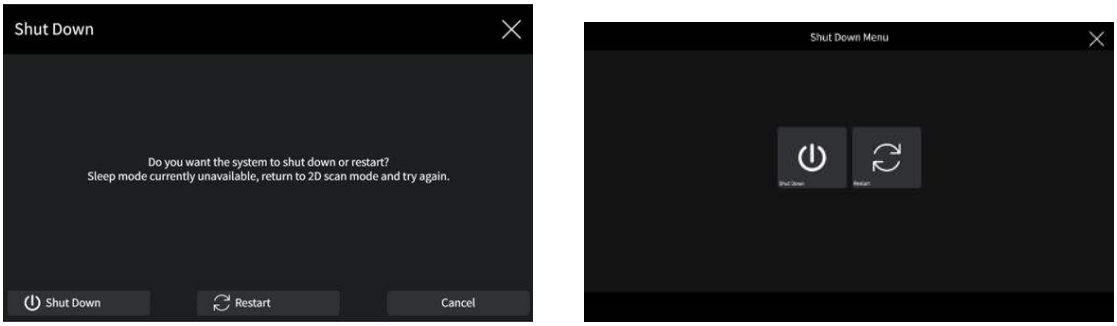


Figure 3-8: Shutdown dialog (monitor example and touch example)

5. Press the ON/OFF Standby button on the console once again. The system performs an automatic full shutdown sequence.
6. Switch OFF the circuit breaker at the rear of the system.

Note *Usually auxiliary equipment need not to be switched ON/OFF separately.*

Warning

Disconnection of the mains power cable from AC mains is necessary!

7. After complete power down, unplug the mains power cable from the AC wall outlet socket.

Note *Do not disconnect the mains power cable from the systems plug unless it is absolutely required for specific replacement procedures,* ***or*** *if it is for any reason not possible to disconnect it from the AC wall outlet socket.*



1 circuit breaker
2 fuses (2x 10A/250VAC)
3 mains power cable incl. pull-out protection
4 equipotential pin

Figure 3-9: Circuit Breaker at rear of system

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

Caution

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

3.5 Connection of Auxiliary Devices

Content in this chapter

*3.5.1 Connecting the Monitor - - -

3.5.1 Connecting the Monitor

Note *Usually the Monitor comes pre-installed with the system.*

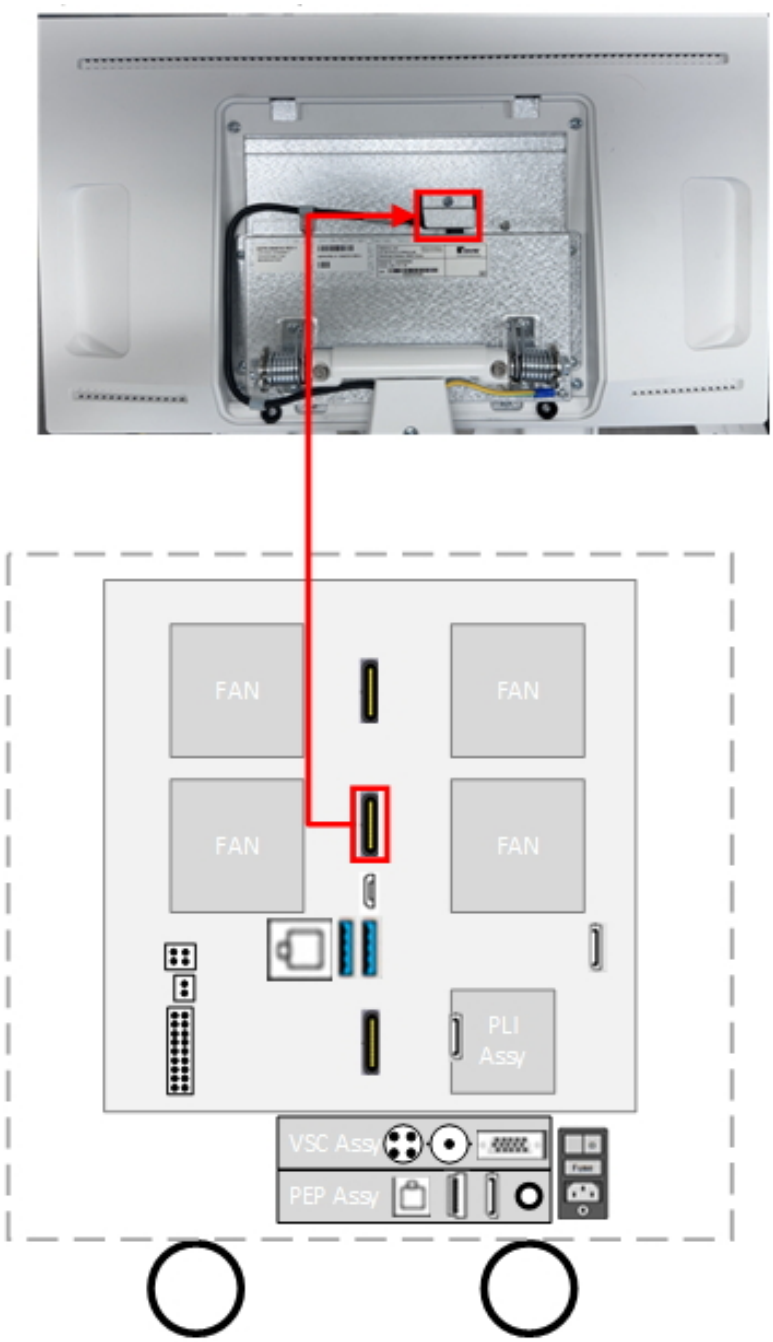


Figure 3-10: Connection Scheme - Monitor

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3.5.2 Connecting the Black & White Printer

Note *Usually the Black & White Printer comes pre-installed with the system.*

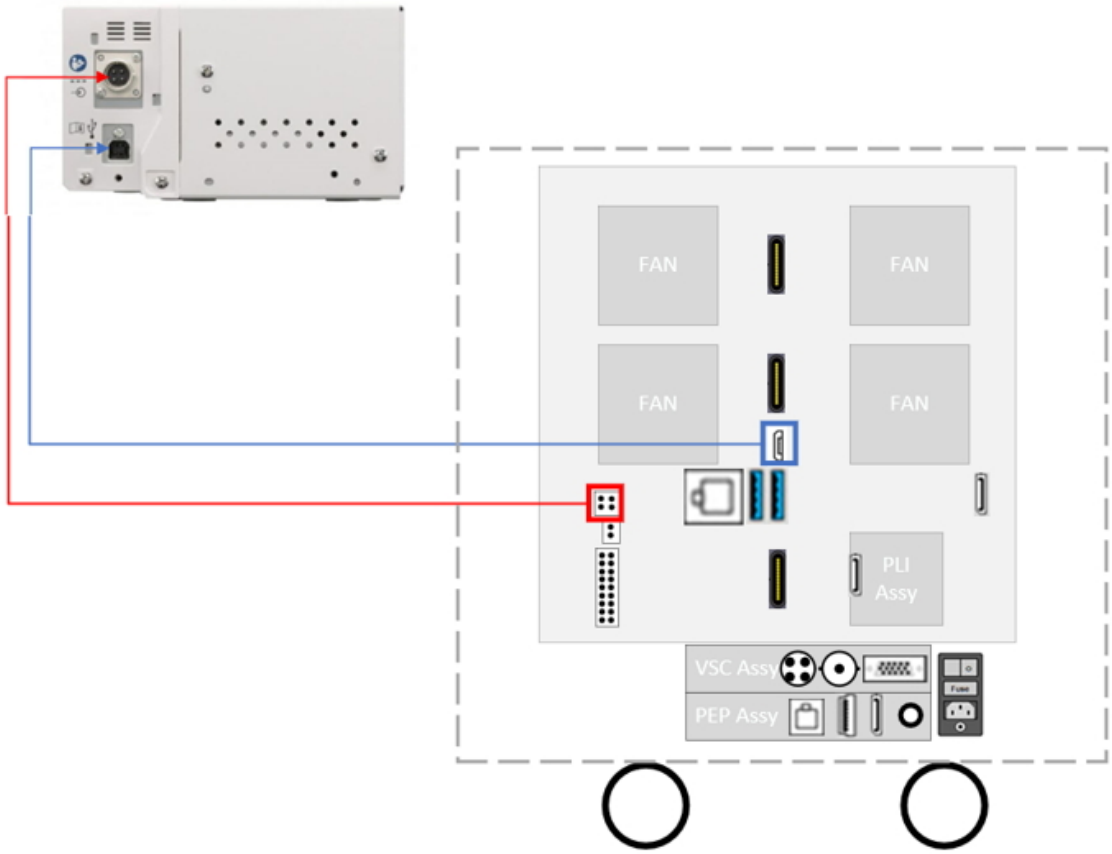


Figure 3-11: Connection Scheme - B&W Printer

3.5.3 Connecting the Color Printer

Caution

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

Note *The Wireless Print Kit (KTZ304239 / H48711KZ) **is required** for connecting and usage of the Color Printer.*

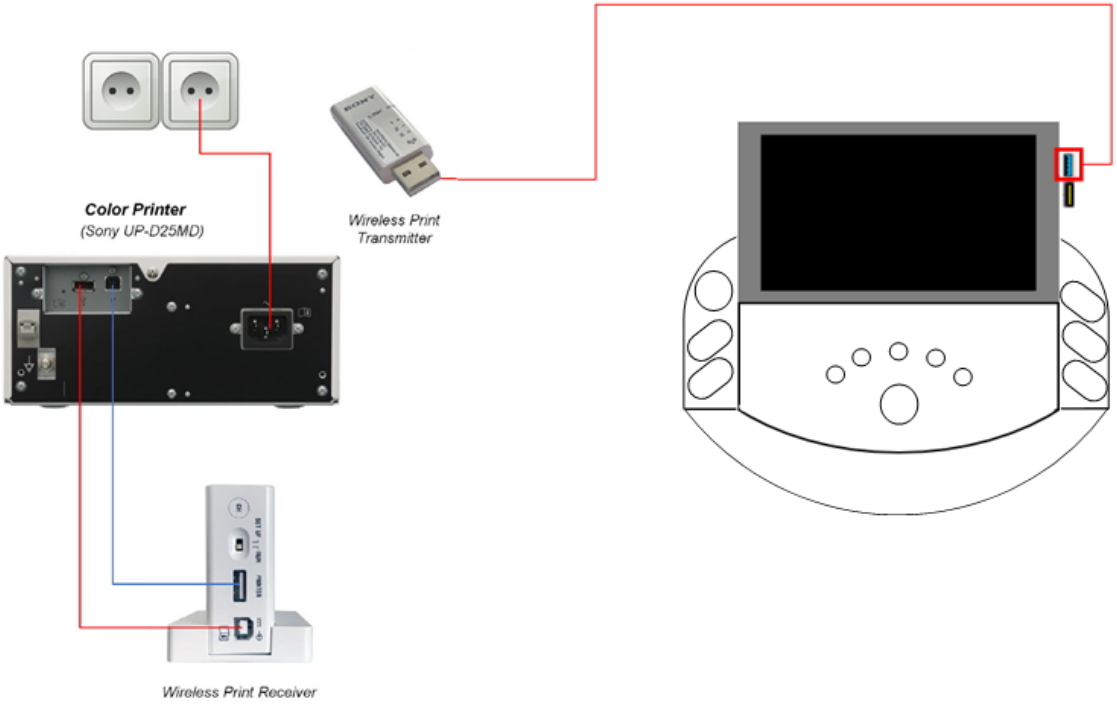


Figure 3-12: Connection Scheme - Color Printer

3.5.4 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 equipment meets the requirements of the EN 60950 standard.

Note *Voluson Performance 16/ Voluson Performance 18 doesn't support direct connection via LAN cable.*

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

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 Performance 16/ Voluson Performance 18 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.
2. Install the Color Laser Printer as described in *Section 3.6.3 on page 3-35*.

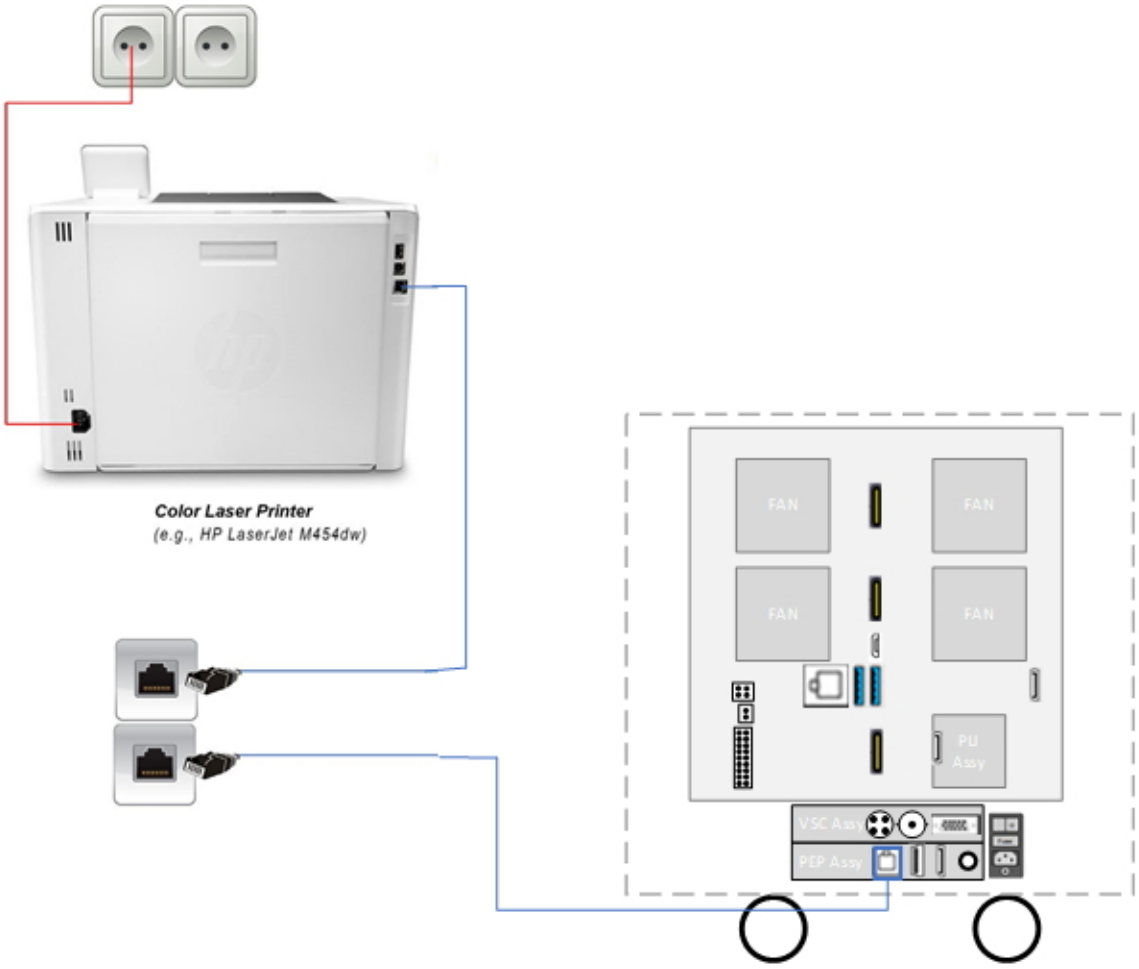


Figure 3-13: Connection Scheme - Color Laser Printer (within Network Environment)

Connection for Wireless/Wi-Fi Direct Communication

Physical connection:

The 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 Performance 16/ Voluson Performance 18 system.
3. Install the Color Laser Printer as described in *Section 3.6.3 on page 3-35*.

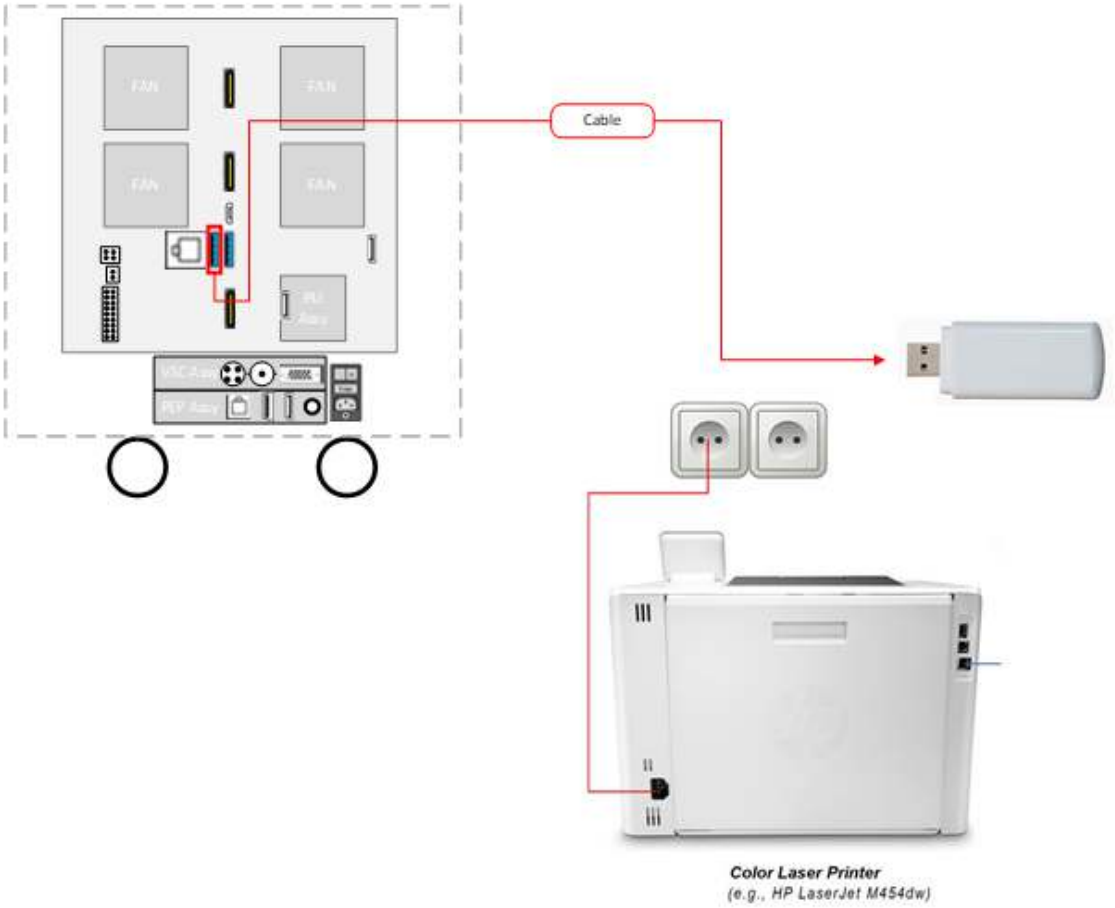


Figure 3-14: Connection Scheme - Color Laser Printer (Wireless/Wi-Fi Direct Communication)

3.5.5 Connecting the Gel Warmer

The optional Gel Warmer need to be plugged into the power supply connector on the TPL (Peripheral Interface Left) of the Voluson Performance 16/ Voluson Performance 18 system.

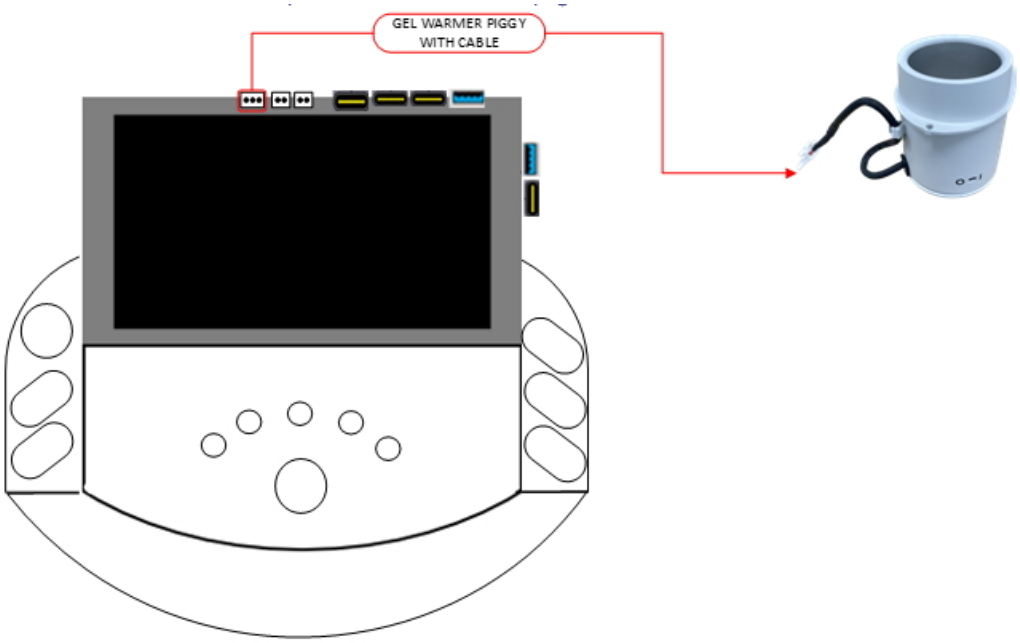


Figure 3-15: Connection Scheme - Gel Warmer

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3.5.6 Connecting the WLAN & Bluetooth Adapter

The optional Wireless Network Adapter need to be plugged into the intended USB A-port behind the Rear Cover Top of the Voluson Performance 16/ Voluson Performance 18 system.

1. Turn ON the power of the system and wait till the system has booted.
2. Plug the Wireless Network adapter into the intended USB-A port of the Voluson Performance 16/ Voluson Performance 18 system. All software drivers are pre-installed for the designated Wireless Network adapter only.

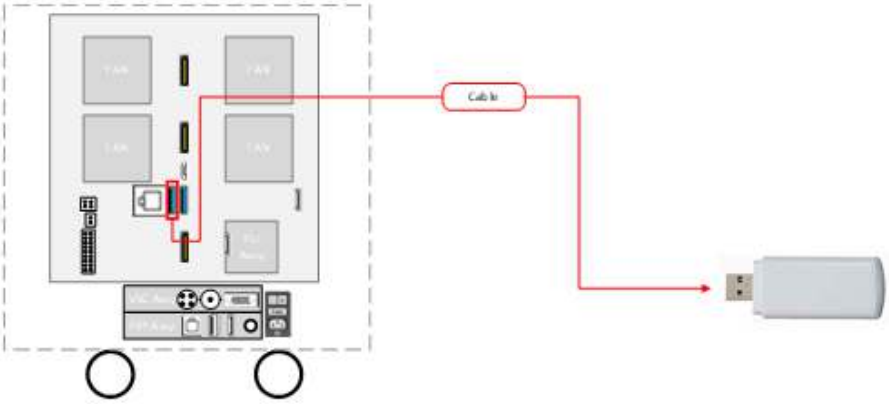


Figure 3-16: Connection Scheme - WLAN & Bluetooth Adapter



Figure 3-17: Actual Installed picture

Note *After physical connection of the WLAN & BluetoothAdapter to the Voluson Performance 16/ Voluson Performance 18 system, follow the procedure described in* *Section 3.13.2 "WLAN Configuration" on page 3-91.*

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3.5.7 Connecting an External Patient Monitor

Note *An External Patient 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.*

Connection by means of the Wireless Display Kit (cable-free)

1. Install the External Patient Monitor and Wireless Display Kit according to the connection scheme below.
2. After physical connection to the Voluson Performance 16/ Voluson Performance 18 system check, and if necessary change the Ext. Monitor Output setting, see: *Section 3.7.5.9 on page 3-68*.

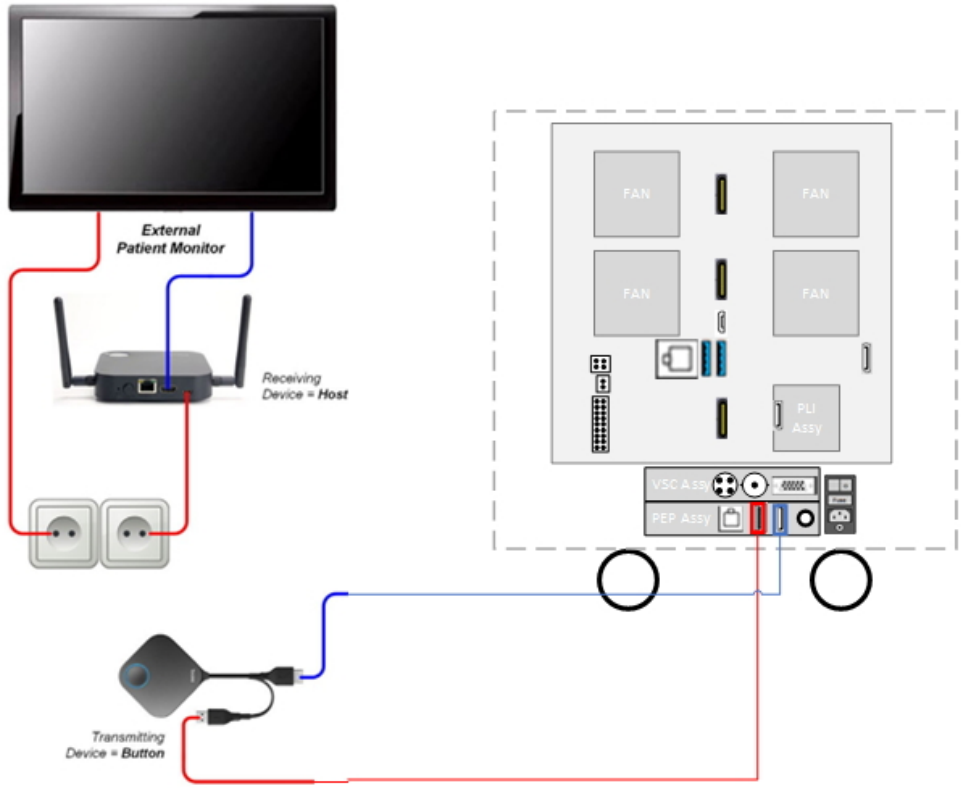


Figure 3-18: Connection Scheme - External Patient Printer (cable-free via Wireless Display kit)

Connection by means of Cables (direct connection) + Isolation Transformer

Caution

An External Patient Monitor **MUST NEVER** be connected to the mains supply directly! Always connect it to an appropriate Isolation Transformer (see).

Caution

The External Patient Monitor is the only item to be connected to the isolation transformer.

1. Power Off/Shutdown the system as described in *Section 4.2.2 "Power Off / Shutdown" on page 4-4*
2. Connect the External Patient Monitor according to the connection scheme below.
3. After physical connection to the Voluson Performance 16/ Voluson Performance 18 system check, and if necessary change the Ext. Monitor Output setting, see: *Section 3.7.5.9 on page 3-68*.

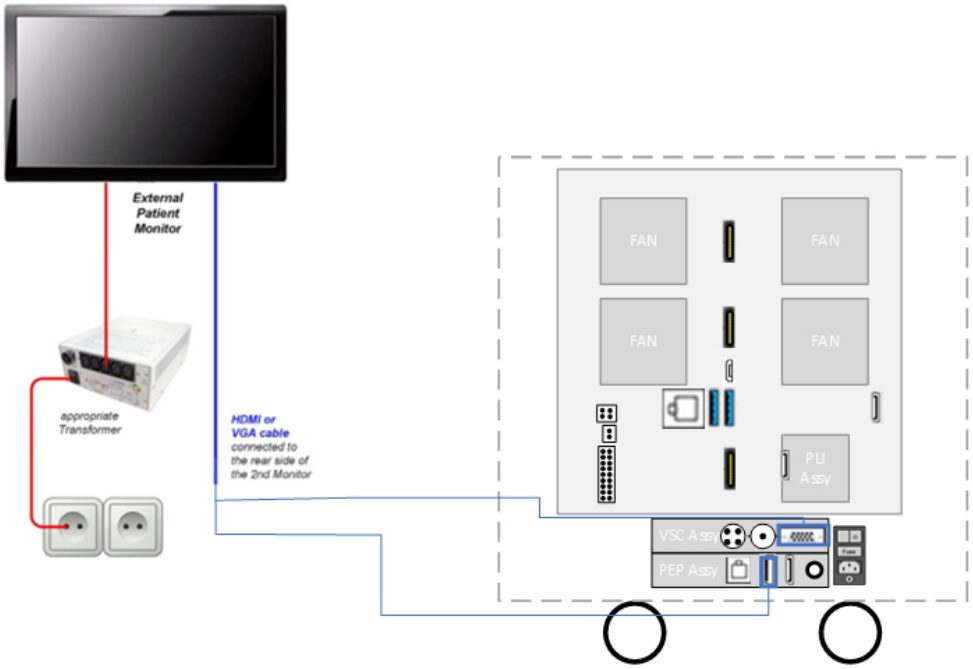


Figure 3-19: Connection Scheme - External Patient Monitor (directly via cables) + Isolation Transformer

3.5.8 Connecting theDigital Expert

1. Connect the Video capture device to the Verisound™Collaboration(formerly Digital Expert Connect) tablet via the USB-A to USB-C connection cable.
2. Connect one end of the HDMI to HDMI cable to the Video capture device. The other end of the cable plug into HDMI Out connector on the rear side of the system.

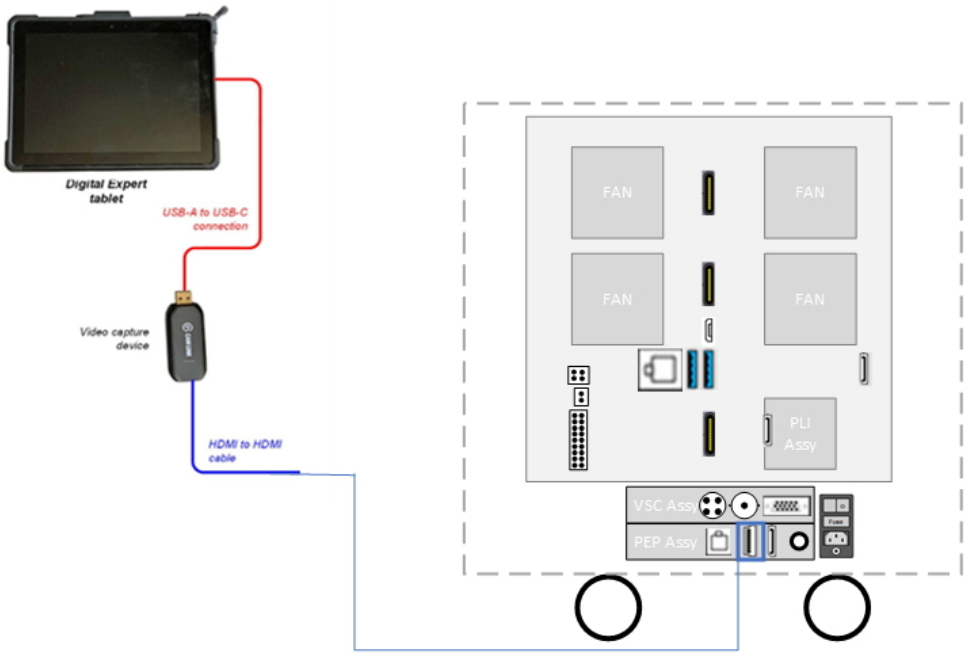


Figure 3-20: Connection Scheme - Verisound™Collaboration(formerly Digital Expert Connect)

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3.5.9 Connecting the Foot Switch

The Foot Switch should be directly connected to any accessible USB-port on the Voluson Performance 16/ Voluson Performance 18 (e.g., on rear of the system).

After physical connection, adjust the Foot Switch as described in *Section 3.7.5.10 on page 3-69*.

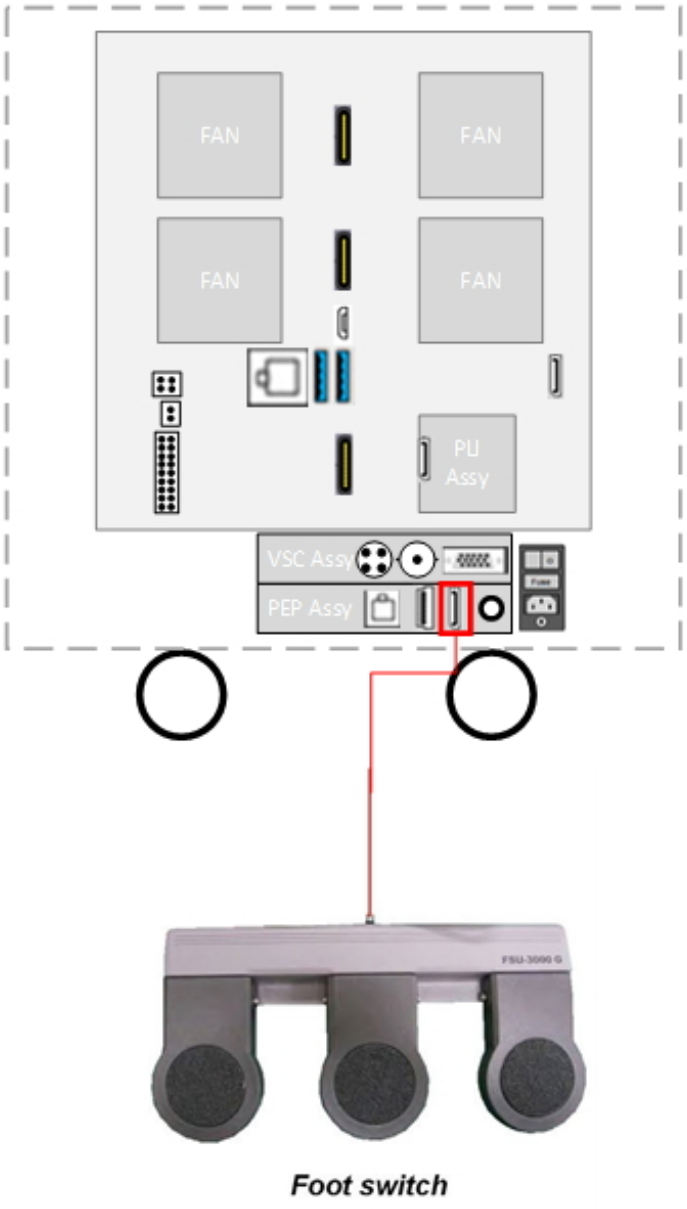


Figure 3-21: Connection Scheme - Foot Switch

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3.5.10 Connecting the Barcode Scanner

The Barcode Scanner should be directly connected to any accessible USB-port on the Voluson Performance 16/ Voluson Performance 18 (e.g., next to Touchpanel).



Figure 3-22: Connection Scheme - Barcode Scanner

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3.5.11 Connecting the ECG-preamplifier

The optional ECG-preamplifier should be connected to a USB Type-C port on the back side of the Display unit of the Voluson Performance 16/ Voluson Performance 18 system.

Note *If the auxiliary device is not already installed, see* *Section 8.6 "Replacement or Activation of Options" on page 8-22*

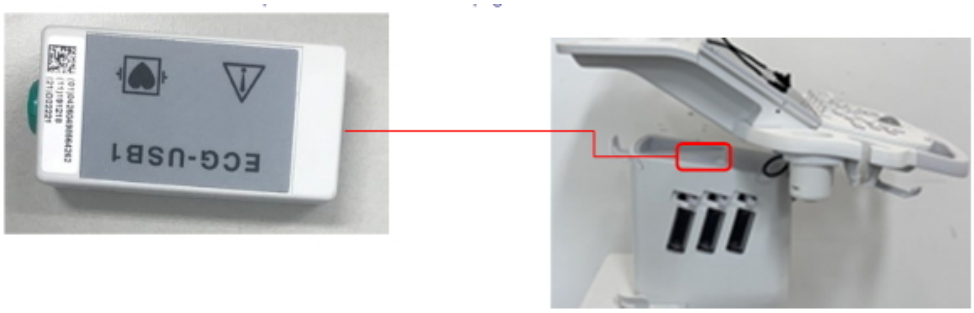


Figure 3-23: Connection Scheme - ECG-preamplifier

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3.5.12 Connecting the Bluetooth adapter

The Bluetooth adapter should be directly connected to OPIO left or right USB-port on the Voluson Performance 16/ Voluson Performance 18.

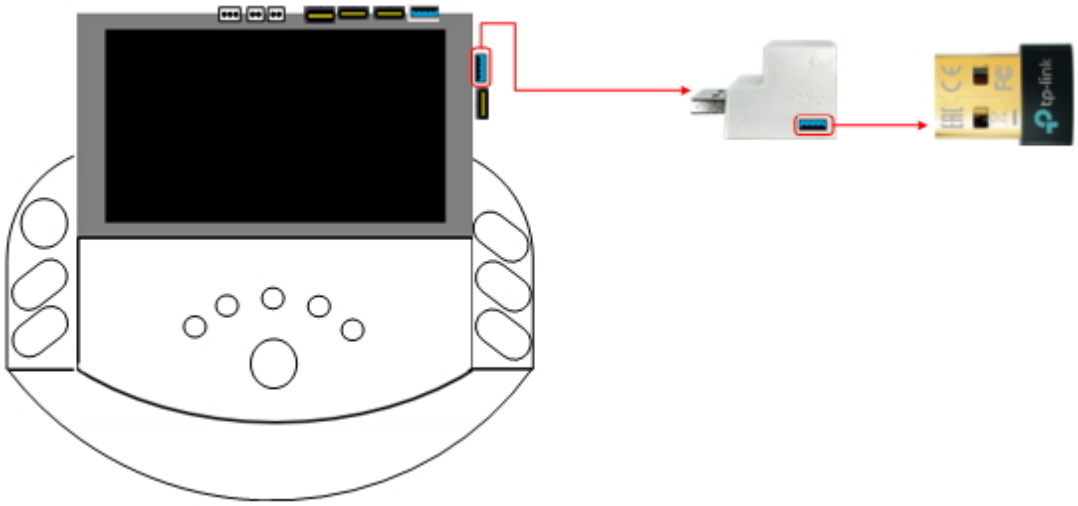


Figure 3-24: Default install to OPIO left USB port

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3.5.13 Connecting an external USB Hard disk or USB Memory Stick

Note *Before connecting an USB device, please read Section 3.5.14 "General Remarks when using external USB-Devices" on page 3-32.*

An external HDD or USB stick may be connected to any accessible USB port of the Voluson Performance 16/ Voluson Performance 18 system.

An external USB Hard Disk Drive or USB stick can be connected once the system is powered ON, or after shutdown. The Voluson Performance 16/ Voluson Performance 18, 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.*

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3.5.14 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!

When an external USB-storage device (such as an USB-memory stick or an external hard disk) is connected to the Voluson Performance 16/ Voluson Performance 18, 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 Performance 16/ Voluson Performance 18 Instructions for Use.*

3.5.14.1 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, select the ***Eject Media*** button at the Right Toolbar.

Caution

Unplugging or ejecting USB devices without first stopping them can cause result in loss of valuable data.

By selecting the ***Eject Media*** button at the Right Toolbar, a dialog window (see: *Figure 3-25 below*) is displayed, which 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 3-25: Drive Management

To stop the external device, either

- select the device and then click the ***Stop Device*** button on the Monitor screen **(A)** or
- touch the ***Device*** to be stopped on the Touchpanel **(B)**.

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3.6 Printer Installation

Note *For connection schemes see Section 3.5 "Connection of Auxiliary Devices" on page 3-16.*

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3.6.7 Button Configuration (Remote Control) - 3-58

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



Warning

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

Note *If the **Whitelisting** option is available and activated in Home - System Setup - Security, 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 3.5.2 on page 3-18*.
3. Verify correct printer settings; see *Section 3.6.5 "Adjustment of Printer Settings" on page 3-54*
4. Assign printer to remote keys, see *Section 3.6.7 " Button Configuration (Remote Control)" on page 3-58*

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 3.5.2 on page 3-18*.
3. Verify correct printer settings; see *Section 3.6.5 "Adjustment of Printer Settings" on page 3-54*
4. Assign printer to remote keys, see *Section 3.6.7 " Button Configuration (Remote Control)" on page 3-58*

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3.6.3 Installing the Network Color Laser Printer

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*3.6.3.3 WLAN Configuration at the Voluson Performance 16/ Voluson Performance 18 system - - - - - - - - - - - - - - - - - - -

3.6.3.1 Prepare the Network Color Laser Printer

1. Power Off/Shutdown the system as described in *Section 4.2.2 on page 4-4*.
2. Connect the printer as described in *Section 3.5.4 on page 3-20*.
3. Power On/Boot Up the system as described in *Section 4.2.1 on page 4-3*
4. Press the **Power ON** button on the printer.
5. Install ink tanks and load paper.

Note *Starting the printer may take up to 3 minutes. The printers "Home screen" and further preparations are different depending on the used HP model type.*

HP M454

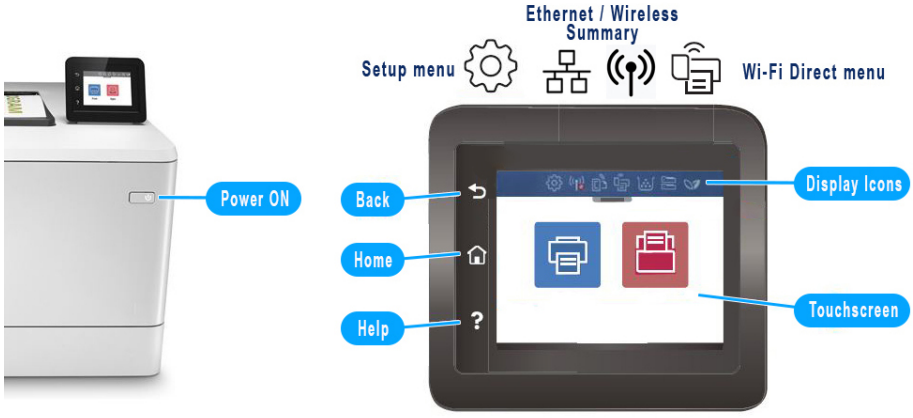


Figure 3-26: basic printer controls - Home screen at HP M454

1. Depending on the connection type (Ethernet or Wireless) touch the proper icon on the Printer Touchscreen (twice).

   Ethernet to display printers IP Address (when connected via LAN cable).

   Wireless to display printers IP Address (when connected via WLAN adapter). Select the ***Setup menu*** icon for configuration, see *Section 3.6.3.2.3 on page 3-42*.

2. If required, turn on Wi-Fi Direct.

   Wi-Fi Direct to display Wi-Fi Direct Name and Password (when connected via WLAN adapter). Select the ***Setup menu*** icon for configuration, see *Section 3.6.3.2.2 on page 3-41*.

3. Touch the ***Home*** button to return to the Home screen.

HP M555



Figure 3-27: basic printer controls - Home screen at HP M555

1. Touch the "Information" icon on the Home screen.
2. Depending on the connection method (LAN cable or WLAN adapter) select the proper item among ***Wi-Fi Direct***, ***Wireless*** or ***Ethernet*** on the printers touchscreen.

   Wi-Fi Direct to display Wi-Fi Direct Name, Password and IP Address (when connected via WLAN adapter). Select the ***Settings*** icon for configuration, see *Section 3.6.3.2.5 on page 3-44*.

   Wireless to display printers IP Address (when connected via WLAN adapter). Select the ***Settings*** icon for configuration, see *Section 3.6.3.2.6 on page 3-45*.

   Ethernet to display printers IP Address (when connected via LAN cable).

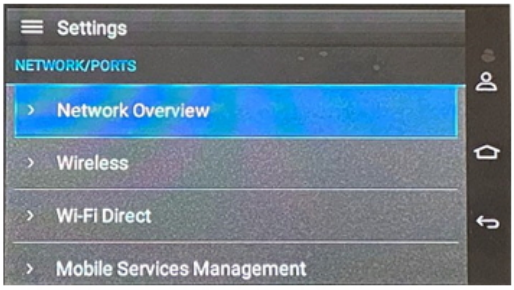
3. Touch the ***Home*** button to return to the Home screen.

Lexmark CS632



Figure 3-28: Basic Printer Controls - Home screen

1. Touch the ***Settings*** icon on the Home screen.
2. Swipe down to select ***Network/Ports***.
3. Depending on the connection method (LAN cable or WLAN adapter) select the proper item on the printers touchscreen:



Ethernet - no configuration required.

Network is automatically configured once the LAN cable is properly connected, see *Section 3.6.3.2.7 on page 3-46*

Wireless - for configuration, see *Section 3.6.3.2.8 on page 3-47*

Wi-Fi Direct - for configuration, see *Section 3.6.3.2.9 on page 3-48*

4. Touch the ***Home*** button to return to the Home screen.

3.6.3.2 Network Configuration

Note *Network Configuration and required setup depends on the used printer and the connection method.*

Content in this chapter

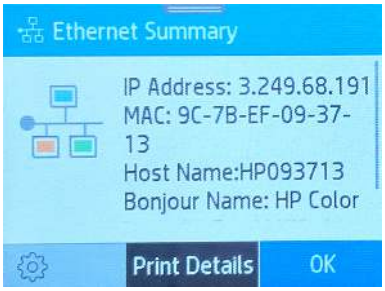
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3.6.3.2.1 HP M454 Network Configuration - Ethernet Connection (LAN cable)

1. Select the ***Ethernet Summary*** icon and write down the *IP Address*.

Table 3-6: Ethernet Summary - Example

	**IPv4 Address** : 3.249.68.191 (example)

Note *Keep in mind this unique printer IP Address. It might be entered during Printer Installation procedure. If preferred, select **Print Details**. The IP Adress is found in the **802.3 Wired** section of the printout.*

2. Touch the ***Home*** button to return to the Home screen.
3. Proceed with *Section 3.6.3.4 "Network Color Laser Printer Installation Procedure" on page 3-50*.

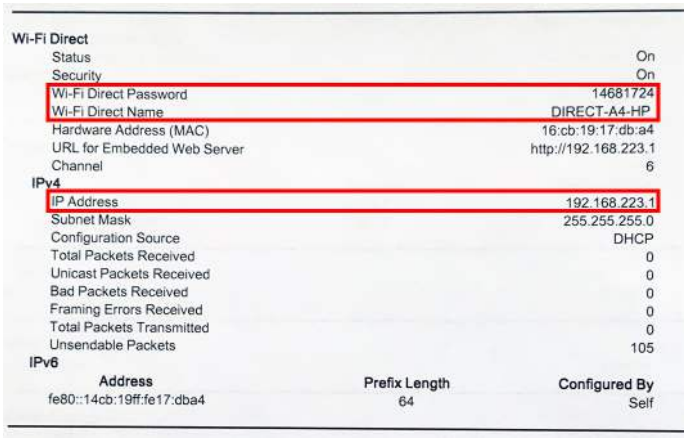
3.6.3.2.2 HP M454 Network Configuration - Wi-Fi Direct (WLAN adapter)

Wi-Fi Direct does not require a centralized network or an access point (wireless router) to share information.

Note *If some other interconnected devices will require connecting to an existing wireless network for daily operations, the Wi-Fi Direct function must not be used.*

1. Touch the ⚙ ***Setup*** icon (twice).
2. Select ***Wi-Fi Direct*** and then set status to ***On*** (slider is green).
3. Touch the 🏠 ***Home*** button to return to the Home screen.
4. Restart (power off and on) the printer.
5. After the restart touch the ⚙ ***Setup*** icon (twice) again.
6. Swipe down to select ***Reports*** → ***Network Configuration Page*** → ***Print***.

   The printers *Wi-Fi Direct Password, Name* and *IP Address* is found in the **Wi-Fi Direct** section of the printout.



Wi-Fi Direct	
Status	On
Security	On
Wi-Fi Direct Password	14681724
Wi-Fi Direct Name	DIRECT-A4-HP
Hardware Address (MAC)	16:cb:19:17:db:a4
URL for Embedded Web Server	http://192.168.223.1
Channel	6
IPv4	
IP Address	192.168.223.1
Subnet Mask	255.255.255.0
Configuration Source	DHCP
Total Packets Received	0
Unicast Packets Received	0
Bad Packets Received	0
Framing Errors Received	0
Total Packets Transmitted	0
Unsendable Packets	105
IPv6	

Address	Prefix Length	Configured By
fe80::14cb:19ff:fe17:dba4	64	Self

Wi-Fi Direct Password: 14681724 (example)

Wi-Fi Direct Name: DIRECT-A4-HP

IP Address: 192.168.223.1 (example)

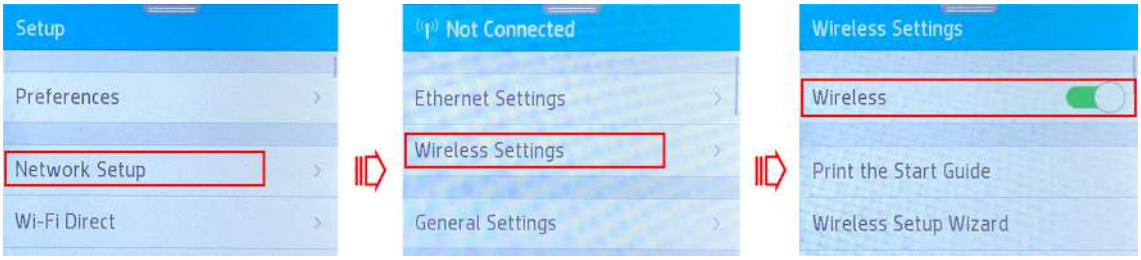
Figure 3-29: Wi-Fi Direct information at printout - Example

Note *Keep in mind this unique printer IP Address. It might be entered during Printer Installation procedure. The Wi-Fi Direct Password must be entered when connecting to the Wi-Fi network. For security purposes, this "Password" needs to be kept a secret!*

7. Touch the 🏠 ***Home*** button to return to the Home screen.
8. Proceed with *Section 3.6.3.3 "WLAN Configuration at the Voluson Performance 16/ Voluson Performance 18 system" on page 3-49*.

3.6.3.2.3 HP M454 Network Configuration - Wireless Connection (WLAN adapter)

1. Touch the ***Setup*** icon (twice).
2. Select ***Network Setup*** → ***Wireless Settings***.
3. Set ***Wireless*** status to ***On*** (slider is green).



The printer is searching for available wireless routers.

Figure 3-30: select Network Setup → Wireless Settings → set Wireless status to On

4. Select the WLAN network to be used (e.g., select ***TP-Link_1553***).
5. Touch to ***Enter the Password***, type the WLAN password and then touch ***Done***.

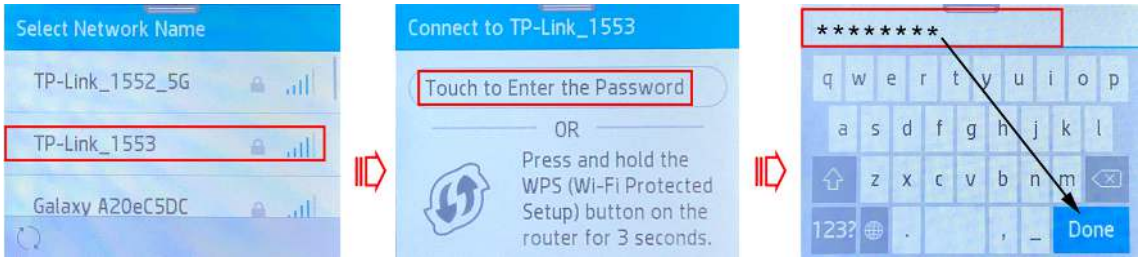
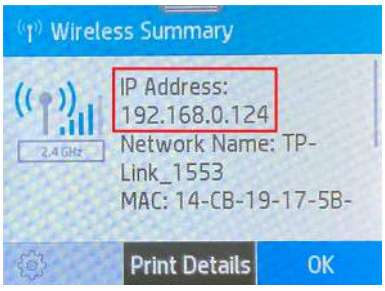


Figure 3-31: select WLAN, enter the WLAN password and then touch Done

6. Confirm your settings and then touch ***OK***.
7. When the printer states *Connection Successful* touch ***OK*** again.
8. Touch the ***Home*** button to return to the Home screen.
9. Restart (power off and on) the printer.
10. After the restart select the ***Wireless Summary*** icon and write down the *IP Address*.



IP Address: 192.168.0.124 (example)

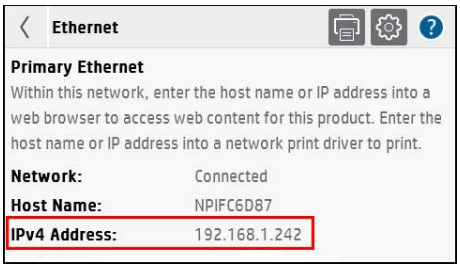
Figure 3-32: Wireless Summary - Example

Note *Keep in mind this unique printer IP Address. It might be entered during Printer Installation procedure.*
*If preferred, select **Print Details**. The IP Adress is found in the **802.11 Wireless** section of the printout.*

11. Touch the ***Home*** button to return to the Home screen.
12. Proceed with *Section 3.6.3.3 "WLAN Configuration at the Voluson Performance 16/ Voluson Performance 18 system" on page 3-49*.

3.6.3.2.4 HP M555 Network Configuration - Ethernet Connection (LAN cable)

1. Touch the ***Information*** icon on the Home screen.
2. Select ***Ethernet*** and write down the *IP Address*.



IPv4 Address: 192.168.1.242 (example)

Figure 3-33: Ethernet information - Example

Note *Keep in mind this unique printer IP Address. It might be entered during Printer Installation procedure.*

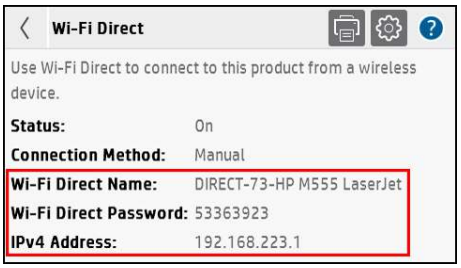
3. Touch the ***Home*** button to return to the Home screen.
4. Proceed with *Section 3.6.3.4 "Network Color Laser Printer Installation Procedure" on page 3-50*.

3.6.3.2.5 HP M555 Network Configuration - Wi-Fi Direct (WLAN adapter)

Wi-Fi Direct does not require a centralized network or an access point (wireless router) to share information.

Note *If some other interconnected devices will require connecting to an existing wireless network for daily operations, the Wi-Fi Direct function must not be used.*

1. Touch the ***Information*** icon on the Home screen.
2. Select ***Wi-Fi Direct***.
3. Touch the ***Settings*** icon.
4. Select ***Wi-Fi Direct*** → ***Status*** and check mark ***On***.
5. Touch the ***Home*** button to return to the Home screen.
6. Restart (power off and on) the printer.
7. After the restart touch the ***Information*** icon on the Home screen again.
8. Select ***Wi-Fi Direct*** and write down the *Wi-Fi Direct Name, Password* and *IP Address*.



Wi-Fi Direct Name: DIRECT-73-HP M555 LaserJet

Wi-Fi Direct Password: 53363923 (example)

IPv4 Address: 192.168.223.1 (example)

Figure 3-34: Wi-Fi Direct information - Example

Note *Keep in mind this unique printer IP Address. It might be entered during Printer Installation procedure. The Wi-Fi Direct Password must be entered when connecting to the Wi-Fi network. For security purposes, this "Password" needs to be kept a secret!*

9. Touch the ***Home*** button to return to the Home screen.
10. Proceed with *Section 3.6.3.3 "WLAN Configuration at the Voluson Performance 16/ Voluson Performance 18 system" on page 3-49*.

3.6.3.2.6 HP M555 Network Configuration - Wireless Connection (WLAN adapter)

1. Touch the ***Information*** icon on the Home screen.
2. Select ***Wireless***.
3. Touch the ***Settings*** icon.
4. Select ***Wireless*** → ***Wireless Station*** → ***SSID List***.

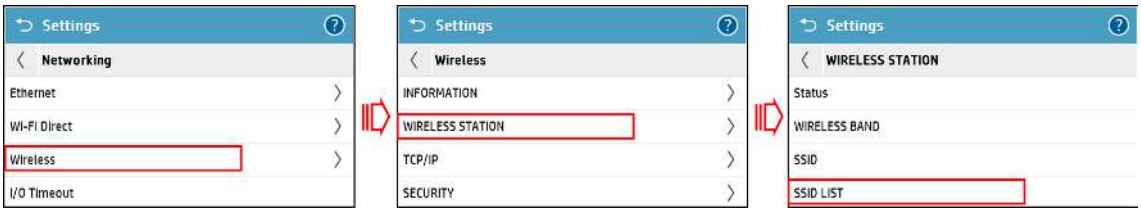


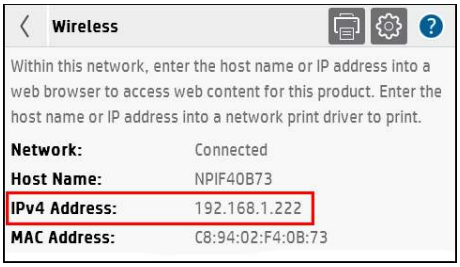
Figure 3-35: select Wireless → Wireless Station → SSID List

5. Check mark the WLAN network to be used (e.g., select ***FRITZ!Box...***) and then touch ***OK***.
6. Swipe down to select ***Authentication***, check mark ***WPA-PSK*** and then touch ***OK***.
7. Select ***Passphrase***, enter the ***WLAN Passord*** and then touch ***OK***.



Figure 3-36: select WLAN, set Authentication and enter WLAN Password

8. Touch the ***Home*** button to return to the Home screen.
9. Restart (power off and on) the printer.
10. After the restart touch the ***Information*** icon on the Home screen again.
11. Select ***Wireless*** and write down the *IP Address*.



IPv4 Address: 192.168.1.222 (example)

Figure 3-37: Wireless information - Example

Note *Keep in mind this unique printer IP Address. It might be entered during Printer Installation procedure.*

12. Touch the ***Home*** button to return to the Home screen.
13. Proceed with *Section 3.6.3.3 "WLAN Configuration at the Voluson Performance 16/ Voluson Performance 18 system" on page 3-49*.

3.6.3.2.7 Lexmark CS632 Network Configuration - Ethernet Connection (LAN cable)

Once the LAN cable is properly connected, the IP Address will be automatically shown on top of the printers touchscreen. No further configuration required.

Note *The IP Address needs to be entered during Printer Installation procedure.*



Example shows fictional numbers.

IP Address: 169.254.182.253

Figure 3-38: Ethernet information - Example

Proceed with *Section 3.6.3.4 "Network Color Laser Printer Installation Procedure" on page 3-50*.

3.6.3.2.8 Lexmark CS632 Network Configuration - Wireless Connection (WLAN adapter)

1. Touch the ***Setting*** icon on the Home screen.
2. Swipe down to select ***Network/Ports.***
3. Select ***Wireless*** → ***Setup On Printer Panel.***

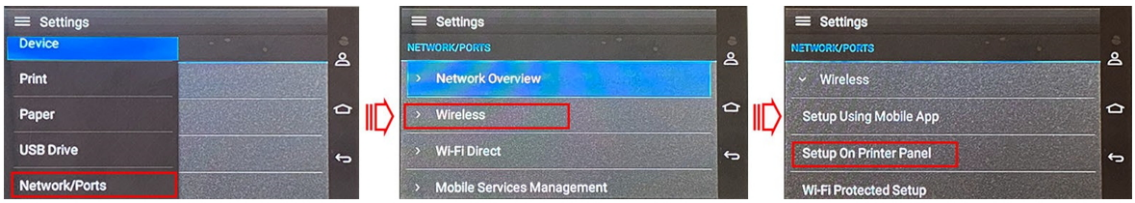


Figure 3-39: Select Network/Ports → Wireless → Setup On Printer Panel

4. Swipe down to select WLAN network to be used (in this example, select **RT-AX53U**).
5. **Enter Password** (of your WLAN network or router) then touch **OK**.
6. Wait until the wireless network shows Success then touch **OK**.

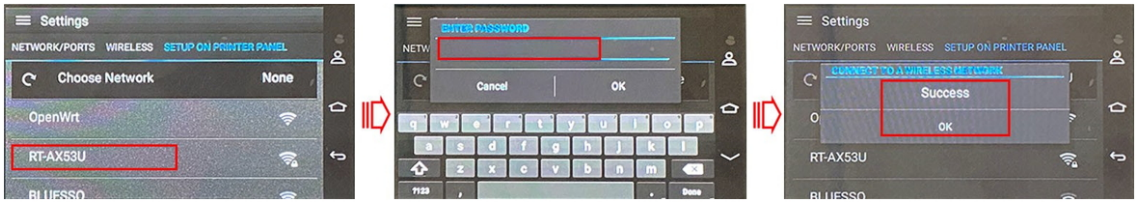


Figure 3-40: Select WLAN network → Enter WLAN Password → Verify Success with OK

7. Touch the ***Home*** button to return to the Home screen.
   The IP Address is automatically shown on top of the printers touchscreen.

Note *The IP Address needs to be entered during Printer Installation procedure.*



Example shows fictional numbers.

IP Address:192.168.2.109

Figure 3-41: Wireless information - Example

8. Proceed with *Section 3.6.3.3 "WLAN Configuration at the Voluson Performance 16/ Voluson Performance 18 system" on page 3-49*.

3.6.3.2.9 Lexmark CS632 Network Configuration - Wi-Fi Direct (WLAN adapter)

Wi-Fi Direct does not require a centralized network or an access point (wireless router) to share information.

Note *If some other interconnected devices will require connecting to an existing wireless network for daily operations, the Wi-Fi Direct function must not be used.*

1. Touch the ***Setting*** icon on the Home screen.
2. Swipe down to select ***Network/Ports.***
3. Select ***Wi-Fi Direct.***
4. ***Enable Wi-Fi Direct*** → select ***On.***



Figure 3-42: Select Network/Ports → Wi-Fi Direct →Enable Wi-Fi Direct (On)

5. Write down the Wi-Fi Direct Name and Wi-Fi Direct Password.
6. Swipe down to **Group Owner IP Address** and write down the displayed IP Address.



Example shows fictional numbers.

Wi-Fi Direct Name: Lexmark CS632 ...

Wi-Fi Direct Password: C!2584^f7 ....

IP Address: 10.3.2.1

Figure 3-43: Write down Wi-Fi Direct Name, Wi-Fi Direct Password and IP Address

Note *Keep in mind this unique printer IP Address. It needs to be entered during Printer Installation procedure. The Wi-Fi Direct Password must be entered when connecting to the Wi-Fi network. For security purposes, this "Password" needs to be kept a secret!*

7. Touch the ***Home*** button to return to the Home screen.

NOTICE

The message "802.1x network is not properly ", which is shown on top of the printers touchscreen **does not have any impact** on properly configured Wi-Fi Direct network printing.

8. Proceed with *Section 3.6.3.3 "WLAN Configuration at the Voluson Performance 16/ Voluson Performance 18 system" on page 3-49*.

3.6.3.3 WLAN Configuration at the Voluson Performance 16/ Voluson Performance 18 system

Note *If the printer is connected via LAN cable, this section should be omitted. Please proceed with Section 3.6.3.4 "Network Color Laser Printer Installation Procedure" on page 3-50.*

1. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
3. Select ***Connectivity*** and then click the ***Device Setup*** tab.
4. Click the ***WLAN Configuration*** button.
5. The WLAN Configuration screen with available networks appears.

Note *If no networks are available, check the WLAN button which needs to show Off. Wait about one minute for pairing. If still no networks available, verify proper connection of the WLAN network adapter.*

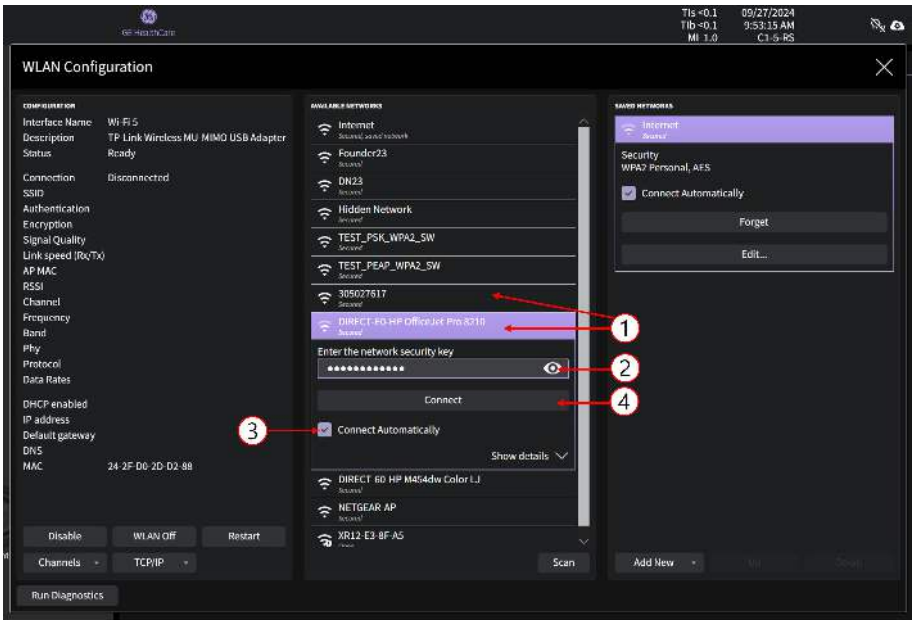


Figure 3-44: Wireless Networks - Connect

6. In the displayed window select the proper network.

Wi-Fi Direct
- Select the printers Wi-Fi Direct Name. For example select ***DIRECT- ...*** **(1)**.
- Enter the networks security key which means the previously noted (or print out) ***Wi-Fi Direct Password*** **(2)**.
- Check mark "Connect Automatically" **(3)**.
- Click ***Connect*** **(4)**.

Wireless
- Select the wireless network to be used. For example select ***FRITZ!Box ...*** **(1)**.
- Enter the networks security key which means the ***WLAN Password*** **(2)**.
- Check mark "Connect Automatically" **(3)**.
- Click ***Connect*** **(4)**.

7. When the network is connected, close the WLAN Configuration page.

Proceed with *Section 3.6.3.4 "Network Color Laser Printer Installation Procedure" on page 3-50*.

3.6.3.4 Network Color Laser Printer Installation Procedure

1. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
3. Select ***Connectivity*** and then click the ***Peripherals*** tab.
4. Click the ***Add Printer*** button.
   Please read the displayed message carefully and click ***Yes*** if you have skills to do this.
5. In the displayed window click on ***The printer that I want isn't listed*** and then click ***Next***.

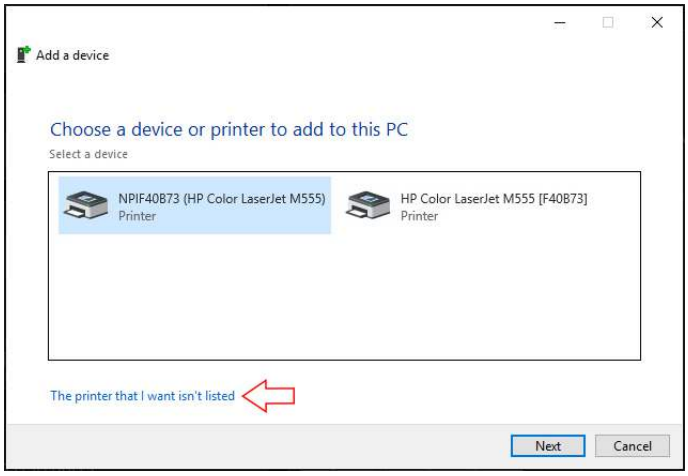


Figure 3-45: the printer is not listed

6. Check mark ***Add a printer using a TCP/IP address or hostname*** and then click ***Next***.

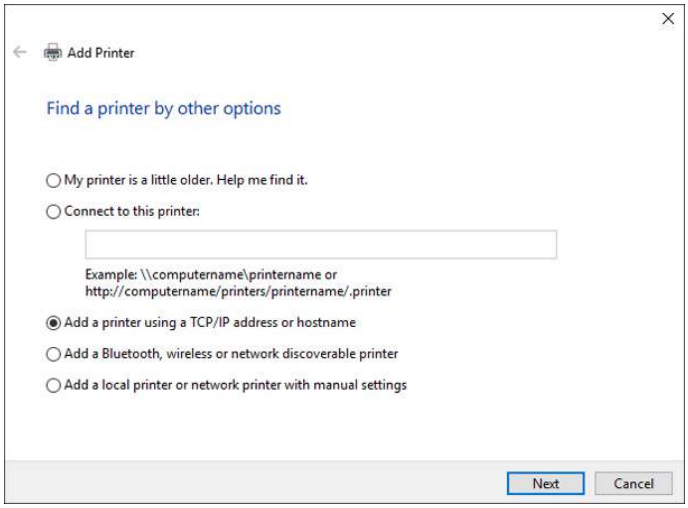


Figure 3-46: add a printer using TCP/IP address

7. In the displayed screen:
   - Select **TCP/IP Device** from the pull-down menu.
   - Enter the previously noted (or print out) **IP address**, suitable for the used connection method.
   - If required, enter a different **Port name**.
   - Remove the check mark at *"Query the printer....."* and then click ***Next***.

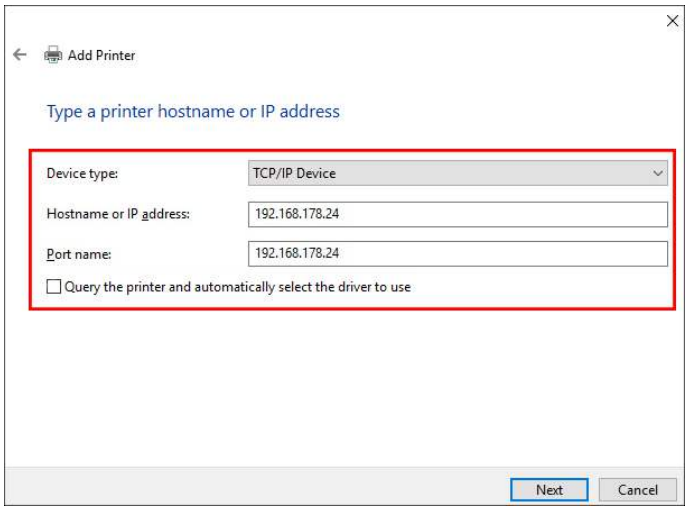


Figure 3-47: enter printers IP Address (example)

8. Click on **Have Disk** and browse for the printer driver:
   - on the internal hard disk browse for R:\system\periph***
   - on drive E:\ (where E: stands for the USB stick)
9. Select the printer driver folder, scroll downwards to select hpcu175u.inf (at HP printers) resp. *LMU02o40.inf* (at Lexmark printer) and then click **Open.**
10. Verify proper file location and then click ***OK.***

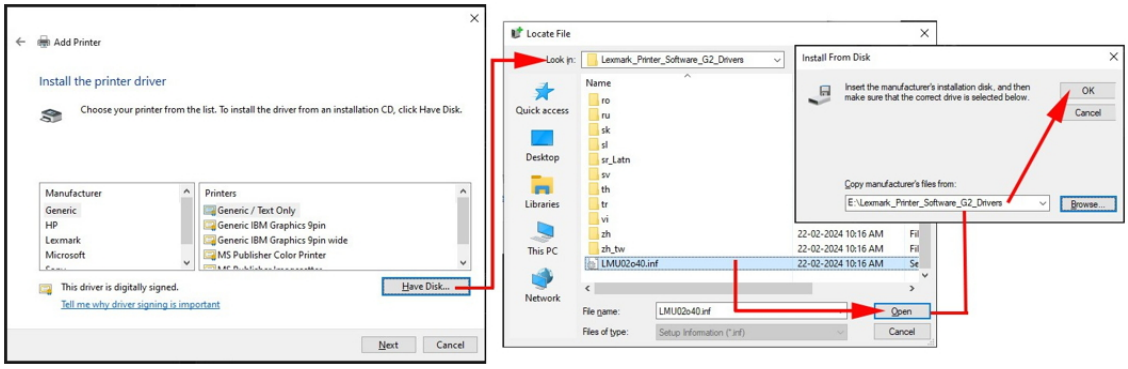


Figure 3-48: Search for printer driver

11. Scroll downwards to select your printer (e.g., select ***Lexmark CS630 Series***) and click ***Next*** to start the installation.

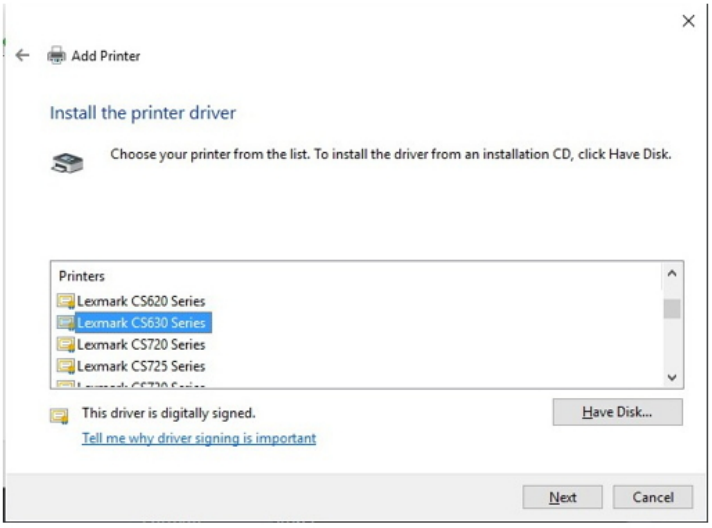


Figure 3-49: Select proper printer (e.g., select Lexmark CS630 Series)

12. If desired, change the *"Printer Name"* (e.g., change it to **Lexmark CS632**) and then confirm with ***Next*** to start the installation.

Note *If the screen "Which version of the driver do you want to use?" appears, check mark "Replace the current driver" and then click **Next**.*

13. In the next screen, check mark *"Do not share the printer"* and then click ***Next***.
14. Remove the check mark at ***Set as the default printer*** and then click on ***Print a test page***.
15. After the printout click ***Finish***.

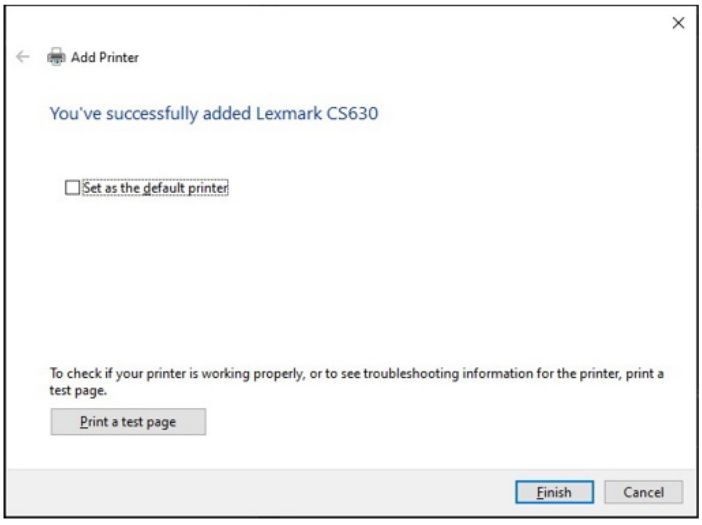


Figure 3-50: installation successful

16. Close all open windows, select ***Save & Exit*** and then reenter system setup.
17. Assign the printer as desired:
    a. to remote keys in the ***Connectivity*** → ***Button Configuration*** tab, see *Section 3.6.7 on page 3-58*.
    b. as Report Printer in the ***Connectivity*** → ***Peripherals*** tab, see *Section 3.6.6 on page 3-57*.
18. Close all open windows, select ***Save & Exit*** and restart the system (turn off and on the system).
19. Print a Test Page (e.g., Patient Report with measurement results).

3.6.4 Printer Installation manually

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

1. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
3. Select ***Connectivity*** and then click the ***Peripherals*** tab.

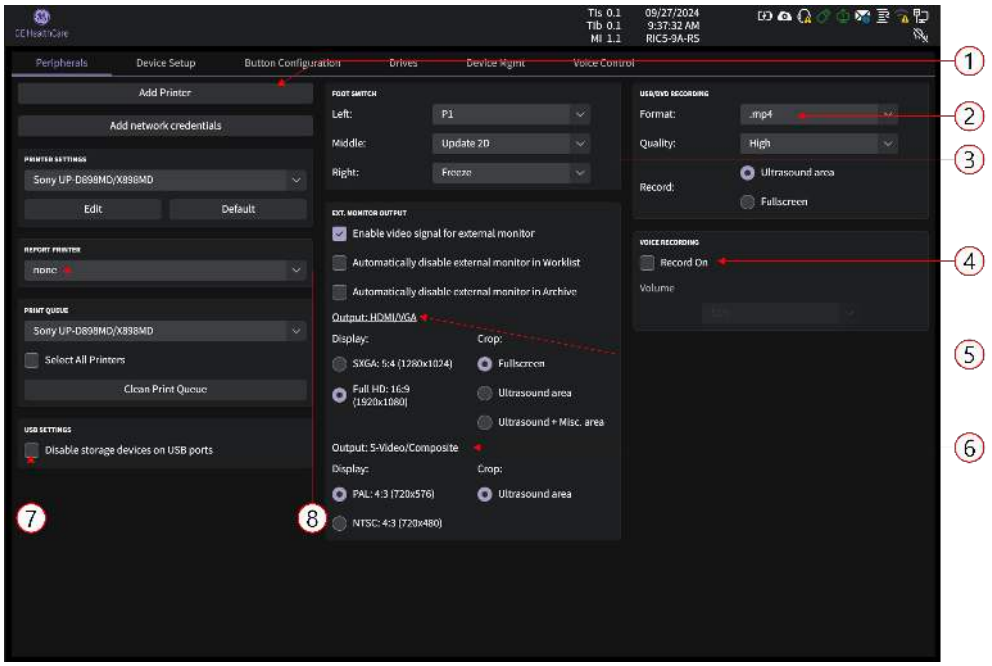


Figure 3-51: System Setup - Connectivity - PERIPHERALS page

1	Add Printer button	5	External Monitor Output selection
2	USB recording (Format and Quality setting)	6	Video Norm selection
3	Foot Switch Remote Control	7	Report Printer selection
4	Voice recording	8	USB Settings (disable USB ports)

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 3-54*.
8. Assign printer to remote keys, see *Section 3.6.7 " Button Configuration (Remote Control)" on page 3-58*.

3.6.5 Adjustment of Printer Settings

After system restart:

1. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
3. 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 3-52: select desired printer

- *"UP-D898MD Printer - Settings" on page 3-54*
- *"UP-D25MD Printer Settings" on page 3-56*



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-D898MD Printer - Settings

1. Call up the "Printer Settings"; see *Section 3.6.5 "Adjustment of Printer Settings" on page 3-54*.
2. Choose Orientation, Format and Printing Preferences.

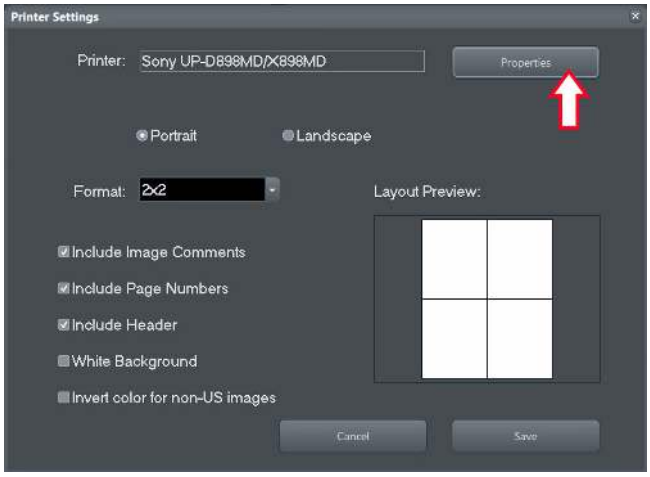


Figure 3-53: Printer Settings

3. Click the ***Properties*** button.

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4. In the ***Main*** page select:
   - Paper Size: **4096x1280**
   - Orientation: **Portrait**
   - Interpolation Method: **Bilinear**

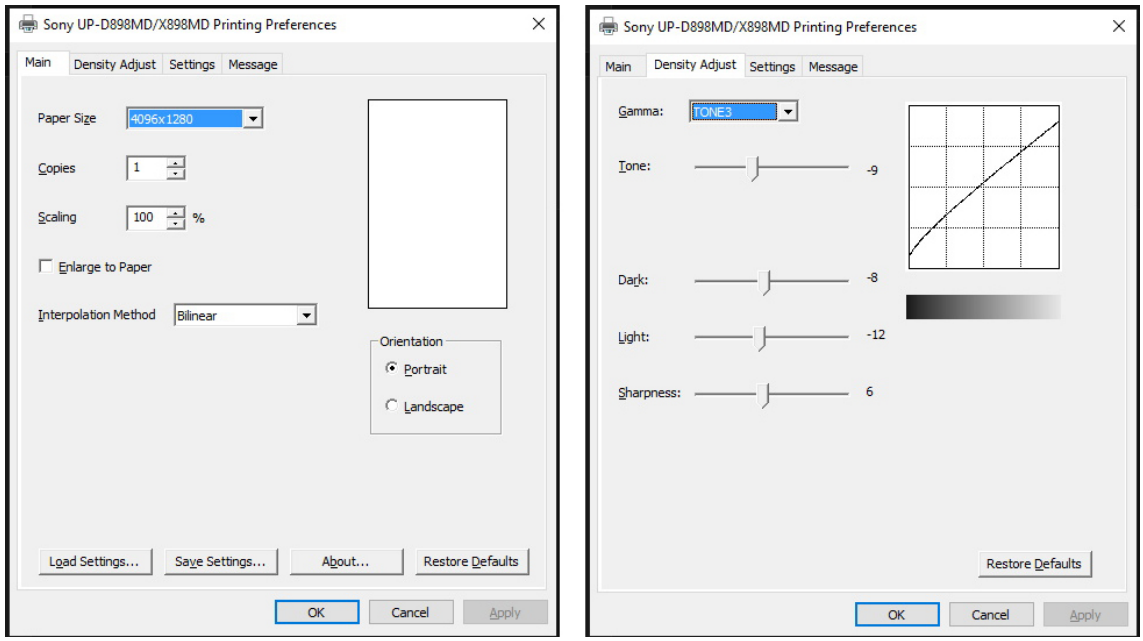


Figure 3-54: Main / Density Adjust page

5. Select the ***Density Adjust*** page and select:
   - Gamma: **TONE3**
   - Tone = **-9**, Dark = **-8**, Light = **-12**, Sharpness = **6**
6. Save the adjusted printer settings with ***Apply*** and ***OK***. Close window and exit System Setup.
7. Assign printer to remote keys, see *Section 3.6.7 " Button Configuration (Remote Control)" on page 3-58*.

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3.6.5.2 UP-D25MD Printer Settings

1. Call up the "Printer Settings"; see *Section 3.6.5 "Adjustment of Printer Settings" on page 3-54*.
2. Choose Orientation, Format and Printing Preferences.

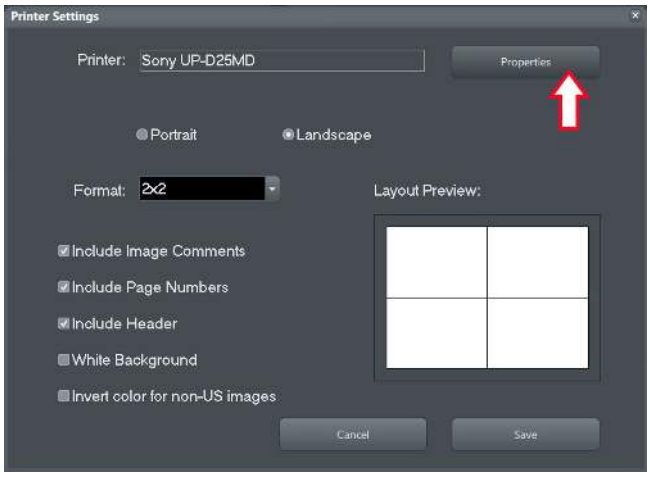


Figure 3-55: Printer Settings

3. Click the ***Properties*** button.
4. 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 the right color ink cartridge has to be used. Otherwise you will get an error message at printing.*

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

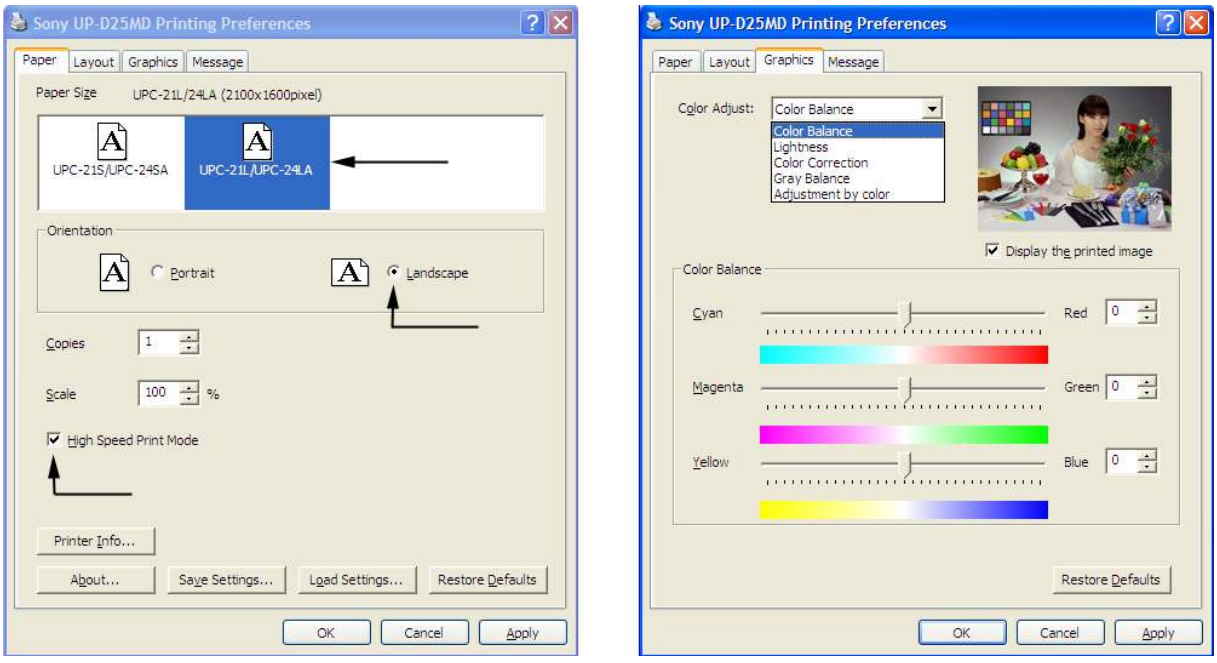


Figure 3-56: Paper / Graphics page

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

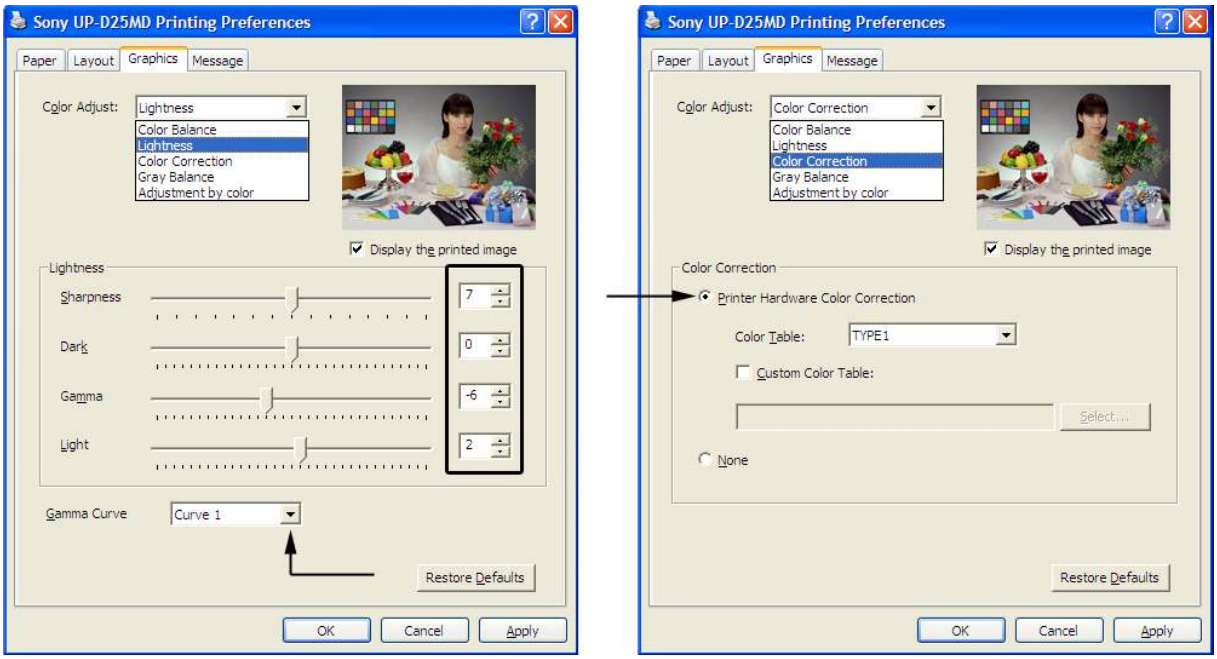


Figure 3-57: Graphic page (Lightness / Color Correction)

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

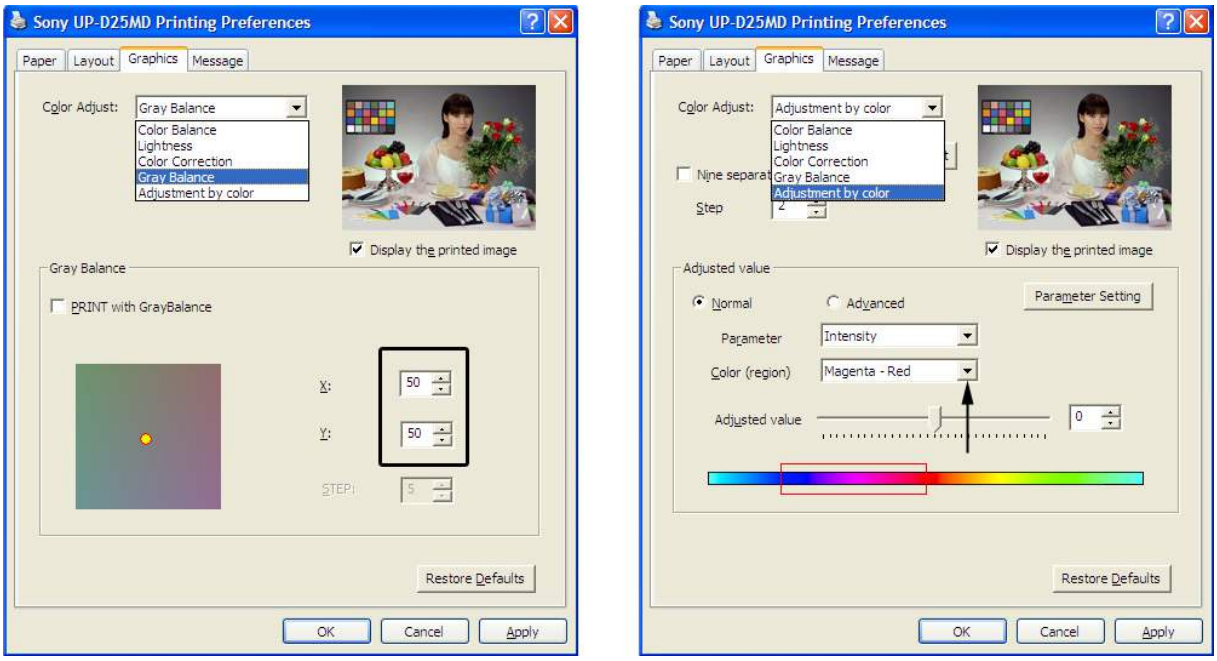


Figure 3-58: Graphic page (Gray Balance / Adjustment by Color)

11. Save the adjusted printer settings with ***Apply*** and ***OK***. Close window and exit System Setup.
12. Assign printer to remote keys, see *Section 3.6.7 " Button Configuration (Remote Control)" on page 3-58*.

3.6.6 Report Printer Selection

1. Click on the ***Peripherals*** tab; see *Figure 3-51 on page 3-53*.
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.*

3.6.7 Button Configuration (Remote Control)

To assign any auxiliary device (e.g., printer) to the remote keys , or to assign specific task to customizable **C1**, **C2**, **C3** and/or **C4** button:

1. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
3. Select ***Connectivity*** and then click the ***Button Configuration*** tab.

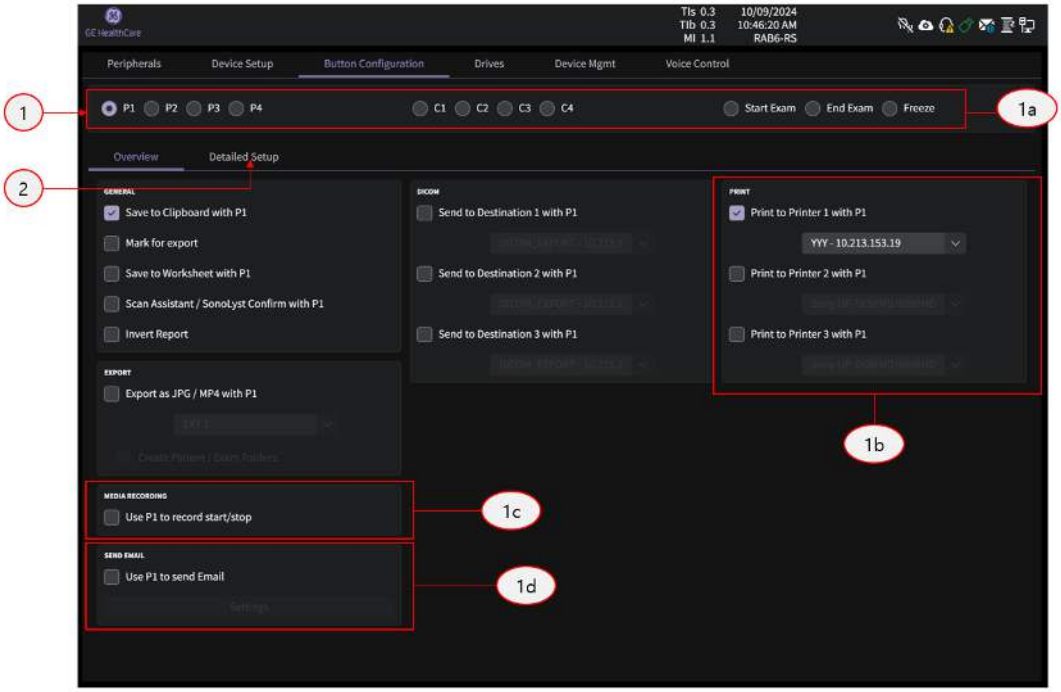


Figure 3-59: System Setup - Connectivity - BUTTON CONFIGURATION page (Overview)

1	Overview	2	Detailed Setup
1a	Configurable buttons		
1b	Select Printer		
1c	Recorder Control		
1d	Select **P?** key to send Email		

1. **Overview** tab: Select basic actions to be performed when pressing a particular key.
2. **Detailed Setup** tab: Choose what exactly happens when a particular key is pressed. (i.e.: If you choose to save images in the Overview tab, then the format of the images to save can be selected in the Detailed Setup tab.)

Content in this chapter

*3.6.7.1 How to configure P1-P4 Keys - - -

3.6.7.2 How to configure C1-C4 Keys

1. Select the Home - System Setup - Connectivity - ***Button Configuration*** tab.
2. Click the desired configurable **C1-C4** key and select its function among the given features in the drop-down menu.

Note *If desired, select **Save/Send/Print (P-Key)**. This opens extended configuration view to allow same functions as for P-Keys.*

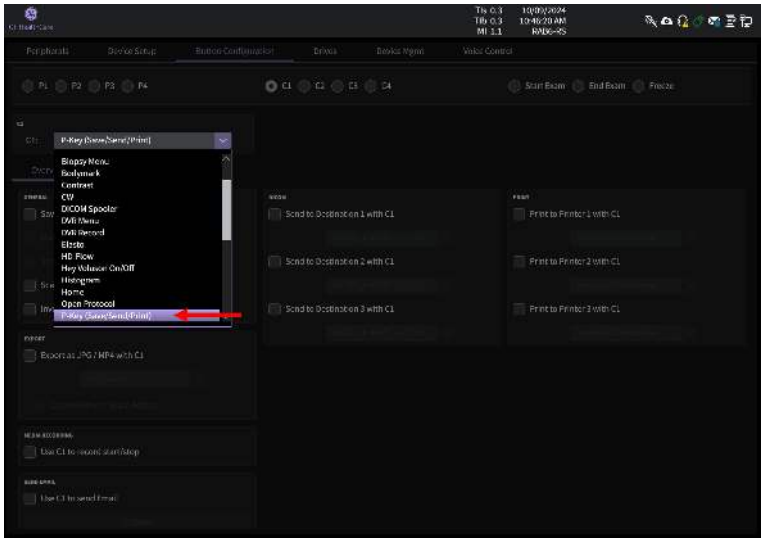


Figure 3-60: System Setup - Connectivity - BUTTON CONFIGURATION page - C1

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3.7 System Configuration (Home Menu)

1. Select the ***Home*** button at the Left Toolbar.



Figure 3-61: Home menu

Note *For further details refer to the Voluson Performance 16/ Voluson Performance 18 Instructions for Use*

Content in this chapter

*3.7.1 IfU (Instructions for Use) - - -

3.7.2 Probe Check

Note *The lens surface or cap surface must be clean (e.g., free of dirt, water or coupling gel) to perform the test.*





1. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***Probe Check*** button at the Left Toolbar.
3. Verify that probe lens/cap surface is clean, then select ***Start Test***.
4. When Probe Check is finished select ***Ok***.

3.7.3 Lock Touch

Frequent and diligent cleaning of the Voluson Performance 16/ Voluson Performance 18 ultrasound system reduces the risk of spreading infection from person to person and helps to maintain a clean work environment.



Caution

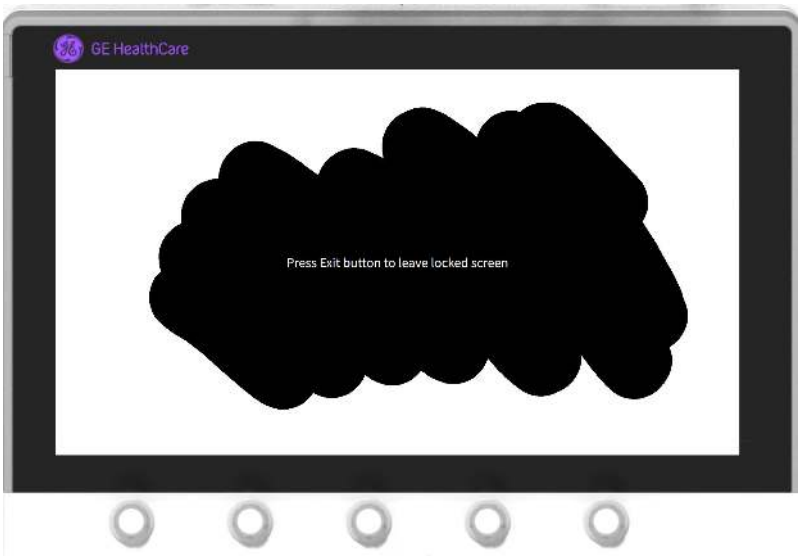
Do not use high-proof alcohol for cleaning. Only use cleaning/disinfecting agents listed in the Instructions for Use of the Voluson Performance 16/ Voluson Performance 18 system.





1. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***Lock Touch*** button at the Left Toolbar. This opens the "Cleaning Mode" screen.
3. Use cleaning agent on a soft, non-abrasive, damp cloth to carefully wipe the Touchpanel (already cleaned area changes color from white to black).

   Caution: DO NOT allow any liquid to drip or seep into the system.



4. When cleaning is finished press the **Exit** button.

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3.7.4 Quick Setup

1. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***Quick Setup*** button to invoke quick setup pages on the screen.

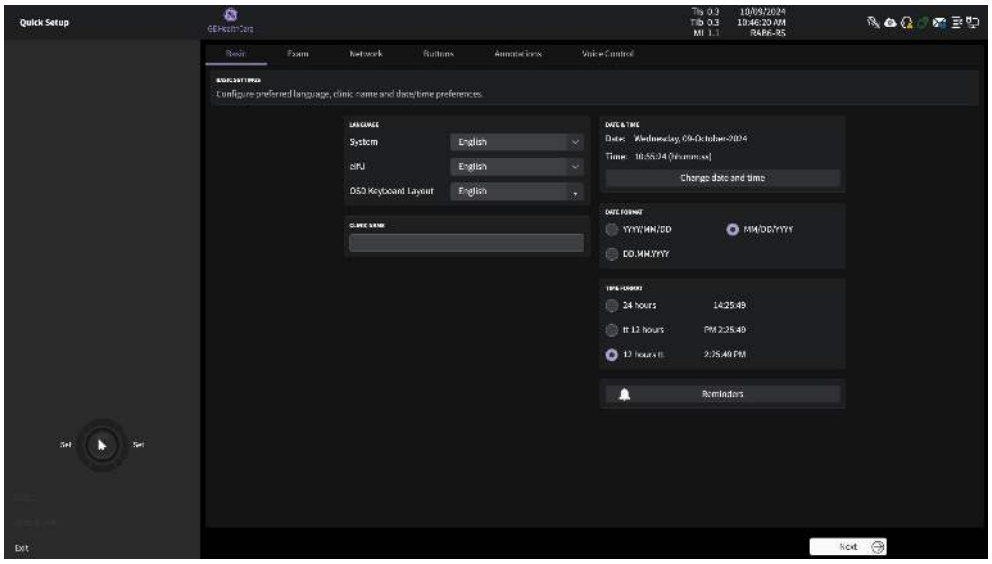


Figure 3-62: Quick Setup (e.g., BASIC)

The Quick Setup contains the most used settings in a guided workflow. Navigation between the 5 different pages is done with the ***Back*** and ***Next*** button. ***Save & Exit*** will save all settings and close the Quick Setup.

- **Basic**

  Configure preferred language, clinic name and date/time preferences.

- **Exam**

  Select applications shown when entering patient exam data. Hidden applications can still be accessed if needed using the configuration selection within the patient information screen.

- **Network**

  Configure network preferences and enter email.

- **Buttons**

  Select programmable key actions based on data management and workflow preferences.

- **Annotations**

  Configure general settings related to annotations, cursor position and bodymarkers. Annotations can be customized by long pressing the ABC menu located on the scan screen.

- **Voice Control (optional)**

  Configure "Hey Voluson" voice control preferences.

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3.7.5 System Setup

1. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.

Modifications of system setup parameters and settings are supported by 8 major groups. Each major group contains diverse dialog pages and sub windows.

Settings

- **General:** *Date & Time*, Clinic Name, Language, Screen saver, etc.
- **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 / Archive:** Drop Down Management, Title Bar Settings, Capitalize Letter in Patient Names, etc.

Protocols

- **Scan Assistant General:** adjustment of general Scan Assistant presets and functions
- **Scan Assistant List:** Overview and List Configuration
- **SonoLyst*live* General:** enable/disable SonoLystlive algorithm, adjust settings and presets
- **SonoLyst*live* 2nd Trim:** set views and measurements for SonoLystlive 2nd Trimester
- **Import/Export:** export all Scan Assistant lists / import an exported Scan Assistant lists

Administration

- ***Service***: enter the password « she » to get access to the Service Tools
- ***System Info***: shows which Software/Hardware version is installed in the system
- ***Probe Check***: set up of automated probe check interval, probe check reports and store duration time
- **Option** shows which options are installed in the system.

Connectivity

- **Peripherals:** *Video Norm* selection, *Foot switch* assignment, *External Monitor Output* settings, *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***: assignment of Remote keys **P-**buttons (e.g., Printer selection), **C-**buttons, ...
- **Drives:** USB and Network drives *Stop Device*, *Map Network Drive*
- ***Device Mgmt***: activate remote device management tool

Security

- ***Authentication***: access setting (password protection) to authentication functions
- ***Disk Encryption***: enables an encryption to secure all Patient Data, Patient Images and corresponding measurements
- ***Whitelisting***: prevents the system from installing unwanted software
- **System Password:** password for the Windows Operating system

Backup

- ***Configuration Backup***: Save/Load/Delete System Configuration Backup
- ***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 Setup

- Menu to program Biopsy Lines
- **Flow Profiles:** Adjustment of different flow profile values

Measure Setup

- **Measure & Calc:** shows all settings, which are used for generic measurements as well as calculations in different applications
- **Parameters:**
  - **Application Parameters:** to adjust Status on Freeze for different modes, Manual Trace method, Calculation Ratio, etc.
  - **Global Parameters:** 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 Performance 16/ Voluson Performance 18 Instructions for Use.*

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3.7.5.3 How to enter Clinic Name - 3-65
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3.7.5.1 How to invoke the System Setup Procedure



1. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
3. Select the corresponding "major group" 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):
functionality depend upon the currently displayed menu
no function in system desktop

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3.7.5.2 How to set Date and Time

1. Invoke System Setup as described in *Section 3.7.5.1 on page 3-64*
2. Select ***Settings*** and then click the ***General*** tab.

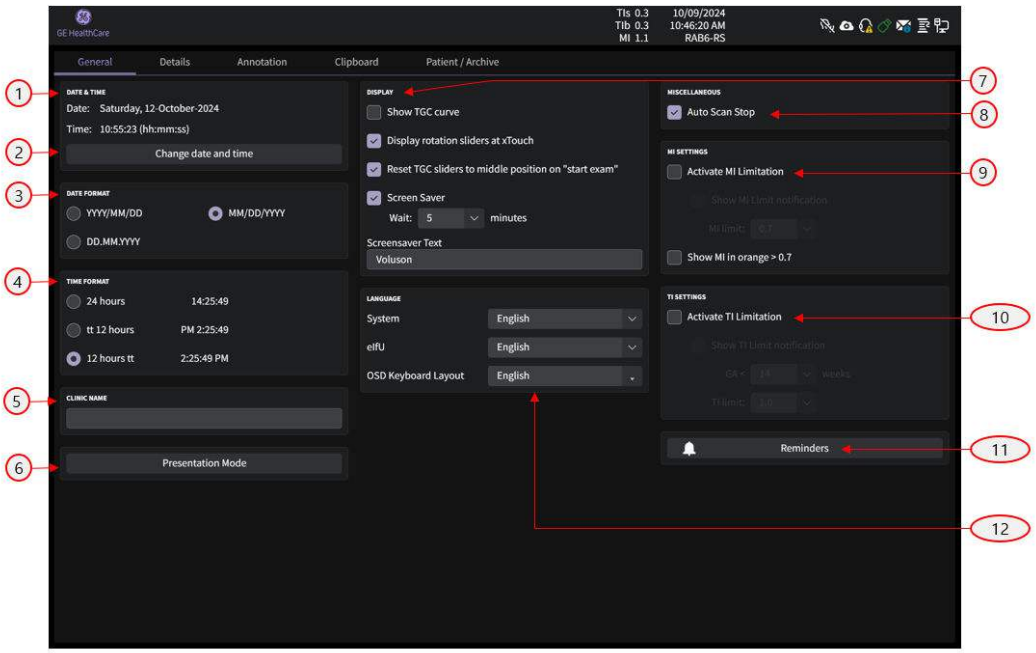


Figure 3-63: System Setup - Settings - GENERAL page

1	Date and Time	7	Display
2	Change date and time	8	Miscellaneous
3	Date Format	9	MI settings
4	Time Format	10	TI settings
5	Clinic Name	11	Reminders
6	Presentation Mode	12	Language

3. Click the ***Change date and time*** 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***.

3.7.5.3 How to enter Clinic Name

1. Invoke System Setup as described in *Section 3.7.5.1 on page 3-64*.
2. Select ***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.

3.7.5.4 How to change System Language

1. Invoke System Setup as described in *Section 3.7.5.1 on page 3-64*.
2. Select ***Settings*** and then click the ***General*** tab.
3. Select the desired "System" language from the pull-down menu.
4. Close the Service page with ***Save&Exit*** and restart the system.

Note *After changing the system language the Voluson Performance 16/ Voluson Performance 18 has to reboot.*

3.7.5.5 How to change Language of Instruction for Use

1. Invoke System Setup as described in *Section 3.7.5.1 on page 3-64*.
2. Select ***Settings*** and then click the ***General*** tab.
3. Select the desired "elfU" language from the pull-down menu.
4. Close the Service page with ***Save&Exit*** and restart the system.

3.7.5.6 How to configure Reminders

Reminders are customized messages that, once configured, are shown on the monitor/touchpanel.

1. Invoke System Setup as described in *Section 3.7.5.1 on page 3-64*
2. Select ***Settings*** and then press the ***General*** tab.
3. Click the ***Reminders*** button.
4. To add a new reminder click the  icon.
5. Enter the desired ***Reminder title***, ***Reminder text*** and ***Date***.

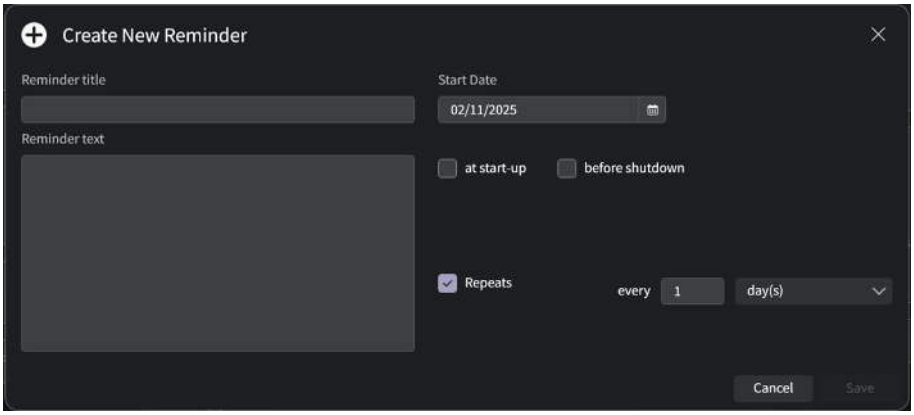


Figure 3-64: System Setup - Settings - General - Reminders - create New

6. Check mark when to display the reminder (at start-up or before shutdown).
7. If desired, check mark ***Repeats*** and adjust repeat options.
8. Close the Service page with ***Save&Exit*** and restart the system.

3.7.5.7 How to configure Automated Probe Check Interval

Additional to the manual ***Probe Check*** button (located in the "Home" menu), an automated Probe Check can be configured.

1. Select ***Home*** button at the Left Toolbar.
2. In the "***Home***" menu touch the ***System Setup*** button to invoke the setup desktop on the screen.

3. Select ***Administration*** and then click the ***Probe Check*** tab.

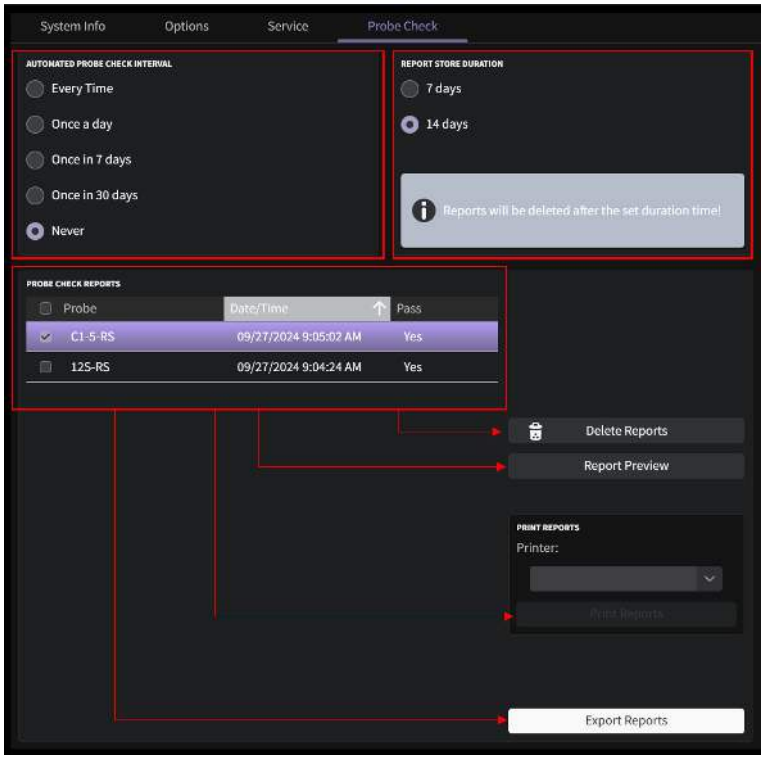


Figure 3-65: System Setup - Administration - Probe Check

4. Adapt settings:
   - **AUTOMATED PROBE CHECK INTERVAL**

     Set the interval when the automated Probe Check is started if a probe is activated.
   - **REPORT STORE DURATION**

     Set how long reports are stored. After the set duration time reports are deleted.
   - **PROBE CHECK REPORTS**

     Check mark desired report(s) and then select
     * ***Delete Reports*** to delete one or more reports
     * ***Report Preview*** to display one report in pdf format
     * ***Print Reports*** to print out one or more reports (select an installed printer from drop-down list first)
     * ***Export Reports*** to export one or more reports

3.7.5.8 How to change Video Norm

1. Invoke System Setup as described in *Section 3.7.5.1 on page 3-64*.

2. Select ***Connectivity*** and then click the ***Peripherals*** tab.

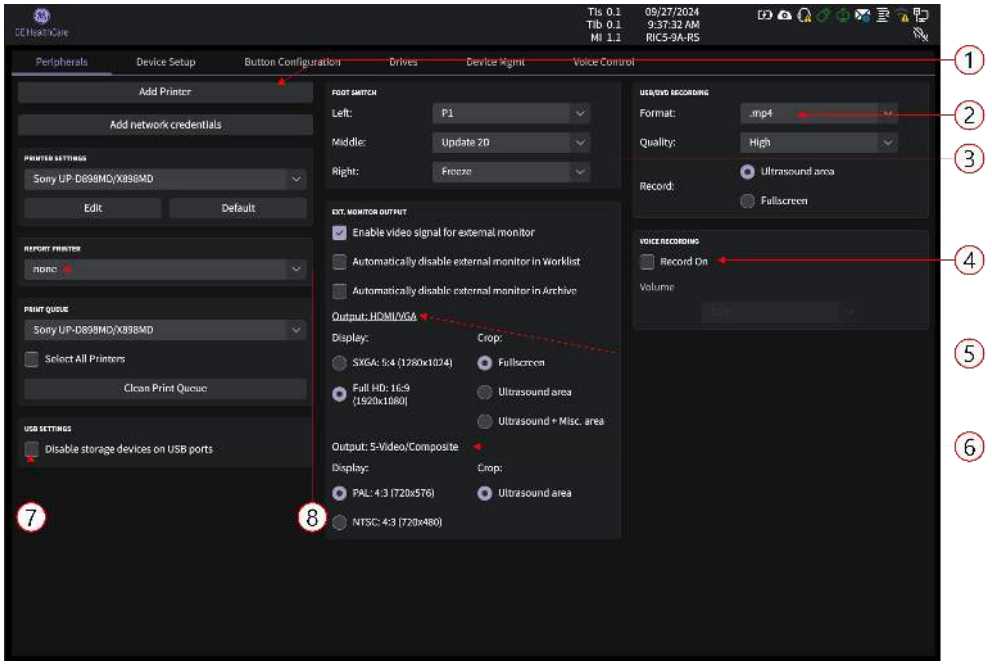


Figure 3-66: System Setup - Connectivity - PERIPHERALS page

1	Add Printer button	5	External Monitor Output selection
2	USB recording (Format and Quality setting)	6	Video Norm selection
3	Foot Switch Remote Control	7	Report Printer selection
4	Voice recording	8	USB Settings (disable USB ports)

3. Click the proper field: PAL (50Hz) or NTSC (60Hz).
4. Close the Service page with ***Save&Exit*** and restart the system.

3.7.5.9 How to change Ext. Monitor Output Settings

1. Invoke System Setup as described in *Section 3.7.5.1 on page 3-64*.
2. Select ***Connectivity*** and then click the ***Peripherals*** tab.
3. If not properly selected, choose desired settings in the "External Monitor Output" section.
4. Close the Service page with ***Save&Exit*** and restart the system.

3.7.5.10 How to adjust Function of the Foot Switch

1. Invoke System Setup as described in *Section 3.7.5.1 on page 3-64*.
2. Select ***Connectivity*** and then click the ***Peripherals*** tab.
3. Select desired function of the Foot Switch.
4. Close the Service page with ***Save&Exit*** and restart the system.

3.7.5.11 How to adjust Format and Quality setting for USB recording

1. Invoke System Setup as described in *Section 3.7.5.1 on page 3-64*.
2. Select ***Connectivity*** and then click the ***Peripherals*** tab.
3. Select the desired recording ***Format*** from the pull-down menu.
4. Select the desired recording ***Quality*** from the pull-down menu.
5. Close the Service page with ***Save&Exit*** and restart the system.

3.7.5.12 How to disable Storage Devices on USB ports

1. Invoke System Setup as described in *Section 3.7.5.1 on page 3-64*.
2. Select ***Connectivity*** and then click the ***Peripherals*** tab.
3. Check mark ***Disable storage devices on USB ports***.

Note *If the option "Advanced Security Features" is not set,* ***Disable storage devices on USB ports*** *is not available.*

Note *When* ***Disable storage devices on USB ports*** *is checked, the system does not recognize when a USB storage device is connected. Therefore, the export / import from and the recording to USB storage devices is not possible. A blue info badge is visible in the tab* ***Drives*** *when USB ports are disabled.*

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

3.7.5.13 How to change the Keyboard Layout

see *Section 6.3 "Modification of Keyboard Layout" on page 6-4*

3.7.5.14 How to configure Service Platform (RSvP Agent)

see *Section 3.13.6 "RSvP Agent Configuration" on page 3-98*

3.7.5.15 How to execute Additional Software Installation (ASI)

1. Invoke System Setup as described in *Section 3.7.5.1 on page 3-64*.
2. Select ***Administration*** and then click the ***Service*** tab.

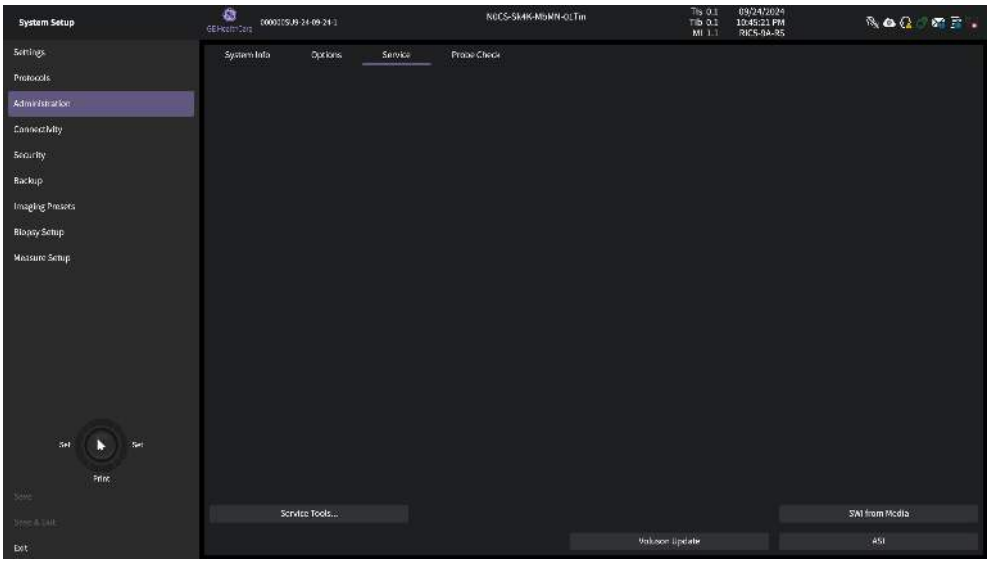


Figure 3-67: System Setup - Administration - SERVICE page

3. Click the ***ASI*** button.

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

3.7.5.16 How to load "Voluson Update" Packages

Note *"Voluson Remote Updates" is an option.*

1. Invoke System Setup as described in *Section 3.7.5.1 on page 3-64*.
2. Select ***Administration*** and then click the ***Service*** tab.
3. Click the ***Voluson Update*** button.
4. In the displayed window select available updates **(A)**.

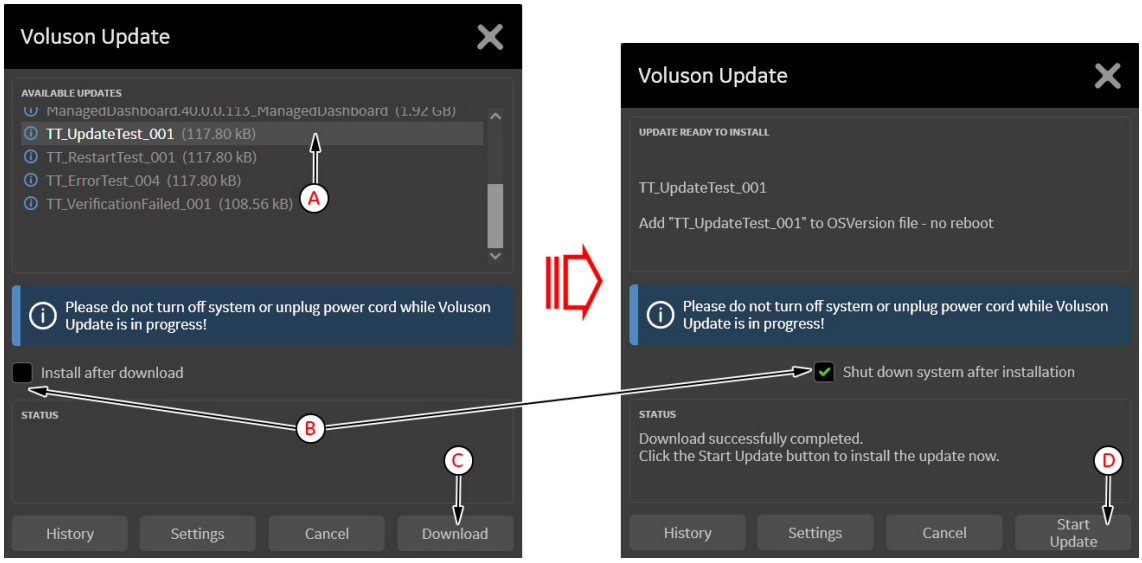


Figure 3-68: Voluson Update

5. Check mark desired settings (**B**).
6. Click ***Download*** **(C)**.

Note *If "Whitelisting" and/or "Disc Encryption" is activated, a password might be required before the solidify process starts (depends on set check marks).*

7. After sucessful download, you might have to click the ***Start Update*** button **(D)** (depends on set check marks) to initiate the installation process.



Sucessfully installed updates are listed in the ***History*** page.

3.7.5.17 How to activate User Login Authentication

1. Invoke System Setup as described in *Section 3.7.5.1 on page 3-64*.
2. Select ***Security*** and then click the ***Authentication*** tab.
3. Check mark ***Activate User Login***.

Note *If requested, select "Security Level" from the given features in the pull-down menu.*

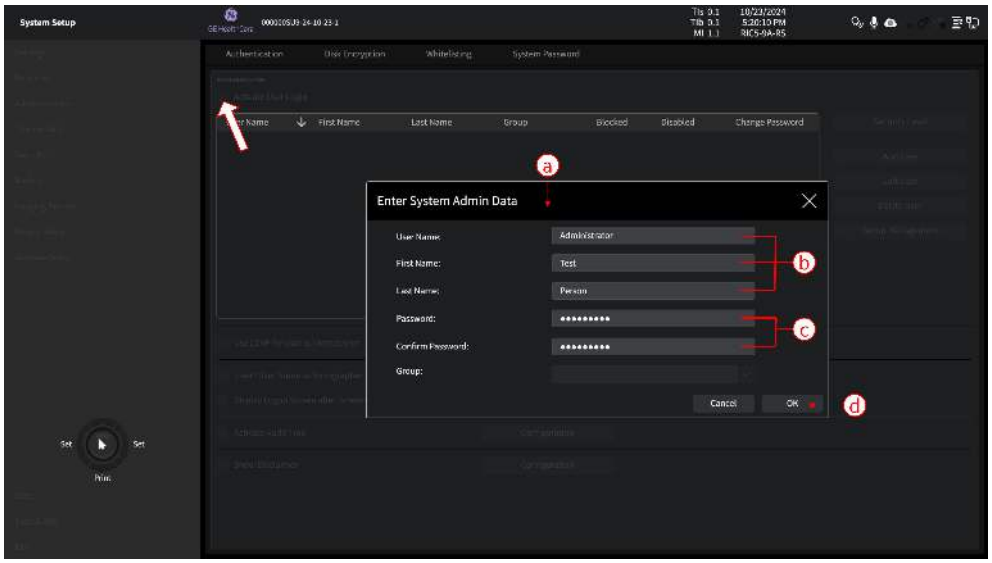


Figure 3-69: System Setup - Security - Authentication

a. The ***Enter System Admin Data*** dialog appears.
b. Enter the ***User Name***, the ***First Name*** and the ***Last Name***.
c. Enter a ***Password*** and ***Confirm Password***.

Note *Restrictions for a valid password depend on **Security Level** setting.*

d. 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.

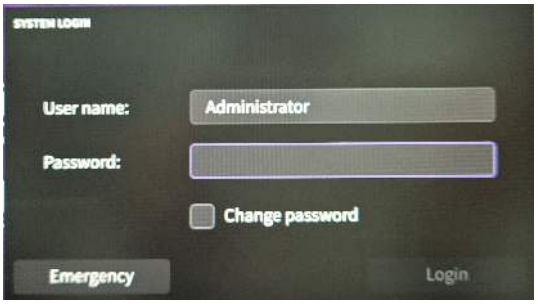


Figure 3-70: System Login

Note *For further details refer to the Voluson Performance 16/ Voluson Performance 18 Instructions for Use.*

3.7.5.18 How to perform Disk Encryption

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

Caution



Without the Encryption Password, the Recovery Key or USB device with unlock key it will not be possible to access the Ultrasound device including emergency mode, scanning, patient information, images, or local archive. GE HealthCare 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 - Security.*

Content in this chapter

*3.7.5.18.1 Disk Encryption Workflow - - -

3. Start Encryption.

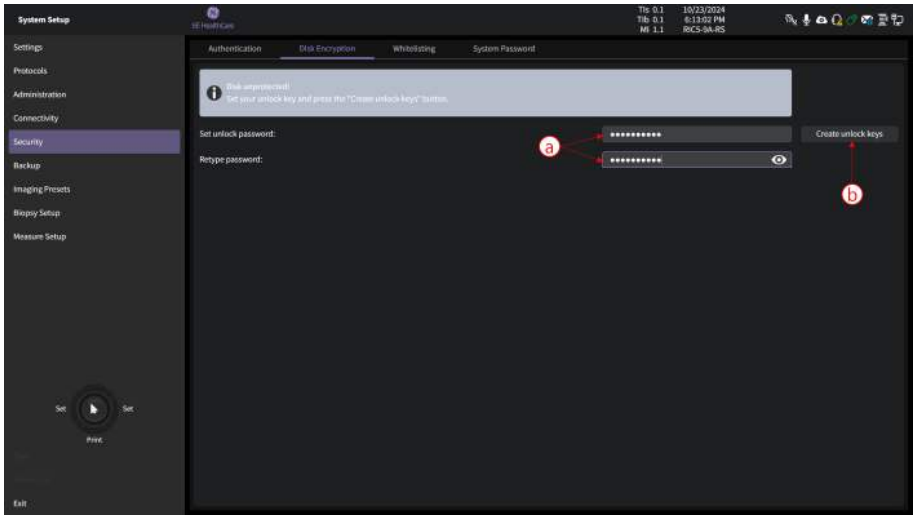


Figure 3-71: System Setup - Security - Disk Encryption

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.

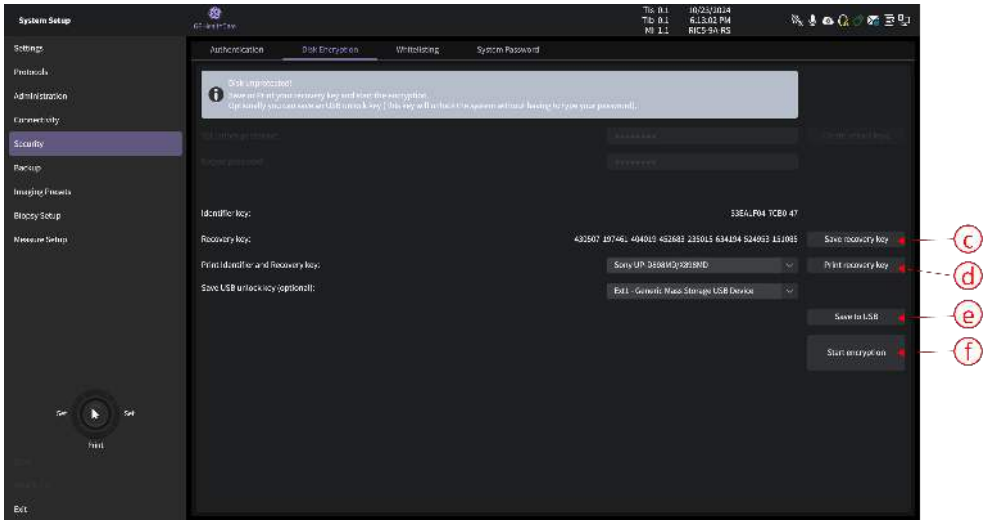


Figure 3-72: System Setup - Security - Disk Encryption

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 *Encryption process of patient data will take a considerable amount of time (one to several hours). Normal scanning can be performed without limitations.*

g. Confirm the dialogs with ***Yes*** and ***OK*** to start encryption.

A progress bar is displayed during disk encryption process.

Caution

Make sure Password, Recovery Key and USB unlock key are kept secret and safe. Without these you will not be able to unlock your Voluson.

3.7.5.18.2 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.

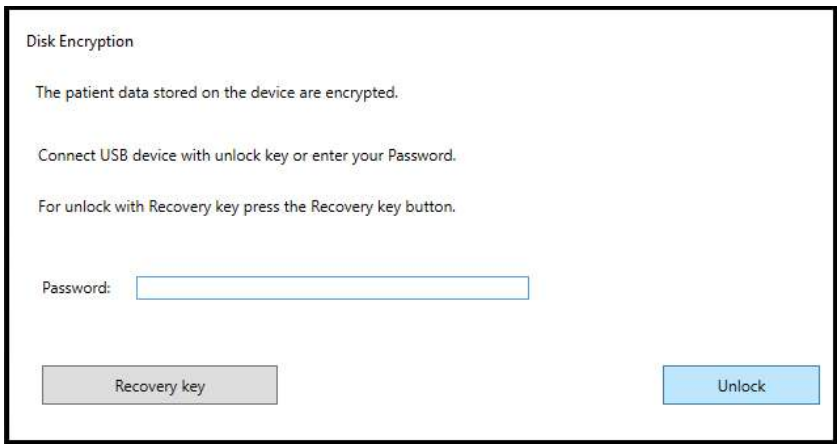


Figure 3-73: unlock screen at encrypted disk

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 Performance 16/ Voluson Performance 18, the system is automatically unlocked during boot up.

3.7.5.18.3 Decrypt Disk

1. Invoke System Setup as described in *Section 3.7.5.1 on page 3-64*.
2. Select ***Administration*** and then click the ***Service*** tab.
3. Select the ***Service Tools...*** button.
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 in ongoing.*

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3.7.5.19 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 - Security.*

1. Invoke System Setup as described in *Section 3.7.5.1 on page 3-64*.
2. On the left side of the screen select ***Security*** and then click the ***Whitelisting*** tab.

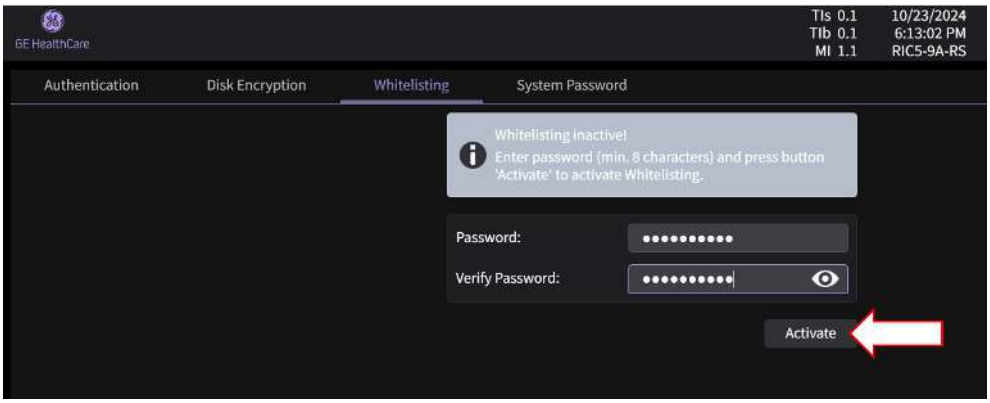


Figure 3-74: System Setup - Security - Whitelisting

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.

3.7.5.20 How to change the System Password

Note *"System Password" is the password for the Windows Operating system. This password is not needed for users and usage of the Voluson Performance 16/ Voluson Performance 18 system. DO NOT change this password unless you are the system administrator.*

1. Invoke System Setup as described in *Section 3.7.5.1 on page 3-64*.
2. On the left side of the screen select ***Security*** and then click the ***System Password*** tab.

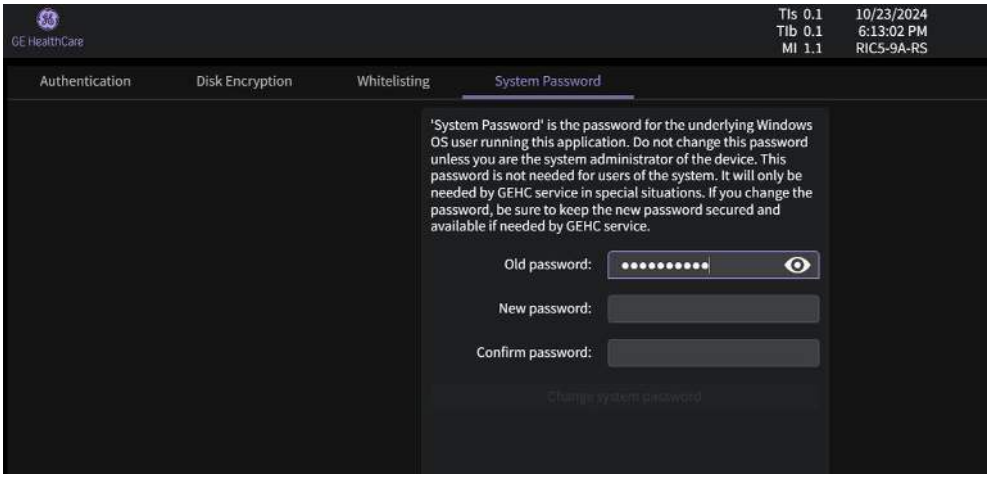


Figure 3-75: System Setup - Security - System Password

3. Enter the current password in the ***Old Password*** field (if the current password is the predefined system password, it is entered by the system automatically).
4. Enter ***New password*** and ***Confirm password***.

Note *The entered password has a minimum of 6 characters.*

5. Click ***Change system password***.
6. Close the Service page with ***Save&Exit*** and restart the system.

3.7.5.21 How to activate Device Management

Note ***Verisound™ Fleet(formerly AVURI)*** *is an option and might not be available in all countries. If this option is not set, the tab **Device Mgmt** is not available in System Setup - Connectivity.*

1. Select ***Home*** button at the Left Toolbar.

2. In the "Home" menu, touch the ***System Setup*** button to invoke the setup desktop on the screen.
3. On the left side of the screen select ***Connectivity*** and then click the ***Device Mgmt*** tab.

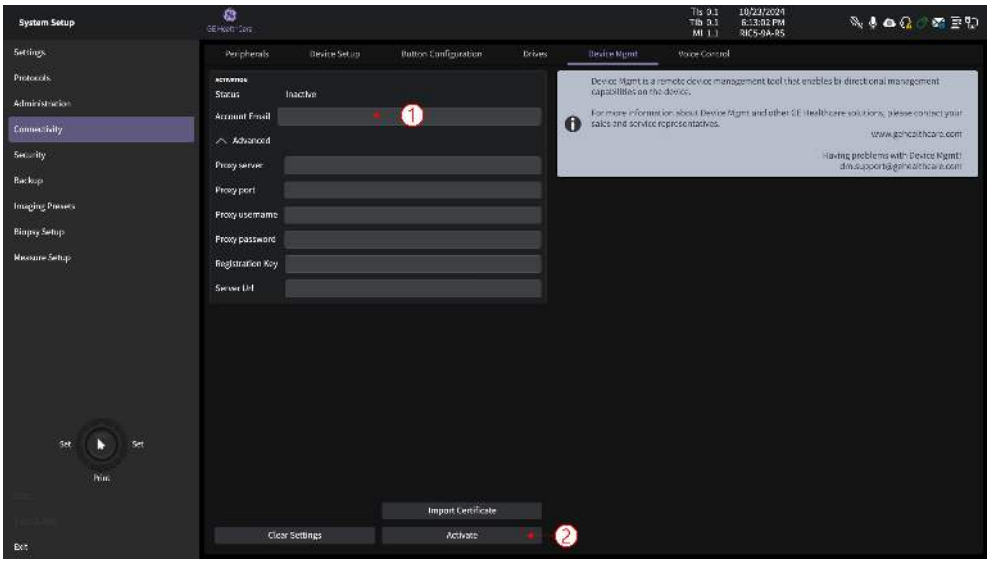


Figure 3-76: System Setup - Connectivity - Device Mgmt

4. Enter ***Account Email*** **(1)**.

Note *If desired select "Advanced" to enter furhter details.*

5. Click ***Activate*** **(2)**.

3.7.6 Monitor Settings



1. Select the ***Home*** button at the Left Toolbar.
2. In the Home" menu touch the ***Monitor Settings*** button.
3. Select adequate/desired color setting for local room conditions.
4. Touch the Cold color setting ***Semi Dark Room*** button to load default monitor settings for your system.

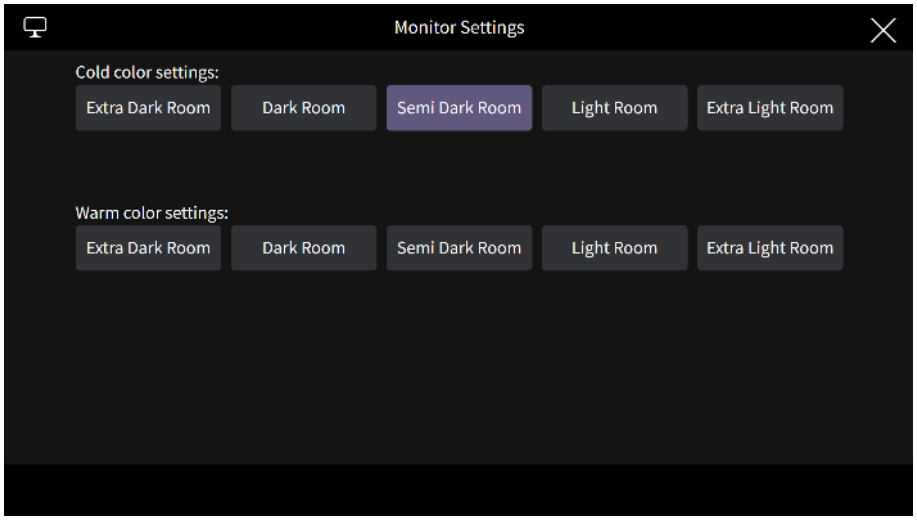


Figure 3-77: Monitor Settings

3.7.7 Color and Light Personalization



1. Select the ***Home*** button at the Left Toolbar.
2. In the Home" menu touch the ***Color & Light Personalization*** button.
3. In the "Color and Light Personalization" menu select adequate/desired colors and brightness for ***Operating Panel*** and ***UI Theme.***

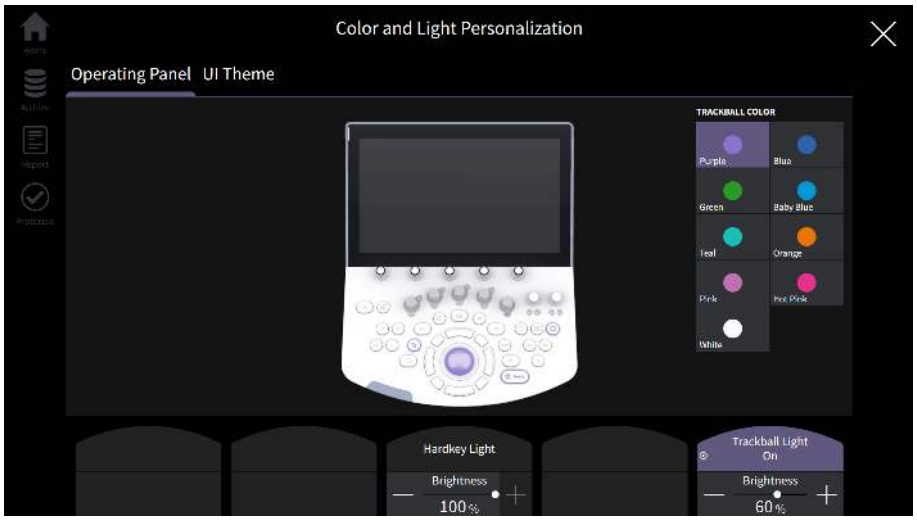


Figure 3-78: Color and Light Personalization

3.7.8 Shortcuts



1. Select the ***Shortcuts*** button at the Right Toolbar.
2. Touch the desired "Shortcut" button.

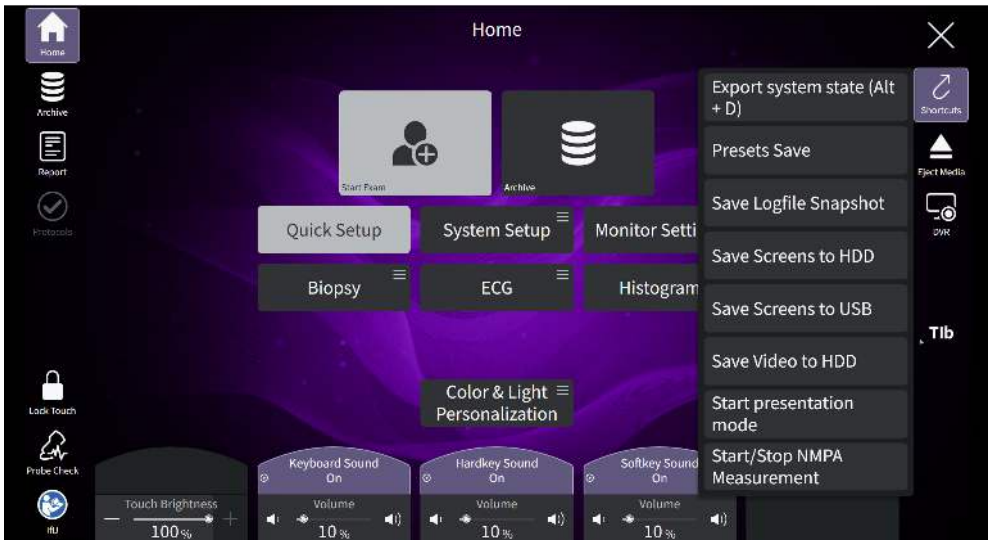


Figure 3-79: Shortcuts

Table 3-7: list of shortcuts + description what they do

Button	Description
Export system state (Alt +D)	Configuration Backup and dump files are exported to D:\ConfigurationBackup
Presets Save	save current user presets
Save Logfile Snapshot	max. 2 Logfiles + screenshot of Monitor & Touch are stored on the D:\export folder as a *.zip file
Save Screens to HDD	saves the image as *.jpg to the D:\export folder on the internal HDD
Save Screens to USB	saves the image as *.png to the automatically generated "Voluson" folder on the last connected external USB drive
Save Video to HDD	records last 30 seconds of Main- and Touchscreen on the D:\export folder as a *.mpg file
Start Presentation Mode	starts presentation mode

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3.8 On-board optional Peripherals

Note *Some peripheral devices (hardware options) may not be available and/or approved in all countries. Please contact Sales & Marketing in your region for information on availability.*



Warning

There is an increased risk of electric shock due to increased leakage current when connecting devices not explicitly recognized by the system manufacturer GE Healthcare Austria GmbH & Co OG to the Voluson Performance 16/ Voluson Performance 18 ultrasound system.

Table 3-8: Approved Peripherals

Device	Manufacturer	Model	Connection	Comment
Digital B/W Printer, 12 Volt DC	SONY	UP-D898DC	USB-Port	*Table 9-10*
Digital Color Printer[2]	SONY	UP-D25MD	Wireless	*Table 9-10*
Wireless Kit for Color Printer	SONY	UPA-WU10R	USB-Port	*Table 9-10*
Color Laser Printer (Network)	Hewlett Packard (HP)	HP LaserJet M454dw	Ethernet LAN or Wireless or Wi-Fi Direct	*Table 9-10*
		HP LaserJet Enterprise M555 + JetDirect 3100w		
ECG Module (ECG-USB1)	NORAV	1200 Series, ECGUSB1DEX	USB Type-C Port	*Table 9-10*
WLAN & Bluetooth Adapter	SparkLan	WUBT-239ACN(BT)	USB-Port	*Table 9-10*
Barcode Scanner	ZEBRA	DS2208	USB-Port	*Table 9-10*
External Keyboard (alphanumeric)	Active Key (AK)	AK-C4110	USB-Port	*Table 9-10*
Foot Switch	Whanam	FSU3000G	USB-Port	*Table 9-10*
Gel Warmer	JCWELL	-	12Vdc port	*Table 9-10*
Isolation Transformer	Noratel	IMED, 300WR 3rd Edition	-	*Table 9-10*
UPS (Uninterruptible Power Supply)	Tripp Lite	SMART1200XLHG[3]	-	*Table 9-10*
		SMX1200XLHG[4]	-	
Power Filter	TNC	BF-10A	-	*Table 9-10*
Wireless Display	BenQ	InstaShow™ WDC10	HDMI and USB-Port	*Table 9-10*
32" Secondary Patient Monitor (USA and EU)	NEC	MultiSync V323	HDMI / VGA	*Table 9-10*
Ethernet protection cable	Prysmian Group	GES.2203369.01	Ethernet LAN	*Table 9-10*
Isolated USB Connector	B&B Electronics	UH401	USB-Port	*Table 9-10*
Vscan Air Charger	BizLink	GP200304	USB-Port	*Table 9-10*

2 requires Wireless Kit for Color Printer
3 for 100-130V AC countries
4 for 220-240V AC countries

3.9 External I/O Connectors

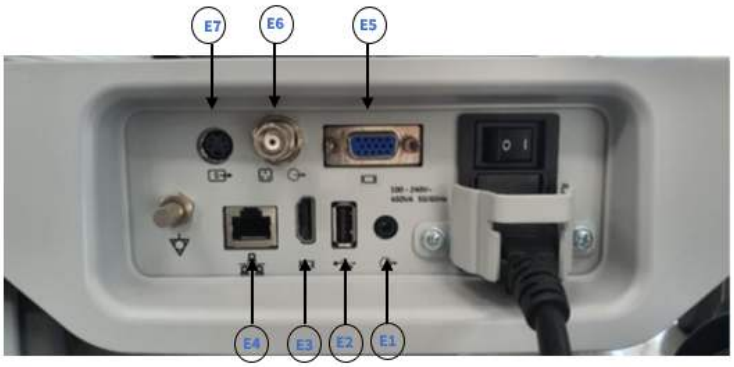


Figure 3-80: External I/O connectors - on rear of system

Item	Connector Name	Table Number	Description
E1	Speaker OUT	-	Connector for external speaker
E2	USB-A	*Table 3-14*	1x USB type A port
E3	HDMI OUT	*Table 3-9*	Connector for external monitor Resolution: Full HD (1920 X 1080)
E4	Network (LAN)	*Table 3-11*	DICOM input/output, twisted pair RJ-45 10/100 megabit/s
E5	VGA OUT	-	Connector for external monitor Resolution: FHD(1920 x 1080)
E6	COMPOSITE	-	Connector for external monitor Resolution: PAL (720 x 576), NTSC (720 x 480)
E7	S-Video OUT	-	S-VIDEO Output Resolution: PAL (720x576), NTSC (720x480)

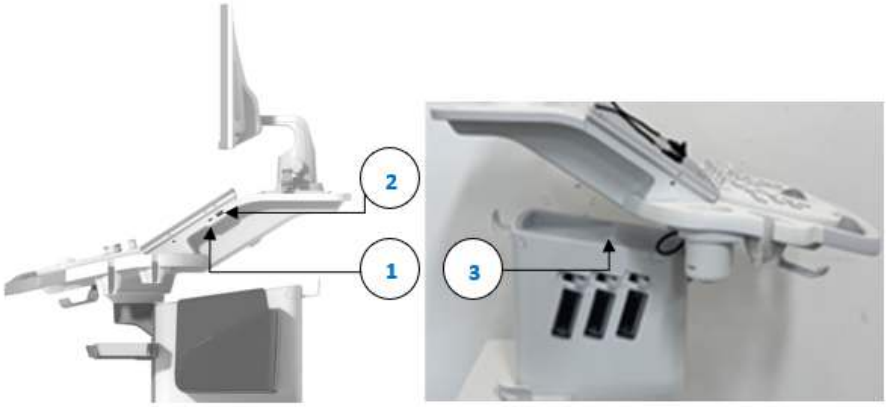


Figure 3-81: External I/O connectors - back and left/right side of the console

Item	Connector Name	Table Number	Description
1	USB-C	*"Table 3-15" on page 3-84*	USB-C 3.0 port (Right side of the Touch panel)
2	USB-A	*Table 3-14*	USB-A 3.0 port (Right side of the Touch panel)
3	USB-C	*"Table 3-15" on page 3-84*	USB-C 3.0 port (Top side of Chassis Frame)

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3.9.1 External I/O Pin Outs

Table 3-9: HDMI OUT connector, 23 Pin

Pin No	Output Signal	Description
1 ~ 12	TMDS clock/data/Shield	TMDS Clock Shield
13	CEC	Not used
14	N/C	Reserved
15,16	SCL/SDA	I2C Line
17,20,21,22,23	GND	Ground
18	5V	Power
19	Hot plug	Not used

Table 3-10: RGB Out Connector, 19 Pin

Pin No	Output Signal	Description
1	Red	RGB Output
2	Green	RGB Output
3	Blue	RGB Output
13	Horizontal - sync	Horizontal -sync
14	Vertical -sync	Vertical -sync
12	DDC_DATA	DATA
15	DDC_CLK	CLK
5,6,7,8.10	GND	Ground
4,9,11	NC	No Connection

Table 3-11: 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 3-12: 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 3-13: Audio Connectors

Pin No	Output Signal	Description
1	GND	GND
2	Audio_Left	Audio_Left
3	Audio_Right	Audio_Right

Table 3-14: USB 3.0 A type Connectors

Pin No	Output Signal	Description
1	VBus	USB Power Supply
2	- Data	USB 2.0 Data (-)
3	+ Data	USB 2.0 Data (+)
4	GND	USB Power Ground
5	StdA SSRXn	SuperSpeed differential pair #1
6	StdA SSRXp	SuperSpeed differential pair #1
7	GND	USB Power Ground
8	StdA SSTX-	SuperSpeed differential pair #2
9	StdA SSTX+	SuperSpeed differential pair #2
Shell	Shield	Shell

Table 3-15: USB 3.0 C type Connectors

Pin No	Output Signal	Description
A1	GND	USB Power Ground
A2	SSTXp1	SuperSpeed differential pair #1
A3	SSTXn1	SuperSpeed differential pair #1
A4	VBUS	USB Power Supply
A5	CC1	Configuration channel
A6	Dp1	Non-SuperSpeed differential pair, position 1
A7	Dn1	Non-SuperSpeed differential pair, position 1
A8	SBU1	Sidehand use
A9	VBUS	USB Power Supply
A10	SSRXn2	SuperSpeed differential pair #4
A11	SSRXp2	SuperSpeed differential pair #4
A12	GND	USB Power Ground
B1	GND	USB Power Ground
B2	SSTXp2	SuperSpeed differential pair #3
B3	SSTXn2	SuperSpeed differential pair #3
B4	VBUS	USB Power Supply
B5	CC2	Configuration channel
B6	Dp2	Non-SuperSpeed differential pair, position 2
B7	Dn2	Non-SuperSpeed differential pair, position 2
B8	SBU2	Sideband use
B9	VBUS	USB Power Supply
B10	SSRXn1	SuperSpeed differential pair #2
B11	SSRXp1	SuperSpeed differential pair #2
B12	GND	USB Power Ground

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3.9.2 Video Specification

Video specifications may be needed to be able to connect laser cameras or other devices to the Voluson Performance 16/ Voluson Performance 18 system.

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 3-16: 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
USB cable (type C)	2m	shielded; USB3.1 or higher
LAN cable	80 m	shielded; Cat5e or higher
VGA cable	15 m	shielded
S-Video cable	5 m	shielded
ECG cable	4 m	shielded
Power cable	4 m	unshielded
PE cable	10 m	unshielded

3.10 Available Probes

See *Section 9.16 "Probes" on page 9-34*, for part numbers to be used when ordering new or replacement service probes.

Note *For Vscan Air probe setup, please refer to Voluson Performance 16/ Voluson Performance 18 Instructions for Use for installing and connecting a Vscan Air Probe*

3.11 Software/Option Configuration

For description refer to:

- *Section 3.7.5 "System Setup" on page 3-63*

Note *For further details refer to the Voluson Performance 16/ Voluson Performance 18 Instructions for Use.*

3.12 Connectivity Setup

The Voluson Performance 16/ Voluson Performance 18 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 Performance 16/ Voluson Performance 18 ultrasound system and other devices in the hospital information system.

The following scenarios are covered:

- stand-alone Voluson Performance 16/ Voluson Performance 18 system; see *Section 3.12.1.3 on page 3-88*.
- Voluson Performance 16/ Voluson Performance 18 and one or several PC workstations - with Software 4D View installed - within a “Sneaker Net” environment. (“Sneaker Net” means that you use a USB Memory stick to move data because no network is available); see *Section 3.12.1.4 on page 3-88*.
- Voluson Performance 16/ Voluson Performance 18 and DICOM server in a network; see *Section 3.12.1.5 on page 3-88*.

3.12.1.1 Dataflow Concept

Communication between the Voluson Performance 16/ Voluson Performance 18 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 3-87*).

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.

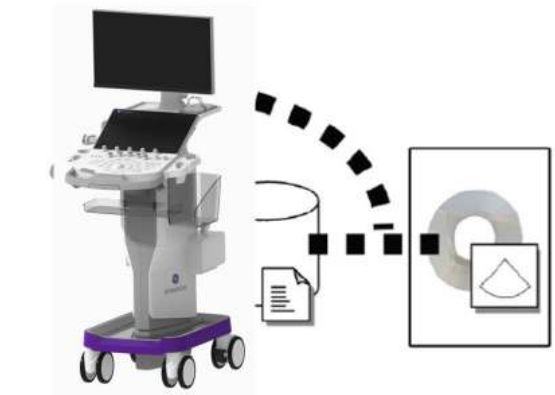
By utilizing data flows, the user can configure the Voluson Performance 16/ Voluson Performance 18 ultrasound system to optimally meet the needs of the facility, while keeping the user interface unchanged. Once the dataflow is selected, the actual location of the database is entirely transparent.

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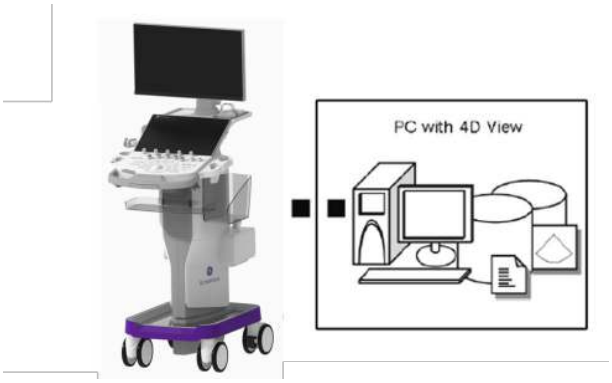
3.12.1.2 Dataflow Examples



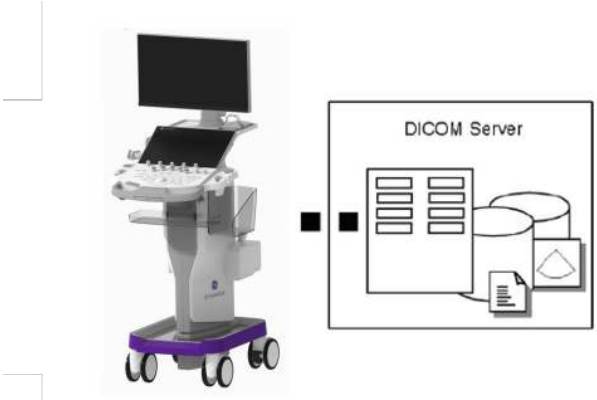
The local database is used for patient archiving. Images are stored to internal hard drive.



The local database is used for patient archiving. Afterwards images are stored to 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.

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3.12.1.3 Stand-alone Voluson Performance 16/ Voluson Performance 18

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 Performance 16/ Voluson Performance 18 Instructions for Use.*

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 Performance 16/ Voluson Performance 18 + 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 Performance 16/ Voluson Performance 18 system without being connected in a network.

The images are first stored on the Voluson Performance 16/ Voluson Performance 18 system's hard drive (Archive) and then exported from the system's hard drive to a sneaker device (e.g., USB Memory stick), and finally imported from the sneaker device to the “4D View” PC's internal hard drive.

Note *For further details refer to the Voluson Performance 16/ Voluson Performance 18 Instructions for Use.*

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 Performance 16/ Voluson Performance 18 and DICOM Server

In this configuration, the Voluson Performance 16/ Voluson Performance 18 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 Performance 16/ Voluson Performance 18.
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 Performance 16/ Voluson Performance 18 to the Peer-to-Peer Network.*

Note *For further details refer to the Voluson Performance 16/ Voluson Performance 18 Instructions for Use.*

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3.13 Network Configuration

Content in this chapter

3.13.1 TCP/IP Configuration - - -

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 Performance 16/ Voluson Performance 18. 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. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
3. Select ***Connectivity*** and then click the ***Device Setup*** tab.
4. Click the ***TCP/IP Configuration*** button, read the message and confirm with ***Yes***.

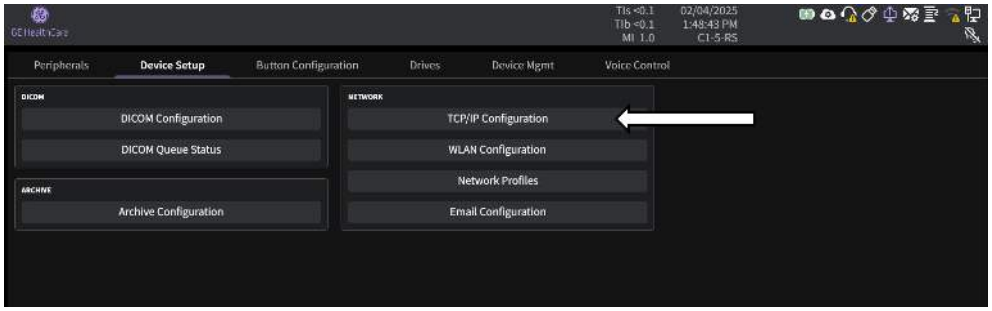


Figure 3-82: TCP/IP Configuration

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

Note *This example shows fictional numbers!*

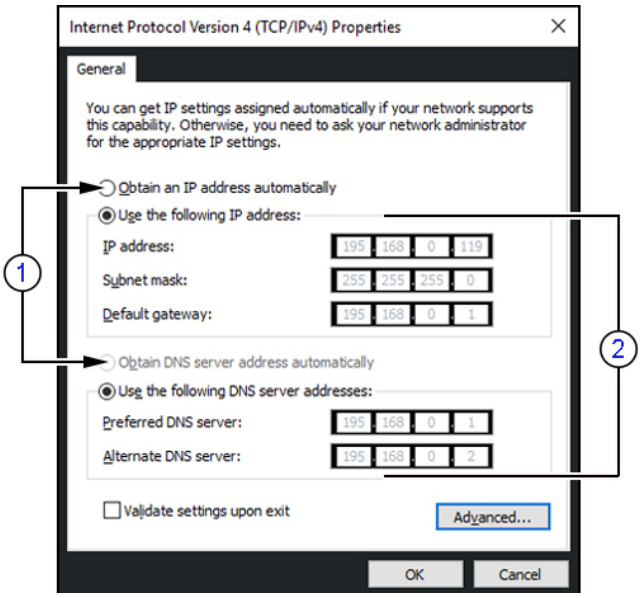


Figure 3-83: Internet Protocol (TCP/IP)

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 Performance 16/ Voluson Performance 18 Instructions for Use.*

3.13.2 WLAN Configuration

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

For fast access to the WLAN Configuration screen (see *Figure 3-84 on page 3-91*) hover the cursor over the WLAN symbol at the right top of the display screen and then press **Set** (left or right trackball key). In the displayed window select ***Setup***.

Content in this chapter

*3.13.2.1 Connecting to the WLAN - - -

3.13.2.2 WLAN Network using fixed TCP/IP

Note *If fixed IP address is required, ask your network administrator for appropriate settings.*

1. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
3. Select ***Connectivity*** and then click the ***Device Setup*** tab.
4. Click the ***WLAN Configuration*** button.
5. The WLAN Configuration screen with available networks appear.
6. Highlight proper wireless network **(1)** and then click ***TCP/IP*** **(2)**.

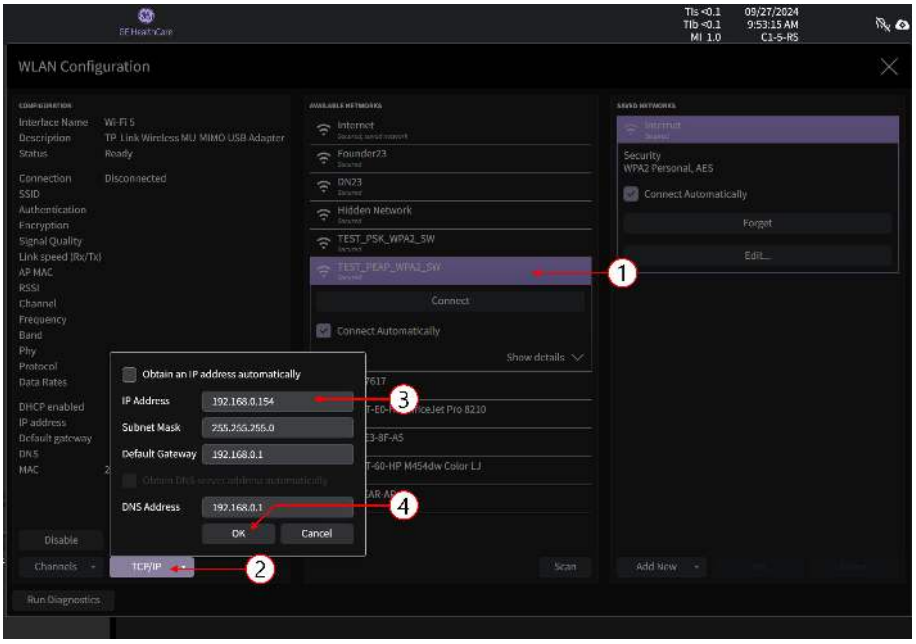


Figure 3-85: Wireless Networks - TCP/IP

7. Type appropriate settings into the displayed dialog window **(3)**.
   - IP Address
   - Subnet Mask
   - Default Gateway
   - DNS Address
8. After you have filled in all the required information, click ***OK*** **(4)**.

Note *If automatic assingment is desired, check **Obtain an IP address automatically**.*

3.13.2.3 Disconnecting from WLAN

1. Hover the cursor over the WLAN symbol at the right top of the display screen and then press **Set** (left or right trackball key).
2. Select ***Disconnect***.

Note *Disconnecting from WLAN is also possible in the Home - System Setup - Connectivity - Device Setup - WLAN Configuration screen.*

3.13.2.4 Restart a WLAN Network

1. Select the ***Home*** button at the Left Toolbar.
2. Select ***Connectivity*** and then click the ***Device Setup*** tab.
3. Click the ***WLAN Configuration*** button.
4. The WLAN Configuration screen with available Networks appears.
5. Select network and then click ***Restart***.

3.13.2.5 Edit an existing WLAN Network

1. Select the ***Home*** button at the Left Toolbar.
2. Select ***Connectivity*** and then click the ***Device Setup*** tab.
3. Click the ***WLAN Configuration*** button.
4. The WLAN Configuration screen with available networks appear.
5. Select network to be customized and then click ***Edit***.

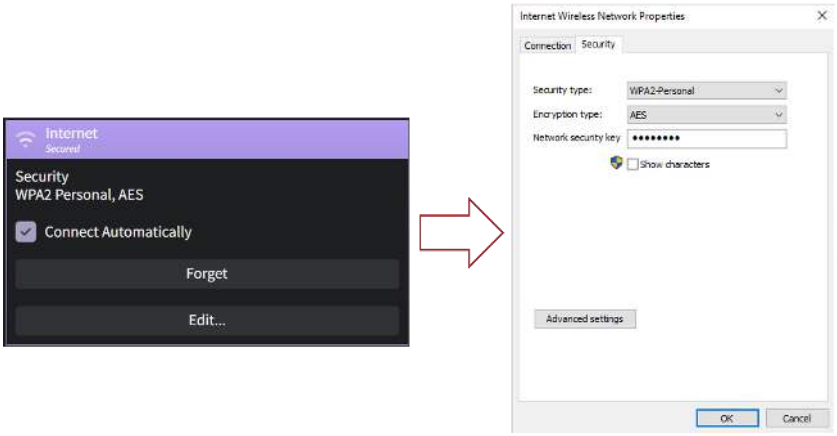


Figure 3-86: Edit Network

6. Customize the following information:
   - **Connection**
     * Check mark desired connection behavior(s)
   - **Security**
     * Security type
     * Encryption type
     * Network security key
   - **Advances settings**
7. After you have filled in all the required information, click ***OK***.

3.13.2.6 Add new WLAN Network

1. Select the ***Home*** button at the Left Toolbar.
2. Select ***Connectivity*** and then click the ***Device Setup*** tab.
3. Click the ***WLAN Configuration*** button.
4. The WLAN Configuration screen with available networks appear.
5. Select ***Add New*** at the right bottom of the display screen.

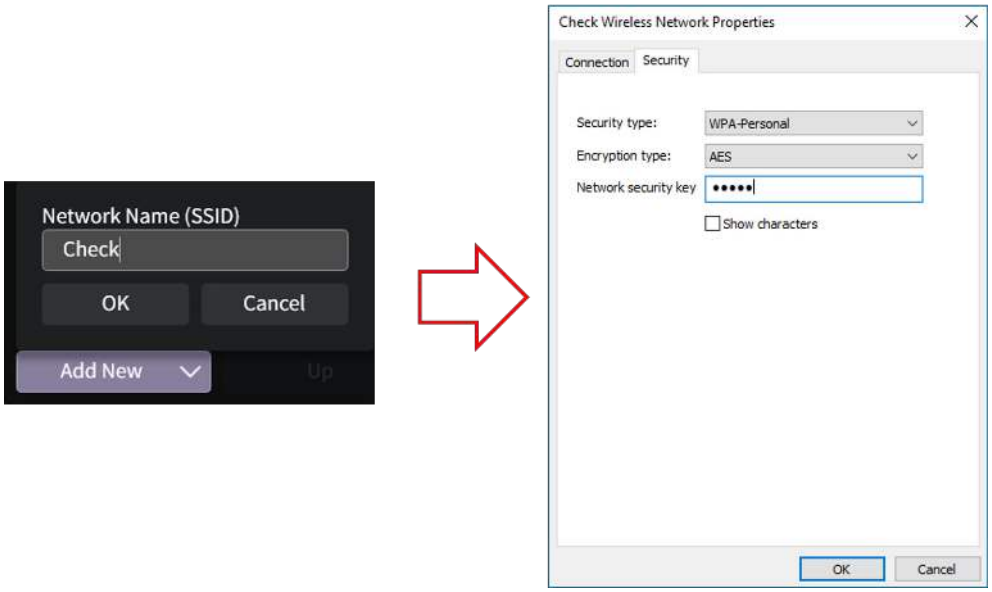


Figure 3-87: Add New Network

6. Enter a ***Network Name (SSID)*** and then click ***OK***.
7. Add the following information to the Wireless Network Properties page:
   - **Connection**
     * Check mark "Connect even if the network is not broadcasting its name"
   - **Security**
     * Security type
     * Encryption type
     * Network security key
8. After you have filled in all the required information, click ***OK***.

3.13.2.7 Removing a WLAN Network

1. Select the ***Home*** button at the Left Toolbar.
2. Select ***Connectivity*** and then click the ***Device Setup*** tab.
3. Click the ***WLAN Configuration*** button.
4. The WLAN Configuration screen with available Networks appears.
5. Select network to be removed and then click ***Forget***.

3.13.3 How to Setup E-mail

If Internet access is available via LAN or Wi-Fi, 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 Performance 16/ Voluson Performance 18 is only supporting E-mail send; no e-mail receive is possible. To receive 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 port (Outgoing Messages)	e.g., 465
SMTP Connection security (Outgoing Messages)	e.g., TLS

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. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
3. Select ***Connectivity*** and then click the ***Device Setup*** tab.
4. Click the ***Email Configuration*** button; see *Figure 3-82 on page 3-90*.

   The Email Configuration screen appears.



Figure 3-88: Email Configuration

5. Enter account settings such as *Your name* and *Email Address,* etc.
6. If available, click on ***Advanced Configuration*** to switch between simple and advanced configuration.
7. 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.
8. Store your configuration with click on ***OK***.
9. Individually enter Patient's Email address and phone number in the PID screen and adjust Email option as descibed in *Section 3.13.4 "How to enter Patient's Email address and Phone number in the PID screen" on page 3-96*

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

1. Enter the “Patient ID” screen by pressing the **Patient** key on the control console.
2. Click the ***Contact Data*** icon **(1)**.

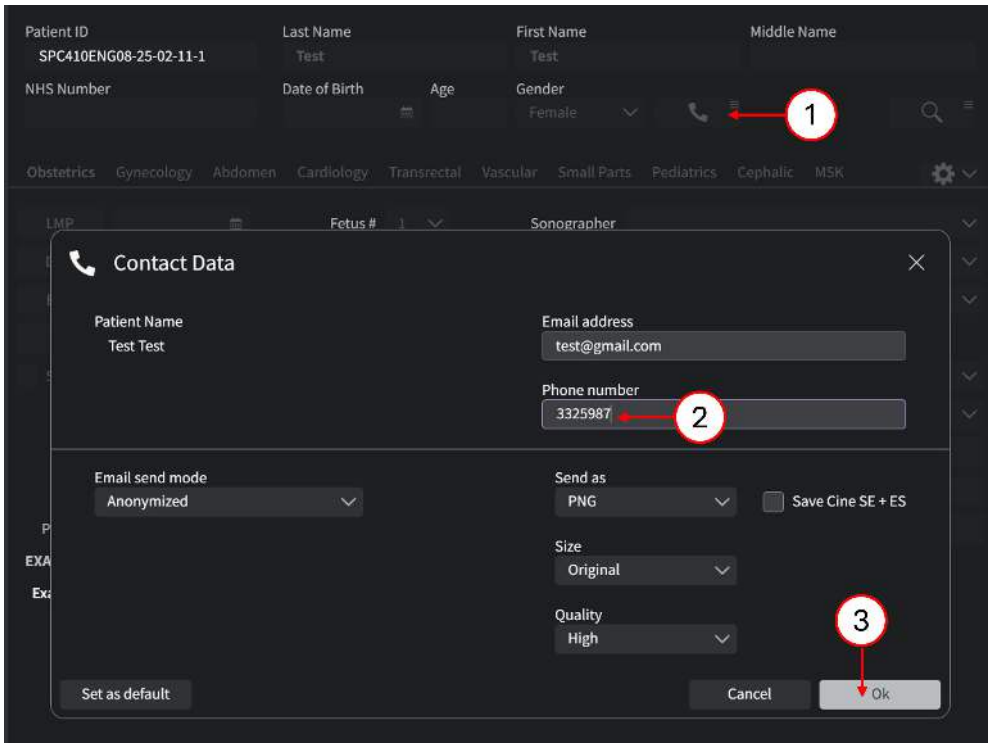


Figure 3-89: Patient ID screen

3. Enter patients Email address and Phone number **(2)** and adjust options.
4. Store configuration with ***OK*** **(3)**.

Note *Since the Email service provider is maybe not located in the same area as your 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*

3.13.5 Map Network Drive

1. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
3. On the side of the screen select ***Connectivity*** and then click the ***Drives*** tab.

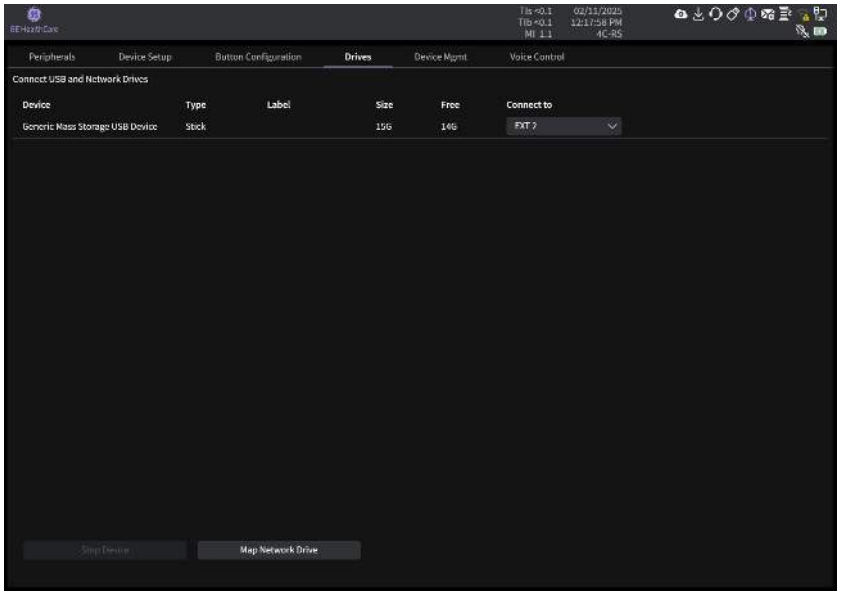


Figure 3-90: System Setup - Connectivity - DRIVES page

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.

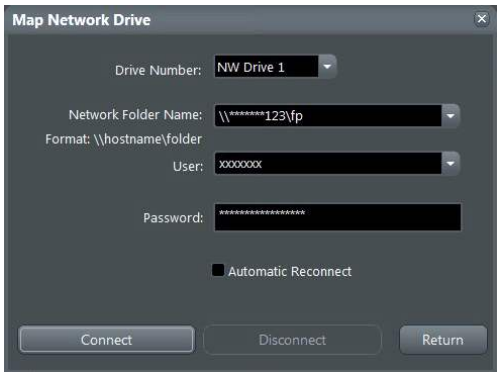


Figure 3-91: Map Network Drive

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 “Drive Management” dialog window that appears when selecting the **Eject Media** button at the Right Toolbar.*

Note *If there is an error during the connection, an important information 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.*



Caution

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!

3.13.6 RSvP Agent Configuration

Prerequisites for RSvP Agent Configuration

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

1. Proxy Server, if necessary

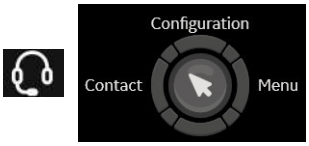
   _____ / _____ / _____ / _____ and Port _____

2. Proxy Authentication, if necessary

   User _____ and Password _____

How to configure Insite/ RSvP Agent





For fast access to the ***Agent Configuration*** page move the cursor to the ***Service*** icon at the right top of the display screen and then press the **upper trackball key**.

Note *There are different possibilities to access the Service Desktop and its available features; see Section 5.13.2 "Service Platform - Access and Security" on page 5-41.*

1. If not already entered by means of the ***Service*** icon (= fast access), enter the Service Desktop via Home - System Setup - Administration - ***Service*** tab.
2. If not already visible, select the ***Agent Configuration*** tab.
3. If a banner at the bottom of the screen shows "*GE HealthCare backoffice connectivity is disabled*", please click ***Start Agent*** first to enable configuration.

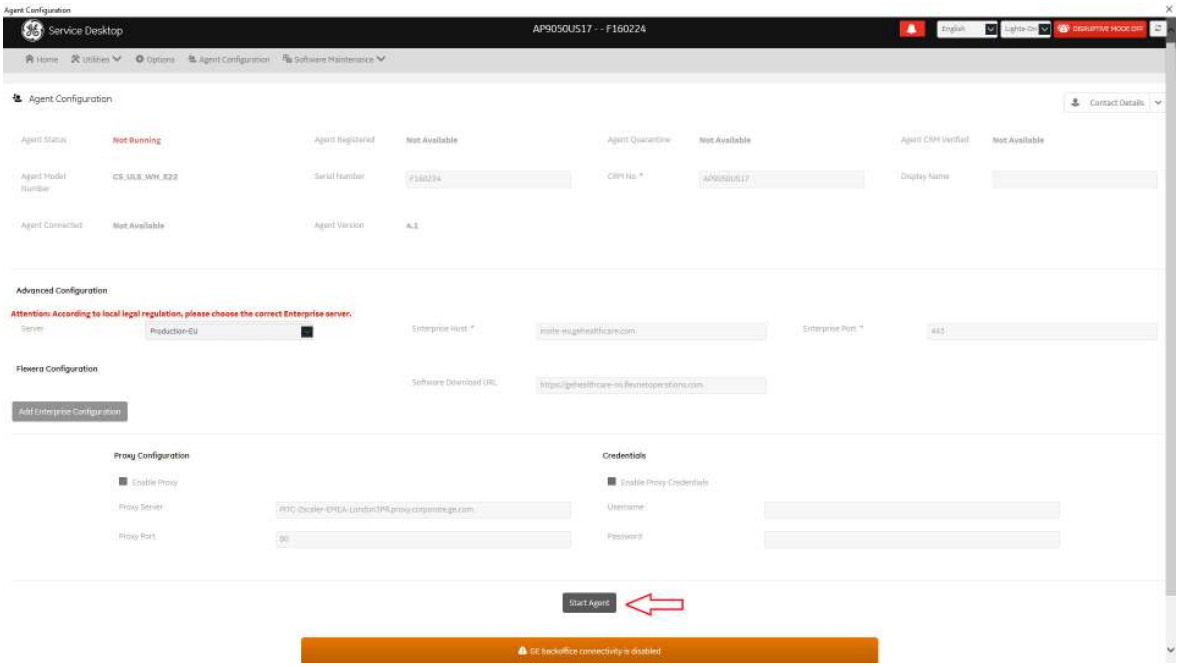


Figure 3-92: Connectivity is disabled -> Start Agent

The CRM number **(2)** is pre-populated with the serial number by default.

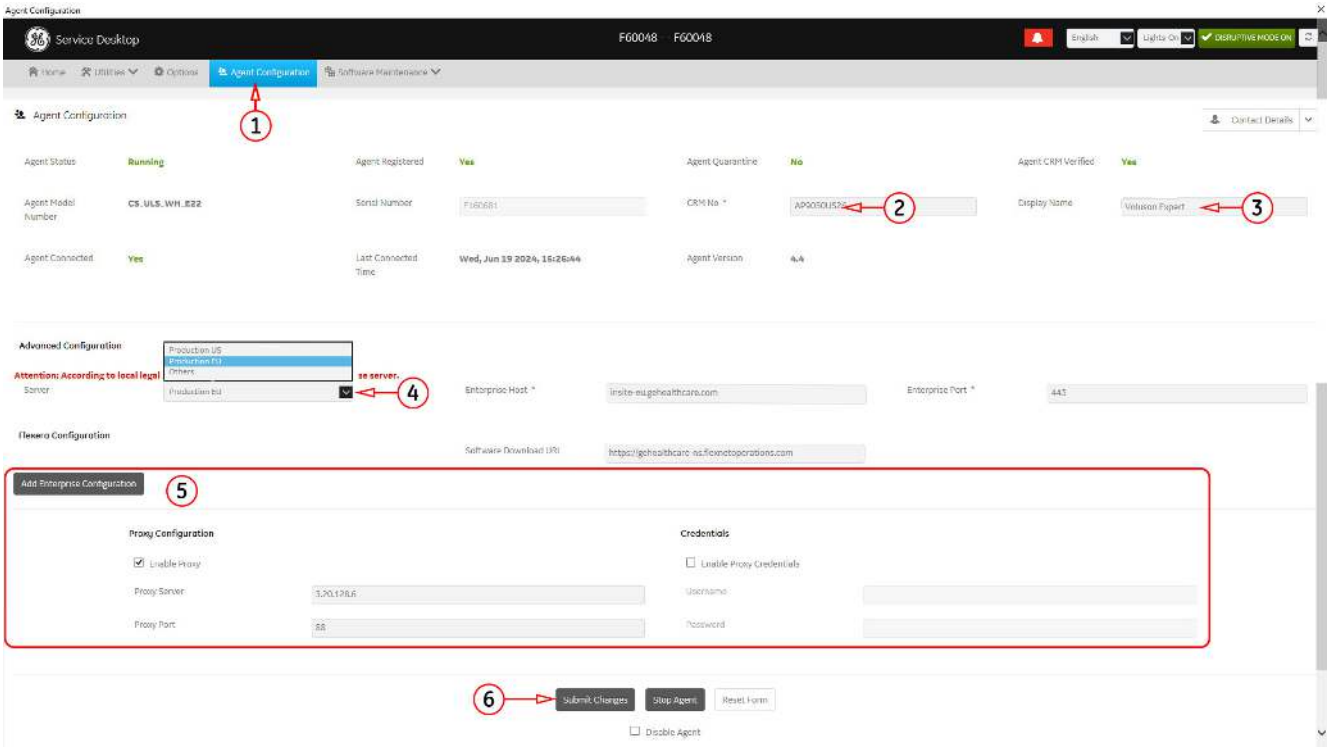


Figure 3-93: Service Desktop -> Agent Configuration (This example shows fictional numbers!)

4. Enter a unique and therefore valid ***CRM No*** **(2)**, according to your region.
5. If desired enter the ***Display Name*** **(3)**.
6. Select the ***Enterprise Server*** **(4)** according to your region from the pull-down menu. Other fields in the "Advanced Configuration" section will become pre-populated and should not be modified.
7. If the customer site requires a Proxy server, check box and enter ***Proxy Configuration*** and ***Credentials*** **(5)**.

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

8. Click the ***Submit Changes*** button **(6)**and then close the page.
9. Reboot the system.
10. Reenter the Service Desktop.
11. In the ***Home*** page confirm connection status.

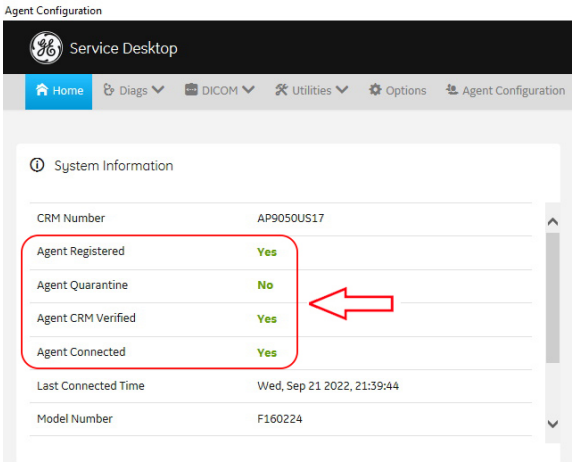


Figure 3-94: confirm connection status in HOME screen

Note *Configuration might take some minutes. Please wait.*

When the Voluson Performance 16/ Voluson Performance 18 system is successfully configured and provided that network is up and running, the values are displayed in "green", see Figure 3-94 above.

3.14 Connectivity Setup Worksheet

Site System Information

Site:
Dept:
Voluson E_
Type:
Floor:
Room:
REV:
Comments:

CONTACT INFORMATION

Name	Title	Phone	E-Mail Address

TCP/IP Settings

System IP Settings

Name - AE Title:
IP Address:
Subnet Mask:
Default Gateway:

Remote Archive Setup

Name - AE Title:
IP Address:
Subnet Mask:
Default Gateway:
Server Name:
Remote DB User Name:

Services (Destination Devices)

	Device Type	Manufacturer	Name	IP Address	Port	AE Title
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Figure 3-95: Site System Information

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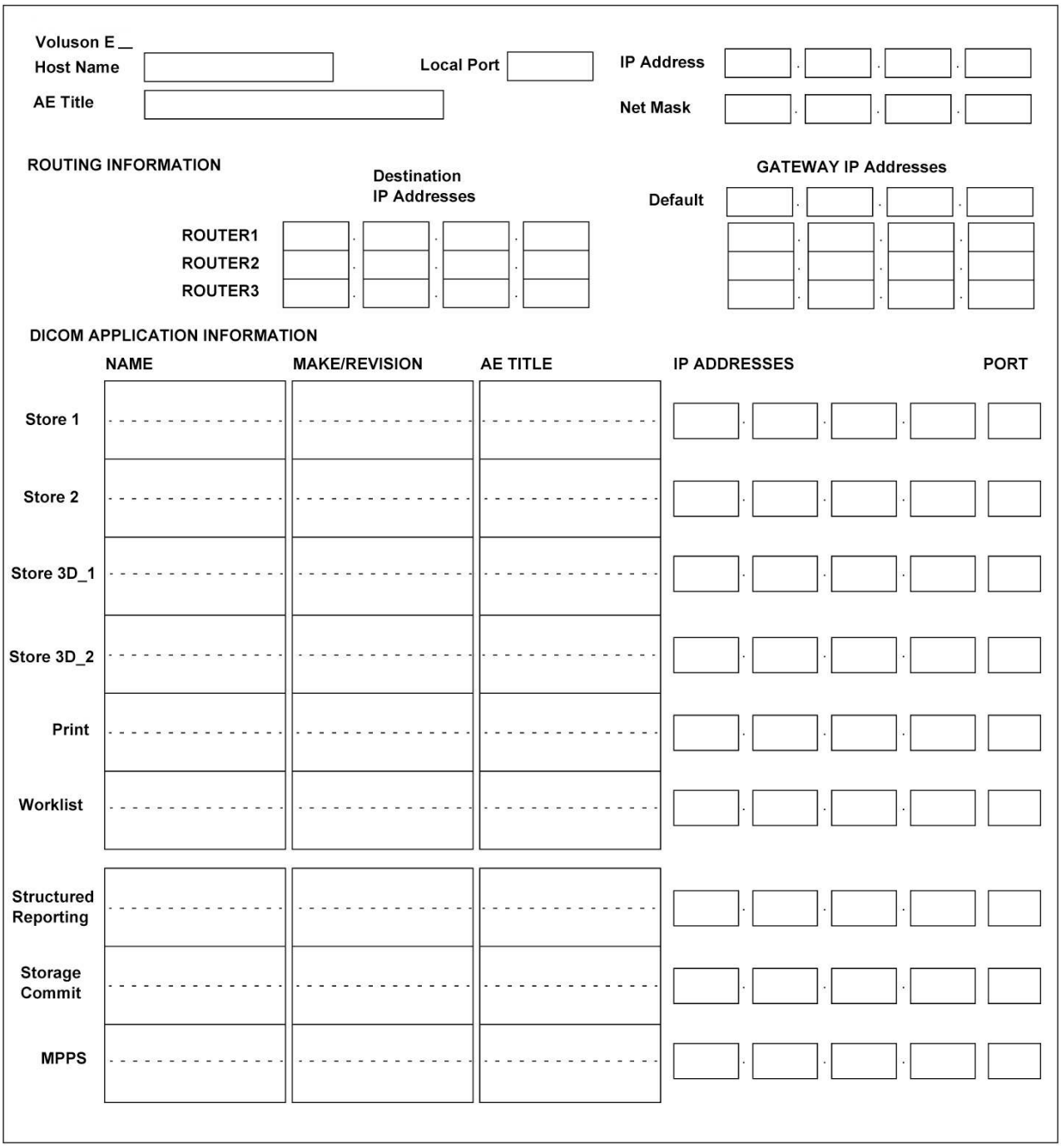


Figure 3-96: Worksheet for DICOM Network Information

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3.15 Paperwork

Note *During and after installation, the documentation (i.e., Instructions for Use, 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 Locater Installation Card

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

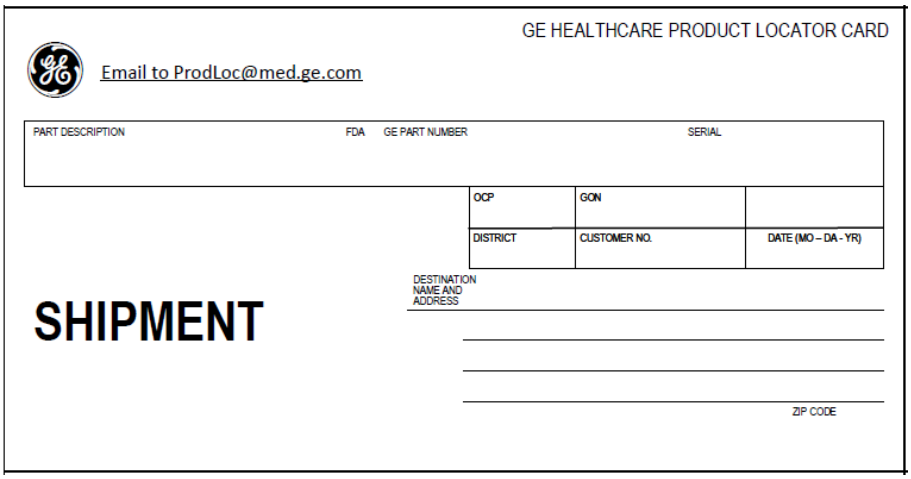


Figure 3-97: Product Locater Installation Card

3.15.2 Instructions for Use

Check that the correct Manual(s) for the system and software revision, is included with the installation. Specific language versions of the Voluson Performance 16/ Voluson Performance 18 Instructions for Use may also be available. Check with your GE HealthCare Sales Representative for availability.

Chapter 4

Functional Checks

This chapter provides procedures for quickly checking major functions of Voluson Performance 16/ Voluson Performance 18 system diagnostics by using the built-in service software and power supply adjustments.

Content in this chapter

*4.1 Required Equipment - - -

4.1 Required Equipment

- An empty (blank) external USB device (stick or hard disk drive).
- At least one probe; see *Section 9.16 "Probes" on page 9-34* for an overview. Usually, you should check all the probes used on the system.

4.2 General Procedure

Caution: The Voluson Performance 16/ Voluson Performance 18 requires all covers!

Do not operate this system unless all board covers and frame panels are securely in place, to ensure safe operation, optimal system performance and cooling. When covers are removed, EMC and EMI compliance might be compromised.

For service procedures where the operation of the system is necessary with board covers or frame panels removed, ensure that there are no EMI sensitive devices in the vicinity of the system. If in doubt, relocate the system to a different environment where no EMI sensitive devices are in the vicinity.



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.

Content in this chapter

*4.2.1 Power On / Boot Up - - -

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



1 circuit breaker

2 fuses (2x 10A/250VAC)

3 mains power cable incl. pull-out protection

4 equipotential pin

Figure 4-1: Circuit Breaker at rear of system

Note *When AC power is applied to the system, the* **Standby/Power** *button on the control console illuminates amber, indicating that the system (including the BackEnd Processor) is in standby mode.*

4. Press the **ON/OFF** standby button (see: *Figure 3-4 below*) on the control console for ~3 seconds.



Figure 4-2: ON/OFF standby button

Note *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.*

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.

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. Select the Home button at the Left Toolbar in the touch screen.
2. In the Home menu, select the System Setup button.
3. Press the ***ON/OFF*** Standby button on the left side of the control console.
4. Check the following dialog appears without Fast Startup checkbox.

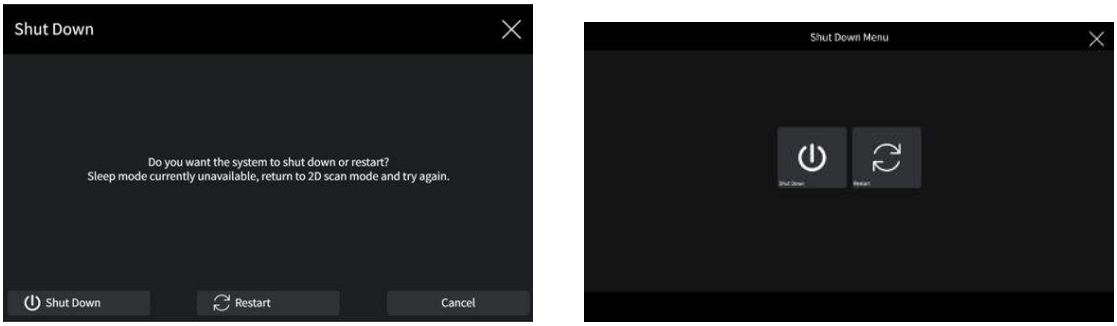


Figure 4-3: Shutdown dialog (monitor example and touch example)

5. Press the ON/OFF Standby button on the console once again. The system performs an automatic full shutdown sequence.
6. Switch OFF the circuit breaker at the rear of the system.

Note *Usually auxiliary equipment need not to be switched ON/OFF separately.*

Warning

Disconnection of the mains power cable from AC mains is necessary!

7. After complete power down, unplug the mains power cable from the AC wall outlet socket.

Note *Do not disconnect the mains power cable from the systems plug unless it is absolutely required for specific replacement procedures,* ***or*** *if it is for any reason not possible to disconnect it from the AC wall outlet socket.*



1 circuit breaker
2 fuses (2x 10A/250VAC)
3 mains power cable incl. pull-out protection
4 equipotential pin

Figure 4-4: Circuit Breaker at rear of system

8. Press on the brakes to block the caster wheels.
9. 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

Content in this chapter

*4.2.3.1 Control Console - - -

7 User interface up/down button (For Voluson Performance 18 Only)

4.2.3.2 Touch Panel

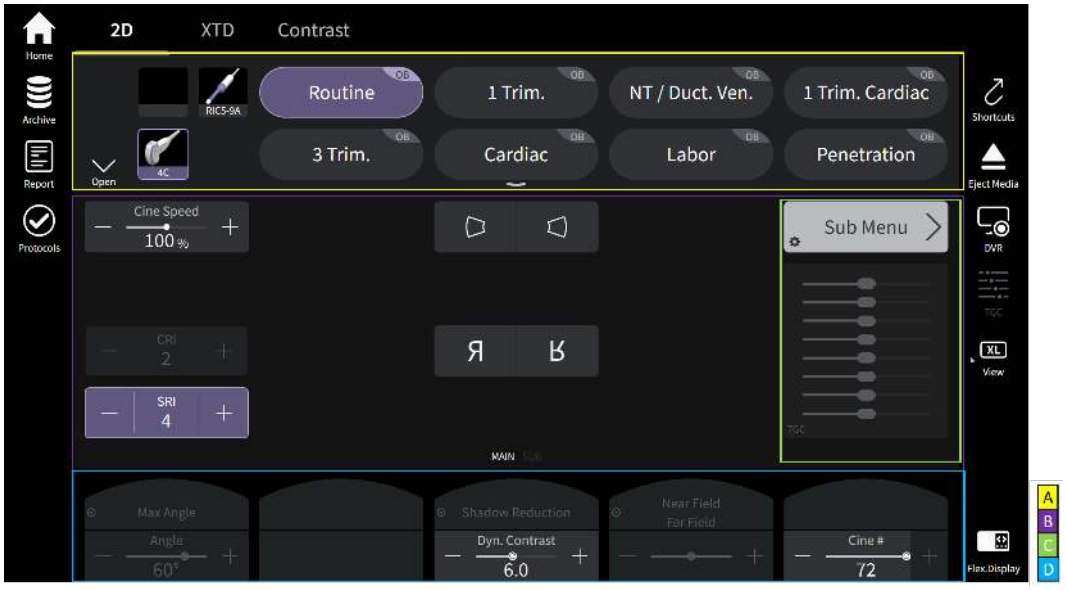


Figure 4-6: Touch Panel - Main Menu

1 Left Toolbar - Soft buttons such as ***Home***, ***Protocols***, etc.

2 Tab Area - additional Operating Modes

3 Right Toolbar - further functions and options supported be the selected Mode

A Shows all presets for the active probe and the selected application; the active one is highlighted.

B Further functions / options supported by the selected Mode

C ***Sub Menu*** and TGC Sliders

D 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.

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

4.2.3.3 Status Icons on Monitor Screen

	Connect to GE HealthCare Clinical Lifeline: remote access inactive
	Connect to GE HealthCare Clinical Lifeline: access pending
	Connect to GE HealthCare Clinical Lifeline: remote access active
	Connection to service failed
	Network cable connected to a network.
	No network cable connected, or connection not ok. Click on the symbol to open Network Configuration screen.
	Network status: remote connection
	Wi-Fi connected
	Wi-Fi disconnected. Click on the symbol for fast access to the WLAN Configuration screen.
	Wi-Fi: remote connection
	Voice control disabled – Off state
	Voice control enabled – Active state
	Email function is not configured.
	Email status: ok
	Email connection failed.
	Microphone: on
	Microphone: muted
	Microphone: recording

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	USB Icon available, Disc inserted For more information see 'USB Recorder (DVR) - Optional' on page 12- 10.
	USB PLAY mode.
	USB PLAY-PAUSE mode.
	USB REC mode.
	USB REC-PAUSE mode.
	USB status: busy.
	Reminder status (only available when a reminder exists). A click on the symbol opens the reminder dialog.
	Software update package available for download (eDelivery - Software Download). Click on the symbol to open a pop-up menu to choose between Download, More Info or Decline.
	Voluson Update (vital updates, e.g., patches) available for download. Click on the icon to open the software download dialog.
	DICOM spooler - idle state
	DICOM spooler - Transfer failed
	DICOM spooler - Transfer in progress
	Spooler: paused (Hold Queue manually or Auto-Hold)
	External monitor: On Click on the icon to switch external monitor on/off.
	External Monitor off
	Device Management - option " Verisound Fleet" is set but not activated. Click on the icon to open the “Device Mgmt” configuration.
	Device Management - connected to the backup server. The option "Verisound Fleet" is activated. Click on the icon opens setup screen.
	Device Management - Mandatory or optional backup is available for download, reload and while download is in progress. Click on the icon to display backup dialog.
	Device Management - Backup upload is in progress.

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	Device Management - Network connection failure (connection interrupted).
	Battery Warning
	Power Mode : 76% ~ 100% (AC power Plugged)
	Battery Mode : 76% ~ 100%
	Power Mode : 51% ~ 75%
	Battery Mode : 51% ~ 75%
	Power Mode : 26% ~ 50%
	Battery Mode : 26% ~ 50%
	Power Mode : 11% ~ 25%
	Battery Mode : 11% 25%
	Power Mode : 0% ~ 10%
	Battery Mode : 0% 10%
	Vscan air probe battery: 0 ~ 10%
	Vscan air probe battery: 11 ~ 25%
	Vscan air probe battery: 26 ~ 50%
	Vscan air probe battery: 51 ~ 75%
	Vscan air probe battery: 76 ~ 100%

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4.3 Functional Checks

For basic functional checks of different modes, measurements, calculations etc. refer to the Voluson Performance 16/ Voluson Performance 18 Instructions for Use.



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.*

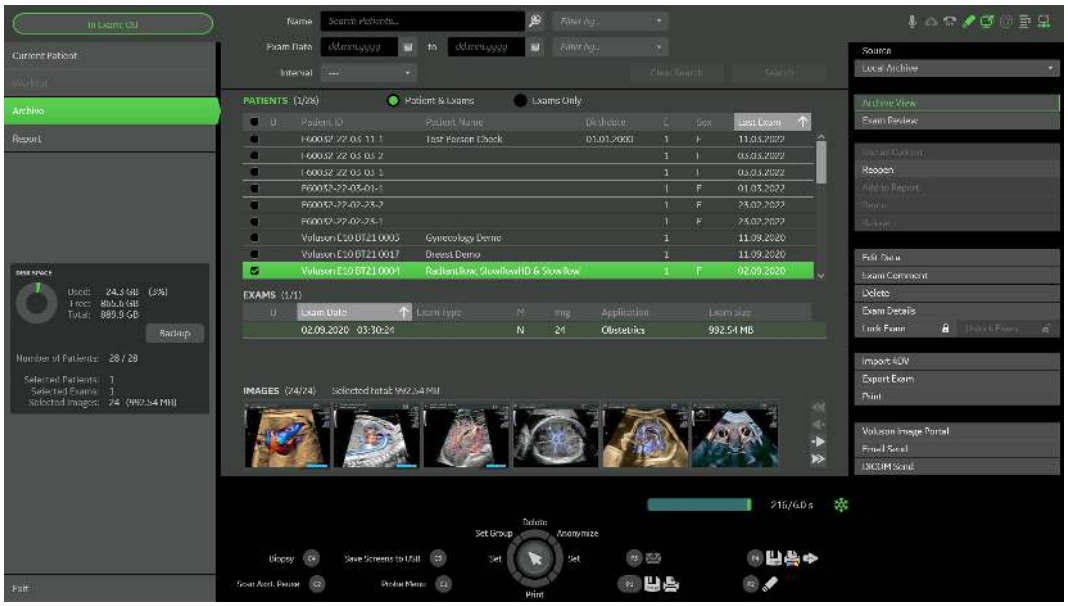
Note *Some function keys only appear on the Touch Panel if they are available for the selected probe.*

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4.3.1 Patient Archive (Image Management)

The Voluson Performance 16/ Voluson Performance 18 provides a Patient/Image Management System that allows fast and extremely easy patient, exam and image management.



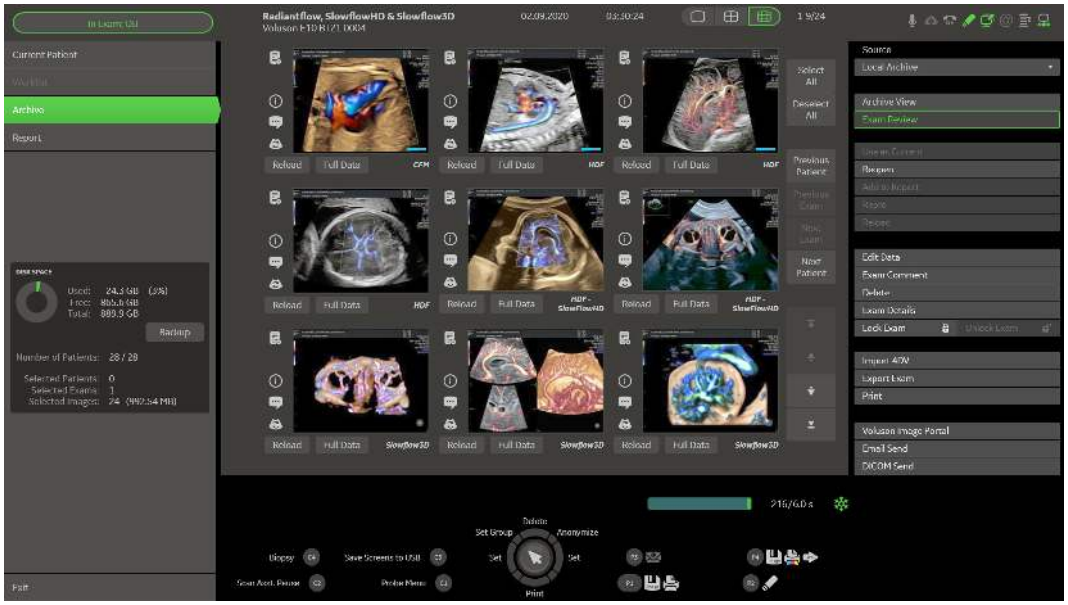


Archive View (image above)

The patient archive database is used for searching a particular exam and/or patient. Via the buttons on the right, it is possible to send images via **Voluson Image Portal**, Email or over the DICOM network, print exams/ images, export exams/images, import exams/images, etc.

Exam Review (image below)

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 Performance 16/ Voluson Performance 18 Instructions for Use.*

Note *Images can be backed up and restored by means of the **Image Archive** function in the System Setup. Operation see Section 4.4.4 on page 4-19.*

4.4 Backup and Restore System Configuration and Image Archive

Content in this chapter

*4.4.1 Save System Configuration Backup - - -

4.4.1 Save System Configuration Backup

Note *It is recommended to 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.*

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

IMAGING

- **2D Presets** 2D user presets
  - ***2D Probe settings*** Applications and presets for all available probes
- **3D/4D Presets** 3D/4D user presets
  - ***Acquisition*** 3D applications, acquisition type and presets for all available 3D/4D probes
  - ***Render*** 3D/4D render applications, usage, types, groups and presets
- **Gray Curves** Gray Maps
- **Flow Profiles**
- **Application Settings** Application and probe factory settings

CONFIGURATION

- **Custom**
  - ***System Settings*** General "Setup" settings such as language, time/date format, video output, archive configuration, probe respond, color and lighting, etc.
  - ***Annotations*** Bodymark initial position, annotation text and touchpanel layout for all applications
  - ***Scan Assistant***
    - Scan Assistant Lists
    - Scan Assistant Settings
  - ***SonoLystlive***
  - ***Measure & Report Configuration*** User specific measure setup settings
    - Measurements → Measure settings and touchpanel layout configuration
    - Reports → Measure report configuration
  - ***Biopsy Lines*** Biopsy line positions and angles
  - ***Reminder*** customized messages
- **Connectivity**
  - ***Peripherals and Button Configuration***
    - Peripheral Settings → Peripherals and printer configuration
    - Button Configuration → P-button and C-button configuration
  - ***DICOM***
    - DICOM Settings → DICOM configuration e.g., DICOM servers, AE Title, Station Name etc.
    - DICOM TLS certificates
  - ***Network***
    - LAN → Network settings: IP address, LAN, network drives, network profiles, data streaming
    - WLAN → Network settings: WLAN
    - Email → Email configuration
  - **Verisound™ Fleet(formerly AVURI)** Cloud-based device and user management across multiple locations
- **Service**
  - ***Service Platform*** Service Platform settings
    - RSVP Config → Agent configuration
    - CSD Settings → Common Service Desktop settings
  - ***Options*** Software feature option permanent and demo key
  - ***Security*** User authentication data such as configuration, user names and groups, LDAP configuration, etc.

    Note: "User Authentication Password" (system administrator password) is required for restoring.

Operation

1. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
3. Select ***Backup*** and then click the ***System Configuration*** tab.
4. Click the ***Save*** button.
5. Choose the destination **(1)**.

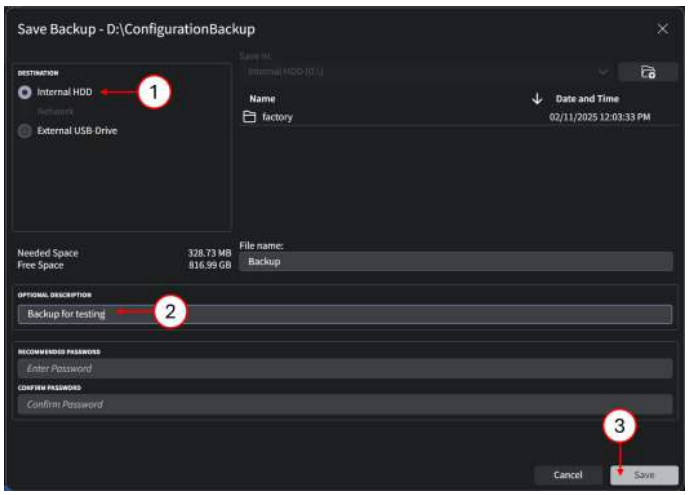


Figure 4-8: Configuration Backup - Save

6. Enter optional description of the Backup **(2)**.

Note *Image data will not be backed up! To backup the Image Archive, refer to Section 4.4.4 on page 4-19.*

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

After copying the data, the Voluson Performance 16/ Voluson Performance 18 reboots and the application starts again.

When the “Configuration 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 3.13.5 on page 3-97*.

4.4.2 Load System Configuration Backup

Caution

It is recommended to backup data before an upgrade; see *Section 4.4.1 on page 4-13*.

The “Configuration 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 Performance 16/ Voluson Performance 18 system!

Note *It is neither required nor advisable to reload a previously stored “Configuration Backup” after a software upgrade that was performed by means of the SWI from Media 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 software version with a lower major number than the system the backup was created on, is prohibited.
2. Options can **only** be restored on the same Voluson Performance 16/ Voluson Performance 18 system with the same major software **and** the same Ext. version.
3. When loading a backup into a system with a software version that has a higher major number, 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:
   - Options
   - State of the Service Platform
   - DICOM TLS Certificates
   - Verisound™ Fleet(formerly AVURI)

Note *If following items are selected for restoring, an important information will be displayed.*

- Measure & Report Configuration
- Biopsy Lines
- Connectivity (Network settings and DICOM configuration)

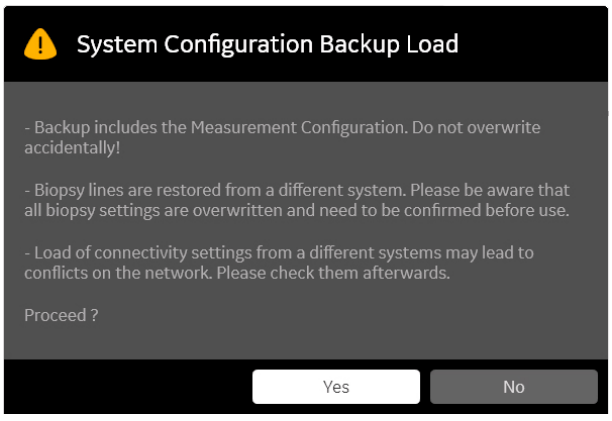


Figure 4-9: important information (example)

Note *If the **Security** item is selected for restoring, the "User Authentication Password" (system administrator password) needs to be entered.*

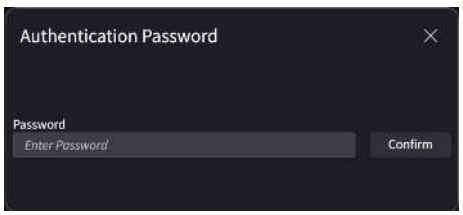


Figure 4-10: Authentication Password required

Operation

1. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
3. Select ***Backup*** and then click the ***System Configuration*** tab.
4. Click the ***Load*** button.
5. Choose the destination **(1)**.

Note *If it is desired to load backup from media Internal HDD, click the "factory folder" icon first and then select the backup to be restored.*

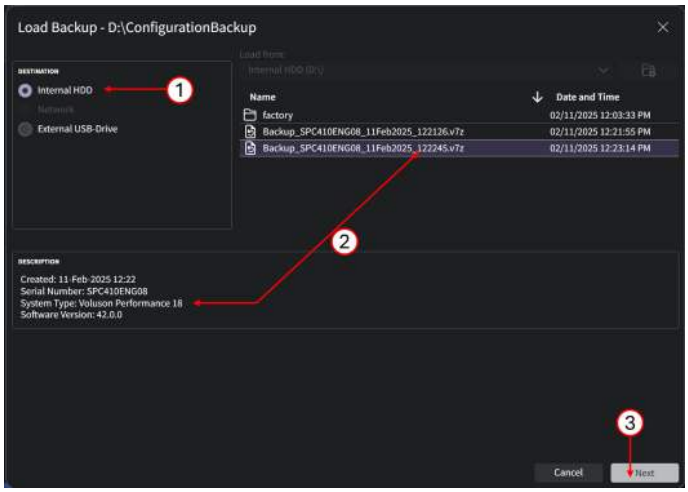


Figure 4-11: System Configuration Load

6. Click on the backup to be restored **(2)**. Additional information is displayed.
7. Select the ***Next*** button **(3)**.

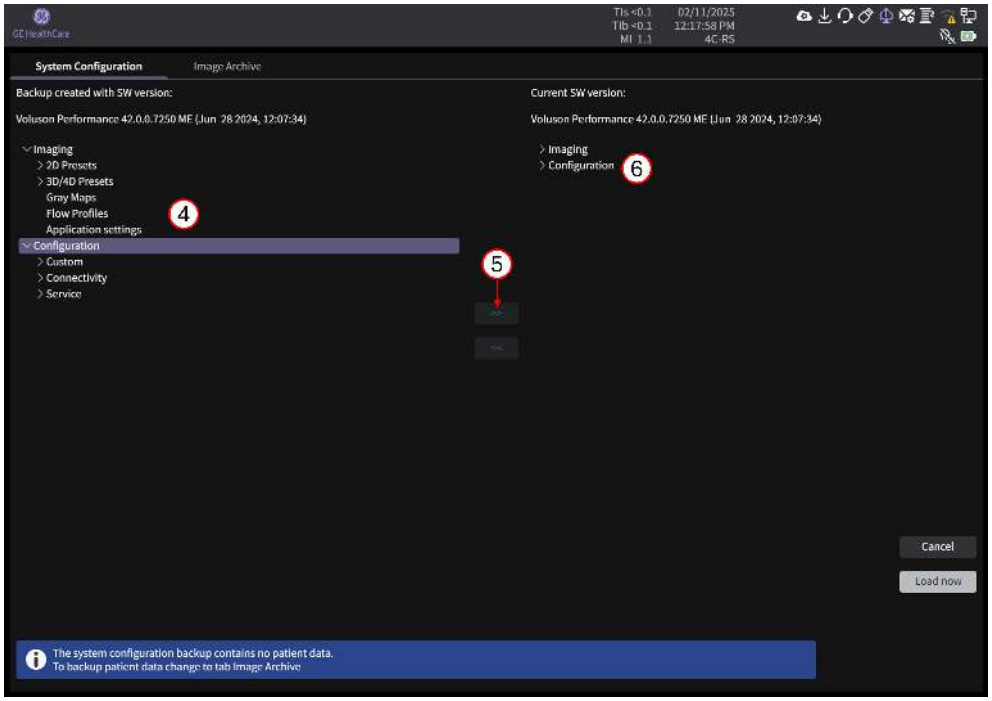


Figure 4-12: select items to be loaded

Settings and data that are allowed for restore are listed in the left "Backup Data" field **(4)**. For detailed description of available items refer to *Section 4.4.1 "Save System Configuration Backup" on page 4-13*.

8. Select all the items to be loaded. Therefore, choose items and click the **[>>]** button **(5)** to copy items into the right "Load Data" field **(6)**.

   For example: All ***Imaging*** settings and all ***Configuration*** settings will be loaded, see *Figure 4-12 on page 4-16*.

9. **ONLY** when it is desired to exclude some items from loading:
   a. Click the **[>]** sign next to an item **(7)** to open the content tree.
   b. Return selected item **(8)** from the “Load Data” field to “Backup Data” field select the **[<<]** button **(9)**.
   For example: **Connectivity** settings will be excluded from loading, see *Figure 4-13 below*.

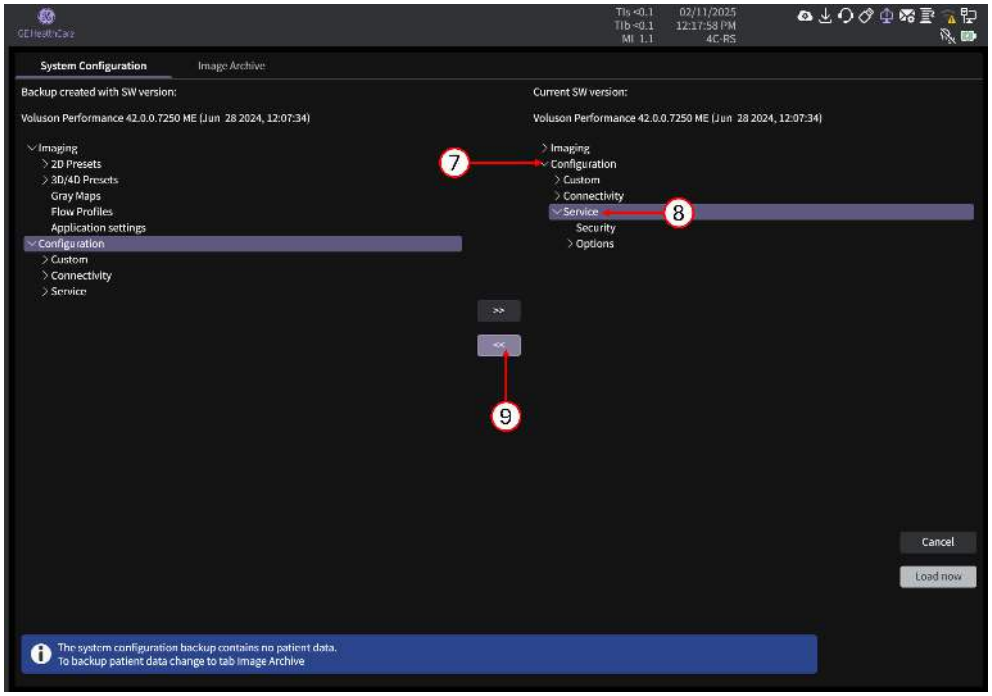


Figure 4-13: return selected item

10. Confirm your selection by clicking the ***Load now*** button.

Note *An important information is displayed, when items are selected that might overwrite user´s settings or when special observation is needed.*

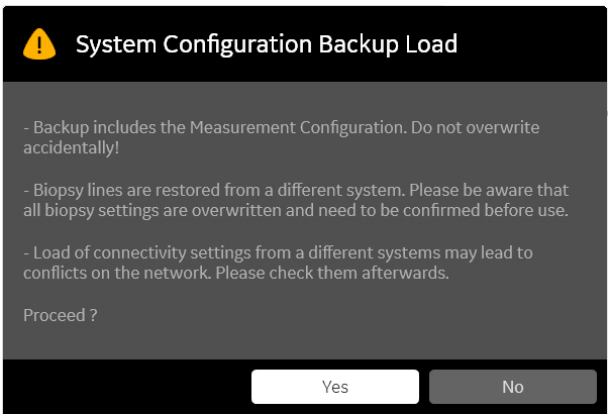


Figure 4-14: important information (example)

Note *When the Configuration Backup contains a configured system administrator and "Security" is selected for reload, the "Authentication Password" (administrator password) needs to be entered.*

11. Click ***Yes*** to start, or ***No*** to cancel the procedure.
    After restoring the data, the Voluson Performance 16/ Voluson Performance 18 reboots and the application starts again.

4.4.3 Delete System Configuration Backup

1. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
3. Select ***Backup*** and then click the ***System Configuration*** tab.
4. Click the ***Delete*** button.
5. Choose the destination **(1)**.

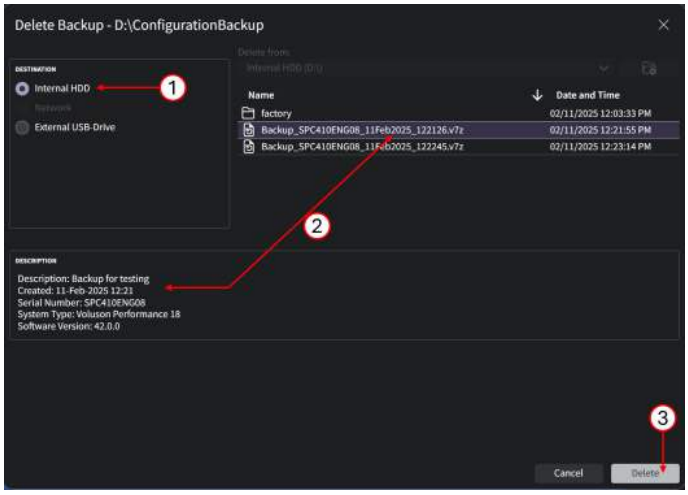


Figure 4-15: Configuration Backup - Delete

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



Caution

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

4.4.4 Archiving Images

Note *It is highly recommended to backup the System Configuration (Section 4.4.1 on page 4-13) and the Image Archive (Section 4.4.4 on page 4-19) once a week.*

4.4.4.1 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. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
3. Select ***Backup*** and then click the ***Image Archive*** tab.

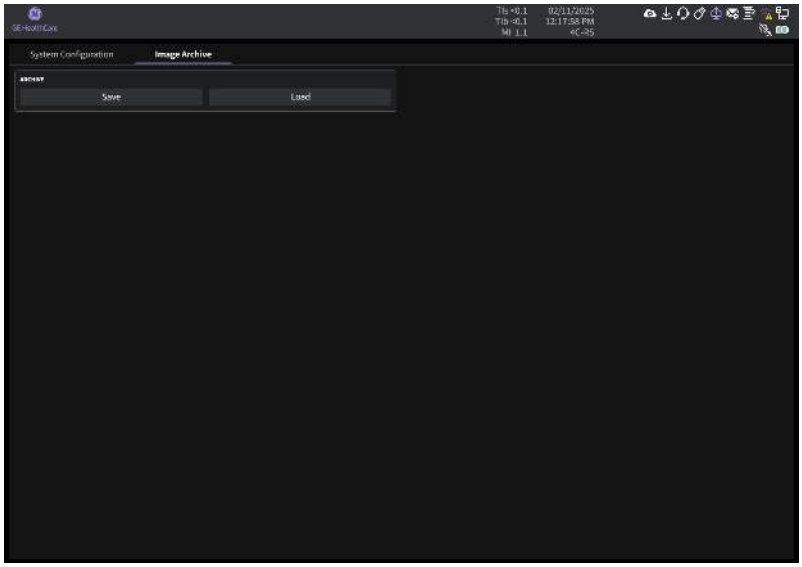


Figure 4-16: System Setup - Backup - IMAGE ARCHIVE page

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

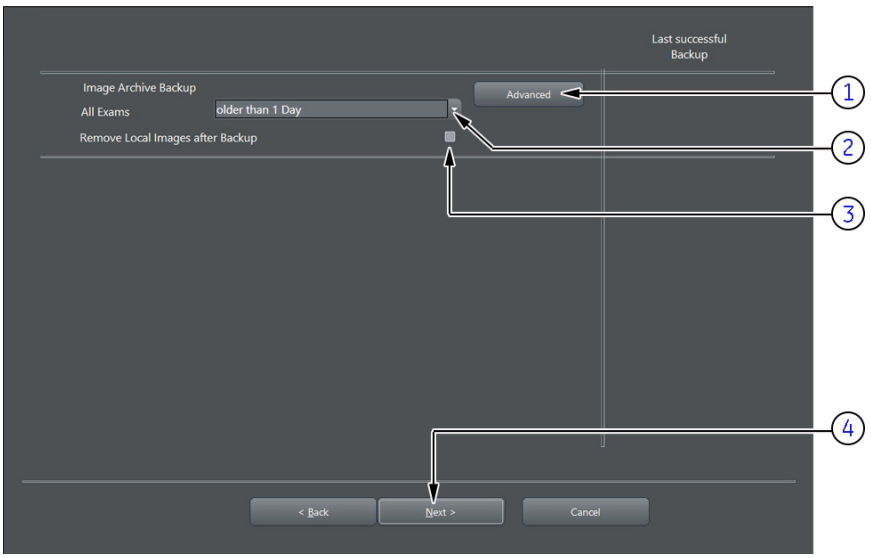


Figure 4-17: Image Archive Save - preparations

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 4-17 on page 4-19), 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 4-18: Image Archive Save - choose destination

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

Note *Voluson Performance 16/ Voluson Performance 18 presets, configurations and image settings will not be backed up! To backup the System Configuration see* *Section 4.4.1 on page 4-13**.*

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

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4.4.4.2 Load Image Archive

1. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
3. Select ***Backup*** and then click the ***Image Archive*** tab.
4. Click the ***Load*** button.



Figure 4-19: 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.

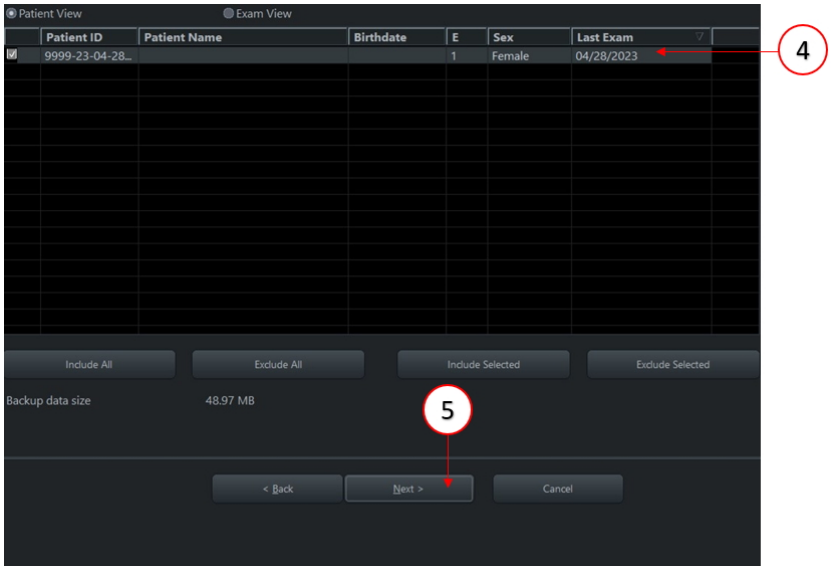


Figure 4-20: select image archive data to be restored

8. Select (check mark) the image archive data to be restored to the Voluson Performance 16/ Voluson Performance 18 system **(4)**.
9. Select the ***Next*** button **(5)**.
10. Select ***Yes*** to start, or ***No*** to cancel the restore procedure.

4.5 Software Configuration Checks

4.5.1 System Setup

1. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
3. 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 Performance 16/ Voluson Performance 18 Instructions for Use.*

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 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 3.7.5.8 on page 3-67*.	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 Presets

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-P4** or **C1-C4**), 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-P4** or **C1-C4**), 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-P4** or **C1-C4**), 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 module and check:

Table 4-2: Peripheral Checks

Step	Page + Task	Expected Result(s)
1	Select the ***Home*** button at the Left Toolbar 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 console can be adjusted in height (Voluson Performance 18 Only).

Note *For further details refer to Section 5.10.3 on page 5-39*

4.7.2 Brakes and Direction (Swivel) Locks

Check the brakes and swivel locks function as described below.

Note *Examine the wheels frequently for any obvious that could cause them to break or bind. Each wheel has an independent brake pedal. A left rear wheel also has a swivel lock.*



Figure 4-21: Wheel lock and swivel lock

1	Brake lock pedal
2	Swivel lock pedal

Brake Pedal

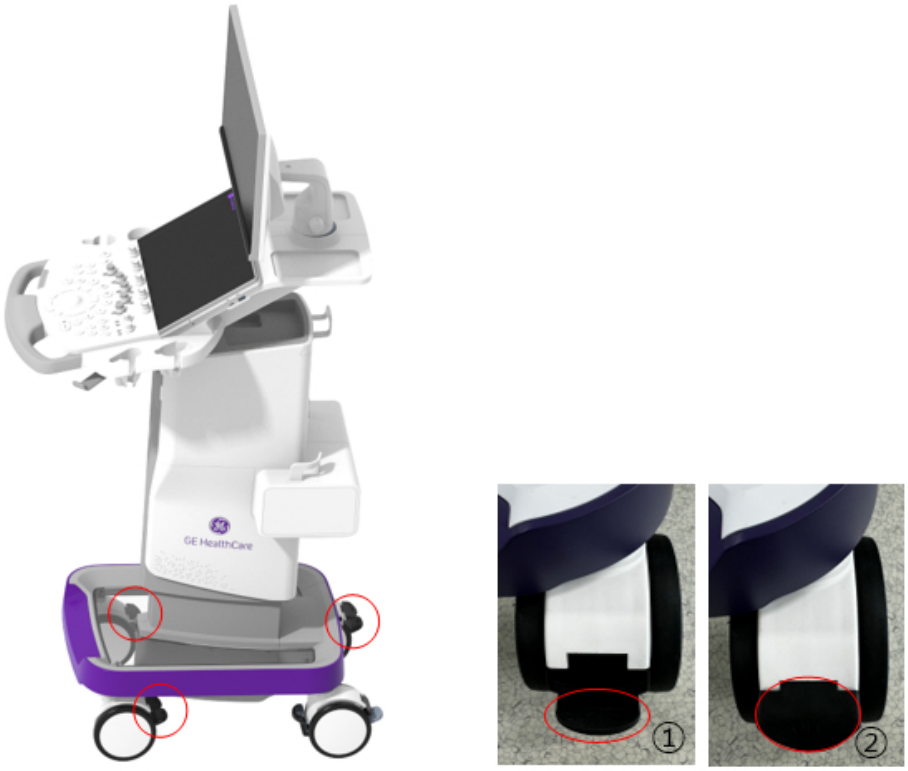


Figure 4-22: Front and right-rear casters

1	Step on lower side pedal to activate brake
2	Step on upper side pedal to release brake



Figure 4-23: Left-rear caster

1	Step on to activate brake
2	Raise up to release brake

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Swivel Lock



Figure 4-24: Rear-left with swivel lock

1	Step on lower side pedal to activate swivel lock with clicking sound
2	Step on lower side of pedal to deactivate swivel lock

Note *Wheel needs to be straight when you activate swivel lock*

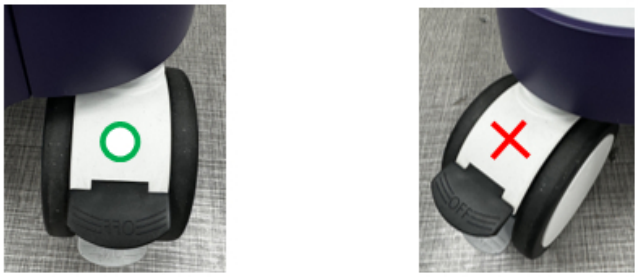


Figure 4-25: Caster position for swivel lock

4.8 Site Log

Table 4-3: Voluson Performance 16/ Voluson Performance 18 - Site Log (Paper Documentation)

Date	Service Person	Problem	Comments

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Chapter 5

Components and Functions (Theory)

This chapter explains Voluson Performance 16/ Voluson Performance 18 system concepts, component arrangement, and subsystem function. It also describes power distribution and optional peripherals.

Content in this chapter

*5.1 General Information - - -

5.1 General Information

Content in this chapter

5.1.1 Description of Operating Modes - - -

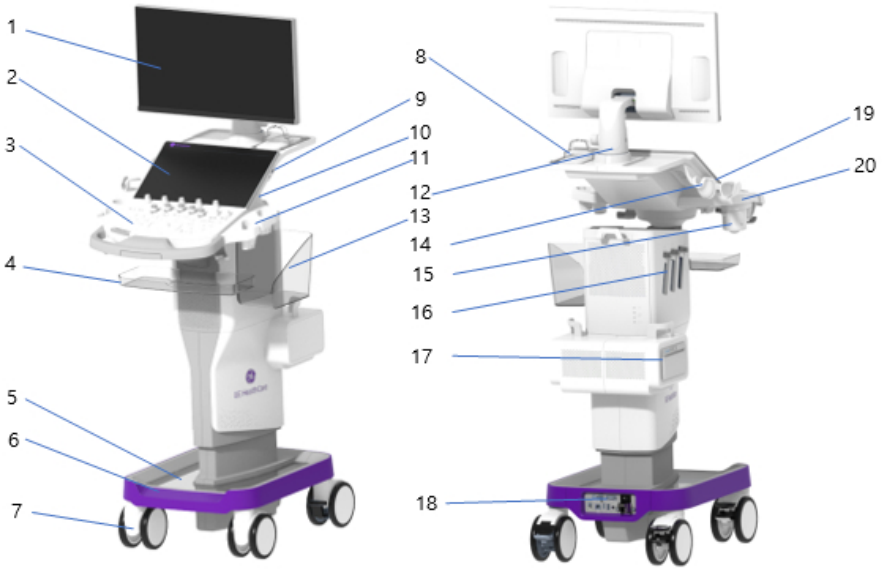


Figure 5-2: ***Voluson Performance 16***

1	21.5“ bezel less screen monitor	11	Probe holder (Right)
2	Touch panel	12	Monitor arm
3	User Interface	13	Side basket (Option)
4	User Interface up/down button	14	Horizontal TV probe holder (Option)
5	Front shelf (Option)	15	Gel holder/Gel warmer (Option)
6	Base tray	16	Probe ports (3 RS ports)
7	Footrest	17	BW printer (Option)
8	Casters	18	External I/O ports
9	Wireless probe charger holder (Option)	19	Microphone (Left)
10	USB ports	20	Probe holder (Left)

The system can be used for:

- 2D Mode Imaging and additional Operating Modes (XTD-View)
- Color Doppler Imaging (CFM, PD 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 Performance 16/ Voluson Performance 18 ultrasound system are the following:

- Integrated FrontEnd (uses advanced FGPA technologies)
- Open connectivity using USB ports
- Bluetooth - wireless connectivity
- high-resolution 21.5"LCD Flat Panel Monitor
- 14” User interface with the touch panel on LCD display

Voluson Performance 16/ Voluson Performance 18 has a digital beam forming system (incorporated in the FrontEnd) which can handle up to 192 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 it is displayed on the Monitor and Peripherals.

Voluson Performance 16/ Voluson Performance 18 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 5-20*
- BackEnd processor: *Section 5.3 on page 5-23*
- Control Console (User interface); System I/O with hard keys, Touch Panel and EL-Display: *Section 5.5 on page 5-28*
- Monitor: *Section 5.6 on page 5-29*
- External I/O: *Section 5.7 on page 5-30*
- Peripherals: *Section 5.8 on page 5-33*
- Power supply and Isolation transformer for the peripherals, *Section 5.9 on page 5-36*
- System mechanical chassis: trolley to keep all major components, *Section 5.10 on page 5-37*

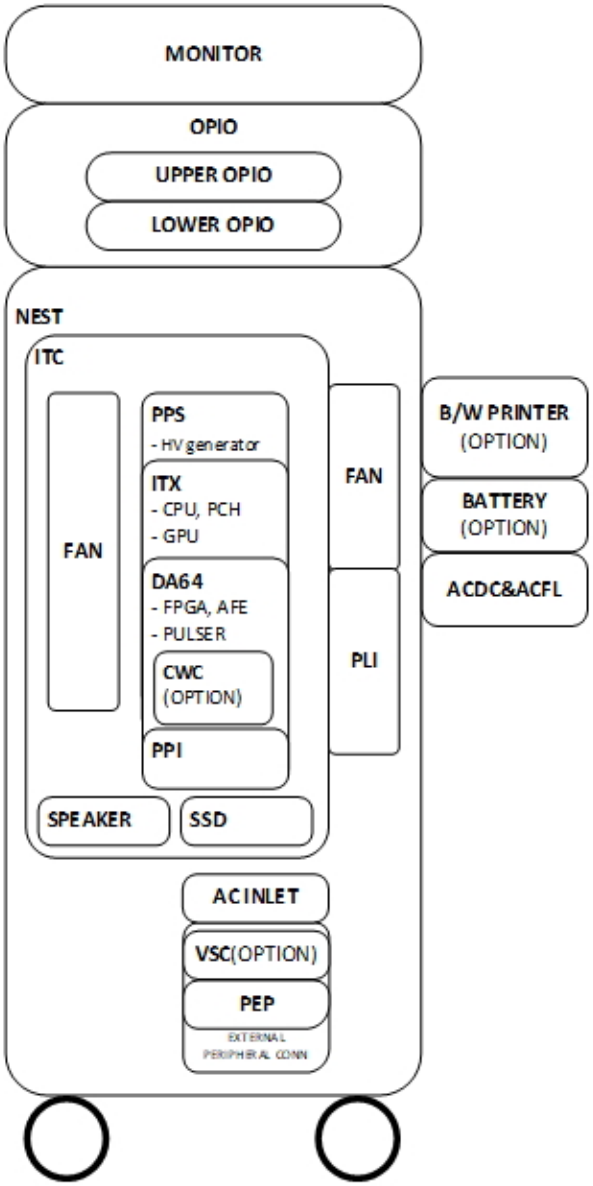


Figure 5-3: Basic Block diagram of Voluson Performance 16/ Voluson Performance 18

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The Voluson Performance 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 Performance 16/ Voluson Performance 18 supports a variety of linear-, curved-, phased array and pencil CW probes for various clinical applications.

Medical application fields include:

- Obstetrics
- Gynecology and Fertility
- Radiology
- Neurology
- Oncology
- Urology
- Pediatrics
- Musculoskeletal

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 Performance 16/ Voluson Performance 18 "Instructions for Use" manual.

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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 Performance 16/ Voluson Performance 18 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.

5.1.1.1.4 Coded Contrast Imaging (optional)

For details see: *Section 5.1.2.6 "Coded Contrast Imaging" on page 5-12*.

5.1.1.1.5 Elastography (optional)

For details see: *Section 5.1.2.7 "Elastography" on page 5-13*.

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 value 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.

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5.1.1.5 3D Imaging

The 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 two dimensional cross-sections of parts of the body. For example, in 2D gray scale imaging, a two-dimensional cross-section of a three-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 three-dimensional structure in the body.

To complete survey a three-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 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 image.

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.

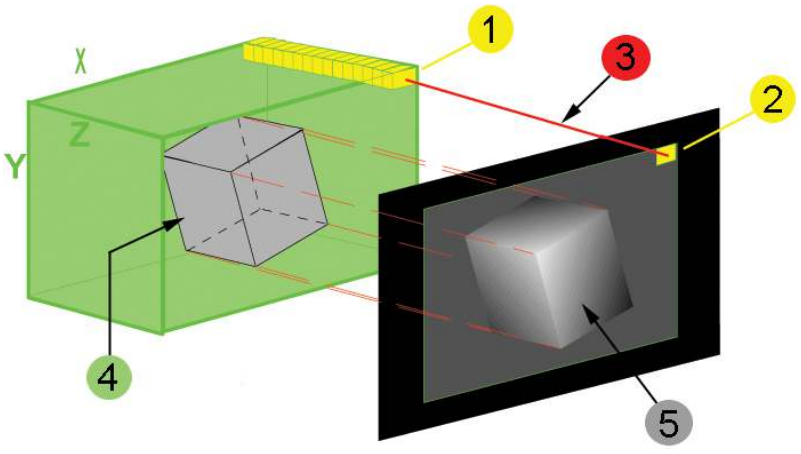


Figure 5-4: Principle: Volume Rendering

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

5.1.2 Description of Software Options

To activate the (purchasable) software options:

1. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
3. Select ***Administration*** and then click the ***Options*** tab.



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

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

Table 5-1: Software Options

HCat #	Software Option	Performance 16	Performance 18
H46052BF	Radiantflow™	Opt	Opt
H46052BG	Volume Imaging Package	Opt	Opt
H46052BH	HD*live*	Opt	Opt
H46052BJ	OmniView	Opt	Opt
H46052BK	VOCAL II	Opt	Opt
H46052BL	Inversion	Opt	Opt
H46052BM	SonoCNS	Opt	Opt
H46052BN	fetal*HS*	Opt	Opt
H46052BP	SonoGYN	Opt	Opt
H46052BR	SonoPelvicFloor 3.0	Opt	Opt
H46052BS	SonoNT/IT	Opt	Opt
H46072BJ	SonoLyst IR/X/*Live*	Opt	Opt
H43252LR	SonoLyst IR/X - 2nd Trimester	Opt	Opt
H46052BW	SonoLyst*live* - 2nd Trimester	Opt	Opt
H46052BY	Follicle Monitoring Package	Opt	Opt
H46052BZ	Labor & Delivery Package	Opt	Opt
H43252LP	Coded Contrast Imaging	Opt	Opt
H43262LZ	Elastography	Opt	Opt
H46062BC	Voice Command “Hey Voluson“	Opt	Opt
H46062BD	Software DVR - USB Recorder	Opt	Opt
H46062BE	Voluson eDelivery – Performance Series	Opt	Opt
H43272LF	Voluson Remote Updates	Opt	Opt
H43252LT	Advanced Security	Opt	Opt
H43252LW	Premium Security	Opt	Opt
H46062BJ	Verisound™ Fleet Management (Previously known as AVURI)	Opt	Opt
H46062BK	Vscan Air SW Activation	Opt	Opt
H43252LY	Russian Language Support (RLS)	Opt	Opt
H46062BM	RAB6-RS Probe Activation*	Opt	Opt
H46062BN	C1-5-RS Probe Activation*	Opt	Opt

HCat #	Software Option	Performance 16	Performance 18
H46062BY	Voluson Performance 18/16 – Latest SW update	Opt	Opt

5.1.2.1 Advanced 4D

5.1.2.1.1 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 40 volumes/second is possible. By freezing the acquired volumes, size can be adjusted, manipulated manually as known from the Voluson 3D Mode.

5.1.2.1.2 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.

5.1.2.1.3 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.

5.1.2.1.4 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.

5.1.2.2 HD*live*

Most current surface reconstructions use an illumination frontal to the rendered object. This can cause the image to look flat. HD*live* 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.

5.1.2.4 VOCAL II - Virtual Organ Computer-aided Analysis

Diagnosis and therapy of cancer is one of the most important issues in medical care. The VOCAL II - Imaging program allows completely new possibilities in cancer diagnosis, therapy planning and follow-up therapy control.

VOCAL II offers additional functions:

- Manual or Semi-automatic Contour detection of structures (such as tumor lesion, cyst, prostate, etc.) and subsequent volume calculation. The accuracy of the process can be visually controlled by the examiner in multi-planar display.
- Construction of a virtual shell around the contour of the lesion. The wall thickness of the shell can be defined. The shell can be imagined as a layer of tissue around the lesion, where the tumor vascularization takes place.
- Automatic calculation of the vascularization within the shell by 3D color histogram by comparing the number of color voxels to the number of grayscale voxels.

5.1.2.5 Advanced VCI

5.1.2.5.1 VCI Omni View - Volume Contrast Imaging (any plane)

More flexibility with Any Plane, VCI plane is freely selectable. Any shape can be drawn. Volumes from older BT's can be loaded and edited with VCI Omni View without any limitations.

- Volumes can be edited in all other Visualization Modes.
- Dual Format is now also possible in Render Mode and Sectional Planes Mode.
- VCI slice thickness can be set to zero.

5.1.2.6 Coded Contrast Imaging

Injected contrast agents re-emit incident acoustic energy at a harmonic frequency much more efficiently than the surrounding tissue. Blood containing the contrast agent stands out brightly against a dark background of normal tissue. Possible clinical uses are to detect and characterize tumors of the liver, kidney and pancreas and to enhance flow signals in the determination of stenosis or thrombus.

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5.1.2.7 Elastography

Elastography refers to the measurement of elastic properties of tissues, based on the well-established principle that malignant tissue is harder than benign tissue.

Elastography shows the spatial distribution of tissue elasticity properties in a region of interest by estimating the strain before and after tissue distortion caused by external or internal forces. The strain estimation is filtered and scaled to provide a smooth presentation when displayed.

During scanning in the elastography mode, the examiner manually slightly compresses the tissue using the ultrasound probe. A strain correlation (strain is the deformation of the tissue by compression) is continuously performed for visual perception on the monitor.

5.1.2.7.1 Elastography Analysis

A selectable sequence of Elastography images are analyzed within a ROI (range of interest). The Strain % or the Elasticity Index is displayed as curves over the time.

The mean value of the Strain % is measured within 1 or more ROI's and Ratios are calculated. "Generic Elasto" measurements are located in the generic measurement menu and are only available if "Elastography" is activated.

5.1.2.9 SonoAVC - Sono Automated Volume Count

This feature can automatically detect low echogenic objects (e.g., follicles) in a volume of an organ (e.g., ovary) and analyze their shape and volume. From the calculated volume an average diameter can be calculated. It also lists the objects according to their size.

- Each object can be calculated automatically.
- A description name can be defined for each object up to 10 descriptions. With the "Add to Report" button all values of the measured objects can be sent to the worksheet. Also the description name will be sent.
- The description name can be edited in the worksheet.
- If the number button is activated, all objects are assigned a number inside the displayed object according to the measurement index.
- Group function: All objects will be added to one volume. The color of all objects will be changed to red and the measurement will show only one result.

5.1.2.11 Anatomical M-Mode (AMM)

Anatomical M-Mode displays a distance/time plot from a cursor line, which can be defined freely. The M-Mode display changes according to the motion of the M cursor. In the Dual format, two defined distances can be displayed at the same time.

AMM is available in grayscale and color modes (CF, HD Flow, TD)

- simultaneous Display of 2 M-Mode Cursors in 2D Mode
- each Cursor is freely rotatable
- can be done after Freeze and on reloaded Cine

5.1.2.13 SRI Advanced - Speckle Reduction Imaging

A type of image noise or interference is generally considered undesirable and can obscure the quality or interpretation of B-mode images. Although somewhat associated with the underlying echogenicity of tissue scatters, image speckle characteristics such as brightness, density or size have no apparent value in determining tissue structure or related properties. The elimination of or significant reduction in speckle improves the quality or diagnostic potential of the image. The method applied in the subject modification utilizes a nonlinear diffusion filtering technique that permits effective speckle reduction in real time. The speckle reduction filter is available to the user in all B-mode imaging, independent of the used probe.

5.1.2.14 SonoCNS

SonoCNS is a method to examine the fetal Central Nervous System (CNS) based on acquired 3D/4D ultrasound volumes. The tool provides the user with a view of the TV (Transventricular), TC (Transcerebellar), TT (Transthalamic) and MS (Mid-sagittal) plane. The required volume can be newly acquired, re-loaded from the archive, or extracted from a 4D cine.

5.1.2.15 Radiantflow

Radiantflow enhances sensitivity and improves artifact suppression to show better vessel separation & 3D like effect in Color Mode.



Radiantflow is a display method which uses the amplitude of the Color flow signal. Note that this may alter the appearance of the Ultrasound information displayed. For diagnostic purposes, this must be taken into account, or the Region of Interest must be checked without Radiantflow.

Note *Radiantflow is probe and application dependent.*

5.1.2.15.1 Slowflow

In blood flow detection a typical issue is the corruption of the data with low-frequency tissue motion (clutter). Thus, in traditional Color- and Power Doppler technologies, the low-frequency components are suppressed by the Wall-Motion-Filter (WMF). The suppression of the low-frequency tissue components also causes a suppression of low-frequency flow components. To overcome this issue, a feasible separation between tissue motion and blood flow has to be applied. SlowFlow is able to suppress the low-frequency clutter motion while preserving the flow information.

Note *Slowflow is probe dependent.*

5.1.2.16 IETA (Internal Endometrial Tumor Analysis)

IETA Worksheet for application GYN. Two IETA models are available.

5.1.2.17 IDEA (International Deep Endometriosis Analysis)

The IDEA (International Deep Endometriosis Analysis group) statement worksheet for application GYN may be used to describe the sonographic features of the different phenotypes of endometriosis and in particular for deep infiltrating endometriosis (DIE).

5.1.2.18 *fetal*HQ

*fetal*HQ is a post processing tool from TOMTEC™ embedded in the software.

5.1.2.19 Shearwave Elastography

Shearwave Elastography on the system is an ultrasound imaging mode in which shear waves are generated in-vivo acoustically via the imaging ultrasound transducer. The motion of the shear waves is then tracked using ultrasound to determine their velocity of propagation, which is a quantifiable indicator of the mechanical properties of the tissue through which it traveled.



Do not use Shear Elasto in case of pregnancy.

Note *Shear Elasto is probe and application dependent.*

5.1.2.20 SonoLyst

SonoLyst uses deep learing based AI technology to analyze images in real time via plane recognition.

SonoLystIR analyzes a frozen ultrasound image and determines whether the image contains one of the pre-defined standard views or not. SonoLystIR can only be used in conjunction with the Scan Assistant. It adds the capability to the Scan Assistant to automatically select Scan Assistant List items linked with one of the pre-defined standard views.

SonoLystX works in conjunction with SonoLystIR. In addition, if a pre-defined standard view is found by SonoLystIR, the fulfillment of criteria is assessed - for example the presence of certain anatomical structures in this plane. The assessment of this analysis is displayed for the user (pre-defined standard view and depending criteria).

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SonoLystlive adds the capability to perform SonoLystIR and SonoLystX in the live and in the frozen image.

5.1.2.21 SonoLystlive

SonoLyst*live* works similar to SonoLystIR without Scan Assistant and can be enabled in the System Setup. This means SonoLyst*live* performs an assessment with respect to pre-defined standard views. The assessed standard view is displayed for the user in the live and in the frozen image. Additionally an indicator is shown which reflects the quality of the detected view based on detected criteria in the assessed standard view. SonoLyst*live* is enabled when an OB exam is started and available in live mode, freeze and in reload.

Note *For further description refer to Section 5.1.2.20 "SonoLyst" on page 5-14.*

5.1.2.22 SonoPelvicFloor

The SonoPelvicFloor tool is a guided tool for Pelvic Floor examination.

It provides the user with the coronal plane of the pelvic floor to recognize malformations or other anatomical variants and relevant measurements on the MHD plane.

5.1.2.23 Ophthalmic Artery



For scanning the ophthalmic artery through the **closed eye** the specific setting has to be activated. NOT intended for ophthalmic use where the probe is directly applied to the eye.



This symbol indicates predefined modes/settings for ophthalmic artery examination, where the probe is applied onto the **closed eyelid**.

Suitable presets fulfill the FDA ophthalmic usage recommendations and are maintained also when the user manually changes these predefined modes/settings. The acoustic power is limited accordingly by the system.

Note *Ophthalmic Artery modes/settings are probe and application dependent. I.e., Ophthalmic Artery presets are available for linear probes 9L-D at application "Obstetrics" only.*

5.1.2.24 Voluson Image Portal

The "Voluson Image Portal" feature is for sharing images via WiFi hotspot from the Archive to an external mobile device (usually the patients mobile phone).

5.1.2.25 Verisound™ Fleet(formerly AVURI)

Verisound™ Fleet(formerly AVURI) is a cloud-based preset and backup management solution which allows users to store, view, restore and push Voluson Performance 16/ Voluson Performance 18 system-related configurations to the GE Healthcare secure cloud and back to the system.

It includes an optional one- or three-year subscription and may be renewed after expiration.

5.1.2.26 eDelivery (Software Download)

Software Extension releases are automatically made available to end users who are entitled for Direct to Device proactive updates with Flexera-based "eDelivery" (SW download).

eDelivery and installation by purchasing this option. The "Software Download - eDelivery" icon (↓ green arrow at right top of the monitor screen) pops-up whenever a new "Software Update Package" is available.

End users can then download the SW package using their browser and start the automated installation whenever preferred.

Note *The option "eDelivery" must be purchased and permanently activated + InSite/RSvP network configuration and proper connection between the Voluson Performance 16/ Voluson Performance 18 system and the SW download server is required.*

5.1.2.27 Vscan Air Activation

This activates Vscan Air probes support.

Note *The "SparkLAN" Wi-Fi Bluetooth stick is required to connect the handheld Vscan Air probe to the Voluson Performance Series ultrasound system and to bring it in operation.*

Note *Due to technical limitations for compatibility, there is no guarantee that a specific version of VscanAir probe will be supported by the ultrasound console Voluson™ Performance system.*

This is due to technical and safety limitations, i.e. incompatibility of specific VscanAir firmware versions with specific ultrasound console Voluson™ Performance system software versions.

Note *For more detailed information refer to the VScan Air User manual or the Instructions for Use of your Voluson Performance Series system.*

5.1.2.28 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 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.

5.1.2.29 USB Recorder

After entering an encrypted Software Option string (password) it is possible to record Ultrasound data on an USB device. Videos are created in .mp4 file format.

5.1.2.30 Voluson Remote Updates

By means of the optional "Voluson Remote Updates” feature vital updates (e.g., patches) can be remotely downloaded and installed to Voluson Performance 16/ Voluson Performance 18 systems.

Note *A proper connection between the Voluson Performance 16/ Voluson Performance 18 system and the update server is required.*

5.1.2.31 Advanced Security Features

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

- *"Disk Encryption" on page 5-17*
- *"Whitelisting" on page 5-17*

5.1.2.31.1 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, the Recovery Key or USB device with unlock key it will not be possible to access the Ultrasound device including emergency mode, scanning, patient information, images, or local archive. GE HealthCare 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 *A Voluson Performance 16/ Voluson Performance 18 system without the option but with encrypted disk is unlockable.*

Note *Disk Encryption is part of the "Advanced Security Features" option.*

5.1.2.31.2 Whitelisting

Whitelisting prevents the Voluson Performance 16/ Voluson Performance 18 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.

Note *"Whitelisting" is part of the "Advanced Security Features" option.*

5.1.2.32 IOTA (International Ovarian Tumor Analysis)

Caution

An IOTA model (LR2, Simple Rules or ADNEX) 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 an IOTA model carries the risk of unnecessary testing, surgery, and/or delayed diagnosis.

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.

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

GE HealthCare is passing on this IOTA worksheets (LR2, Simple Rules or ADNEX) 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 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 additional to the LR2 model.

The IOTA mathematical logistic regression model, LR2 is stated in literature as described in the Advanced Reference Manual - Chapter IOTA.

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).

Caution

User of IOTA Simple Rules should have specific experience on how to use the program and be familiar with the IOTA terminology. Relevant information on the use of IOTA Simple Rules is available at www.iotagroup.org.

The IOTA Simple Rules model is stated in literature as described in the Advanced Reference Manual.

IOTA ADNEX

The IOTA ADNEX model can be used by medical doctors to diagnose ovarian cancer in women who have at least one persistent adnexal (ovarian, para-ovarian, and tubal) tumor and are considered to require surgery. The IOTA ADNEX model estimates the probability that an adnexal tumor is benign, borderline, stage I cancer, stage II-IV cancer, or secondary metastatic cancer (i.e. metastasis of non-adnexal cancer to the ovary).

Caution

Users of IOTA ADNEX should have specific experience on how to use the program and be familiar with the IOTA terminology. Relevant information on the use of IOTA ADNEX is available at www.iotagroup.org/sites/default/files/Van_Calster_BMJ_2014_ADNEX.pdf.

The IOTA ADNEX model is stated in literature as described in the Advanced Reference Manual.

5.1.3 Data Location

The Voluson Performance 16/ Voluson Performance 18 storage system is divided into 4 partitions:

C: System partition:

- Operating System (Windows)10 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

5.2 FrontEnd Processor

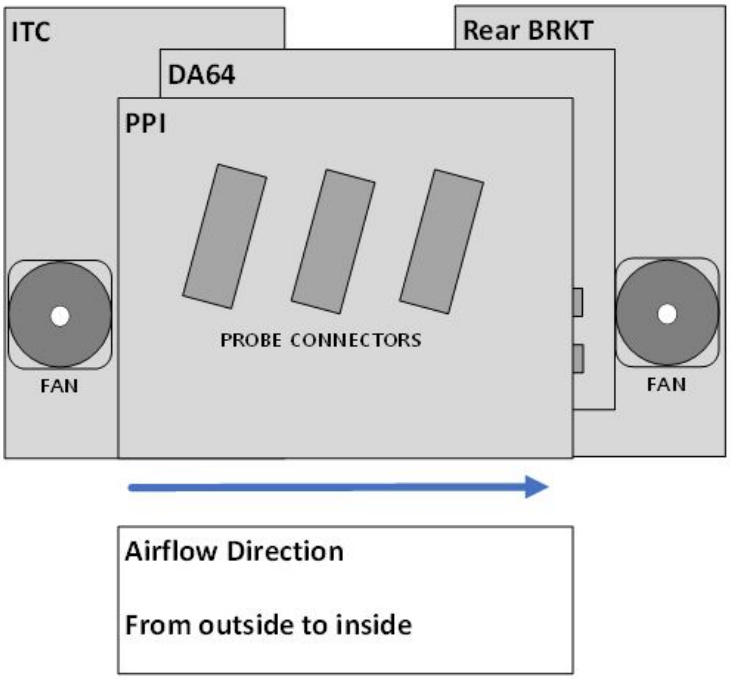


Figure 5-5: FrontEnd - Block diagram

Content in this chapter

*5.2.1 PPI - Probe Interface board - - -

5.2.1 PPI - Probe Interface board

Switches the Probe Connectors (3 RS -Connectors) and recognizes Probes

- 3 RS-Probe Connectors
- Probe Select Relays
- Probe Recognition

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5.2.2 DA64- Beam former board

DA64 board has 64 TX/RX channels, respectively. beamformer board is a complete 64 channel ultrasound Front-end

5.2.2.1 DA64-IF(Interface) - FPGA

A.) Beamformer interface

B.) DMA Logic

C.) PPI (PC400 Probe Interface board) FPGA programming interface

D.) Ultrasound Data Pre-processing

E.) System control

F.) 4D motor control

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5.3 BackEnd Processor

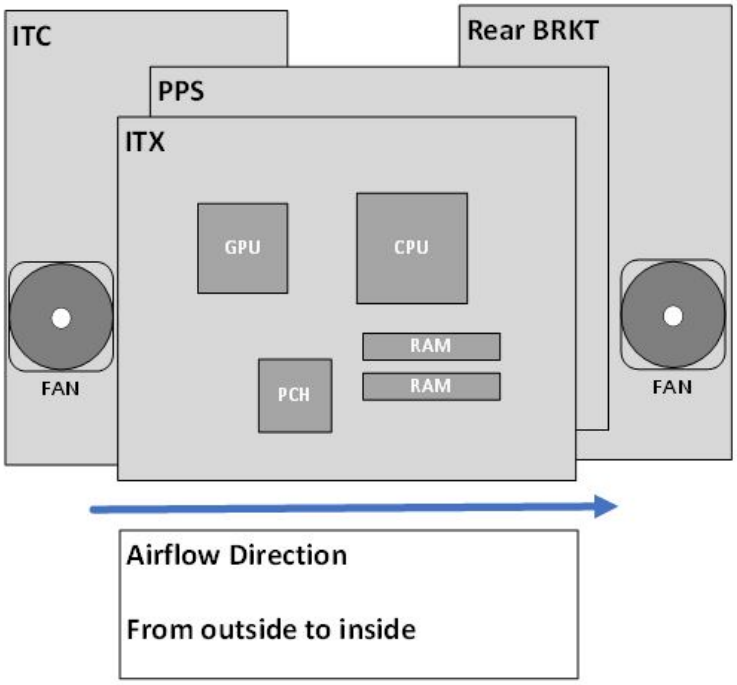


Figure 5-6: BackEnd - Block diagram

Content in this chapter

5.3.1 ITX - Information Technology Extended board (Base Board) - - - - - - - - - - - - - - - - - 5-24
5.3.2 PEP-Peripheral board - 5-26

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5.3.1 ITX - Information Technology Extended board (Base Board)

Built in or external Components:

- CPU
- Graphic cards (GPU-UI)
- PCH(Platform Controller Hub)
- Video splitter and MUX
- System Control
- Connections to
  - User Interface (via USB)
  - Frontend (via PCIe)
  - Peripherals (Main Monitor etc)
  - Provide external connectivity

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5.3.1.2 CPU/GPU

The ITX(Information Technology Extended) board has an Intel LGA1151 socket for i3-7101TE CPU and MXM Type-A GPU (Nvidia T1000) which computes, receives scanning data and acts interface with external peripheral devices.

- CPU: Intel Core i3-7101TE Processor, 3.4GHz
- Major Task: Source of Peripheral PC Interface signal, LAN, USB 2.0, USB 3.0, RGB, Sound, PCIE
- GPU (Graphic Process Unit) NVIDIA Quadro) T1000 MXM
  - NVIDIA® Quadro® T1000 embedded graphics

  Processor
  - Based on Turing architecture with 896 CUDA

  Cores
  - MXM 3.1 Type-A form factor, PCI Express

  Gen3 x16
  - 4 GB GDDR6 memory, 128-bit bus
  - 128 GB/s peak memory bandwidth
  - 2.6 TFLOPS Single Precision Floating Point

  Performance
  - 4 x DisplayPort 1.4a output with audio
  - 8K Ultra HD output at 60Hz, HDR support

5.3.1.3 SSD(Solid State Drive)

The Hard Disk is the main storage device of the Voluson Performance Series.The Voluson Performance Series use NVME M.2 512GB/1TB SSD, which is controlled by the CPU via signals from PCIe,

5.3.2 PEP-Peripheral board

Built in or external Components:

- LAN
- USB 2.0 port
- HDMI
- UVSC option board connector
- System status LED indicator

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5.4 Internal I/O

Note *The "Mainboard type" can be read out in the System Setup - Administration - SYSTEM INFO page (see Figure 7-1 on page 7-3).*

Content in this chapter

5.4.1 Internal I/O Voluson Performance 16/ Voluson Performance 18 - - - - - - - - - - - - - - 5-27

5.4.1 Internal I/O Voluson Performance 16/ Voluson Performance 18

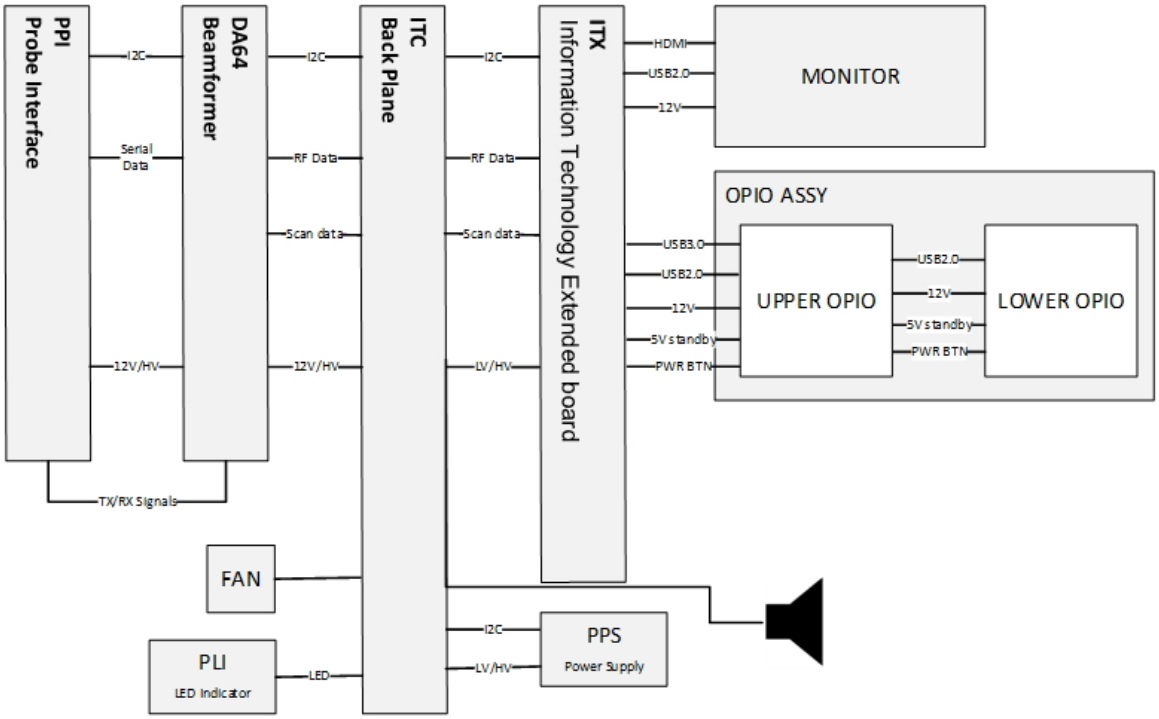


Figure 5-7: Internal I/O Voluson Performance 16/18

5.5 Control Console (User Interface)

The Voluson Performance 16/ Voluson Performance 18 control console (User Interface) consists of the following electronic sub-assemblies and/or functional components:

- OPIO Assy-Operating Input Output Assembly:

1. Upper OPIO – Touch Display Unit
   - The display panel is embedded with Touch sensors, Embedded Oncell type.
   - It supports The Full HD Display (1920 x 1080 pixels) and connects Upper OPIO - Display PCBA to ITX via a USB3.0 Type C connector to receive a USB3.0 signal.
   - The 14" capacitive touch screen is processed on the Upper OPIO - Touch PCBA.
   - There are 2 Microphones, one on each side of the Upper OPIO -Touch Display Unit.
   - It has 4 ports USB 3.0 HUB controller.
     * 2 user-accessible USB 3.0 Type C connector ports on the right side of the OPIO ASSY Display Unit and Top side of Chassis Frame.
     * 1 user-accessible USB 3.0 Type A connector ports on the right side
     * Display converter for converting USB3.0 to HDMI.
   - Power On/Off button to boot up / shut down the Voluson Performance Series system.
   - It uses scaler IC that can control color coordinate, Luminance and temperature.
2. Lower OPIO- Extended Keyboard
   - Extended Keyboard (Mainboard) with an Extended Keyboard Controller coordinating encoders, joycoders, function keys, backlights
   - USB Trackball with dedicated buttons to emulate standard three button mouse functions.
   - A trackball ring for an easy extraction of the trackball e.g. in case of cleaning
   - Hot key combinations supporting serviceability (see: *#unique_308/unique_308_Connect_42_F-ControlConsole*)

5.6 Monitor

Monitor is designed for a LCD monitor style display unit. The screen format and electrical interface are intended to support the VESA FHD(1920(H) × 1080(V) at 60Hz) screen. Supported gray scales are native 8bit per 1(one) sub pixel. All input signals are LVDS(Low Voltage Differential Signaling) interface compatible.

5.7 External I/O

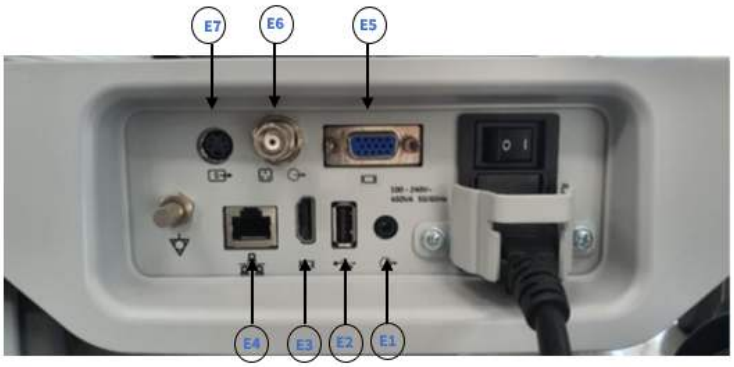


Figure 5-8: External I/O connectors - on rear of system

Item	Connector Name	Table Number	Description
E1	Speaker OUT	-	Connector for external speaker
E2	USB-A	*Table 3-12*	1x USB 2.0 type A port
E3	HDMI OUT	*Table 3-9*	Connector for external monitor Resolution: Full HD (1920 X 1080)
E4	Network (LAN)	*Table 3-11*	DICOM input/output, twisted pair RJ-45 10/100 megabit/s
E5	VGA OUT	-	Connector for external monitor Resolution: FHD(1920 x 1080)
E6	COMPOSITE	-	Connector for external monitor Resolution: PAL (720 x 576), NTSC (720 x 480)
E7	S-Video OUT	-	S-VIDEO Output Resolution: PAL (720x576), NTSC (720x480)

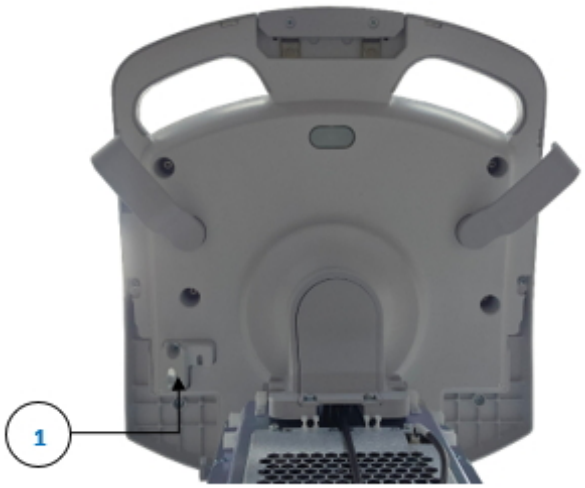


Figure 5-9: External I/O connectors - on behind Rear Cover Top

Item	Connector Name	Table Number	Description
1	Power	-	connector intended for optional Gel Warmer

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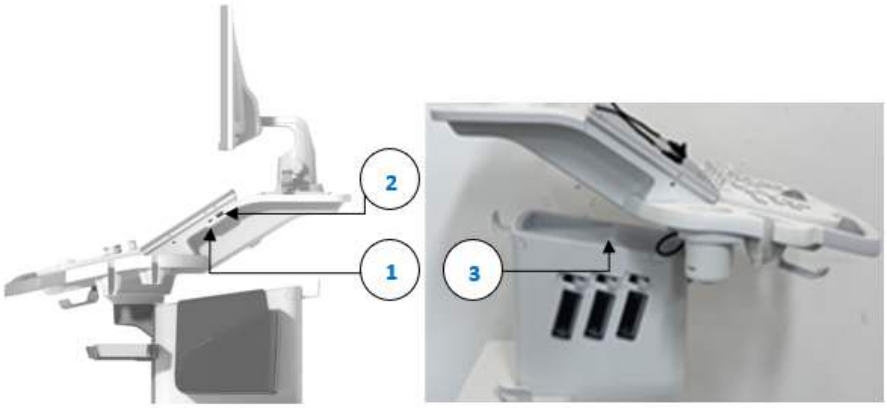


Figure 5-10: External I/O connectors - back and left/right side of the console

Item	Connector Name	Table Number	Description
1	USB-A	*Table 3-15*	USB-A 3.0 port (right side of the Touch panel) intended for optional ECG module
2	USB-C	*Table 3-15*	USB-C 3.0 port (right side of the Touch panel) intended for optional Peripherals
3	USB-C	*Table 3-15*	USB-C 3.0 port (back side of the Touch panel) intended for optional Peripheral

Note *For further description of I/O connectors refer to Section 3.9 "External I/O Connectors" on page 3-81.*

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5.8 Peripherals and/or optional Equipment

Note *Some peripheral devices (hardware options) may not be available and/or approved in all countries. Please contact Sales & Marketing in your region for information on availability.*

Content in this chapter

*5.8.1 Printers - - -

5.8.1 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-P4** or **C1-C4** on the Voluson Performance 16/ Voluson Performance 18 control console (depending on system configuration).

Color Digital Printer

The Color Digital Printer requires the optional wireless kit to receive image data using Wi-Fi signal connection. The print command is controlled by the keys **P1-P4** or **C1-C4** on the Voluson Performance 16/ Voluson Performance 18 control console (depending on system configuration).

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 Performance 16/ Voluson Performance 18 system, to work within the network environment (usually the hospital network) or it can be connected via Wi-Fi Direct (communication without requiring a central wireless access point).

5.8.2 Wireless Print Kit for the Color Printer

The Wireless Printer Kit is an accessory for Sony medical color printers, comprising a Wireless Print Transmitter and Wireless Print Receiver. It replaces a conventional wired USB connection between printer and system, enabling the printer to be installed in a location separate from the Voluson Performance 16/ Voluson Performance 18 ultrasound system.

There's no need for installing extra software: transmitter and receiver are paired automatically over distances of up to 10m.

5.8.3 Foot Switch

The Foot Switch is used for comfortable system control when no hand is free. To adjust function of the Foot Switch (Left/Middle/Right) see *Section 3.7.5.10 on page 3-69*.

5.8.4 ECG Module

The ECG module is used for acquiring an ECG signal to be displayed with the ultrasound image. This optional peripheral serve 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 Gel Warmer

The optional Gel Warmer rapidly and uniformly warms ultrasonic gel to body temperature, for enhanced patient comfort.

5.8.6 Wireless Network (WLAN) Adapter

The Voluson Performance 16/ Voluson Performance 18 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 3.5.6 "Connecting the WLAN & Bluetooth Adapter" on page 3-23*.

The Wireless Network (WLAN) USB Adapter provides a mobile network connection to the local area network.

Wi-Fi Bluetooth stick "SparkLAN"

The Wi-Fi Bluetooth stick "SparkLAN" is a single-chip Wireless LAN (WLAN) USB stick with integrated Bluetooth (BT). It is required for "*"Vscan Air Activation"*" and operation (optional). Additionally it supports the needed hotspot functionality for the "*"Voluson Image Portal"*" feature.

5.8.7 Wireless Display Kit for the External Patient Monitor

The Wireless Display Kit is an easy-to-use presentation device allowing cable-free connection between the Voluson Performance 16/ Voluson Performance 18 ultrasound system and an External Patient Monitor.

The kit comes with one receiving device (Host) and transmitting device (Button). Simply plug and play with no need for installing extra software or drivers.

5.8.8 Verisound™Collaboration(formerly Digital Expert Connect)

Verisound™Collaboration(formerly Digital Expert Connect) offers users of Voluson Performance 16/ Voluson Performance 18 ultrasound systems the ability to collaborate with remote experts by audio, video, chat and screen-share. Via a mobile tablet next to your console, Verisound™Collaboration(formerly Digital Expert Connect) connects you face-to-face to a live clinical applications trainer.

5.9 Power Distribution

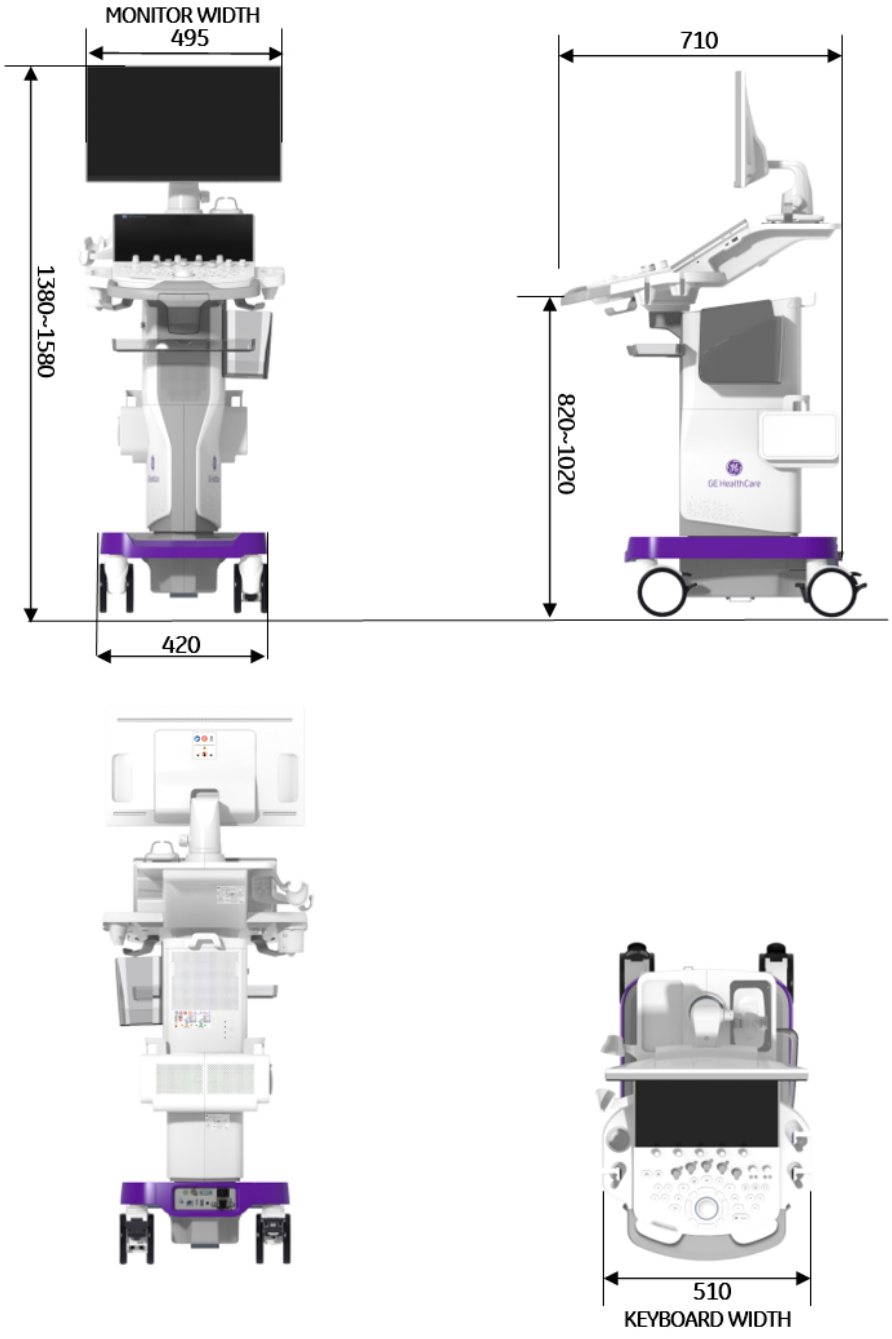
Content in this chapter

*5.9.1 ACDC - primary DC Power Supply - - -

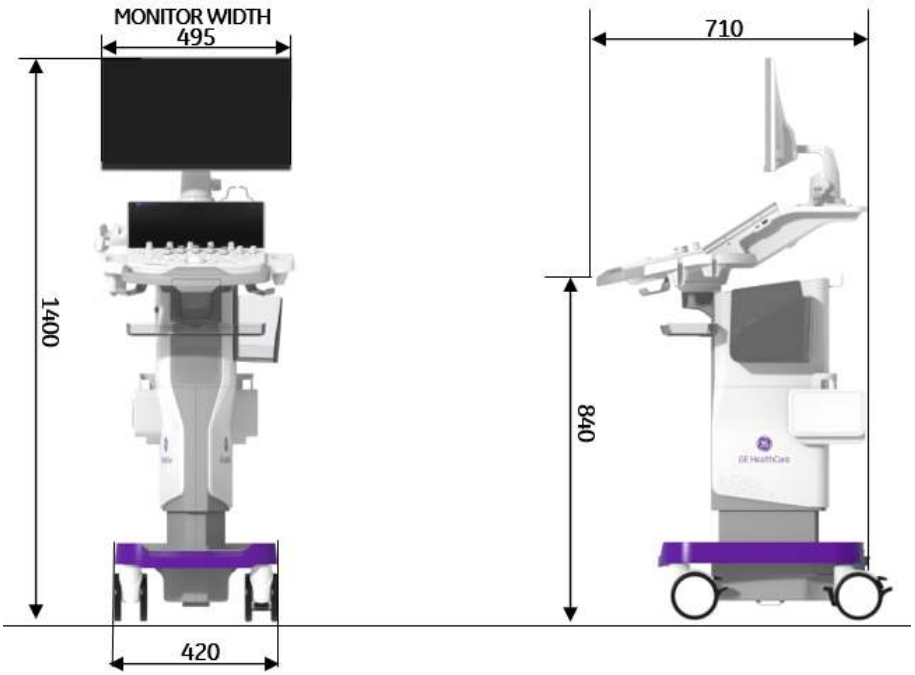
5.10 Mechanical Descriptions

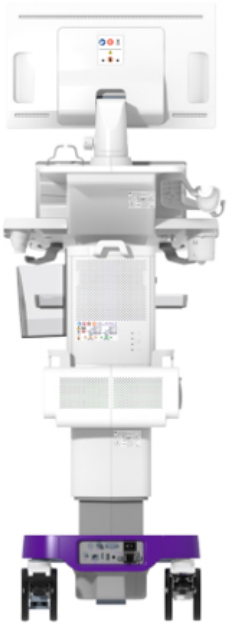
5.10.1 Physical Dimensions

Voluson Performance 18 (Unit: mm)



Voluson Performance 16 (Unit: mm)







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5.10.2 Monitor

The Voluson Performance 16/ Voluson Performance 18 system has a flat panel monitor that can be tilt and rotate.

- Tilt: + 90° / - 25°
- Rotate: + 90°/- 90°



Make sure nothing would be jammed while moving!

5.10.3 Control panel Positioning(This section only applies to Voluson Performance 18)

The control panel can be adjusted in height: 200mm (7.87 inch)

The height of the control panel can be adjusted by pressing the UP/DOWN BUTTON located in the front handle. Press and hold the button until the control panel is positioned at the desired height and release the button.

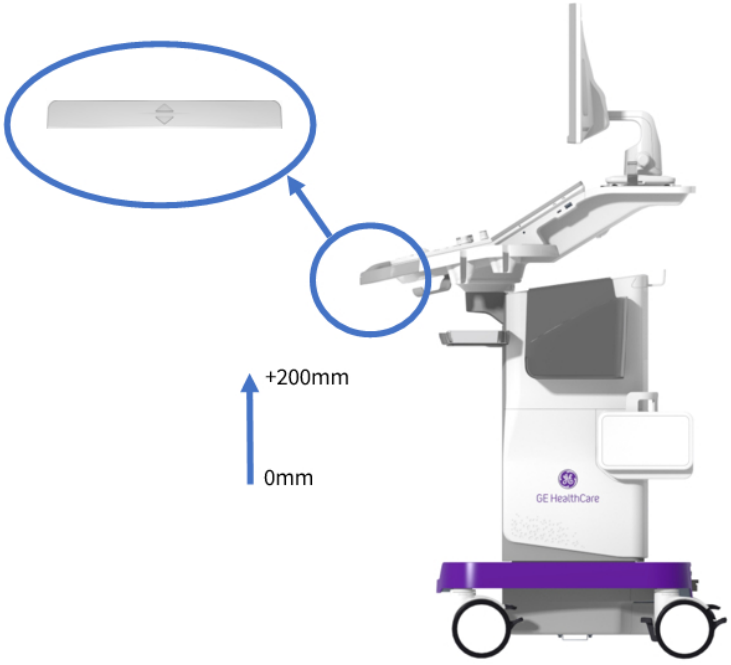


Figure 5-11: Adjustable control panel

5.11 AIR FLOW CONTROL

The air enters the system through the two fans located at the front, passes through the nest box, and exits as warm air through the four fans located at the rear of the system.



Figure 5-12: Main Air Inlet/Outlet at Voluson Performance 16/ Voluson Performance 18

5.13 Service Platform

5.13.1 Introduction

The Service platform is the connectivity to the Voluson Performance 16/ Voluson Performance 18 system that allowsGE HealthCare to deliver remote diagnostics capability. It is your direct link with a GE HealthCare Online Service Engineer or Applications Support Engineer, or a Request for Service via the ***Service*** icon at the right top of the display screen.

The ***Service*** icon in the status bar changes symbol and color depending on ongoing activity; see *Table 7-2 on page 7-13*.

5.13.2 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.

Therea are different possiblilities to the Service Desktop and its available features:

- *"Local Access"* (extended): via System Setup - Administration - ***Service*** page
- *"Remote Access"*. This offers the possibility to view the entire customer´s desktop and operation system. Remote access to the Voluson Performance 16/ Voluson Performance 18 system requires permission and customer input before a GE HealthCare service technician or OLC can access the customer's ultrasound system remotely.

5.13.2.1 Local Access

1. If not already in read mode, **Freeze** the image.
2. Select the ***Home*** button at the Left Toolbar.
3. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
4. Select ***Administration*** and then click the ***Service*** tab.
5. Enter the password **« she »** and click the ***Accept*** button to display the Service Tools page.
6. Click the **Service Tools...** button.
7. Click the ***Service Desktop*** button.

The Service Desktop 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 "Service Desktop" on page 7-14*.

5.13.2.2 Remote Access

Note *Remote access is ONLY possible if the Service Platform is properly configured (either by the user or a GE HealthCare technician at site). Operation see Section 3.13.6 "RSvP Agent Configuration" on page 3-98.*

This allows GE HealthCare technicians to view the entire customer´s desktop and operation system. Using VCO (**V**irtual **C**onsole **O**bservation) a service technician or the OLC (**O**n**L**ine **C**enter) can access and modify all settings and programs or run diagnostics on the customer's Voluson Performance 16/ Voluson Performance 18 system.

Remote access to the Voluson Performance 16/ Voluson Performance 18 system requires permission and customer input before a GE HealthCare service technician or OLC can access the customer's system remotely.

Disruptive Mode can be selected by the customer directly on the Voluson Performance 16/ Voluson Performance 18 (see *Section 7.5.2 on page 7-13*), or requested remotely by the service technician or OLC.

5.14 Service Desktop

The ***Service Desktop*** is an interface that provides access to system information, status and diagnostics. The Service Desktop has different content or views depending on the access level.

- Class A - is the standard (basic) view
- Class C - is the view enabled by the option "Service Advanced"

There are different possibilities to access the Service Desktop and its available features:

- *"Local Access"*: via System Setup - Administration - ***Service*** page
- *"Remote Access"*: This offers GE HealthCare technicians the possibility to view the entire customer's desktop and operation system.

As soon as the Service Desktop is started, the Service Desktop ***Home*** Page appears.

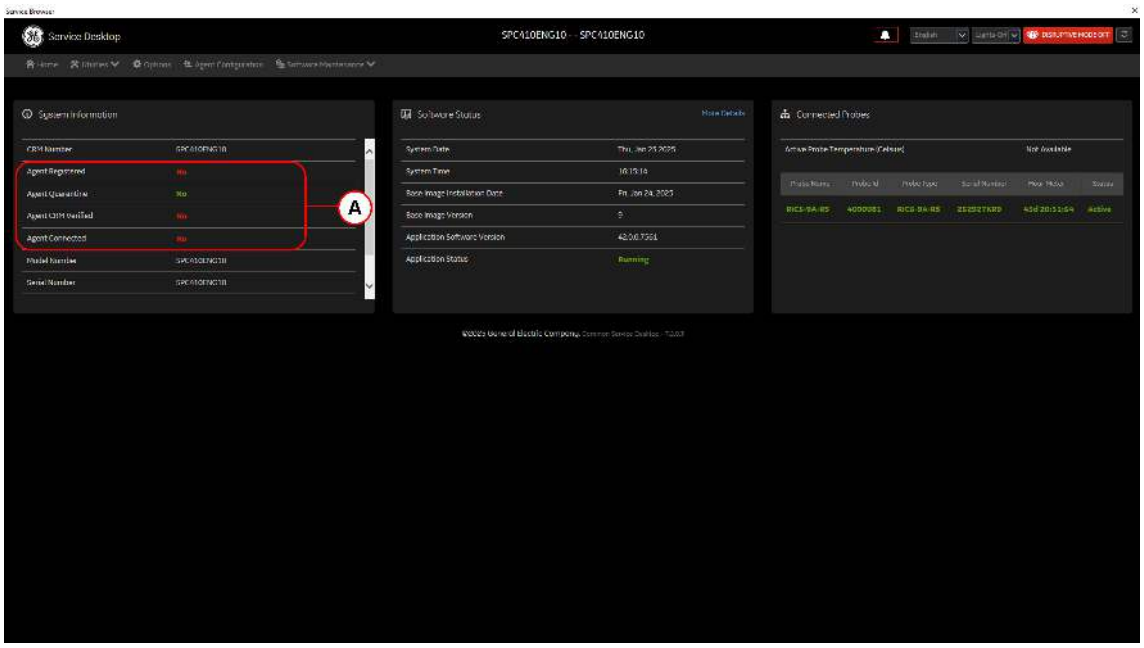


Figure 5-13: Service Desktop - Home

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 "Service Desktop" on page 7-14*.

5.15 Service Page

5.15.1 Introduction

The Service Page contains specific software/hardware test modules, system setup, update, etc. for Voluson Performance 16/ Voluson Performance 18 systems only.

5.15.2 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.

5.15.3 Service Page Login

1. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
3. Select ***Administration*** and then click the ***Service*** tab.
4. Enter the password « she » and click the ***Accept*** button to display the Service Tools page.

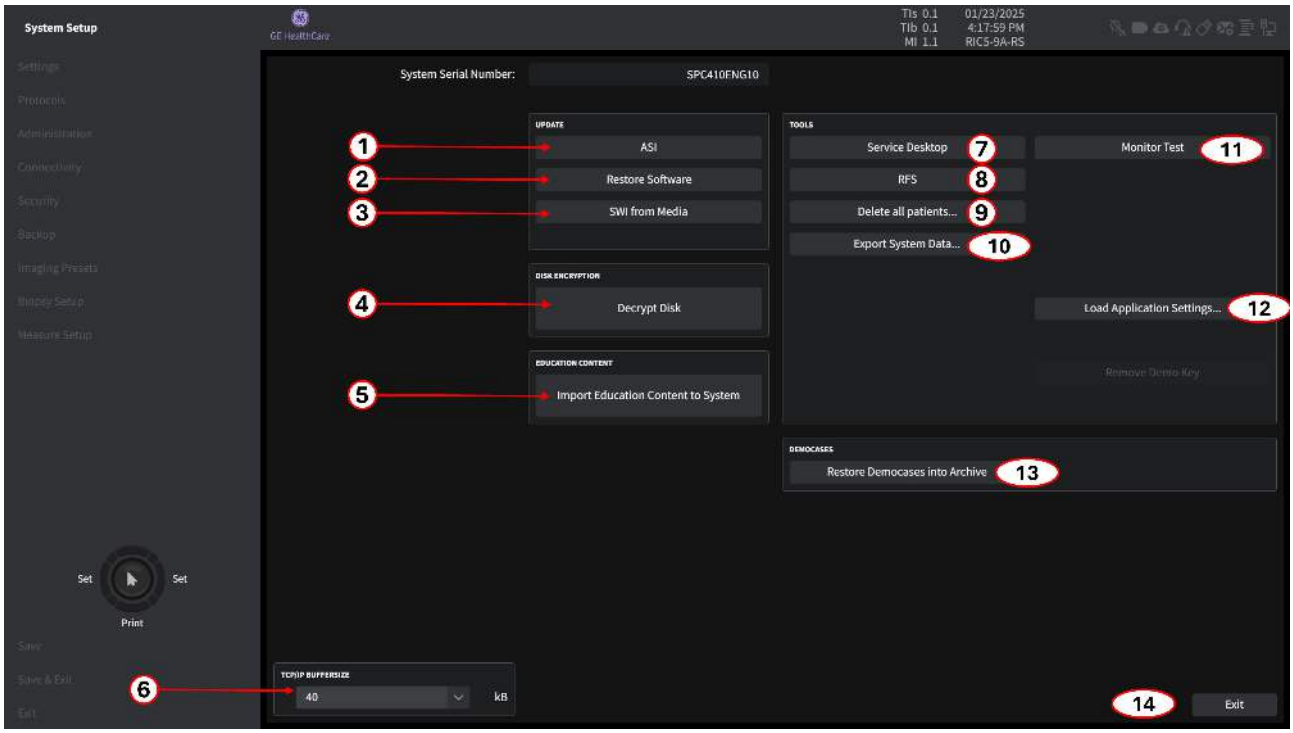


Figure 5-14: Service Tools page

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

5.15.3.1 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 USB that is used.

5.15.3.3 Restore Software

1. Click the ***Restore software*** button to perform an automatic restore of the system software from the hard disk.

   The installation procedure starts with saving and recording the settings present on the system (silent “Configuration Backup" and "Rollback”). During the software restore the system will restart several times.
2. **Disconnect any unessential external USB media devices** (also the USB device with the Disk Encryption - Unlock key) as this might interfere with the recovery/installation procedure. Please keep printers, LAN cable and WiFi in case of usage active and connected.

Note *If a Network Color Laser Printer (e.g., HP LaserJet M454) was installed before the upgrade, it might be required to reinstall/readjust this printer as described inSection 3.6.3 on page 3-35. The printer driver is available on the internal hard disk (R:\system\periph\HP_Laserjet_400).*

Note *Existing User Programs, 3D/4D Programs and Auto Text remain unaffected! Therefore it is not necessary to perform any readout preparations.*

5.15.3.4 SWI from Media

By means of the ***SWI from Media*** button, the Systems C:\ image is partly or completely updated. The System Software parts to be upgraded depend on contents of the used Media.

Note *During “SWI from Media” the used system configuration will be stored on R:\. If required, the previously used system configuration (before SWI from Media was performed) can be restored by activating the “Rollback” function. Operation see: Section 5.17.4 on page 5-48.*

5.15.3.5 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).*

5.15.3.6 Import Education Videos to System

Click the ***Import Education Video to System*** button to import tutorial videos (*.mp4) from external source to the internal HDD (D:\Education).

5.15.3.7 TCP/IP Buffersize

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

5.15.3.9 Service Desktop

Each user is only granted access to the tools that are authorized for their use.

5.15.3.10 Request for Service (RFS)

Fill out the “Request For Service” form and then send the problem description to GE HealthCare Service/ Application representatives. Operation see *Section 7.2 "Request for Service (RFS)" on page 7-6*.

5.15.3.11 Delete all Patients

1. Click the ***Delete all Patients...*** button.

   Following important information appears on the screen.

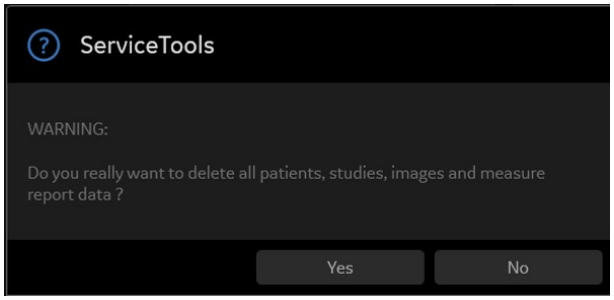


Figure 5-15: important information

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**!

5.15.3.12 Export System Data

Select the ***Export System Data*** button in the “Service Tools” page to save Configuration Backup of the system state. This includes dump-files and text files, the full Service Database information about probes, boards, Software, Options and the Event Log File. Operation see *Section 7.4.2.2 on page 7-11*.

5.15.3.14 Keyboard Layout

To change the keyboard layout to different languages. Operation see: *Section 6.3 "Modification of Keyboard Layout" on page 6-4*.

5.15.3.15 Monitor Test

Select the ***Monitor Test*** button to perform color calibration. Operation see: *Section 6.2.2 "Monitor Test" on page 6-3*.

5.15.3.16 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 effects on image quality (e.g., after reloading an old “Configuration Backup”).

1. Click ***Load Application Settings*** on the “Service Tools” page (see *#unique_152/unique_152_Connect_42_F_ServiceTools-SVC*).
2. Choose the media and then click ***Next***.

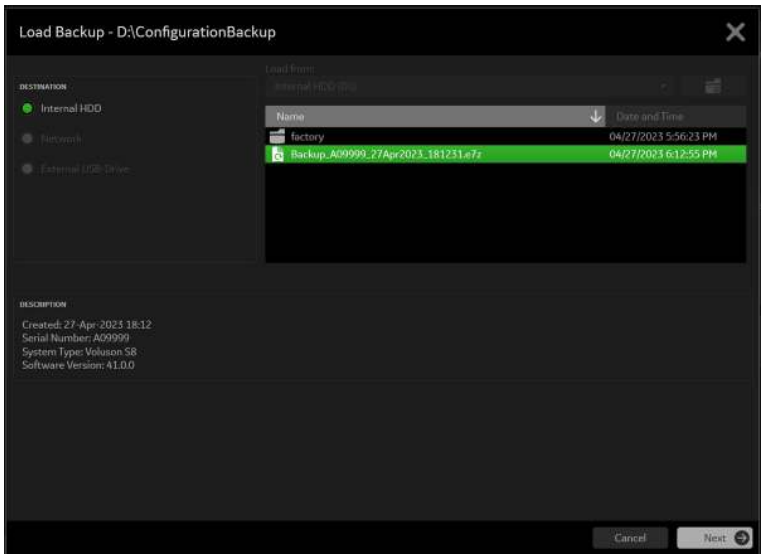


Figure 5-16: Application Settings Load

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 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).

5.15.3.17 Remove Demo Key

Select the ***Remove Demo Key*** button to remove the current active Demo (option) key.

5.17 Boot Screen Functions

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



Figure 5-17: Boot screen

Content in this chapter

*5.17.1 Voluson - - -

5.17.3 Memtest (Memory Check)

1. Turn system OFF and then back ON.
2. As soon as the Boot screen appears, flip the rightmost "toggle-flip" **Joycoder** on the control console to stop the boot-up countdown.
3. Flip the **Joycoder** again until the **MemTest** item is highlighted and then press **Freeze**.

The PC Memory Test starts automatically and takes about 2.5 hours. If there are errors, they will be listed.

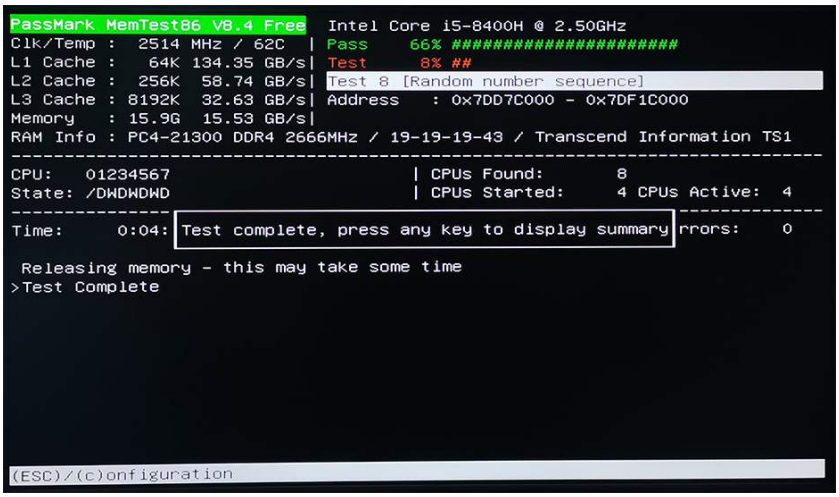


Figure 5-18: Memory check screen

Note *After one cycle (~ 2.5 hours) the memory check starts again. If you don't interrupt the memory test, it will perform never ending cycles of memory checks. To interrupt the test, press the* **Esc** *key. If the* **Esc** *key does not work, please press the* **ON/OFF** *standby button.*

Note *If after one cycle (about 2.5 hours), no error messages are listed, it can be assumed that the BackEnd Processor including power supply is working properly.*

5.17.4 Rollback

This function offers the possibility to simply restore the previously used system configuration (rollback), which was stored on R:\ during “SWI from Media" or installing a "SW Update Package" (= eDelivery).

1. Turn system OFF and then back ON.
2. As soon as the Boot screen appears, flip the rightmost "toggle-flip" **Joycoder** on the control console to stop the boot-up countdown.
3. Flip the **Joycoder** until the **Rollback** item is highlighted and then press **Freeze**.
4. When the following WARNING message appears, select ***OK*** by using the Trackball and then press the **left Trackball key**.



Figure 5-19: Warning message

After performing a "Rollback" the system reboots. The Ultrasound Application is started and finally the 2D screen is displayed on the monitor.

Chapter 6

Alignment and Calibration

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

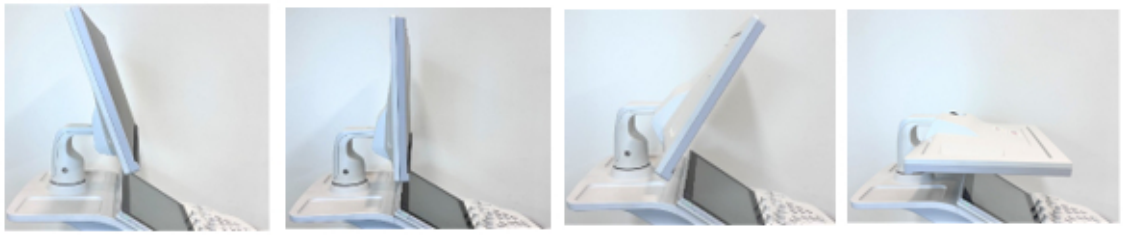
*6.1 Regulatory - - -

6.1 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 Monitor Adjustment

Tilt (+90°/- 25°)



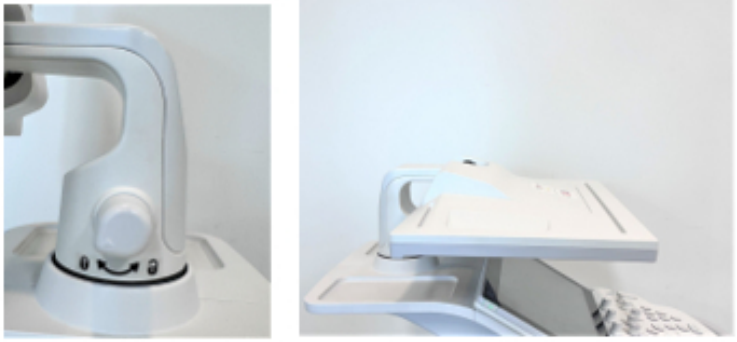
Rotation (+90°/-90°)



To lock the Monitor Arm rotation see *Section 6.2.1 "Preparing for Transport" on page 6-3*.

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 must be in a secure position.

1. Press the UP/DOWN BUTTON on the front handle and lower the system to its minimum height. **2. Rotate the monitor to face forward and turn the knob clockwise to lock the rotation.** **3. Flip down the monitor to its lowest.**


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

6.2.2 Monitor Test

1. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
3. Select ***Administration*** and then click the ***Service*** tab.
4. Depending on the SW version, enter the password « she » and click ***Accept***, or click the ***Service Tools*** button.
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, GRAYSCALE, COLOR ROWS with different color intensities, hardly visible WORDING on the screen and RECTANGLES with different grey tons.
   - Each pattern is displayed correctly (without any tint or discolored pixels).
8. To exit the Monitor Test program, press the **middle (top) trackball** key.

6.3 Modification of Keyboard Layout

Note *Modification of the Keyboard Layout is not possible by the user. Please contact your local distributor or GE HealthCare service representative for input language setting.*

1. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
3. Unlock your “standard” SSA dongle (**Unlock** - **PIN** - **Unlock**). As soon as the ***green LED*** is blinking, the SSA dongle is ready for use.
4. Connect the SSA dongle to any USB port on the Voluson Performance 16/ Voluson Performance 18 system and then click ***OK***.
5. Select ***Administration*** and then click the ***Service*** tab and click ***Service Tools*** button.
6. Click on the ***Keyboard Layout*** button.

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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 - - -

7.1 Collect vital System Information

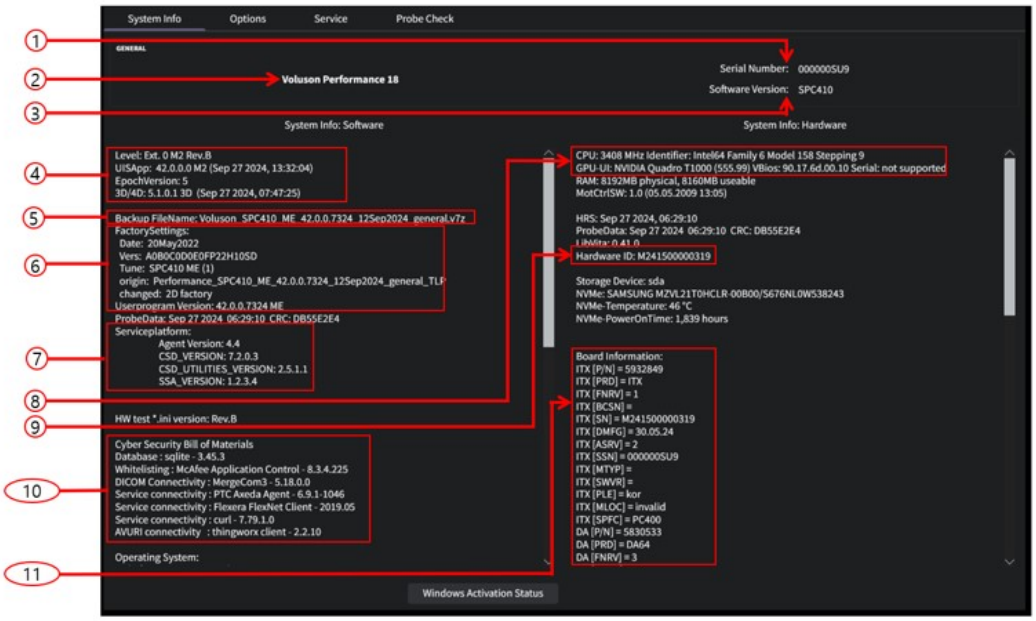
1. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
3. Select ***Administration*** and then click the ***System Info*** tab.

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, Userprogram 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.*

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

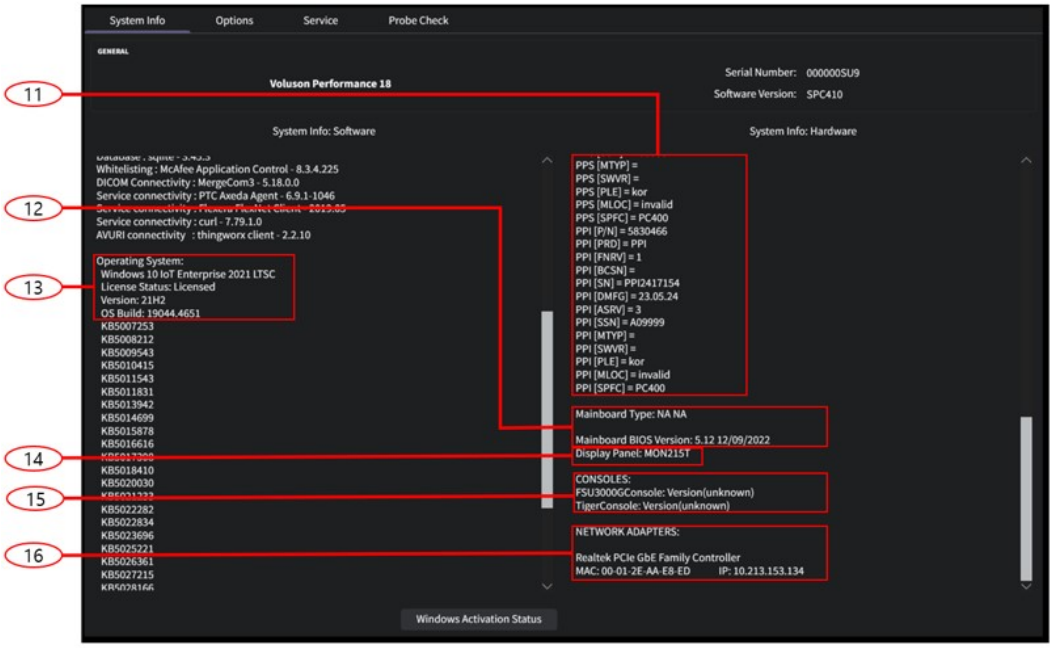


Figure 7-1: System Setup - Administration - SYSTEM INFO page

1	Serial Number	9	Hardware ID
2	System Type Voluson Performance 18 or Voluson Performance 16	10	Cyber Security Bill of Material
3	Software Version SPC410	11	Board Information (Hardware Configuration)
4	Application Software 42.0.x.xxxx	12	COMe Module mainboard type e.g Congatec(BIOS) UEFI version
5	Backup File Name	13	Operating System (and its License Status)
6	Factory Settings: Date, Tune- and Userprogram version	14	Monitor Display Type (e.g., HDU)
7	Service Platform Agent 4.4	15	Console version
8	GPU Type, VBios-Version and Serial Number	16	MAC address and IP address

7.1.1 Keyboard Shortcuts

It is not required, but **recommended** to use an external alphanumeric keyboard.

Press the **Ctrl** + **H** key simultaneous to display the shortcuts list and a description of what they do.



Figure 7-2: Keyboard Shortcuts list (Ctrl + H)

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

Shortcut	Description	Access Level
Shift + Ctrl + F1	save Logfile snapshot (max. 2 Voluson Logfiles + screenshot of Monitor & Touch are stored on D\:export as a *.zip file)	User
F2	Indicator menu	User
F3	USB Device dialog	User
F4	Spooler	User
F7	Annotations - Go to Home position	User
F8	Annotations - Toggle visible layers	User
F9	Annotations - Grab last word	User
F10	Annotations - Delete last word	User
F11	Checklist - Pause	User
F12	Annotations - Set Home	User
Backspace	Checklist - Uncheck	User
Alt + Backspace	undo typing	User
Ctrl + C	copy text	User
Alt + D	export system state (Configuration Backup and dump files) to D:\ConfigurationBackup	User
Shift + Delete	cut text	User
Down	Checklist - selection down	User
Enter	Checklist - Check	User
Ctrl + H	list of keyboard shortcuts	User
Ctrl + Insert	copy text	User

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Shortcut	Description	Access Level
Shift + Insert	insert text (paste) from clipboard	User
Left	Checklist - selection left	User
Alt + P	save screens to HDD (D:\export)	User
Page down	Archive reload - next	User
Page up	Archive reload - previous	User
Print Screen	save screens to USB	User
Alt + R	records last 30 seconds of Main- and Touchscreen on the D:\export folder as a *.mpg file (to improve reproducibility of customer issues) **Note:** • video recording is stopped (last 30 seconds are saved) at system shutdown, a system crash or when stopped manually by this button • this function won't work when Biopsy mode is active • max. 5 videos can be saved. If more than 5 are saved, the oldest file will be replaced • videos cannot be replayed on the system	User
Right	Checklist - selection right	User
Ctrl + S	Presets save	User
Space	Annotations - on	User
Ctrl + U	User programs	User
Up	Checklist - selection up	User
Ctrl + V	insert text (paste) from clipboard	User
Ctrl + X	cut text	User
Ctrl + Z	undo typing	User

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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 3.13.6 "RSvP Agent Configuration" on page 3-98.*

There are 2 possibilities to contact GE HealthCare:

- by means of the Remote Status Icon that is displayed on top of the screen

  Move the cursor to the Remote Status icon at the right top 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. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
3. Select ***Administration*** and then click the ***Service*** tab.
4. Depending on the SW version, enter the password « she » and click ***Accept***, or click the ***Service Tools*** button.
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.)

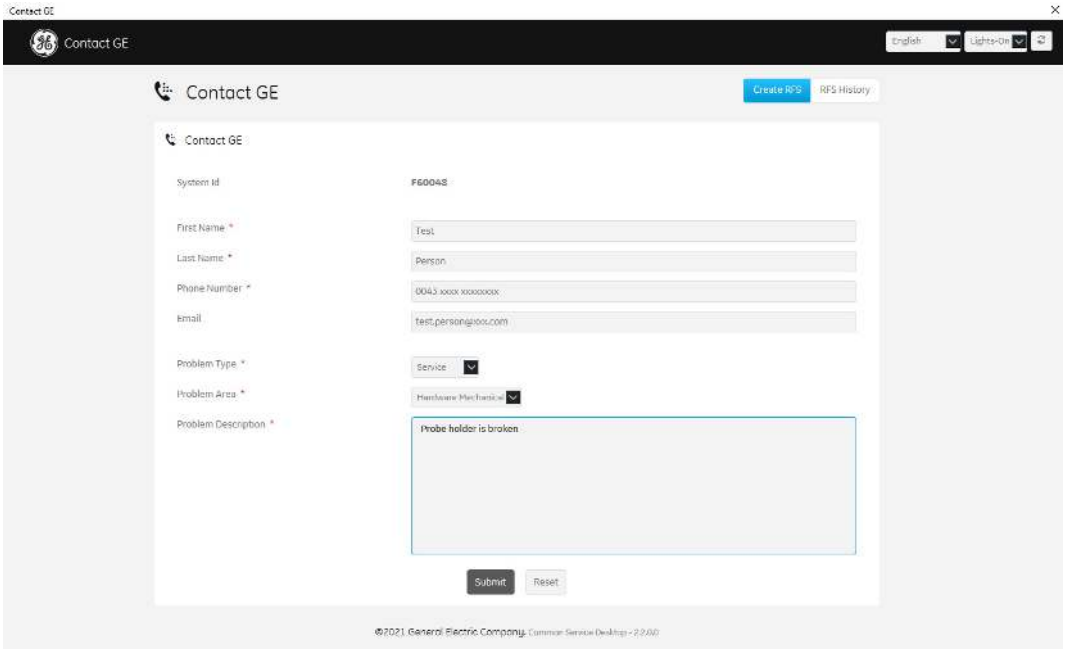


Figure 7-3: Contact GE - Request for Service

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

   A request confirmation message is displayed.

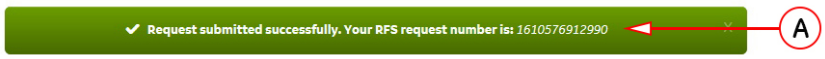


Figure 7-4: Request submitted

8. Write down and keep the RFS Request Number **(A)** for follow up procedures.

The request is saved in the ***RFS History*** tab for reviewing.

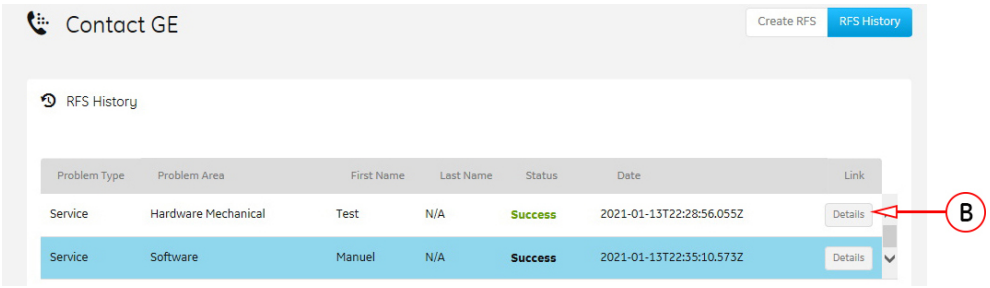


Figure 7-5: Contact GE - RFS History

9. For detailed description click on ***Details*** **(B)** of the proper report.

7.3 Check Point Voltages

Power Supply (PPS) Status LED

Turn on mains switch and check LED of P5V, N5V, LIVE5V,12V, SSD, LAN and BATT on backplane.

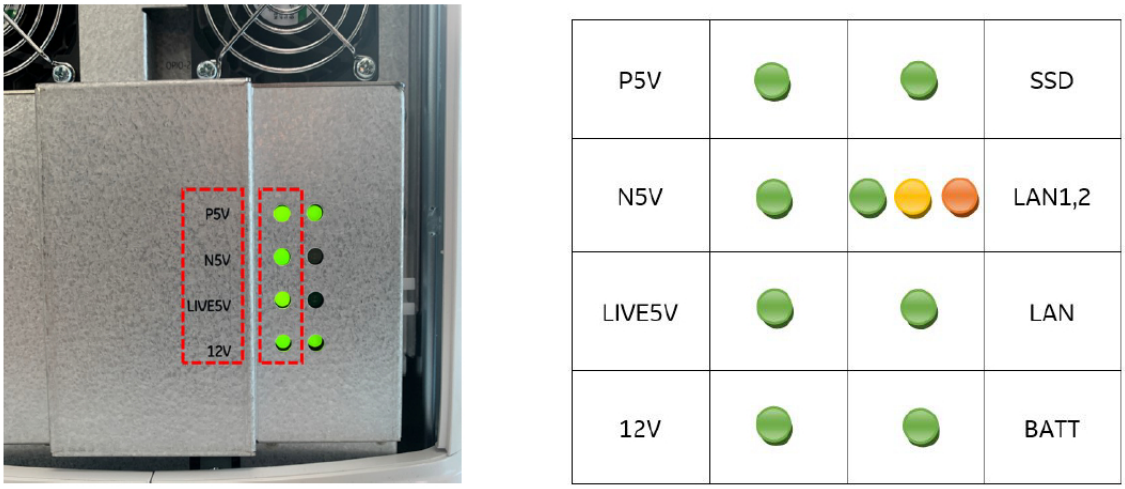


Figure 7-6: Check LED on backplane

Note *If LED is on, PPS has full function (all voltages are within the specified range).*

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. as *.png to the automatically generated "Voluson" folder on the last connected external USB drive. For more details see *Section 7.4.1 on page 7-9*
2. as *.jpg to D:\export by pressing the **Alt** + **P** key on an alphanumeric keyboard

   Note: Successive **Alt** + **P** keystrokes (max. 20) overwrite existing screenshots at destination HDD!
3. creates one screenshot (Alt-D.png, saved on D:\export) + “Configuration Backup” of the System state saved on D:\ConfigurationBackup by pressing the **Alt** + **D** key on an alphanumeric keyboard

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7.4.1 Capturing a Screen

The following is the generic process to capture a screen from the Voluson Performance system.

1. Navigate to, and display the image/screen to be captured.
2. Press the assigned **Cx** key on the control console and save the image as *.png to the automatically generated "Voluson" folder on the last connected external USB drive.

   For example: The **C3** key is used to "Save Screens to USB".

   A message is displayed whenever a screen is sucessfully saved and exported.



Figure 7-7: summary of keys configuration

Note *Some few system screens are restricted/excluded from beeing captured this way.*

Note *In case of system errors that need to be recovered or when experiencing strange behavior, it is highly recommended to export system state. Therefore, select the **Shortcuts** button at the Right Toolbar and then touch the **Export system state (Alt +D)** button, or press* **Alt** *+* **D** *on an alphanumeric keyboard.*

7.4.2 Export Log's and System Data

There are two possibilities to export system data (and log´s):

1. *"Export System Data (by pressing the ALT + D key)"* to save a screenshot and “Configuration Backup” of the current system state
2. *"Export Log's and System Data (via Service Page)"* via the ***Export System Data*** button in the System Setup - Administration - Service page

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7.4.2.1 Export System Data (by pressing the ALT + D key)

Alt + **D** is used to gather detailed information and data from the system. In addition it creates one screenshot (Alt-D.png) of the point in time when **Alt** + **D** was pressed. The main use is when OLC need detailed information about the system (e.g., when experiencing strange behavior or when the problem should be investigated). It is not intended to replace or enhance the existing Configuration Backup functionality.

Configuration Backup files created by **Alt** + **D** are 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 (one zipped Backup file is generated) can be stored on the hard disk (D:\ConfigurationBackup), or you can export them to any media. The zipped backup file includes 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 screenshots.

Note *Successive* **Alt** *+* **D** *keystrokes overwrite existing screenshots at destination (internal) HDD.*

1. Select the ***Shortcuts*** button at the Right Toolbar and then touch the ***Export system state (Alt +D)*** button, or press **Alt** + **D** on an alphanumeric keyboard.

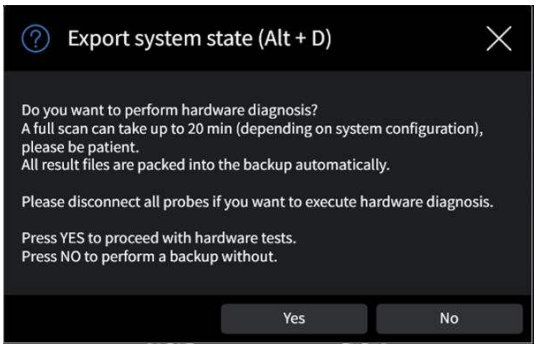


Figure 7-8: Export system state (Alt + D)

2. Select whether you want to backup data with our without hardware diagnosis tests.

Please detach all probes if you want to execute hardware diagnosis, then click ***Yes***.

3. Select the destination of the “System state” backup **(1)**.

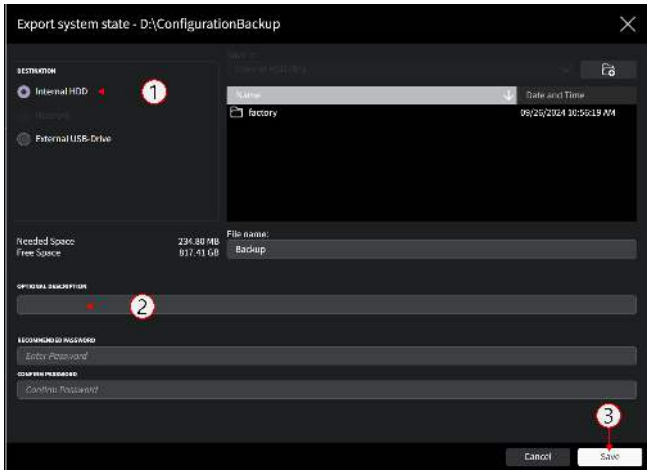


Figure 7-9: Export system state

4. If desired, enter optional description **(2)**.
5. Select the ***Save*** button **(3)** to start the backup process.

After saving the data, the Voluson Performance 16/ Voluson Performance 18 reboots and the application starts again.

7.4.2.2 Export Log's and System Data (via Service Page)

1. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
3. Select ***Administration*** and then click the ***Service*** tab.
4. Enter the password « she » and click ***Accept*** button to display the ***Service Tools*** page.
5. Click on the ***Export System Data*** button to save Configuration Backup of the system state. This includes dump files and text files, full Service Database information 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.

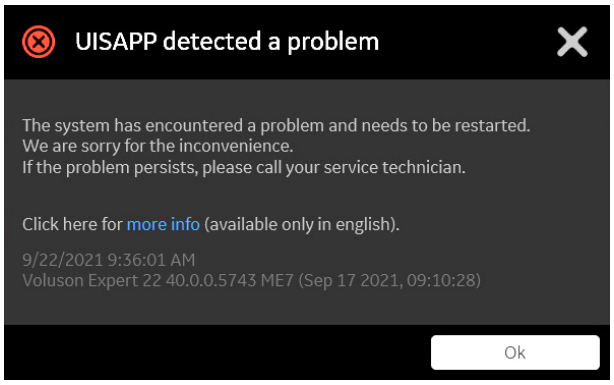


Figure 7-10: system has encountered a problem

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

7.5 Remote Access to the Service Platform

Content in this chapter

*7.5.1 General - - -

7.5.2 How to locally enable/disable Disruptive Mode and VCO

1. If not already in read mode, **Freeze** the image.
2. Move the cursor to the ***GE*** icon at the right top of the display screen.
3. Press the **right trackball key** (= right-click).
4. Select ***Connect Clinical Lifeline*** (see: *Figure 7-11 below*). This activates “Disruptive Mode” and “VCO” for the application OLC to quickly assist the customer.

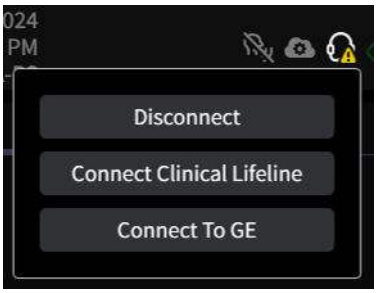
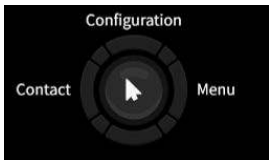


Figure 7-11: Connect Clinical Lifeline

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

Note *Visual information about remote status is shown in the status area on the right top of the screen.*

Table 7-2: visual information about GE HealthCare remote status

Gray = Idle State	Remote access is inactive.
	Move the cursor over the ***GE*** icon to show trackball functions • ***Contact*** : *Section 7.2 "Request for Service (RFS)" on page 7-6* • ***Configuration***: *Section 3.13.6 "RSvP Agent Configuration" on page 3-98* • ***Menu***: Displays the Remote Access menu *Figure 7-11 on page 7-13*
Yellow = Access pending	Remote Access is active, but Disruptive Mode and Virtual Console Observation (VCO) are not yet enabled.
Red = Disrupted State	Remote Access is active. All processes (Virtual Console Observation and Service Desktop) are active. In this state the Voluson Performance 16/ Voluson Performance 18 system should NOT be used clinically.

If a GE HealthCare Service Technician requests Remote Access Permission

If a GE HealthCare Service technician requests remote access to your Voluson Performance 16/ Voluson Performance 18 system, following message appears on the screen.

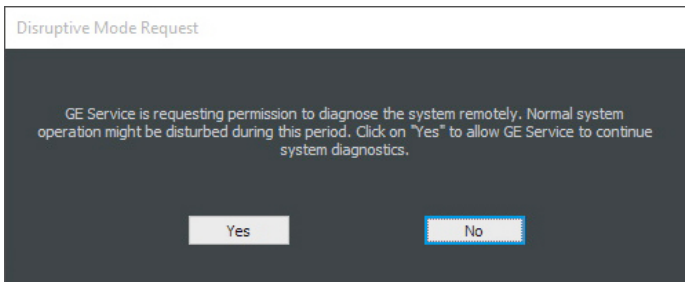


Figure 7-12: Disruptive Mode Request

To enable Disruptive Mode click ***Yes***.

Note *If the customer does not wish to have diagnostics running at the time of the request, select **No**. A message is sent back to the OLC or FE that permission to change Disruptive Status is denied.*

7.6 Service Desktop

This section describes the features of the ***Service Desktop*** and its different access levels:

Basic Service access (Class A)	A user locally logged into the Voluson Performance 16/ Voluson Performance 18 system with local service access privilege. This level provides limited access to ***Service Desktop*** widgets and utilities.
Service Advanced access (Class C)	A user locally logged into the Voluson Performance 16/ Voluson Performance 18 system with local service access privilege. This level requires a "Service Advanced" option string (= Service Key) for enabeling enhanced access to ***Service Desktop*** widgets and utilities.

Service Advanced access (Class C) activates enhanced diagnostic options. Those additional options are marked with an asterisk ***** in following sub-sections.

Note

Remote access to the Voluson Performance 16/ Voluson Performance 18 system requires permission and customer input before a GE HealthCare service technician or OLC can access the customer's system remotely.

Disruptive Mode can be selected by the customer directly on the Voluson Performance 16/ Voluson Performance 18 (see Section 7.5.2 on page 7-13), or requested remotely by the service technician or OLC.

The navigation bar at the top of the screen shows the top-level menu choices.

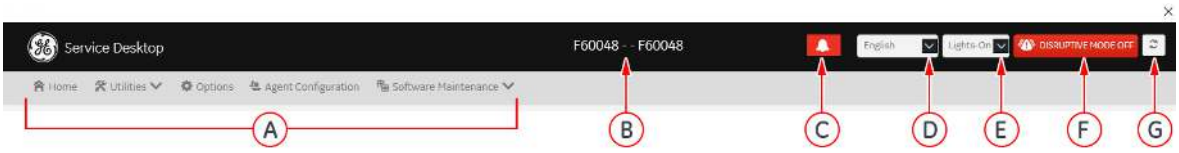


Figure 7-13: Service Desktop - Navigation

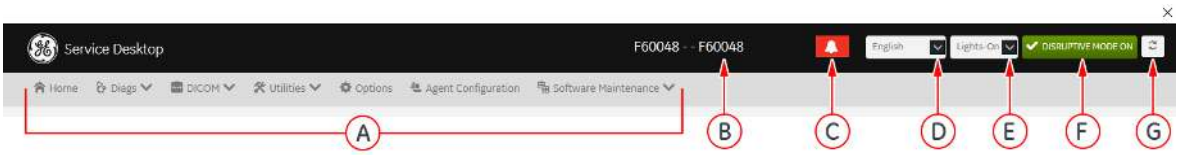


Figure 7-14: Service Desktop - Navigation when "Service Advanced" option is active*

A	Top-level menu choices
B	Display for CRM Number, Hospital Name and Serial Number
C	Notification
D	Control to change the language
E	Control to change color theme of pages
F	Disruptive Mode Status
G	Refresh - reloads content of the web page

Content in this chapter

*7.6.1 Service Desktop - Home - - -

7.6.1 Service Desktop - Home

The ***Home*** page displays a compact overview of information about the Voluson Performance 16/ Voluson Performance 18 system.

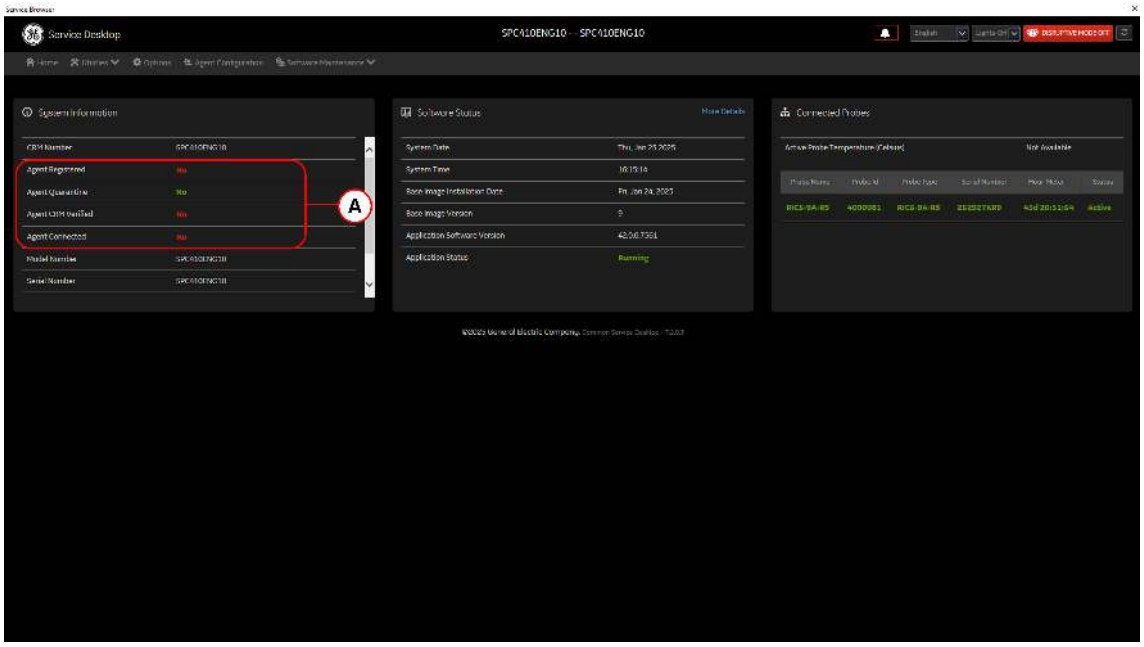


Figure 7-15: Service Desktop - Home

System Information

Supplies common information about the Voluson Performance 16/ Voluson Performance 18 system.

When the Voluson Performance 16/ Voluson Performance 18 system is successfully configured and provided that network is up and running, the displayed values **(A)** are:

Agent Registered → **Yes** Agent Quarantine → **No** Agent CRM Verified → **Yes** Agent Connected → **Yes**

CRM Number	System identifier assigned to the customer unit by the service region.	
Agent Registered	Register status	• **Yes** - System is registered. • No - System is not registered.
Agent Quarantine	Quarantine status	• Yes - More than one device registered with the same CRM Number. • **No** - Just one device with the listed CRM Number is registered .
Agent CRM Verified	CRM Verified status	• **Yes** - System is verified. • No - System is not verified.
Agent Connected	Connection status	• **Yes** - System is connected to the RSvP Agent. • No - System is currently not connected to the RSvP Agent.
Last Connected Time	Date and Time of last connection to the RSvP Agent.	
Model Number	Part number of the Voluson Performance 16/ Voluson Performance 18 system, acc. Identification and Rating plate.	
Serial Number	Serial number of the Voluson Performance 16/ Voluson Performance 18 system, acc. Identification and Rating plate.	
System Type	System type of the Voluson Performance 16/ Voluson Performance 18 system, acc. Identification and Rating plate.	
Facility	Hospital or facility where the Voluson Performance 16/ Voluson Performance 18 is installed.	

Color Status

Throughout the Service Desktop, colors indicate the following:

 Status is normal  Status is a warning  Status is an error

Software Status

Displays systems date and time and general information about the application software and base image version installed on the Voluson Performance 16/ Voluson Performance 18 system.

System Status*

Supplies status quo and reports of the Voluson Performance 16/ Voluson Performance 18 system.

- **Hardware Configuration**

  View the contents of the Hardware Configuration.

- **Temperature**

  Display temperature status for FRUs (including limit warning and error count of temperatures out of spec) and a graphical representation of the monitored temperatures.

  For detailed analyze refer to *Section 7.6.1.1 "Temperature Monitoring*" on page 7-17*.

- **Battery Status**

  not available

- **Voltage**

  FRU status summary on Voltage monitoring.

  For detailed analyze refer to *Section 7.6.1.2 "Voltage Monitoring*" on page 7-19*.

- **Bootup Cycle**

  View issues with the bootup process.

- **GPU**

  Status summary of GPUs and graphical temperature-, GPU usage-, and GPU memory usage monitoring.

  For detailed analyze refer to *Section 7.6.1.3 "GPU*" on page 7-20*.

- **USB Devices**

  Display the USB connected devices.

- **Available Memory**

  Displays the memory availability of the Voluson Performance 16/ Voluson Performance 18 system.

- **Software Install Date**

  Shows the software installation date.

- **Time since Last Reboot**

  Shows the time since last reboot.

Network Configuration*

Supplies network IP address information (wired / wireless) as well as full ipconfig details.

Disk Drive Space*

Supplies information about partitions of the hard drive. Each partition displays free space and total size.

Connected Probes

Supplies information about name, ID, serial number and status of connected probe(s).

7.6.1.1 Temperature Monitoring*

1. Navigate to ***Home*** → ***System Status*** → ***Temperature*** and select ***FRU status***.

   This displays a summary of the FRUs being monitored and the details for each FRU (temperature out of spec including an overall count of the event warnings and errors).

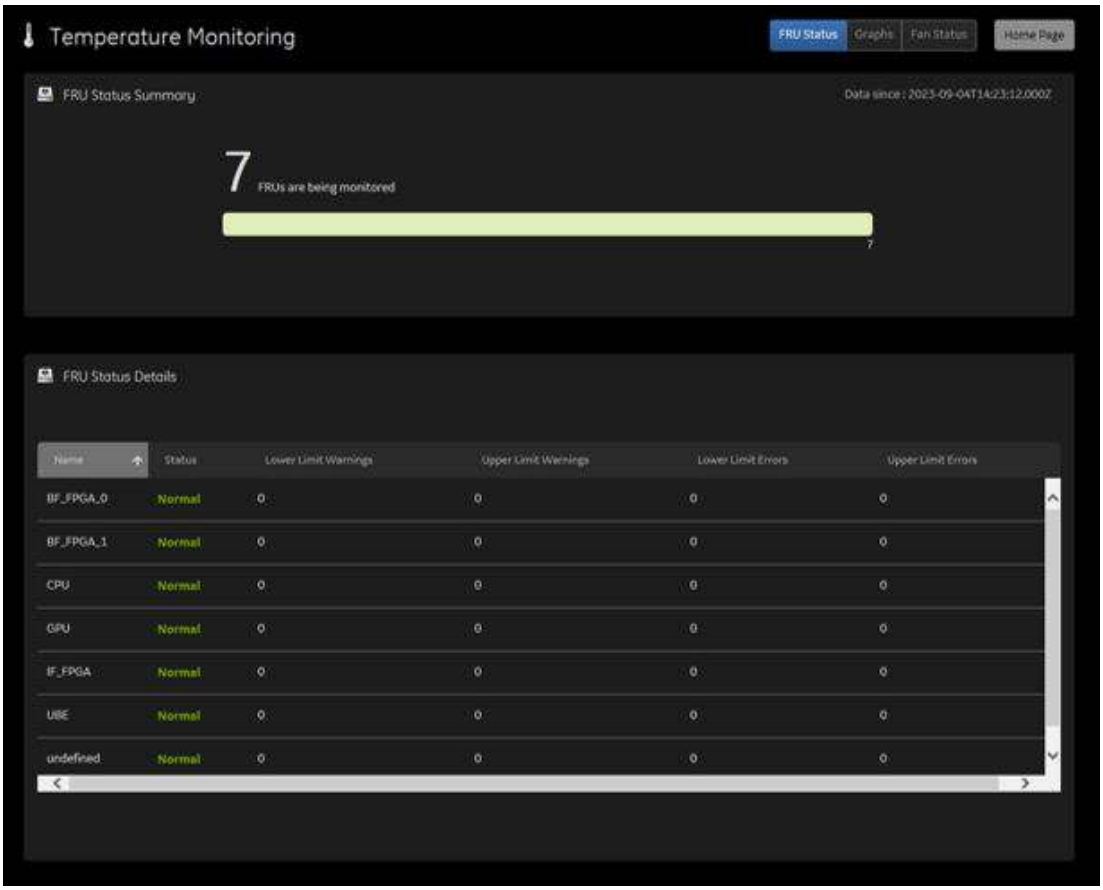


Figure 7-16: Service Desktop - Home -> System Status -> Temperature -> FRU status

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2. Select ***Graphs*** to display temperature graphs for the configured monitoring points.



Figure 7-17: Service Desktop - Home -> System Status -> Temperature -> Graphs

3. Select ***Fan Status*** to display status of Frontend and Backend Fans.

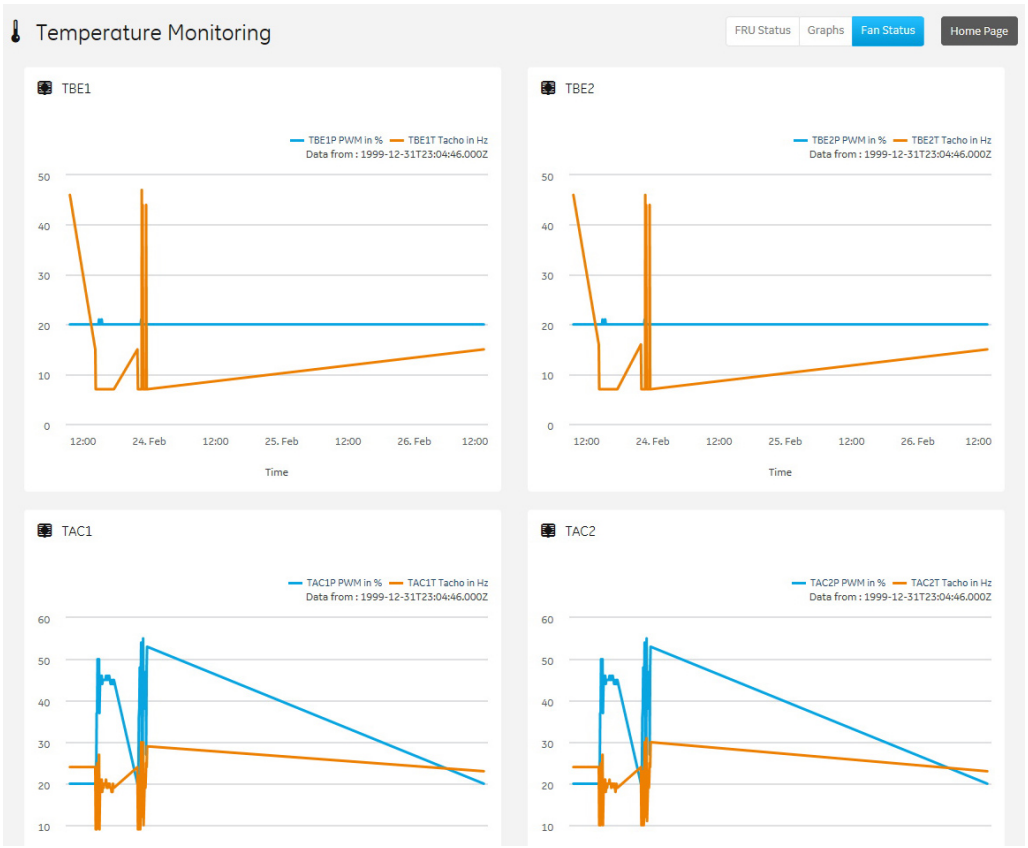


Figure 7-18: Service Desktop - Home -> System Status -> Temperature -> Fan Status

4. Select ***Home Page*** to exit monitoring.

7.6.1.2 Voltage Monitoring*

1. Navigate to ***Home*** → ***System Status*** → ***Voltage*** and select ***FRU status***.

   This displays a summary of the FRUs being monitored and the details for each FRU (voltage out of spec including an overall count of the event warnings and errors).

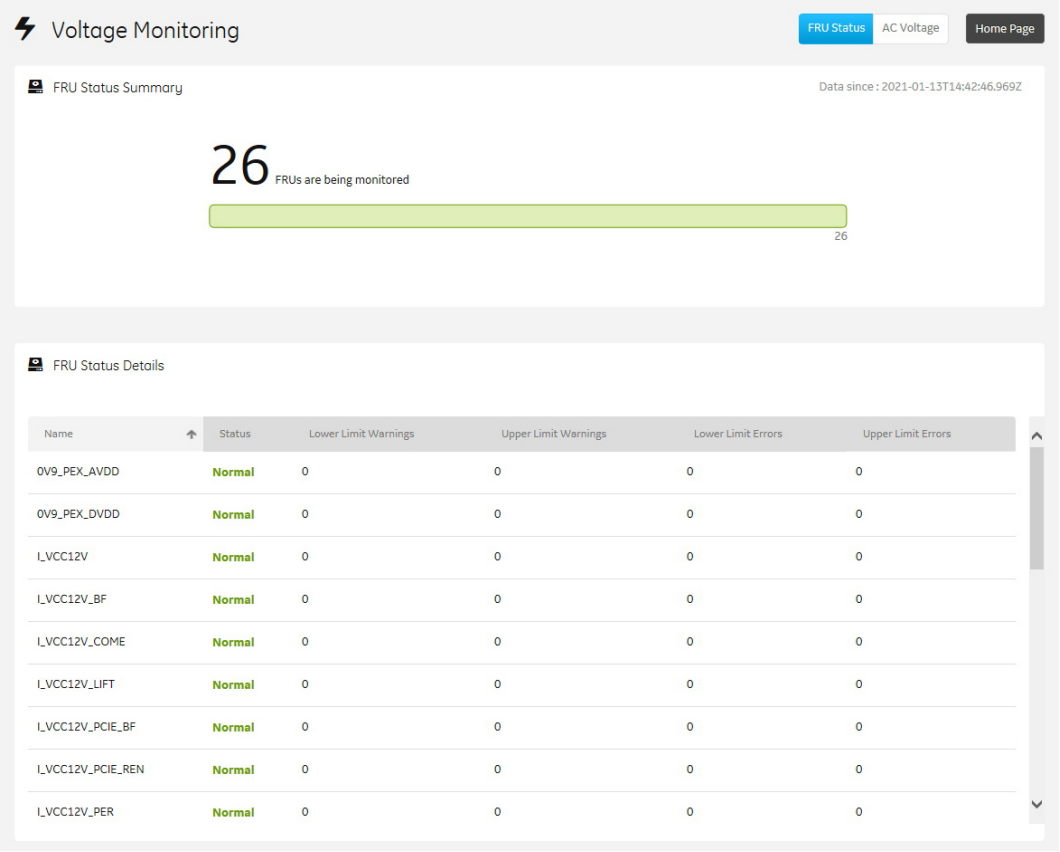


Figure 7-19: Service Desktop - Home -> System Status -> Voltage -> FRU status

2. Select ***Home Page*** to exit monitoring.

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7.6.1.3 GPU*

1. Navigate to ***Home*** → ***System Status*** → ***GPU***.
   This displays the temperature, GPU usage and memory usage of the installed graphic card(s).

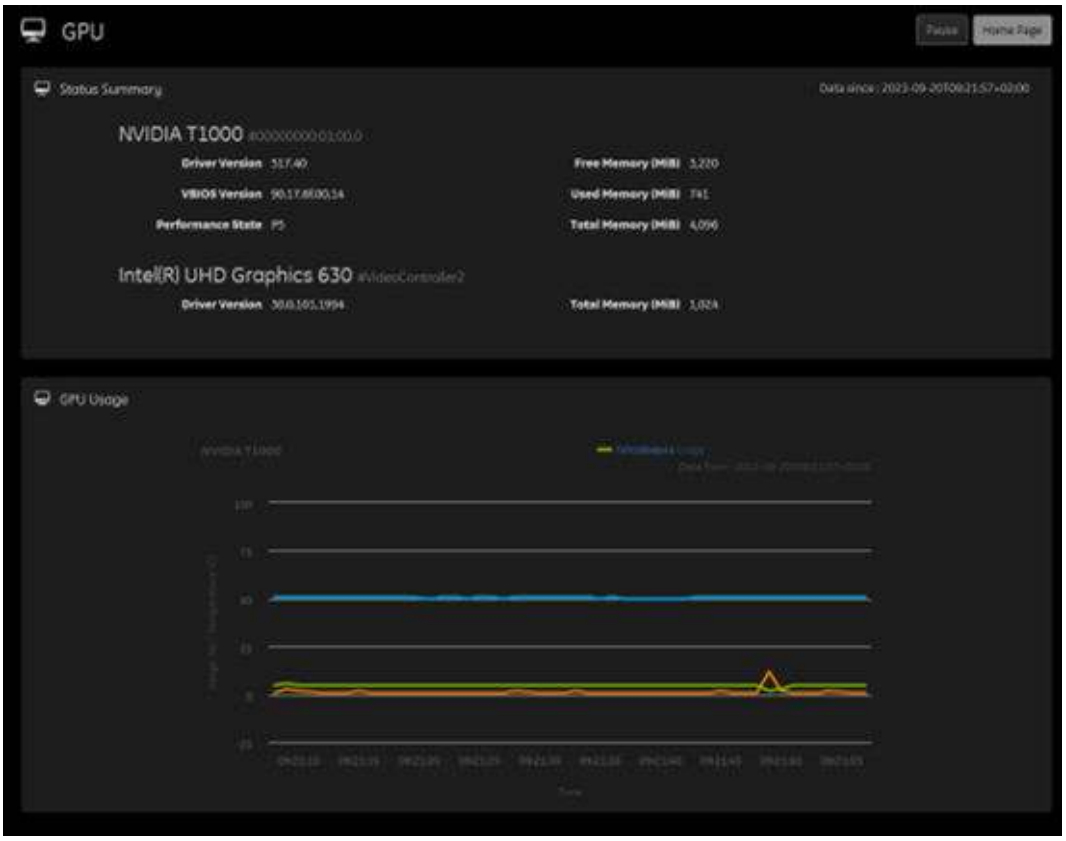


Figure 7-20: Service Desktop - Home -> System Status -> GPU

2. Select ***Home Page*** to exit monitoring.

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7.6.2 Service Desktop - Diags*

The top-level menu ***Diags*** contains troubleshoot functionalities and diagnostics at hardware components.

1. **Run Diags** - The Voluson Performance 16/ Voluson Performance 18 system is capable of testing its own components using internal diagnosis hardware. These tests can be used to find not correctly working hardware more easily.
2. **Diags History** - view a history of the diagnostics you have run and the results

Service Desktop - Diags require a "Service Advanced" option string (= Service Key).

Note ***Disruptive Mode needs to be turned ON*** *before executing any diagnostic tests. Operation see* *Section 7.6.2.1 "Before performing Diagnostics*" on page 7-22*.

Note *Please observe that some tests may not be available on your Voluson Performance 16/ Voluson Performance 18. Tests depend on system type and configuration.*

Note *After performing any diagnostics, always disable "Disruptive Mode" and* ***reboot the system****. Operation see* *Section 7.6.2.9 "After performing Diagnostics*" on page 7-32*.

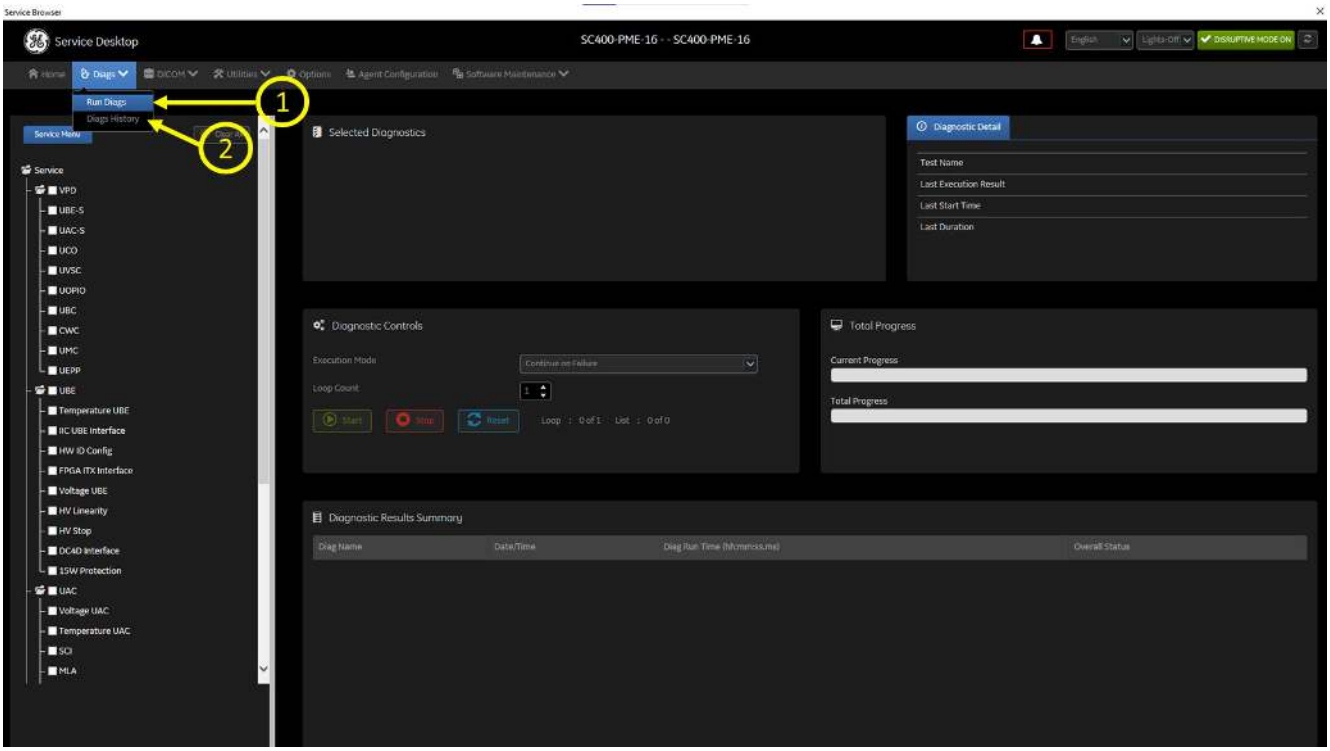


Figure 7-21: Service Desktop - Diags when "Service Advanced" option is active*

Content in this chapter

7.6.2.1 Before performing Diagnostics - - -

7.6.2.1 Before performing Diagnostics*

Disruptive Mode needs to be turned ON before executing any diagnostic tests.

1. In the Service Desktop window click the ***Disruptive Mode Status*** field **(A)** in the navigation bar at top of the screen. (Alternatively navigate to Utilities -> Disruptive Mode Utility.)
2. To turn on the "Disruptive Mode Utility" click ***Enable*** **(B)**.

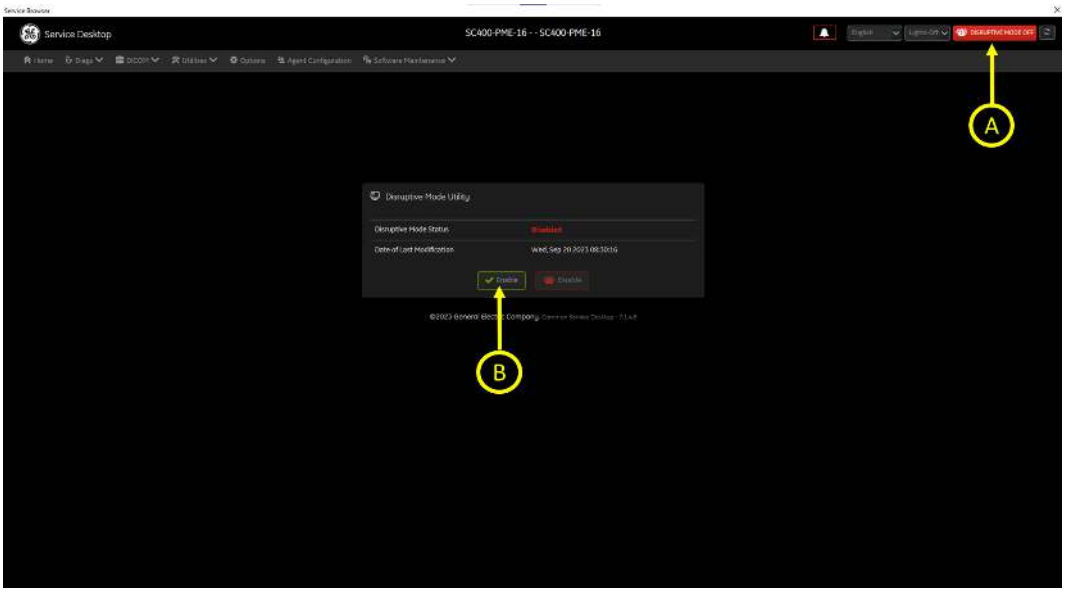


Figure 7-22: Disruptive Mode Utility

3. The following screen confirms Disruptive Status change **(C)**. The Disruptive Mode Status field **(D)** on the right top of the screen changes accordingly.

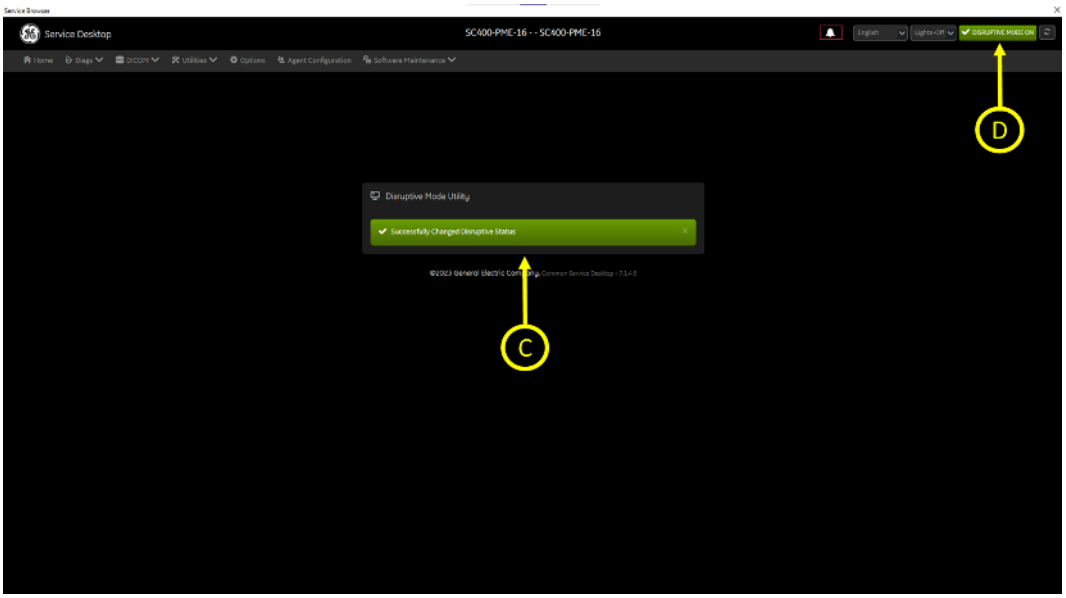


Figure 7-23: Sucessfully changed Disruptive Status

4. Proceed with *Section 7.6.2.2 "How to Run Diagnostics*" on page 7-23*.

7.6.2.2 How to Run Diagnostics*

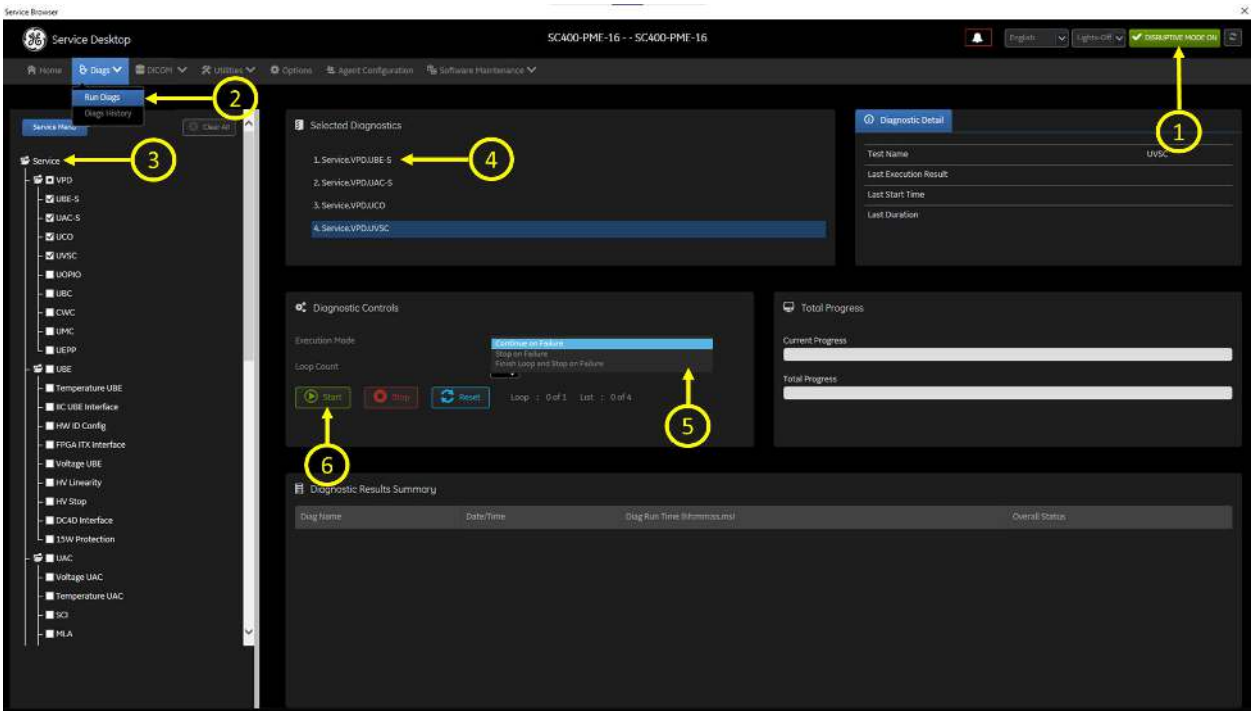


Figure 7-24: Service Desktop - Diags -> Run Diags

1. If not already done, turn Disruptive Mode **ON** to execute diagnostic tests.
2. Navigate to ***Diags*** → ***Run Diags***.
3. From the **Service** directory tree, select the diagnostic (e.g., All tests). If required adapt your selection (check/uncheck diagnostic items).

Note *Verify if the selected diagnostic items require that all the probes are detached. If prompted (and not already done), disconnect all probes.*

4. Select the desired ***Execution Mode*** from the pull-down menu.
5. Click ***Start***.
6. View progress in the "Total Progress" area.
7. Check out results (Passed or Failed) in the "Diagnostic Results Summary" area.

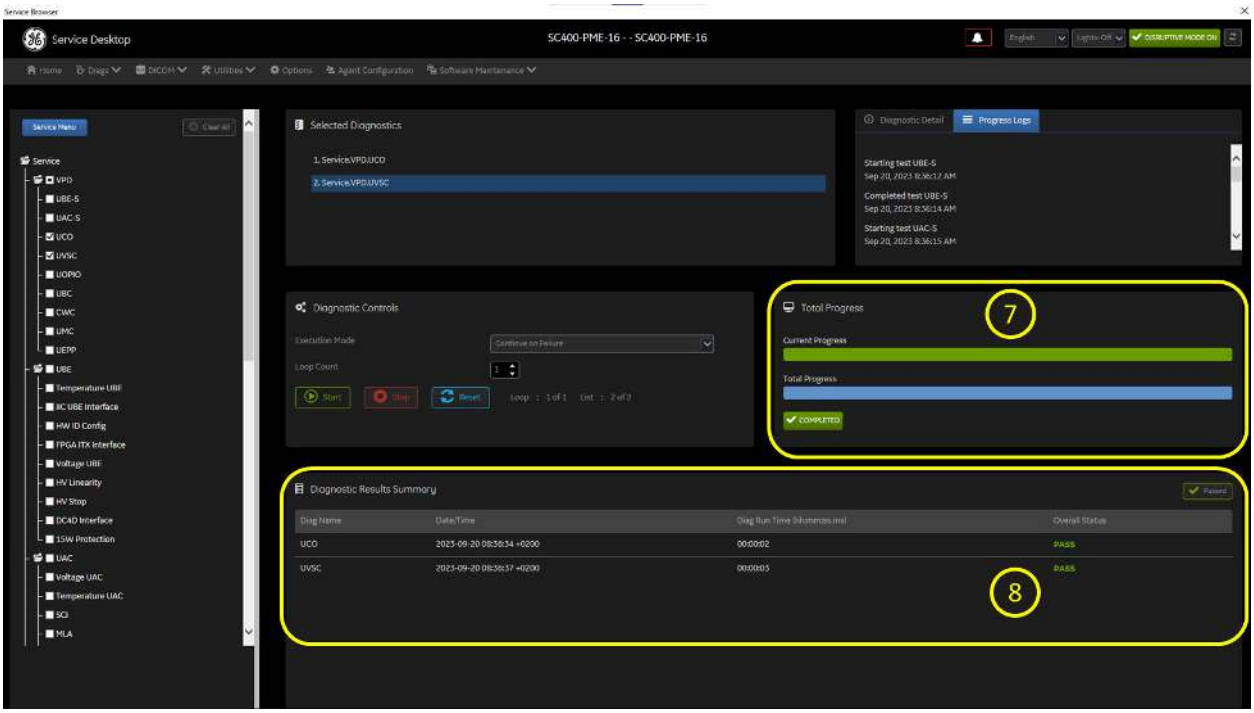


Figure 7-25: Service Desktop - Diags -> Run Diags → completed

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Note *After performing any diagnostics, always disable "Disruptive Mode" and **reboot the system**. Operation see Section 7.6.2.9 "After performing Diagnostics*" on page 7-32.*

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7.6.2.3 Run Diagnostics - BackEnd*

- **SSD drive test**

  This test examines the read performance of the built-in HDD drive. The diskspd.exe tool is used for a performance analysis.

  Errors:

  - The return value of the diskspd.exe tool
  - The read performance of the tested drive is too low

- **SSD PCIe test**

  This test examines the PCIe performance of the built-in SSD drive

  Errors:

  - The PCIe performance of the tested drive is too low

- **GPU PCIe test**

  This test examines the PCIe performance of the built-in GPU

  Errors:

  - The PCIe performance of the tested drive is too low

- **UBE voltage**

  This test pulls information regarding the voltage and current consumption from the UBE board.

  Errors:

  - The data read/write from/to HW fails
  - A data value is not within the limits

- **Temperature UBE**

  This test pulls information regarding the temperature of the UBE board.

  Errors:

  - The data read/write from/to HW fails
  - A data value is not within the limits

- **HV_4D test**

  Thistest checks communication and functionality of the 3 high voltage generator's microcontrollers by

  - Checking IIC communication with voltage generator uCs,
  - bringing voltage generator uCs in pre-defined states and checking status registers
  - measuring and comparing voltages and currents in pre-defined states

  Errors:

  - The data read/write from/to HW fails
  - The status registers show unexpected errors.
  - A data value is not within the limits

back to *"Service Desktop - Diags*" on page 7-21*

7.6.2.4 Run Diagnostics - FrontEnd*

UAC

- **UAC Voltage**

  This test checks pulls information regarding the voltage and current consumption from the UAC board.

  Errors:

  - The data read/write from/to HW fails.
  - The data values are not within the limits.

- **Temperature UAC**

  This test information regarding the temperature of the UAC board.

  Errors:

  - The data read/write from/to HW fails.
  - The data values are not within the limits.

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- **UAC Monitoring ADC**

  HW has implemented monitoring features using an ADC. This monitoring is tested by comparing some measured values against pre-defined values

  Errors:

  - The data read/write to HW fails.
  - The data values are not within the limits.

- **Signal Generator high/low/mid**

  This test checks if the signal quality is as expected.

  Errors:

  - The data read/write from/to HW fails.
  - The data values of the acquired signal does not match the level/frequency/amplitude.

- **ATGC high / ATGC low**

  This test checks if the signal level is influenced as expected by the ATGC.

  Errors:

  - The data read/write from/to HW fails.
  - The data values of the acquired signal does not match the level/frequency/amplitude.

- **TR switch**

  This test checks if TR-switch opens and closes

  Errors:

  - The data read/write from/to HW fails.
  - The data values of the acquired signal does not match the level/frequency/amplitude.

- **TR Control**

  This test checks if TR-control lines are switch in the correct way.

  Errors:

  - The data read/write to HW fails.
  - The data values of the acquired signal does not match the level/frequency/amplitude.

- **TX Control**

  This test checks if TX-control lines are switch in the correct way.

  Errors:

  - The data read/write to HW fails.
  - The data values of the acquired signal does not match the level/frequency/amplitude.

- **TX Pulser**

  This test checks the correct amplitude and form of a pulse on each channel. It checks pulser A and B with positive and negative waveform

  Errors:

  - The data read/write to HW fails.
  - The data values of the acquired signal does not match the level/frequency/amplitude to HW

- **CW**

  This test checks the receive paths of the CW signal in the system.

  Errors:

  - Amplitude, phase or noise levels not within the expected ranges.

- **CW Pulser**

  This test checks the transmit paths of the CW signal in the system.

  Errors:

  - Amplitude, phase or noise levels not within the expected ranges.

back to *"Service Desktop - Diags*" on page 7-21*

7.6.2.5 Run Diagnostics - Probes*

- **ePAT_VITA**

  This test checks the functionality and sensitivity of probe elements.

  Errors:

  - The data read/write from/to HW fails.
  - The probe is defect.
  - System does not detect Hall zero position on motor driven probes.

  Operation see *"ePAT_VITA* " on page 7-28*.

  Note *This test can be performed at all probes.*

back to *"Service Desktop - Diags*" on page 7-21*

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7.6.2.5.1 ePAT_VITA*

This test checks the functionality and sensitivity of probe elements.

Note *This test can be performed at all probes.*

ePAT_VITA Procedure

- Clean probes before the test. Any remaining coupling gel will disturb measurements.
- Be aware of the sensitive probe head. Impact to the probe head could result in irreparable damage.
- For Volume probes (e.g., RAB, RIC,...), which are filled with oil, it is recommended to position the head horizontally in such a way that any air bubbles are moved away from the array. Wait some seconds until air bubbles are surely moved aside.

1. If not already connected, plug all probes to be tested to the Voluson Performance 16/ Voluson Performance 18 system.
2. Navigate to ***Diags*** → ***Run Diags***.
3. Check mark ***ePAT_VITA*** **(A)** and then click ***Start*** **(B)**.

   Probe diagnostic tests will run for all connected probes and show up completion status **(C)** after few minutes.

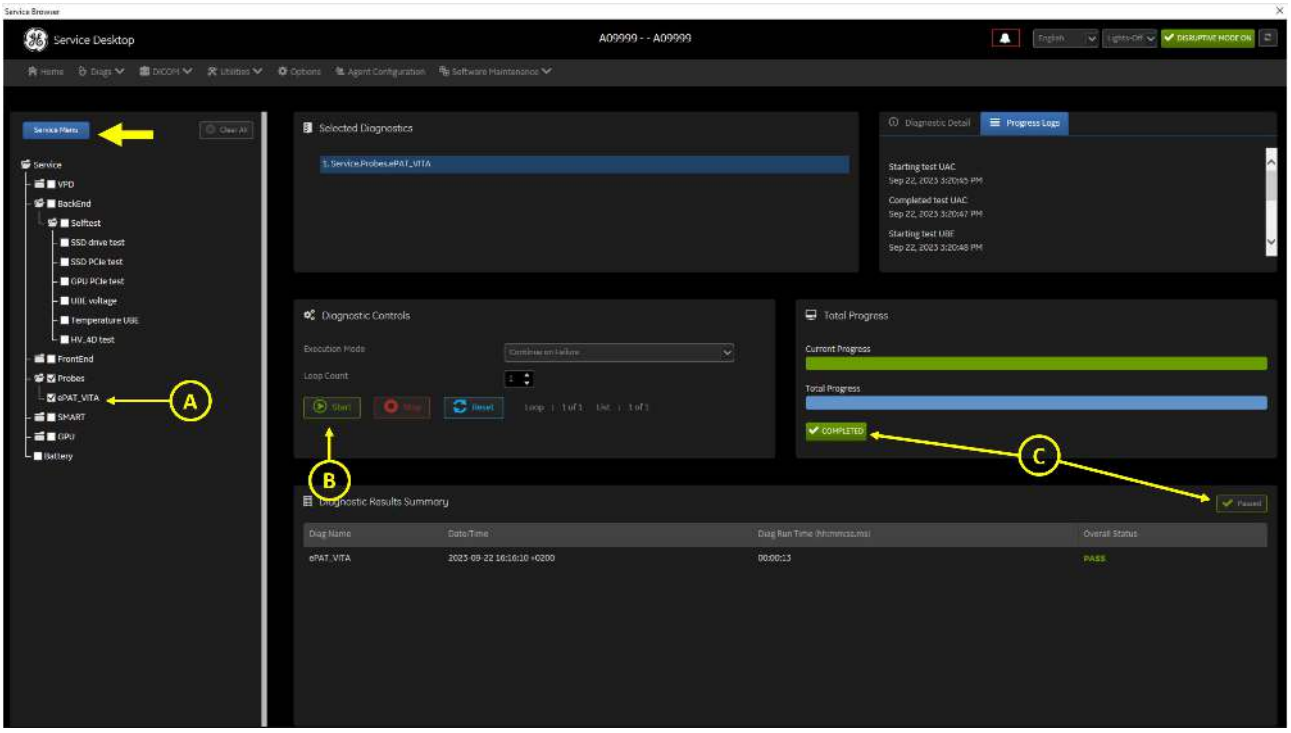


Figure 7-26: ePAT_VITA - Passed

View Detailed Results

1. Navigate to ***Diags*** → ***Diags History*** and select the specific ePAT_VITA test report.

Note *Move the scroll bar downwards to view specific probe assessment results of all connected probes.*

a. ***Test output*** - shows details about tested probe

b. ***Assessment result*** - lists up abnormal probe elements (in case there are any). Plot and table show detailed element sensitivity

c. ***Probe element sensitivity*** - plot and table show detailed element sensitivity

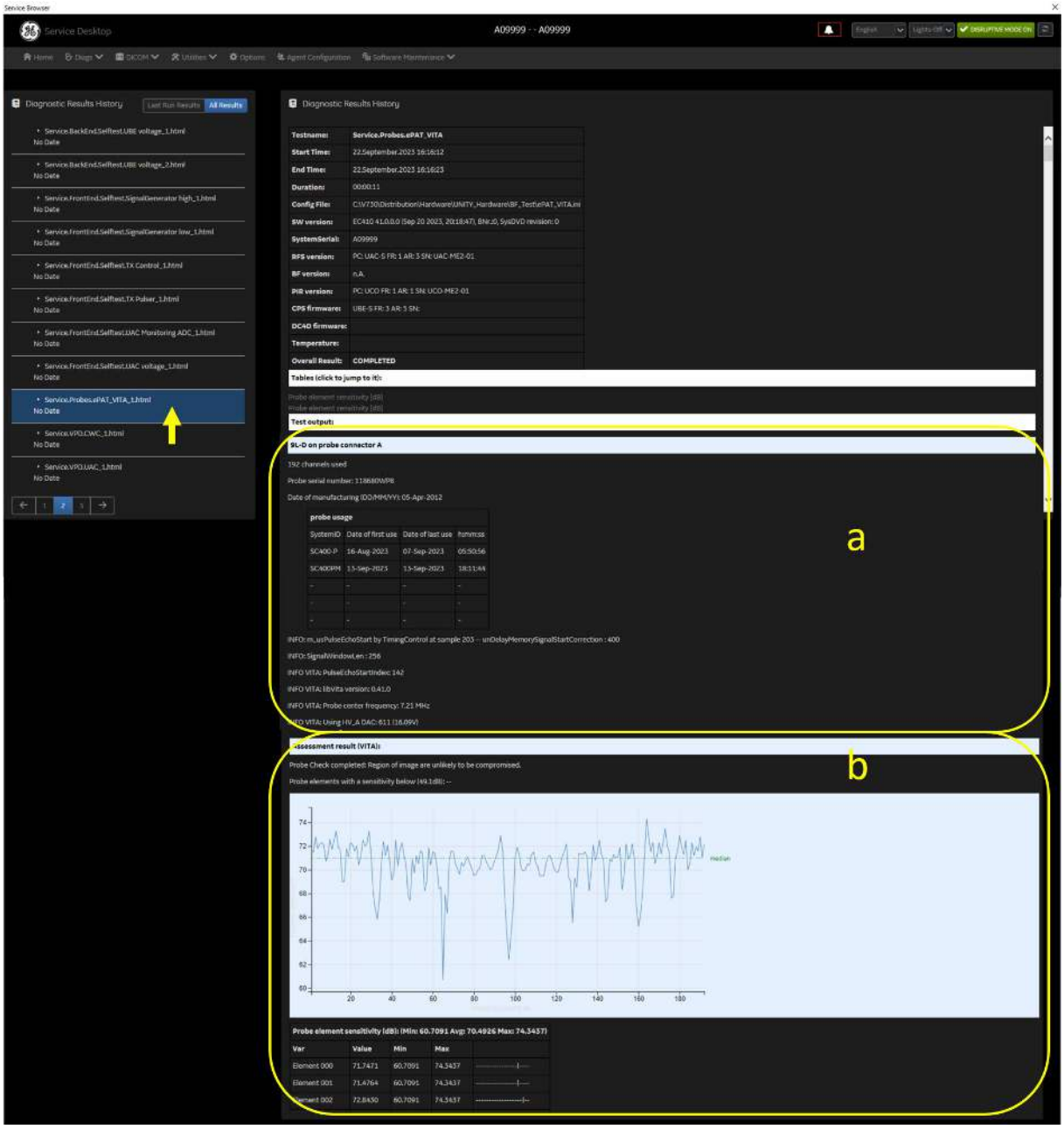


Figure 7-27: Service Desktop - Diags -> Diags History (enlarged)

back to *"Service Desktop - Diags*" on page 7-21*

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7.6.2.6 Run Diagnostics - SMART*

The S.M.A.R.T (**S**elf **M**onitoring, **A**nalysis and **R**eporting **T**echnology) HDD Status - Reporting tool is a piece of software, which is present on most modern hard disks that continuously gathers data about performance and operations, such as hour meter, temperature, read/write failures, etc.

The manufacturer of the hard disk limits these measurements to certain thresholds. When these thresholds are met (e.g., due to old age or excessively high temperatures), the S.M.A.R.T software concludes that the hard disk is very likely to fail within the next 24 hours.

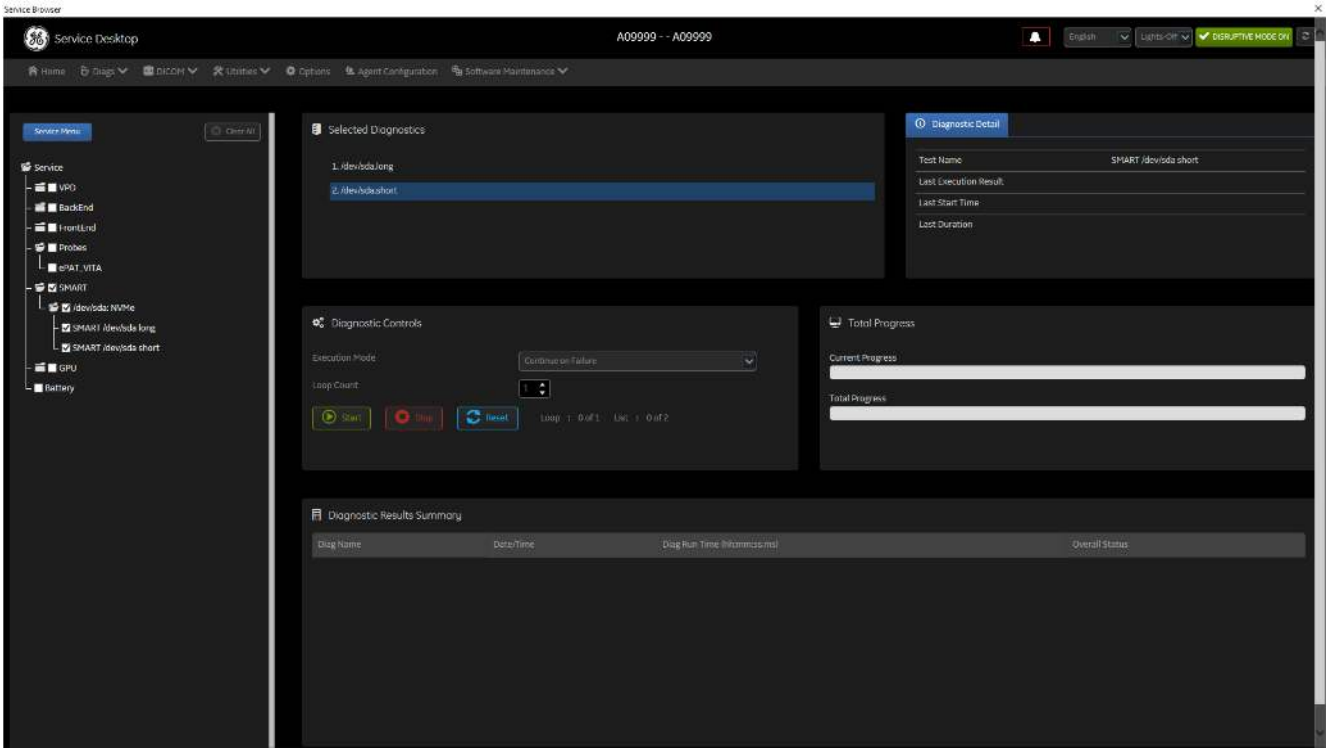


Figure 7-28: Service Desktop - Diags -> Run Diags -> SMART

The duration time of the tests depend on the installed hard disk types. SMART Tests for M.2 NVMe disks are almost instant, while tests of optical hard disks depend on read/writing speed. Typical durations for Hard disk drives: long ~ 5 minutes, short ~ 1.5 minutes.

- **dev/sdb** (NVMe device)

  Smart Tests for second installed Hard disk (C: System partition); usually M.2 SSD

  - SMART /dev/sdb long: Wait for test to complete.
  - SMART /dev/sdb short: Wait for test to complete.

back to *"Service Desktop - Diags*" on page 7-21*

7.6.2.7 Run Diagnostics - GPU*

GPU Memory Test executes a software-based tester to test for "soft errors" in GPU memory or logic.

It uses a variety of proven test patterns to verify the correct operation of GPU memory and logic.

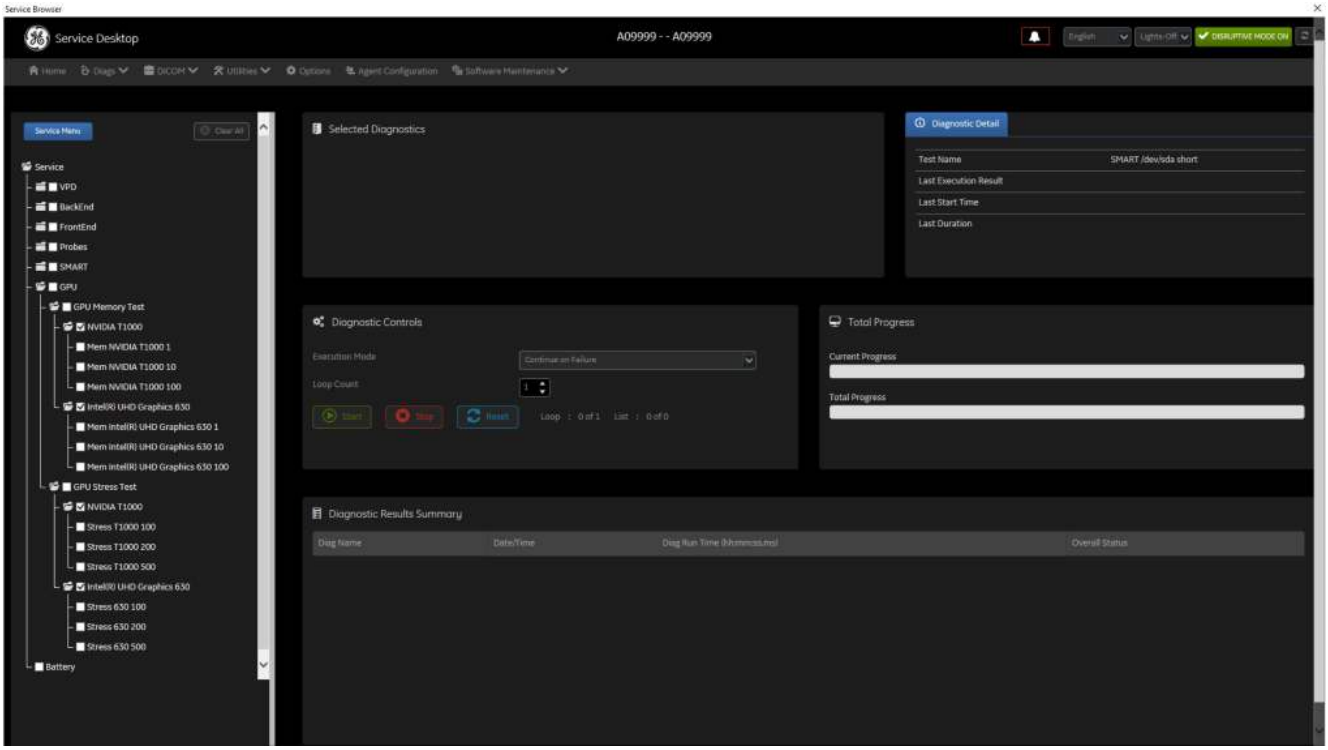


Figure 7-29: Service Desktop - Diags -> Run Diags -> GPU

- **GPU Memory Test**

  GPU Memory Test executes a software-based tester to test for "soft errors" in GPU memory or logic.

  It uses a variety of proven test patterns to verify the correct operation of GPU memory and logic.

  - NVIDIA Quadro T1000
    - Mem NVIDIA Quadro T1000 1: Wait about 10 seconds minutes for test to complete.
    - Mem NVIDIA Quadro T1000 10: Wait about 1 minute for test to complete.
    - Mem NVIDIA Quadro T1000 100: Wait about 9 minutes for test to complete.

- **GPU Stress Test**

  GPU Stress Test executes a software-based tester to test for "soft errors" in GPU memory or logic.

  It uses a high computational load and memory usage to verify the correct operation of GPU memory and logic under heavy usage.

  - NVIDIA Quadro T1000
    - Stress T1000 100: Wait about 7 minutes for test to complete.
    - Stress T1000 200: Wait about 15 minutes for test to complete.
    - Stress T1000 500: Wait about 35 minutes for test to complete.

back to *"Service Desktop - Diags*" on page 7-21*

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7.6.2.8 Diags History*

Navigate to ***Diags*** → ***Diags History*** to view a history of the diagnostics run on the Voluson Performance 16/ Voluson Performance 18.

Select the test result to display detailed Diagnostic Result History.

Test results are also located in D:\export\ for retrieval by the OnLine Center (OLC).

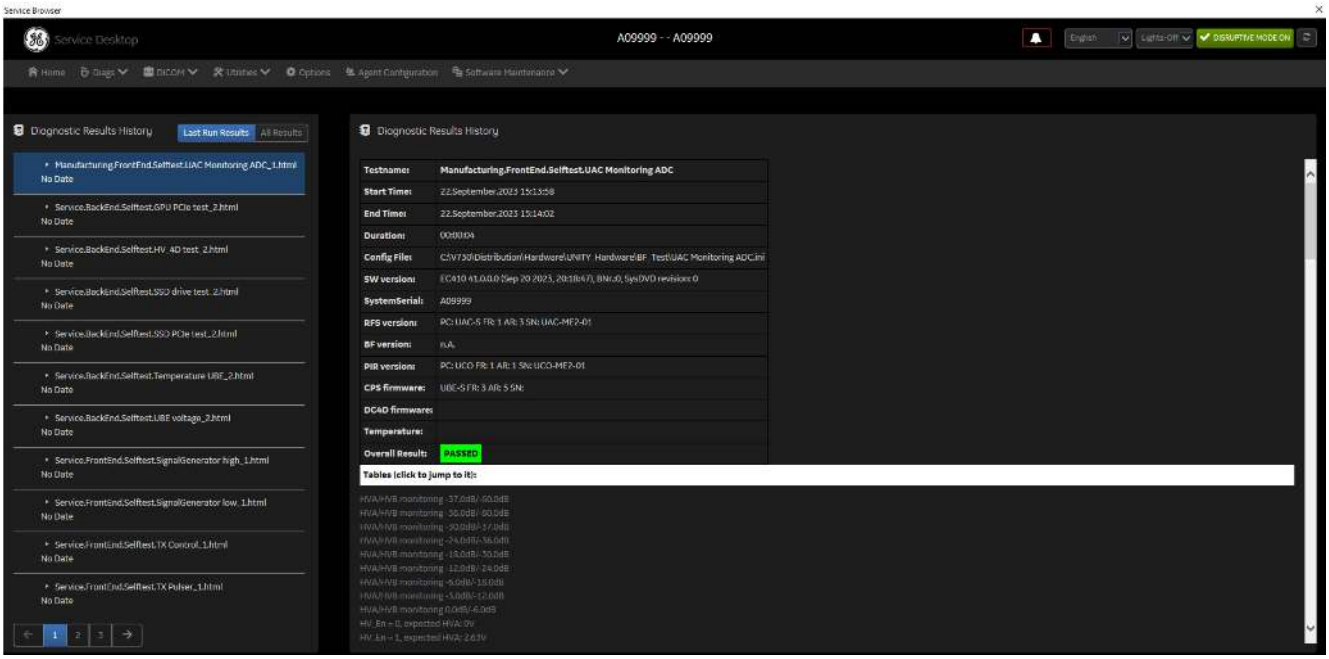


Figure 7-30: Service Desktop - Diags -> Diags History

back to *"Service Desktop - Diags*" on page 7-21*

7.6.2.9 After performing Diagnostics*

After performing any diagnostics, **always turn Disruptive Mode OFF** and reboot the system.

1. In the Service Desktop window click the the ***Disruptive Mode Status*** field in the navigation bar at top of the screen **(A)**.
2. To turn off the "Disruptive Mode Utility" click ***Disable*** **(B)**.

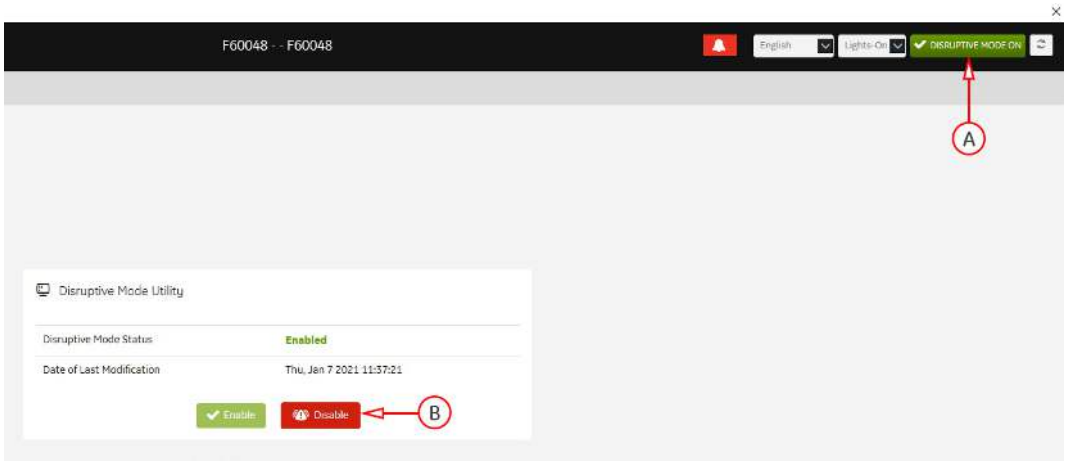


Figure 7-31: Utilities → System Shutdown

3. The following screen confirms Disruptive Status change. The Disruptive Mode Status field on the right top of the screen changes accordingly.
4. Close the Service Desktop and restart the system. (Turn system OFF and then back ON.)

back to *"Service Desktop - Home" on page 7-15*

7.6.3 Service Desktop - DICOM*

The top-level menu ***DICOM*** is used to troubleshoot DICOM components and connectivity.

Service Desktop - DICOM require a "Service Advanced" option string (= Service Key).

- **DICOM Spooler** - provides a summary of the current and recently outgoing jobs and their status. This summary shows Transferred jobs, Failed jobs, Pending jobs, etc. A pie chart shows health of the spooler.

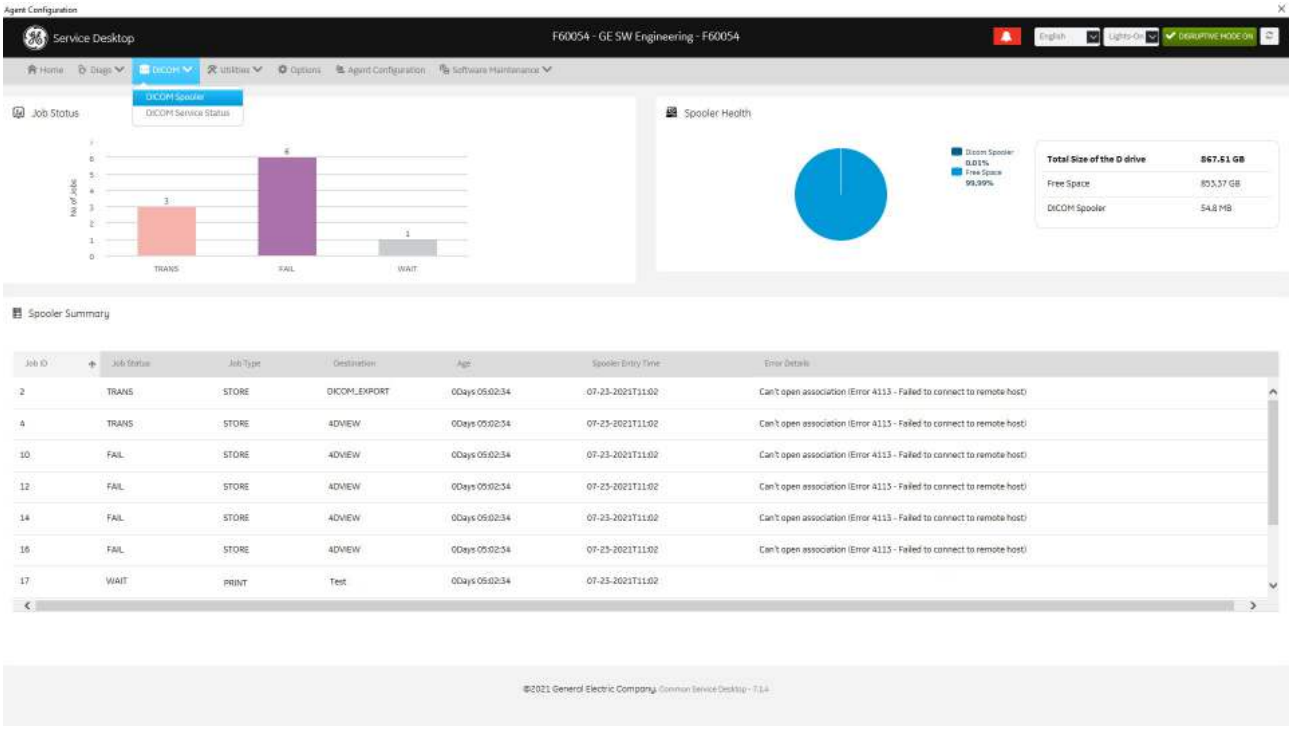


Figure 7-32: Service Desktop - DICOM -> DICOM Spooler

- **DICOM Service Status** - shows the AE Title and the Port Number of the Console.
  In this window you can check the connectivity of all available, or individual DICOM devices.

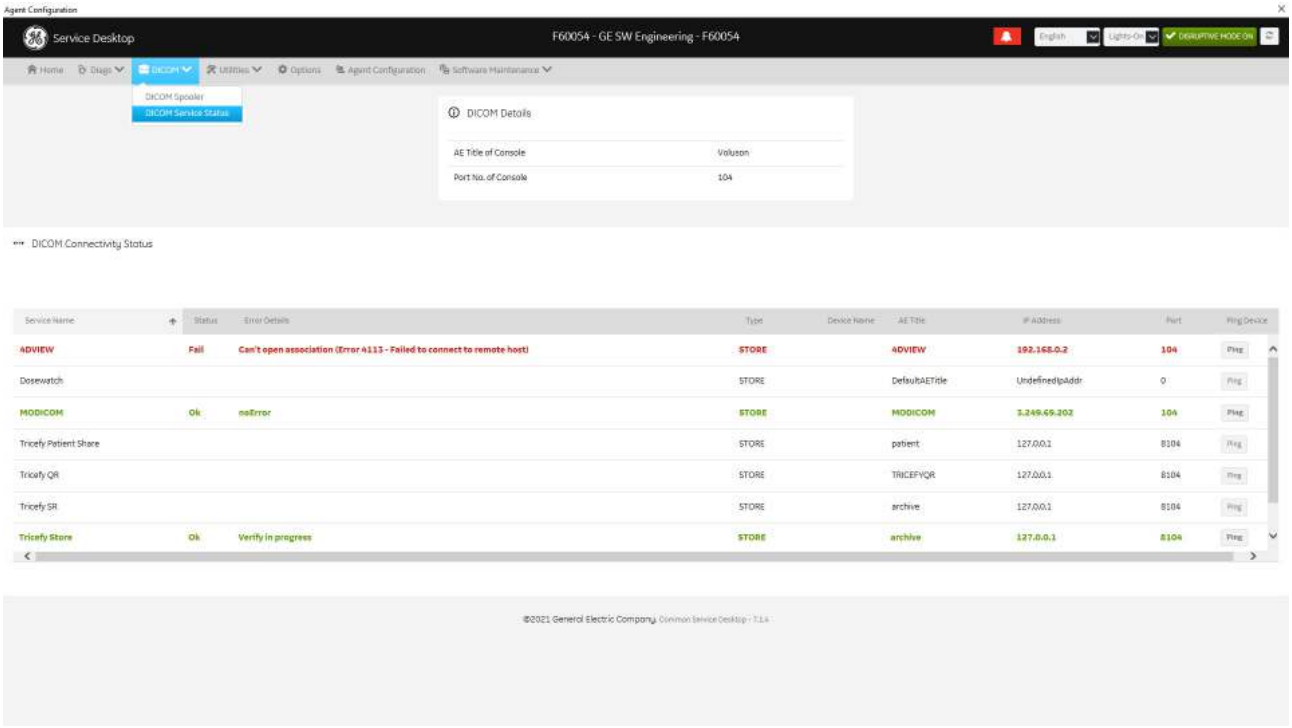


Figure 7-33: Service Desktop - DICOM -> DICOM Service Status

back to *"Service Desktop - Home" on page 7-15*

7.6.4 Service Desktop - Utilities

The top-level menu ***Utilities*** contains a variety of utility tools and troubleshoot functions for indicating the status and manage the Voluson Performance 16/ Voluson Performance 18 system.

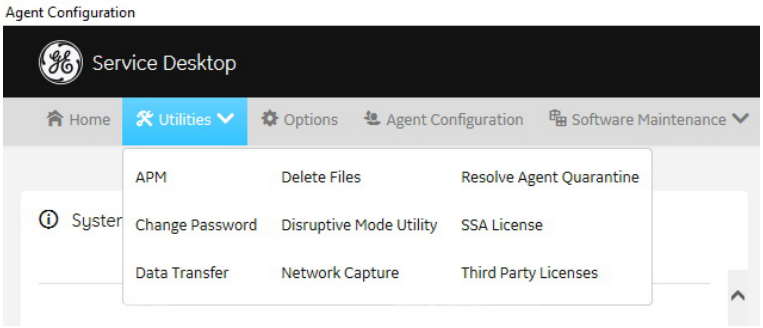


Figure 7-34: Service Desktop - Utilities (Overview)

Content in this chapter

*7.6.4.1 APM - - -

7.6.4.1 APM

APM enables upload of system usage data for Asset Performance Management purposes. The data contain protected health information.

The upload may only be enabled if a signed service contract is in place.

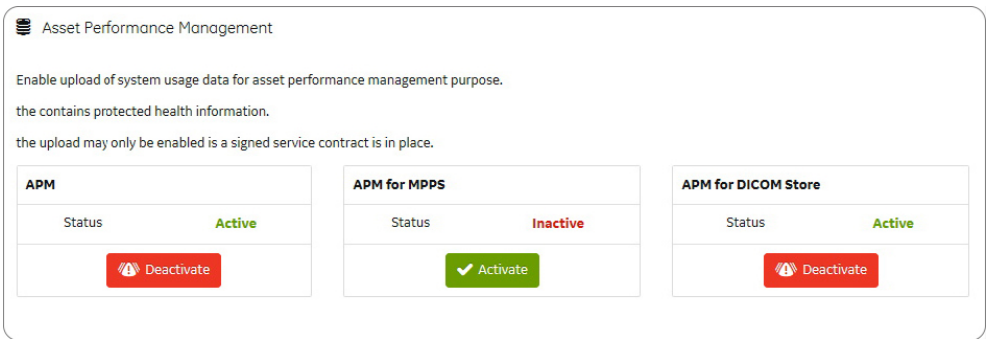


Figure 7-35: Service Desktop -> Utilities -> APM

When connected (***APM is active***), the Voluson Performance 16/ Voluson Performance 18 system has the capability to transmit certain data sets to the Back Office. These data sets pertain to system utilization and are accessible via proprietary tools only. Upon request, GE HealthCare can provide a complete listing of data sets gathered.

Data sets will be transmitted during the warranty period and when the Voluson Performance 16/ Voluson Performance 18 system is under a maintenance contract with GE HealthCare. The requirement for data transfer is a signed service agreement with valid data transfer clauses

The Field Engineer has the ability to stop the data transmission. The data transfer needs to be manually enabled by the Field Engineer if there is an active contractual agreement for the data transfer.

back to *"Service Desktop - Utilities" on page 7-34*

7.6.4.2 Change Password

Change Password allows to change the **GE**Service password that is used to perform portions of remote service. Both, "File transfer" and "SSH" depend on this **GE**Service password.

Note *Before changing the GEService password, make sure the Voluson Performance 16/ Voluson Performance 18 is connected to the network and the RSvP Agent is properly configured (see Section 3.13.6 "RSvP Agent Configuration" on page 3-98).*

If the GEService password is changed when offline, the back-office is not updated. At the next remote session, the password is not matching => this will prevent from "File transfer" and/or "SSH" services and may slow down remote service.

Note ***Change Password*** *is not available via remote connection.*

Please be aware that a **password change needs to be repeated** whenever a software upgrade (upgrade to any higher Ext. version) took place. When loading new software, the password is reset to the factory default password, but is not automatically updated at the back-office.

Warning

Risk of losing data: If the password is lost, GE HealthCare will not be able to recover or reset it. The loss of a password may result in the loss of patient data.

GE HealthCare will not be able to recover or reset changed passwords. Securely record the new password.

How to change the password

1. In the Service Desktop window navigate to ***Utilities*** → ***Change Password***.
2. Select **GEService** from the ***User Type*** pull-down menu **(A)**.

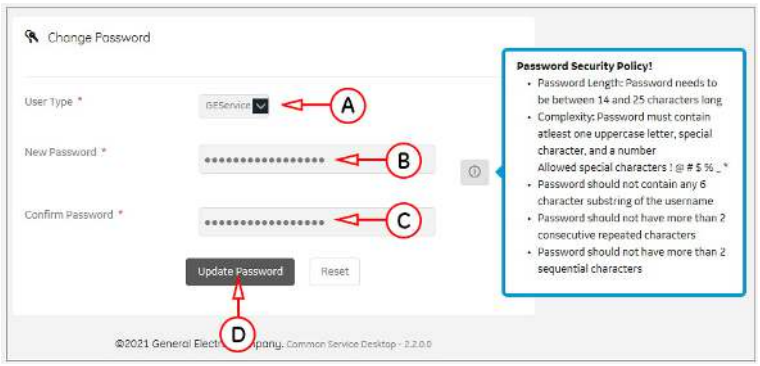


Figure 7-36: Utilities → Change Password

- **GEService** is the user for GE HealthCare Service. Both, File transfer and SSH depend on this user and password combination. When using SSH in FFA, the user and password will always be requested. Entering the incorrect password multiple times will lock you out. When changing this password, the Voluson Performance 16/ Voluson Performance 18 should be online so the back office updates. If the password is changed when offline, the back-office will not be updated and you will have to change the password again with the Voluson Performance 16/ Voluson Performance 18 online. There is no notification when this password has been changed. Changes to this password do not affect logs sent to the Service data lake.

3. In the ***New Password*** field **(B)** type the new password according to password requirements.
4. In the ***Confirm Password*** field **(C)** type the new password again.
5. Click ***Update Password*** **(D)**. A *"Password changed successfully"* message is shown.

Note *At any later time, there is no indication that a password change happened.*

6. Reboot the system.

back to *"Service Desktop - Utilities" on page 7-34*

7.6.4.3 Data Transfer

Data Transfer provides a way to enable/disable file upload based on permissions configured in the UISApp.

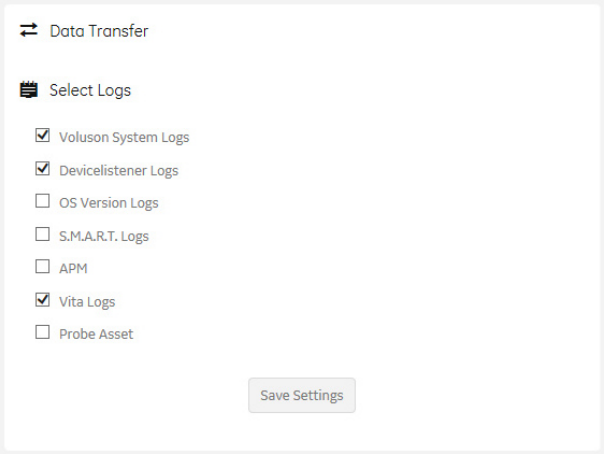


Figure 7-37: Data Transfer

7.6.4.4 Delete Files

Delete Files displays all files and folders present in the D:\export folder and allows for their deletion. Deleting unneeded files improves performance and reduces the need to defragment the disk drive.

7.6.4.5 Disruptive Mode Utility

Disruptive Mode Utiltiy provides a way to enable and disable disruptive mode troubleshooting.



Normal operation and patient scanning might be disturbed and limited while disruptive mode is enabled. Once service activity is completed (e.g., after performing diagnostics), **always disable "Disruptive Mode" and reboot the system** before returning it to the customers use.



Disruptive Mode can be selected by the customer directly on the Voluson Performance 16/ Voluson Performance 18 (see *Section 7.5.2 on page 7-13*), or requested remotely by the service technician or OLC.

7.6.4.6 Network Capture

Network Capture displays network traffic between the Voluson Performance 16/ Voluson Performance 18 and configured devices.

Each network capture outputs two log files: one for main logging with no protected information and another including protected information. These log files are useful when debugging connectivity issues. Because these log files can be large, they are only kept for one week.

7.6.4.7 Resolve Agent Quarantine

This functionality resolves the agent from quarantine state only during agent upgrades. If agent goes to quarantine due to any other reason, this utility will not fix the quarantine issue.

7.6.4.8 SSA License

SSA License displays status and information about the SSA (Secure Service Access) class M key connected to the system.

7.6.4.9 Third Party Software Licenses

The ***Third Party Software Licenses*** page displays all the third party software licenses used as part of the Service Platform.

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7.6.5 Service Desktop - Options

In the top-level menu ***Options*** all the available software options and their status is listed.

The Hardware Number and the Serial Number is displayed in the Software Option Details field **(A)**.

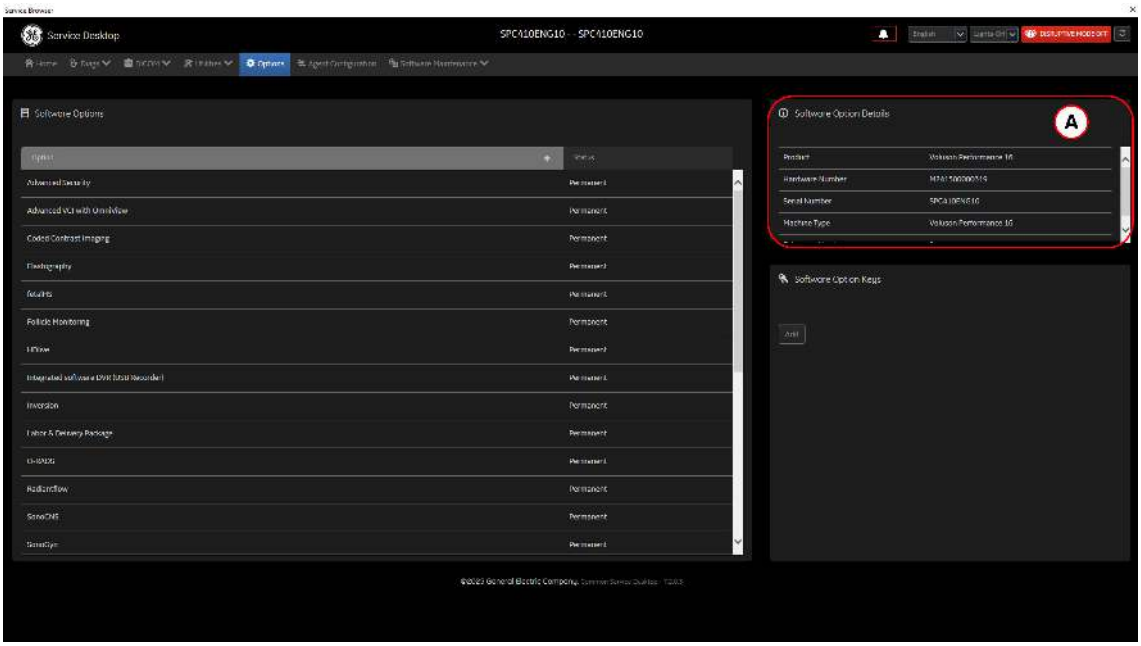


Figure 7-38: Service Desktop - Options

back to *"Service Desktop - Home" on page 7-15*

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7.6.6 Service Desktop - Agent Configuration

In the top-level menu ***Agent Configuration*** you should properly enter and fill in all fields required for remote access and troubleshooting by a GE HealthCare Service technician.

Note *Remote access is ONLY possible if the Service Platform is properly configured (either by the user or a GE HealthCare technician at site). Operation see Section 3.13.6 "RSvP Agent Configuration" on page 3-98.*

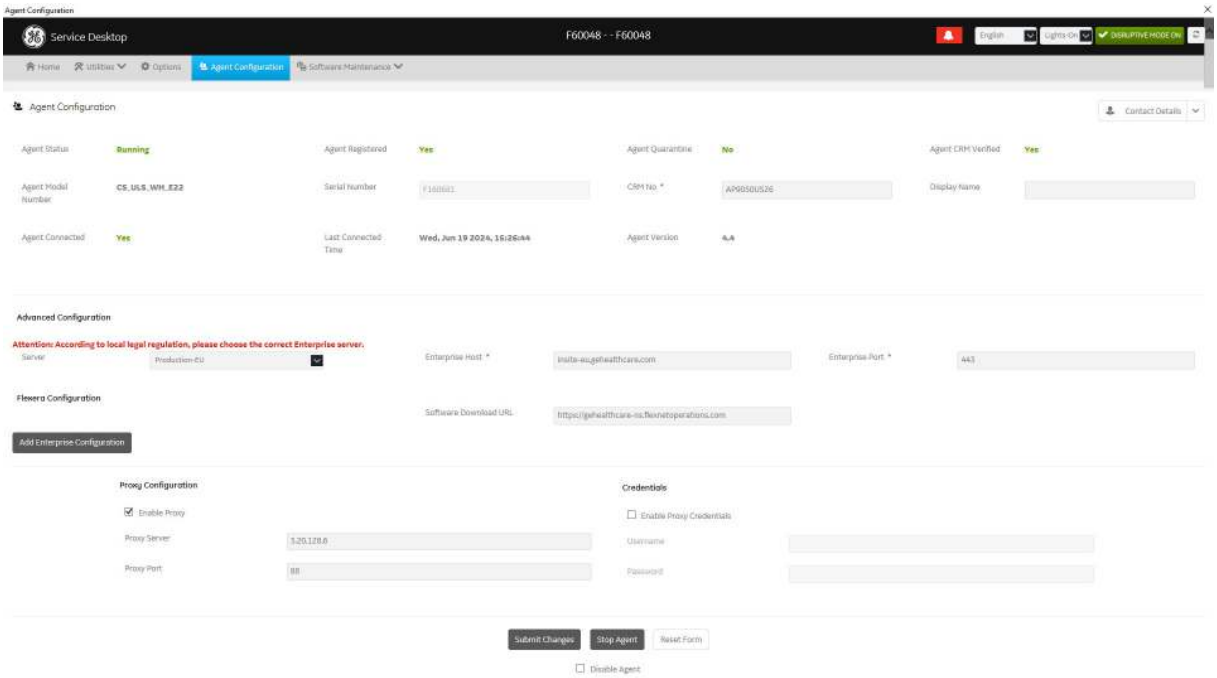


Figure 7-39: Service Desktop - Agent Configuration

back to *"Service Desktop - Home" on page 7-15*

7.6.7 Service Desktop - Software Maintenance

The top-level menu ***Software Maintenance*** is used to manage software updates, which includes checking for pending updates and initiating the download for installation.

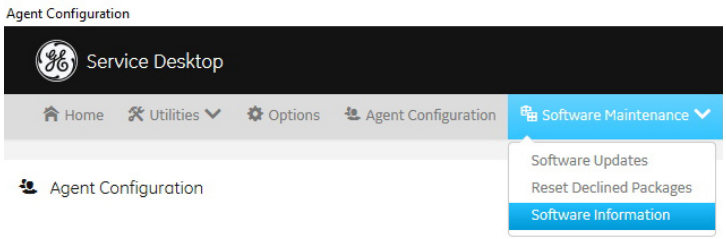


Figure 7-40: Service Desktop - Software Maintenance (Overview)

Content in this chapter

*7.6.7.1 Software Updates - - -

7.6.7.1 Software Updates

Software Updates are assigned by CRM number.

1. Click ***Query for Updates*** to check for available software updates.



Figure 7-41: Service Desktop - Software Maintenance -> Software Updates

2. SW Update Packages for download are populated.

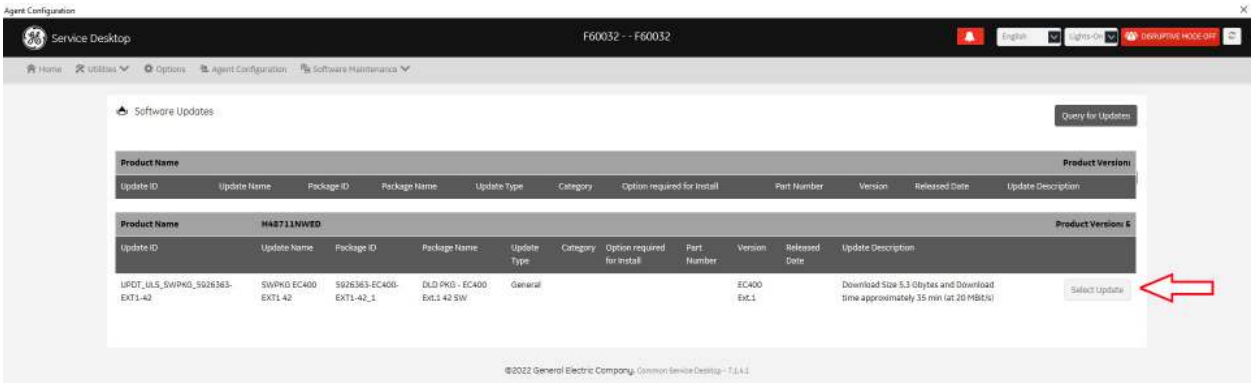


Figure 7-42: Service Desktop - Software Maintenance -> Software Updates - download information

3. Click ***Select Update*** and confirm with ***OK*** to initiate download of the package.



Figure 7-43: Service Desktop - Software Maintenance -> Software Updates - update successfully set

For detailed information and proper download/installation procedure see *Section 8.2.3 " eDelivery - Software Download and Installation of a SW Update Package" on page 8-14*.

7.6.7.2 Reset Declined Packages

Reset Declined Packages provides a way to reset software updates that have been previously declined through software download.

By clicking ***Reset*** the selected package is reset so that it is again available through a query on *"Software Updates"*.

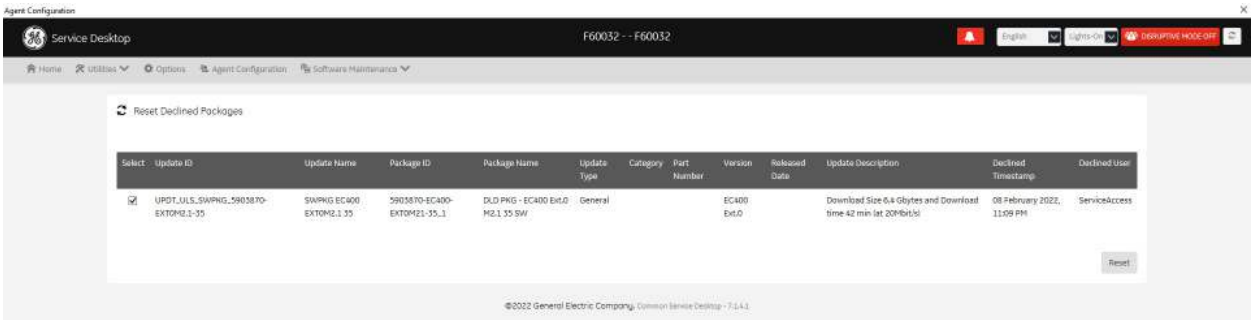


Figure 7-44: Service Desktop - Software Maintenance -> Reset Declined Packages

7.6.7.3 Software Information

Software Information displays general information about the software currently installed on the Voluson Performance 16/ Voluson Performance 18 system.

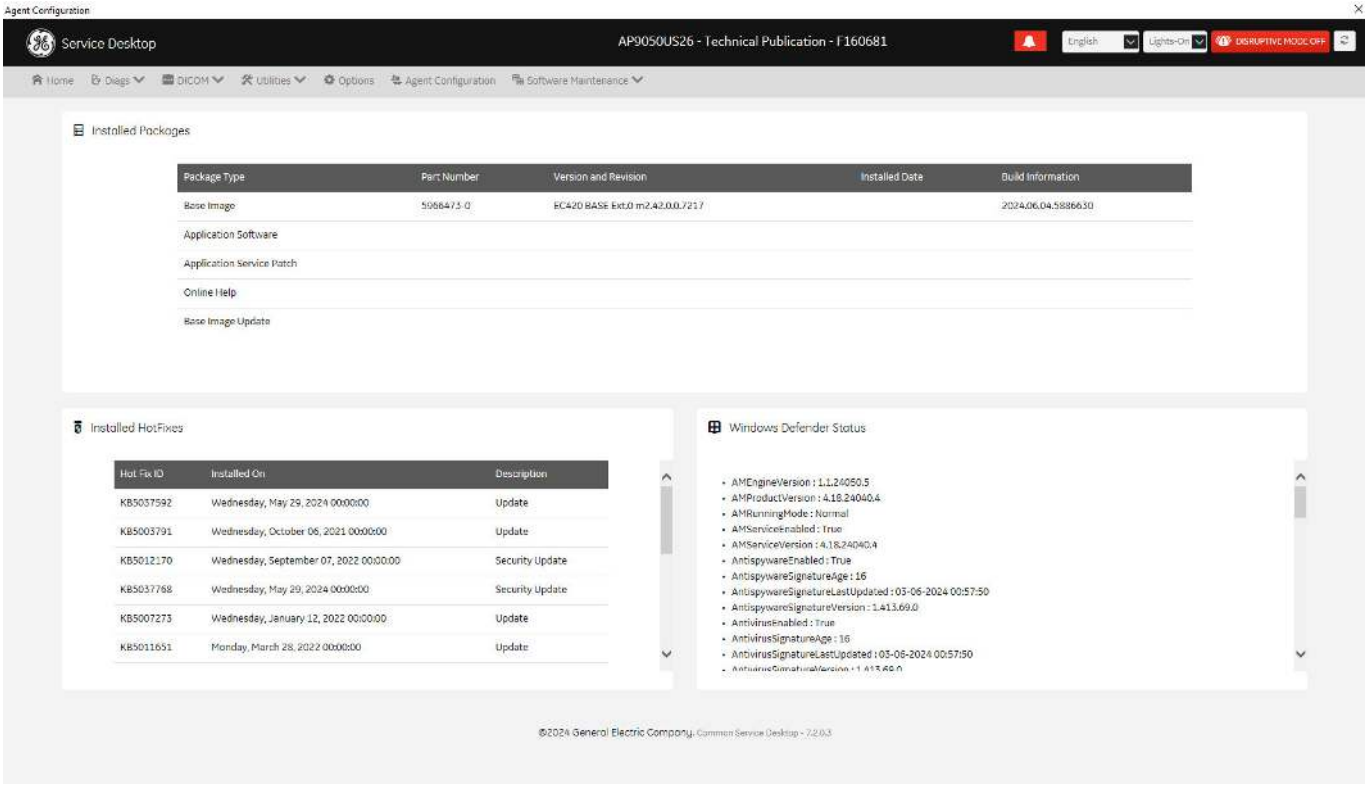


Figure 7-45: Service Desktop - Software Maintenance -> Software Information

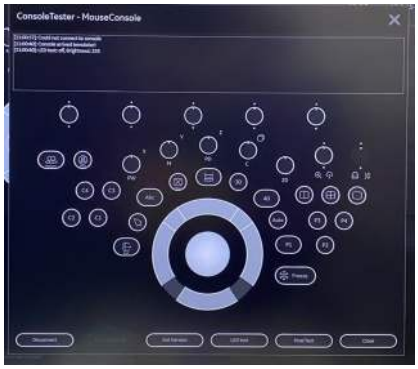
7.7 User Interface Troubleshooting

7.7.1 Touch Panel Display

Only +12V are needed to show Voluson Performance 16/ Voluson Performance 18 Touch Panel Display on the User Interface (OPIO).

7.7.2 Console Test

1. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
3. Select ***Administration*** and then click the ***Service*** tab.



Note *The* **ON/OFF** *Standby button MUST NOT be pressed.*

For description of keys and their functions as well as the key code numbers see *"#unique_408"*.

Task	Actions and expected Results
Disconnect	Disconnect <--> Reconnect
Cart Lightning	Touch the ***Cart Lightning*** button repeatedly to switch all cart lightning functions.
Get Version	The Console version is shown in the status window on the screen.
LED Test	Select the ***LED Test*** button. Each LED will be switched on. (First each hardkey lights up green and then changes to white.) The ***Clear LED´s*** button sets all LED´s off. (The white illumination of all hardkeys is switched off.)
Pixel Test	Touch the ***Pixel Test*** button repeatedly to step through RED, GREEN and BLUE. Each color is displayed correctly (without any tint or discolored pixels).
Hardkey Test	Press each hardkey and touch Toggle switch controls. Indication (+ key code number) of each key is shown in the Status window on the screen.
Encoder/ Joycoder Test	Swivel, push and flip the encoders/joycoders and check the display in the Status window on the screen.
Trackball Test	Check movement of the mouse cursor. Press each trackball button and check the display in the Status window on the screen.
Touch Test	Touch onto the “field” that is shown on the systems Touch panel.

Exit the Test program with ***Back*** and afterward select ***Close***.

7.8 Troubleshooting Trees, Instructions and Tech Tips

Content in this chapter

*7.8.1 System does not boot up - - -

7.8.3 No Doppler Audio Signal on Loudspeakers - 7-46
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7.8.8 Monitor Troubleshooting - 7-52
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7.8.13 RTC (Real-Time Clock) Error due to an empty CMOS Battery (set correct date & time) - 7-55

7.8.1 System does not boot up

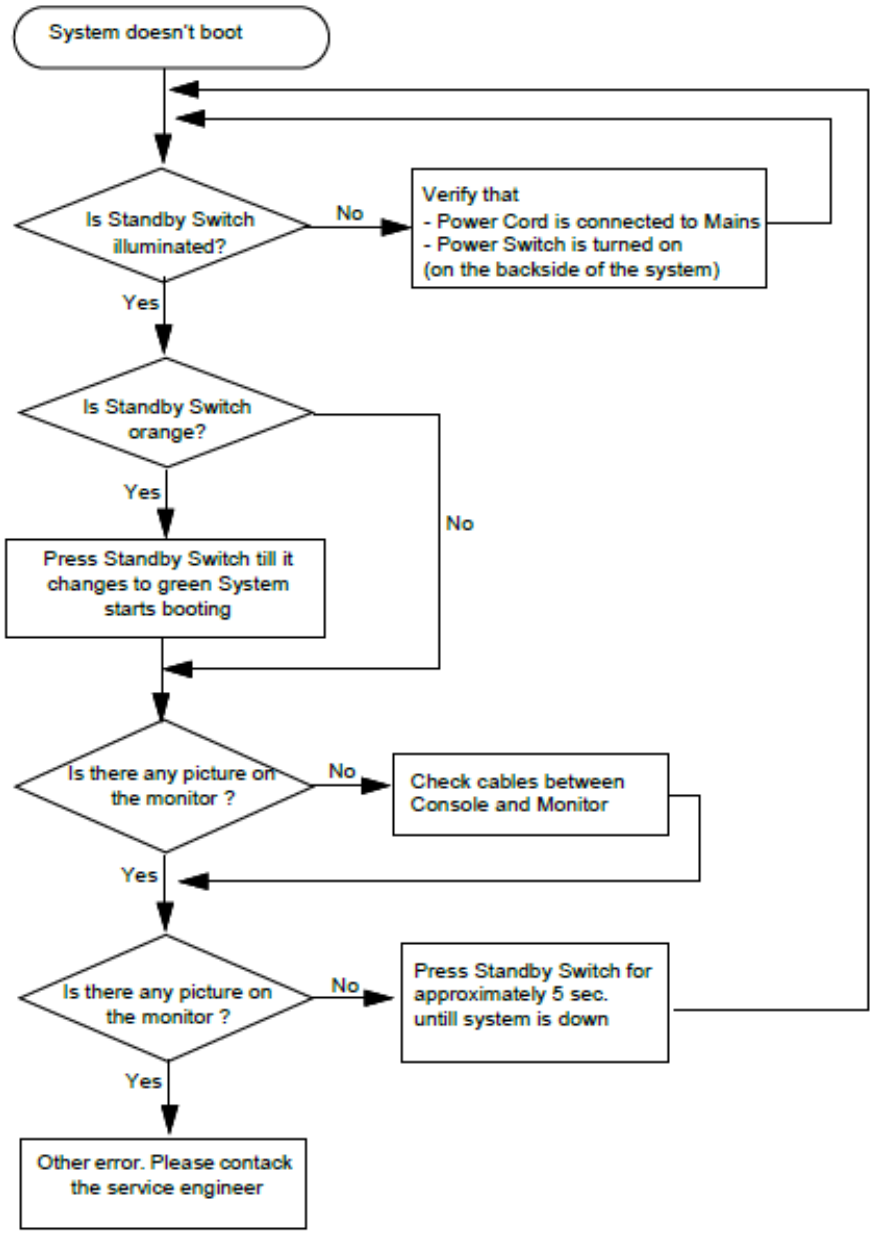


Figure 7-46: System does not Power On / Boot Up

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7.8.2 No Image on the Main Monitor

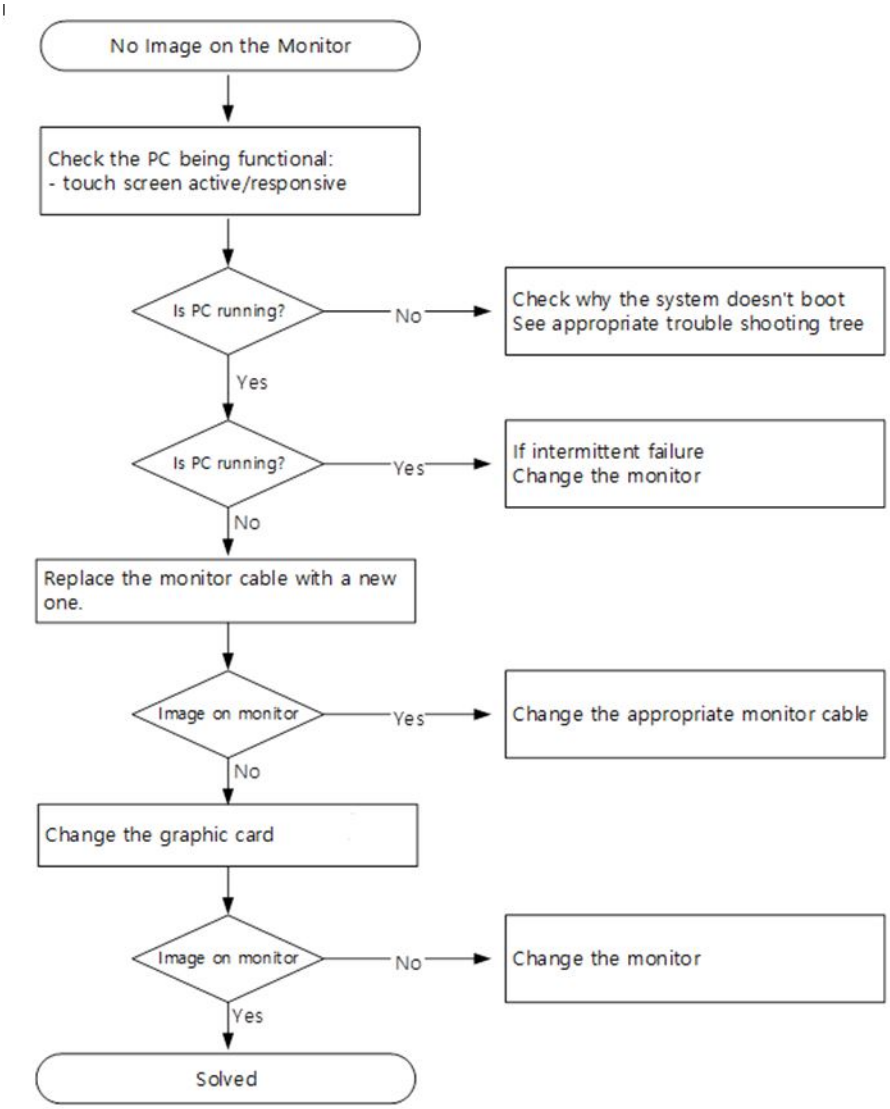


Figure 7-47: No Image on the Main Monitor

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7.8.3 No Doppler Audio Signal on Loudspeakers

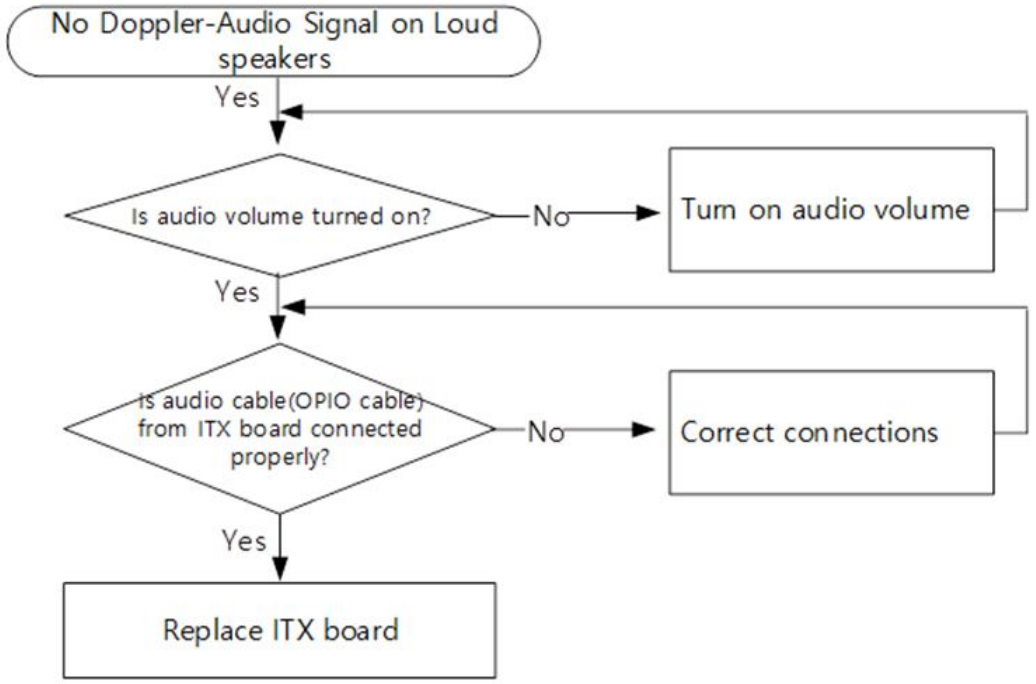


Figure 7-48: No Doppler Audio Signal on Loudspeakers

7.8.4 USB-driver not found after software reloading

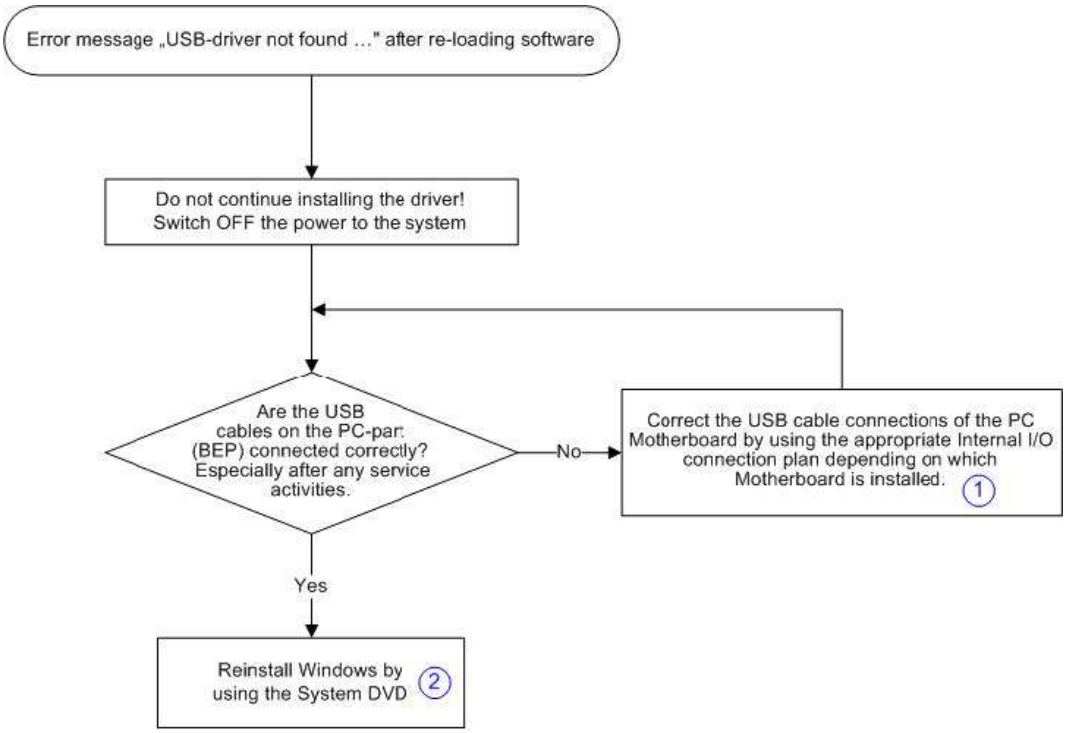


Figure 7-49: USB-driver not found after software reloading

7.8.5 Noise disturbs the Image

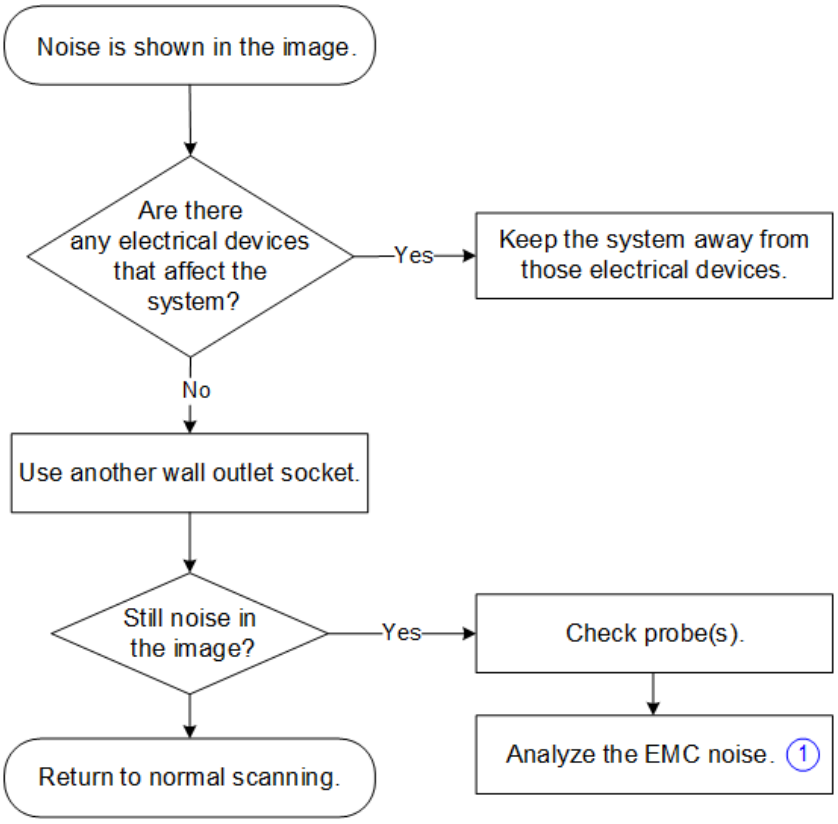


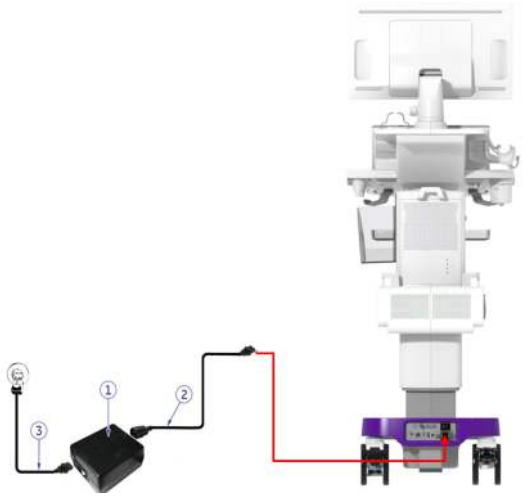
Figure 7-50: Noise disturbs the Image - Troubleshooting

1 *Section 7.8.5.1 "How to analyze the EMC noise" on page 7-48*

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7.8.5.1 How to analyze the EMC noise

1. Switch on the Voluson Performance 16/ Voluson Performance 18 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 Performance 16/ Voluson Performance 18 system like LAN/Ethernet, VGA, HDMI, DisplayPort, 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 Performance 16/ Voluson Performance 18 system. Connect the Power Filter between AC mains and the Voluson Performance 16/ Voluson Performance 18 system.



Note *Make sure, that:*

- *the Power Filter **(1)** is located behind (not under) the Voluson Performance 16/ Voluson Performance 18 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 Performance 16/ Voluson Performance 18 system.*
- *the AC mains power cable **(3)** is not located close to the short 1m Power Extension cord **(2)**.*

Figure 7-51: Power Filter - Connection Scheme

4. Switch on the Voluson Performance 16/ Voluson Performance 18 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 Performance 16/ Voluson Performance 18; perform step 2.) again.
6. Connect one by one other cords to the Voluson Performance 16/ Voluson Performance 18 system like LAN/Ethernet, VGA, HDMI, DisplayPort, S-Video, USB, ... and check for EMC noise.

If a stand-alone UPS (Uninterruptible Power Supply) is available to power the Voluson Performance 16/ Voluson Performance 18

Connect the UPS between AC mains and the Voluson Performance 16/ Voluson Performance 18 system in the same manner as shown in *Figure 7-51*; - instead of the stand-alone Power Filter.

1. Switch on the Voluson Performance 16/ Voluson Performance 18 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 Performance 16/ Voluson Performance 18 system like LAN/Ethernet, VGA, HDMI, DisplayPort, 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 Performance 16/ Voluson Performance 18; perform step 3.) again.

6. Connect one by one other cords to the Voluson Performance 16/ Voluson Performance 18 system like LAN/Ethernet, VGA, HDMI, DisplayPort, 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, 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.

7.8.6 Trackball Malfunction

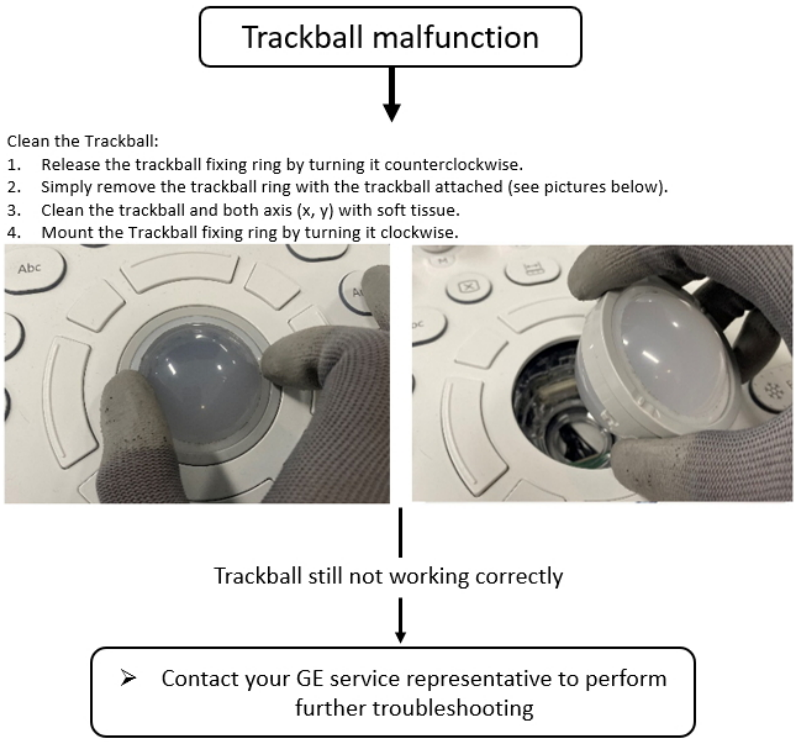


Figure 7-52: Trackball Malfunction - Troubleshooting

Connect a USB-Mouse to one of the USB-Connectors of the Voluson Performance 16/ Voluson Performance 18 system. So the system remains operable until the trackball problems are solved.

7.8.7 Printer Malfunction

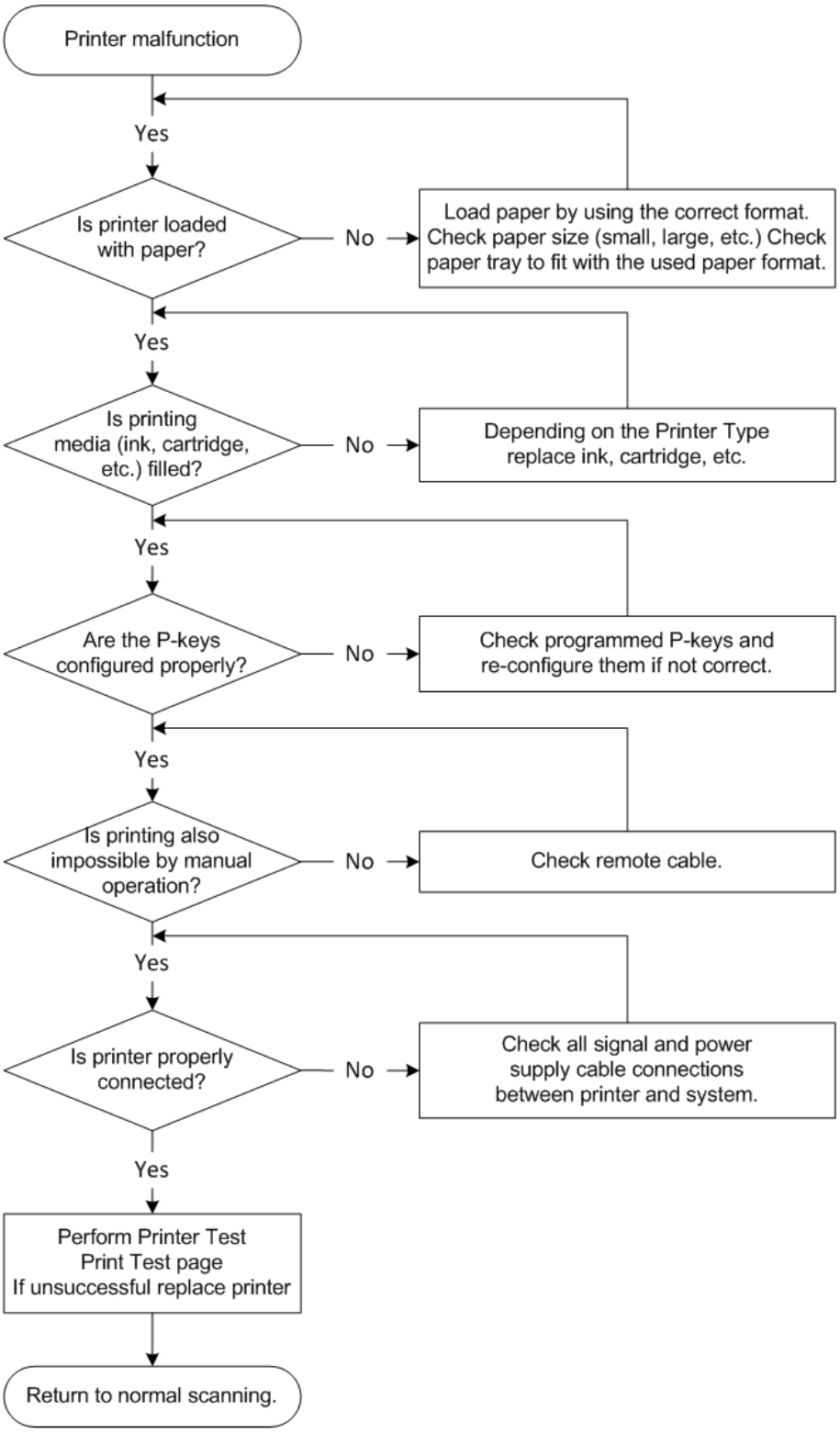


Figure 7-53: Printer Malfunction

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7.8.8 Monitor Troubleshooting

Fault symptom	Check these items
No image	Check the USB Type-C cable are properly connected to monitor.
	Check the HDMI and Power cable are properly connected to ITX Assy.
	Check no pins of the USB Type-C are bent.
Video test patterns are not clear, bright, parallel or square	Replace the monitor as described in *Section 6.2 "Monitor Adjustment" on page 6-2*

Note *For further details see Section 6.2 "Monitor Adjustment" on page 6-2.*

7.8.10 The "SW Download - eDelivery" icon won't appear/disappeared

There can be several reasons why the "Software Download - eDelivery" icon (green arrow at the right top of the monitor screen; see) won’t appear or disappeared:

- system is NOT entitled for Flexera-based “eDelivery” (Software Download)
- Permant key is not received from OAC
- bad or no RSvP connection
- Maintenance on the FlexeNet Operations production application
- software download “Decline” (even if done unintentionally)

Note *For "Workaround" procedures (e.g., when software download has been declined) see "#unique_420" and/or "Reset Declined Packages".*

Note *To avoid any delay it is highly recommended to create a SysSTICK (download SW content from Global Service Room) or order appropriate service part (from GPO) BEFORE planning the customer visit!*

7.8.10.2 Reset Declined Packages

1. Enter Service Desktop (Home - System Setup - Administration - Service - Servcie Desktop).
2. Select top-level menu ***Software Maintenance*** - Reset Delined Packages (A).
3. If available, check mark delined SW package (B).

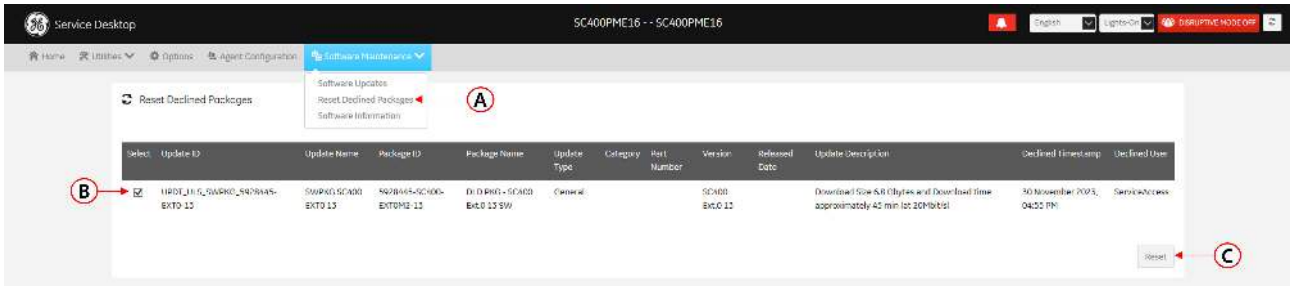


Figure 7-54: Service Desktop - Software Maintenance -> Software Updates

4. Click ***Reset*** (C) and confirm the dialog with ***OK***. Declined packages are reset successfully.
5. Proceed with *"#unique_420"*.

7.8.11 Network Troubleshooting

7.8.11.1 No Connection to the Network at all

	Cable disconnected or no network signal on a connected cable.
	Cable connected to a network.
	Remote connection.

1. Check that the network cable between the Voluson Performance 16/ Voluson Performance 18 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.

	WiFi disconnected.
	WiFi connected.
	Remote connection.

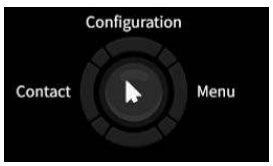
7.8.11.2 Email connection

	Email function is not configured.
	Email status: successfully sent (OK)
	Email status: not sent (fail)

7.8.11.3 Remote Service Connection

Note *Visual information about remote status is shown in the status area on the right top of the screen.*

Table 7-3: visual information about GE HealthCare remote status

	**Gray** = Idle State	Remote access is inactive.
		Move the cursor over the ***GE*** icon to show trackball functions • ***Contact*** : *Section 7.2 "Request for Service (RFS)" on page 7-6* • ***Configuration***: *Section 3.13.6 "RSvP Agent Configuration" on page 3-98* • ***Menu***: Displays the Remote Access menu *Figure 7-11 on page 7-13*
	**Yellow** = Access pending	Remote Access is active, but Disruptive Mode and Virtual Console Observation (VCO) are not yet enabled.
	**Red** = Disrupted State	Remote Access is active. All processes (Virtual Console Observation and Service Desktop) are active. In this state the Voluson Performance 16/ Voluson Performance 18 system should NOT be used clinically.

7.8.12 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 Performance 16/Voluson Performance 18 systems.

Cause: Activation servers of Microsoft are not reachable.

Solution:

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

Figure 7-55: License Status: NOTIFICATION => Windows is not activated

2. Make sure that the Voluson Performance 16/Voluson Performance 18 system is connected to the internet.
3. Contact your local IT department to make sure that inside your local network infrastructure activation

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7.8.13 RTC (Real-Time Clock) Error due to an empty CMOS Battery (set correct date & time)

Issue An empty or dead CMOS battery (located on the ITX board) is not always easy detected. As long as the Voluson Performance 16/ Voluson Performance 18 system is not completely disconnected from power, the system is supported by standby voltage.

If standby voltage is lost (e.g., after power outage or after pulling the main power cable for a certain period) and the battery is empty, the system automatically shuts down immediately after the next boot-up.

Note *BIOS system date and time is still lost. This is point out by a message that appears at every system restart.*

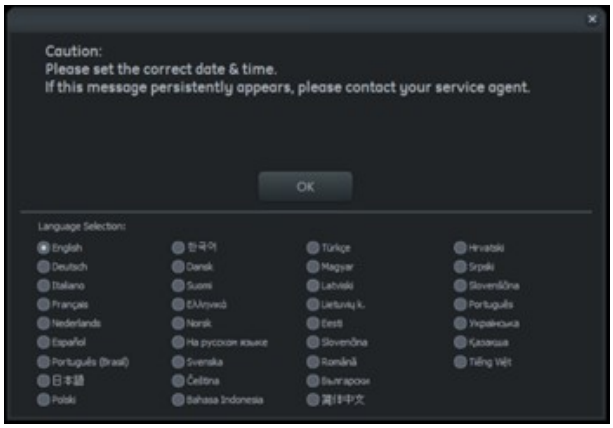


Figure 7-56: check/set correct date & time

Note: As long the error flag in BIOS is not reset, not only the message (see *Figure 7-56*) will appear, but also the System Date & Time is set to 2000/01/01 - 0:00 at every system bootup/restart. Setting the correct date & time is necessary to get accurate examination results.

Short-term Workaround Whenever the message appears, manually correct Date & Time in the Home → System Setup → Settings → General tab.

Long-term Solution Please contact your GE HealthCare service technician to replace the CMOS battery.

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Chapter 8

Replacement Procedures

This chapter contains replacement procedures for different modules and their subsystems.

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Warning



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

1. When installing boards, ESD may cause damage to a board. ALWAYS connect yourself, via an arm-wrist strap, to the ESD connection point located on the rear of the system (nearby 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.

8.1 Returning/Shipping System, Probes and Repair Parts

When returning or shipping the Voluson Performance 16/ Voluson Performance 18 system in the original packaging:

- the control console must be centered and locked
- system must be lowered to its minimum height with monitor flapped down

Note *For detailed description see Section 6.2.1 on page 6-3.*

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

GE HealthCare policy states that body fluids must be properly removed from any part or equipment prior to shipment. GE HealthCare 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 Performance 16/ Voluson Performance 18 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.

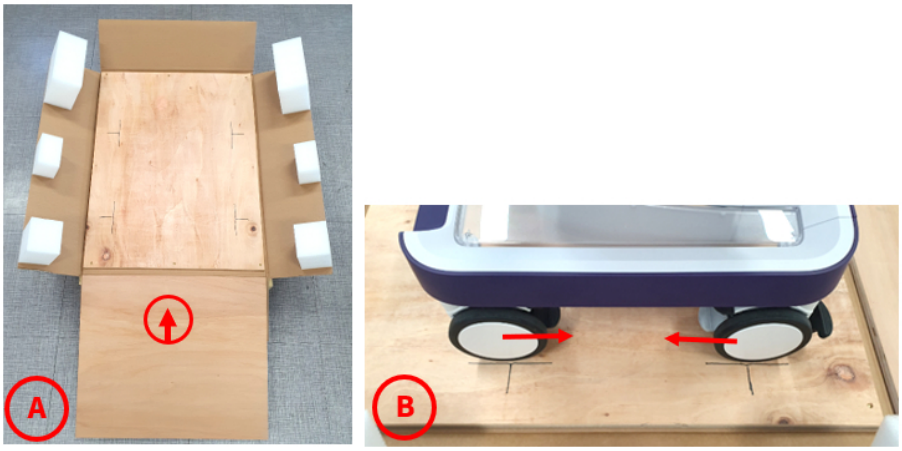
If the system is sent for repair, please ensure that any patient information is backed up and erased from the system before shipping. It is always possible during system failure and repair to lose patient data. GE HealthCare is not responsible for the loss of this data.

If PHI (Patient Healthcare Information) data needs to be sent to GE HealthCare employees for service purposes, GE HealthCare 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.

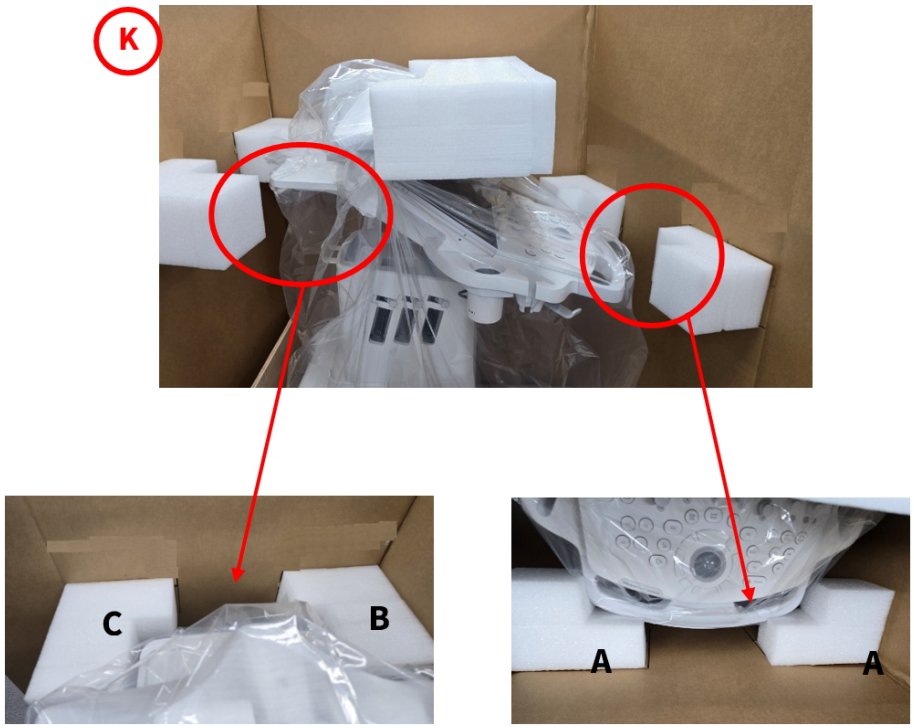
For brief repacking instructions refer to *Section 8.1.1 on page 8-4*.

8.1.1 Repacking the System

Note *Shipping the Voluson Performance 16/ Voluson Performance 18 ultrasound system in its original packaging is only possible when the control console is centered and locked in position, the system is lowered to its minimum height and the monitor is flapped down and locked. Refer to* *Section 6.2.1 "Preparing for Transport" on page 6-3.*

Step	Task
A	Place the system on the BOX BOTTOM ASSY **Note** *System front should face circled arrow direction.*
B	Position all four casters as shown in the image below, and then lock them in place. (Align the center of the caster with the center of the mark, as shown in the image below.) 
C	Adjust the system height to its lowest position. (Voluson Performance 18 Only) 

Step	Task
D, E	D: Lower the monitor to its lowest position. E: Cover the montior with the MONTIOR PROTECTION BAG.  
F G H	Cover the system with VINYL COVER. Place the OPTION BOX on the front of the footrest if required (OPTION BOX PE foam should face the BASE COVER). Cover the 4 sides of the BOX BOTTOM ASSY and tape around the box at least 2 turns as shown in the image below.   
I	Place the MONITOR PAD on the front side of the monitor as shown image below. 

Step	Task
J	Attach the PE foam using the top edge that is drawn on the OUTSLEEVE as a reference. 
K	Pack the system with the OUTSLEEVE. (Pad B, C should face the rear side of the system. Pad A should face the front side of the system.) 
L	Fix the OUTSLEEVE with 3 P-JOINTS.
M	Place the TOP COVER on the top of the package.
N	Place the HARDENED ON THE TOP of the package. 

Step	Task
O	Band the package like the image shown below. 

Caution

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

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8.2 System Software - Installation/Upgrade procedure

Important *SW Extension updates are only available with SW SPC410**Ext.1 and higher**. Therefore, SWI from Media and/or eDelivery (Software Download) is not possible at initial Ext.0 release.*

Introduction

There are different possibilities to update the system software.

1. via the ***SWI from Media*** button in the System Setup ***Service*** page; see *Section 8.2.2 on page 8-11*

   Software parts to be upgraded (e.g., Ultrasound Application Software, Service Software, MS patches, etc.) and installation time depend on contents of the used Media.

   PRECONDITIONS:

   - A new software specific "Permanent key" is required.
   - Media (usually a USB-Stick) containing the new **SW Ext. release package** (*.zip file) is required.

Note *Please contact your local distributor or GE HealthCare service representative to get necessary key and media.*

2. via ***eDelivery*** by downloading and installing a Software Update Package , See *Section 8.2.3 on page 8-14*

   Software parts to be upgraded (e.g., Ultrasound Application Software, Service Software, MS patches, etc.) and download/installation time depend on contents of the "SW Update Package".

   PRECONDITIONS:

   - Option **"Voluson eDelivery – Performance Series"** must be purchased and permanently activated at Home - System Setup - Administration - Options ; See *Section 8.2.1.2 "Check/Collect vital System Setup data" on page 8-9*
   - Proper internet connection
   - In case of Disk encryption enabled: system needs to be unlocked by Password, Recovery key or USB device with Unlock key.

Manpower

Once the Software Package is downloaded:

One person, approx. 1 hour (depends on installation procedure, software content, etc.)

Tools

- Media (usually a USB-Stick) **or**
- Flexera-based "eDelivery" (Software Download) option active
- Ultrasound Multipurpose Phantom*(if available)

8.2.1 Before the Software Installation/Upgrade Procedure

Before performing the Software Upgrade:

1. Backup all presets and database; see: *Section 4.4.1 on page 4-13*.

Note *No preset changes are expected since only the Application Software is updated. However, it is always best practice to ensure patient data and presets are backed up before proceeding with software installation.*

2. Perform initial verification of the system and its functions.
3. Check/Collect vital System Setup data; see *Section 8.2.1.2 on page 8-9*, such as:
   - Application Software version
   - installed Options
   - Wi-Fi Auto Connect status
   - status of "Advanced Security Features" (Whitelisting and Disk Encryption)

Caution: If the option "Advanced Security Features" is active at the Voluson Performance 16/ Voluson Performance 18 system

Whitelisting	**Check "Whitelisting" status.** If Whitelisting is active, it needs to be re-activated after the upgrade.
Disk Encryption	**The 48-digit "Recovery key" needs to be saved, noted, or print out BEFORE starting** any SW Loading, Recovering or Initializing procedure! **Note:** Without the "Recovery key" or the user defined Password, it is not possible to perform any modification. A USB device with unlock key may not be recognized during the installation.

4. **Disconnect any unessential external USB media devices** (also the USB device with Unlock key) as this might interfere with the recovery/installation procedure. Please keep printers, LAN cable and Wi-Fi in case of usage active and connected.
5. **ONLY** if the currently installed software has to be upgraded to a higher version via ***SWI from Media***:
   a. A new software specific "Permanent key" is required..
   b. Media (usually a USB-Stick) containing the new **SW Ext. release package** (*.zip file) is required.

Note *Please contact your local distributor or GE HealthCare service representative to get necessary key and media.*

8.2.1.2 Check/Collect vital System Setup data

1. Select the ***Home*** button at the Left Toolbar.
2. In the "Home" menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
3. Select ***Security***.
4. If available, click the ***Disk Encryption*** tab.
   - Select media and click the ***Save to USB*** button **(A)** to save the unlock key to an external USB device.
   - Choose any connected printer from the pull-down menu and click ***Print recovery key*** **(B)**.

Note *If printing is not possible, it is **required to write down the 48-digit "Recovery key"!** A USB device with unlock key may not be recognized during the installation.*

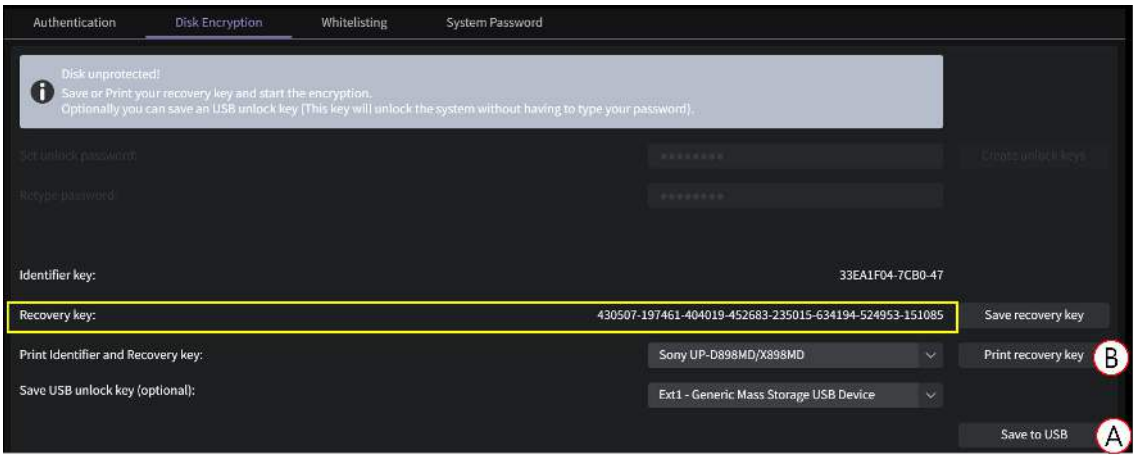


Figure 8-1: System Setup - Security - Disk Encryption

5. If available, click the ***Whitelisting*** tab and check whether Whitelisting is active or inactive.

6. Click the ***System Info*** tab and check the currently installed Software version of the system.

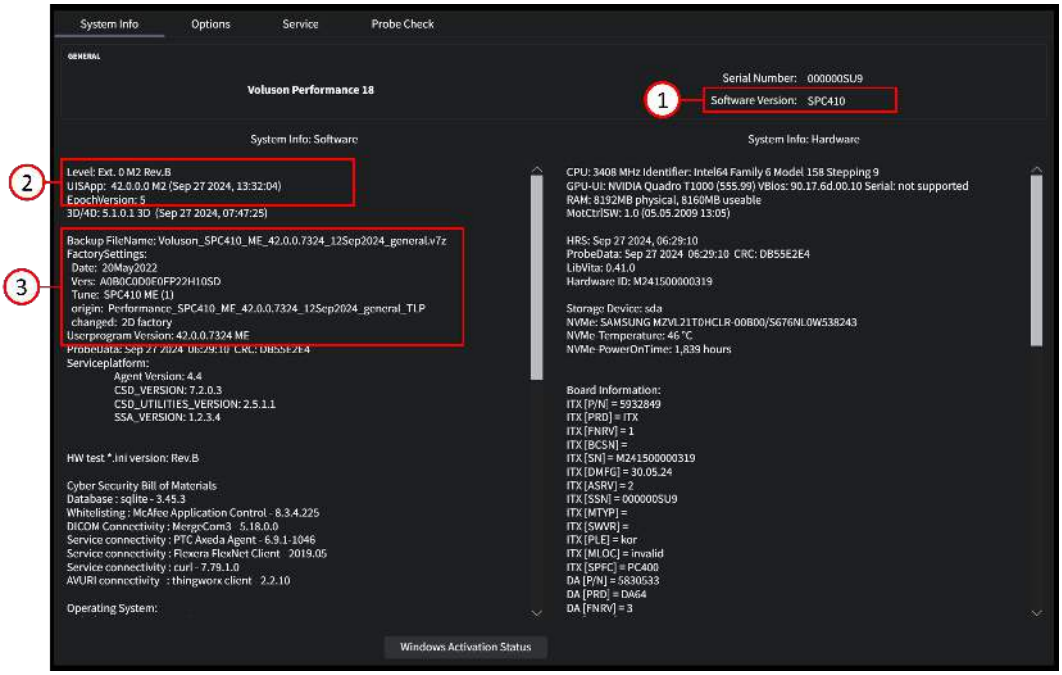


Figure 8-2: Version check: System Setup - Administration - System Info page

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

7. Click the ***Options*** 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 8-3: 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	Service Key (expire date is shown in the "Valid" column)
4	Permanent Key

8. Select ***Connectivity*** and then click the ***Device Setup*** tab.
9. Click the ***WLAN Configuration*** button.
10. Check if "Connect Automatically" is checked.

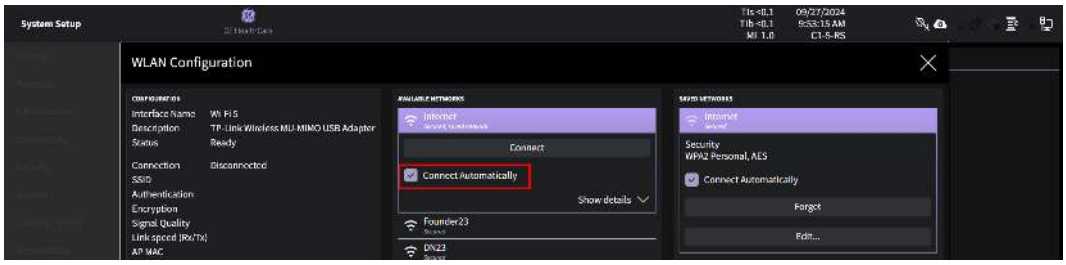


Figure 8-4: Wi-Fi Auto Connect (System Setup - Connectivity - Device Setup - WLAN Configuration)

11. If the software has to be upgraded to a higher version via the ***SWI from Media*** button, please contact your local distributor or GE HealthCare service representative.
12. Proceed with proper installation procedure :
    - *"SWI from Media - System Software Installation" on page 8-11*
    - *" eDelivery - Software Download and Installation of a SW Update Package" on page 8-14*

8.2.2 SWI from Media - System Software Installation

Be sure to have the media containing the new **SW Ext. release package** (*.zip file) and the new **Permanent Key** available before starting the installation.

Please contact your local GE HealthCare service/sales representative.

Important *SW Extension updates are only available with SW SC4xx Ext.1 and higher. Therefore, SWI from Media and/or eDelivery (Software Download) is not possible at initial Ext.0 release. Typically installation and testing will take approx. 45 minutes. DO NOT interrupt the installation process!*

1. *"Check/Collect vital System Setup data" on page 8-9* as described in *Section 8.2.1.2 on page 8-9*.
2. If not already done, disconnect any unessential external USB media devices (HDD and USB sticks). Please keep printers, LAN cable and Wi-Fi in case of usage active and connected.
3. Connect the media (usually a USB-Stick) containing new SW Ext. release package (*.zip file).
4. Select the ***Home*** button at the Left Toolbar.
5. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
6. Select ***Administration*** and then click the ***Service*** tab.
7. Choose the media (e.g., External USB Drives) and then select the proper ****.zip*** file from the media.

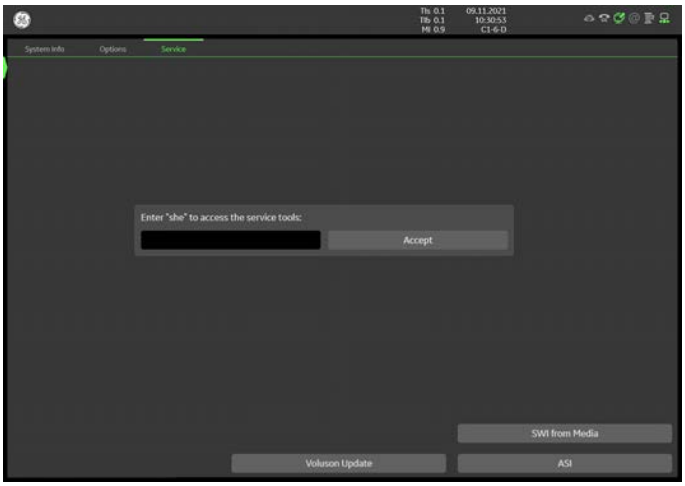


Figure 8-5: Service Tools

8. Verify ****.zip*** selection and then click ***Install***.

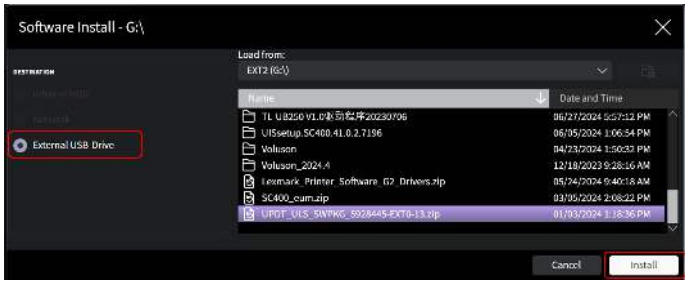


Figure 8-6: select media and choose proper SW installation ".zip" file*

9. Check the information and configuration are recorded and click *Ok*.

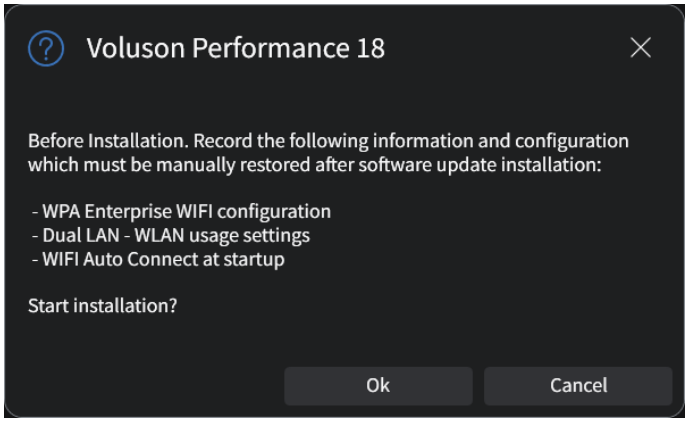


Figure 8-7: click Install and enter appropriate Permanent Key (image shows fictional number)

10. Enter the appropriate “Permanent Key” (calculated in OAC) and confirm with *Ok*. During the occurring latency the SW package is copied to the internal HDD. Please wait …

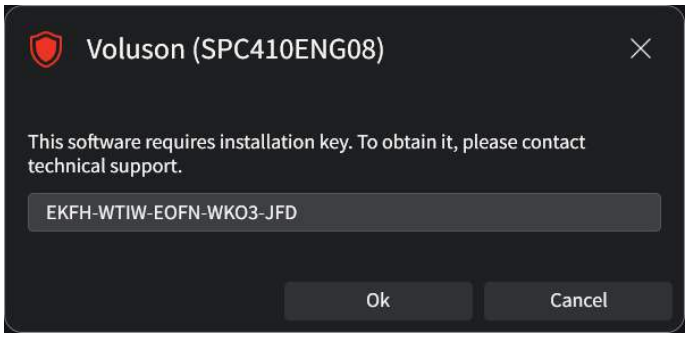


Figure 8-8: click Install and enter appropriate Permanent Key (image shows fictional number)

11. Enter the appropriate “Permanent Key” and confirm with *OK*.

    During the occuring latency the SW package is copied to the internal HDD. Please wait ...

12. If not already done, remove **all** USB media devices (also the one containing the SW installation **.zip* file) and confirm the message with *OK*.

    The system saves a Configuration Backup in silent mode on R:\.

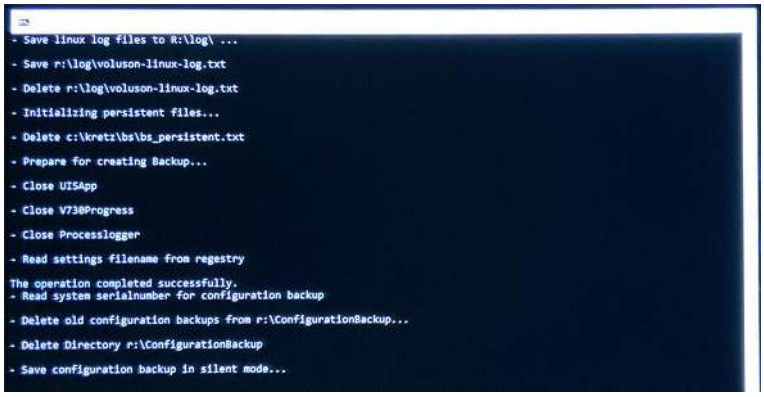


Figure 8-9: save configuration backup

    A silent “Rollback” image from C:\ is stored on R:\. After executing all LINUX commands, the Voluson Performance 16/ Voluson Performance 18 system reboots again.

13. Updating will take some time …
14. Please wait until all processes are finished.

15. Finally, 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 will reboot several times!***

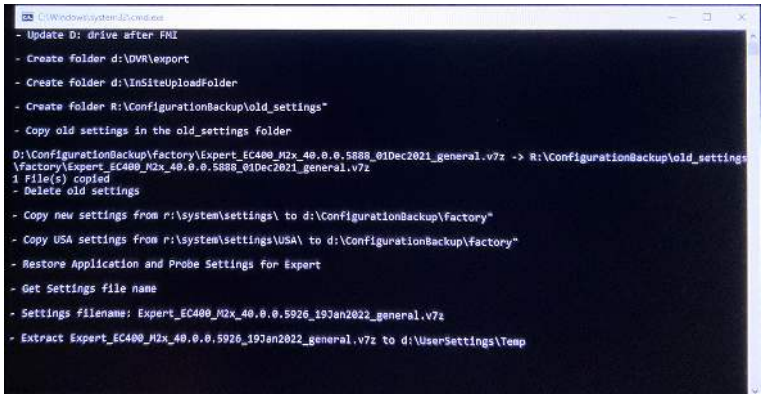
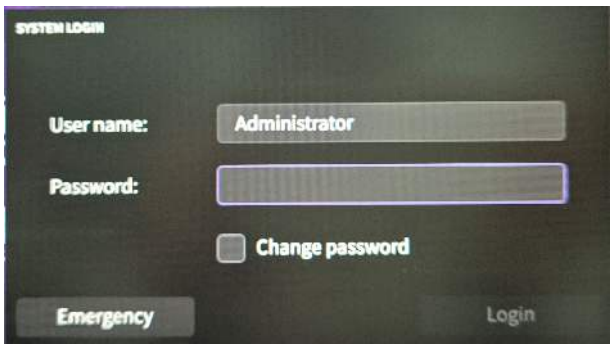


Figure 8-10: automated processes are running

16. Please wait until all processes are finished.

17. If the "System Login" window appears during boot up, enter **User Name** and **Password** and click ***Login***.



18. Finally the 2D screen is displayed on the monitor.

19. If the Touchpanel 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.*

20. Perform Software and Functional checks as described in *Section 8.3 on page 8-18*.

If you are, for any reason, not satisfied with the new software, "**Rollback**" the installation (restore the previously used system configuration). For more detailed information, see *Section 5.17.4 on page 5-48*. After a "Rollback" the system is operable like before the software update.

8.2.3 eDelivery - Software Download and Installation of a SW Update Package

Important *SW Extension updates are only available with SW SPC4xx **Ext.1 and higher**. Therefore, SWI from Media and/or eDelivery (Software Download) is not possible at initial Ext.0 release.*

Note *Download time will vary. It depends on "SW Update Package" size and Internet connection speed. Process may take up to one hour and should not be interrupted.*

Note *Installation is almost automated and can be started whenever desired by the customer. Typically installation and testing will take approximately 45 minutes. DO NOT interrupt the installation process!*

Note *To keep the interruption time to a minimum, we recommend to start the download/installation process **after customers business hours**. Software verification and basic functional checks are recommended afterwards.*

System software installation starts with saving and recording the settings present on the system (silent “Configuration Backup" and "Rollback”). Then the new software is written to the hard disk. Application Settings are automatically updated, to match with new Software version.

Requirements for eDelivery (Software Download)

- Option" Voluson eDelivery"must be purchased and permanently activated at Home - System Setup - Administration - Options; see *Figure 8-3 on page 8-10*
- Voluson Performance Series system must to be mapped in Flexera and entitled for Software Download.
- Properinternet connection between the Voluson Performance Series system and the SW download server.
- RSvPconnection has to be configured and checked out, see: *Section 3.13.6 on page 3-98*.
- FlexeraURLs that need to be whitelisted at the site.
- In case of Disk encryption enabled : systemneeds to be unlocked by Password, Recovery key or USB device with Unlock key.

Note *Software download (eDelivery) via wireless **WPAx-Enterprise** connection is **NOT SUPPORTED**. Please use wirednetwork connection (use LAN-cable).*

How to know if a SW Update Package is available for download and installation

Once the “Software Download - eDelivery” icon (see *Figure 8-11 below*) pops-up, end users can download the“SW Update Package” using their browser and start the installation whenever preferred by means of the:

- "SW Download - eDelivery" icon (green arrow at the right top of the monitor screen) →***Download***

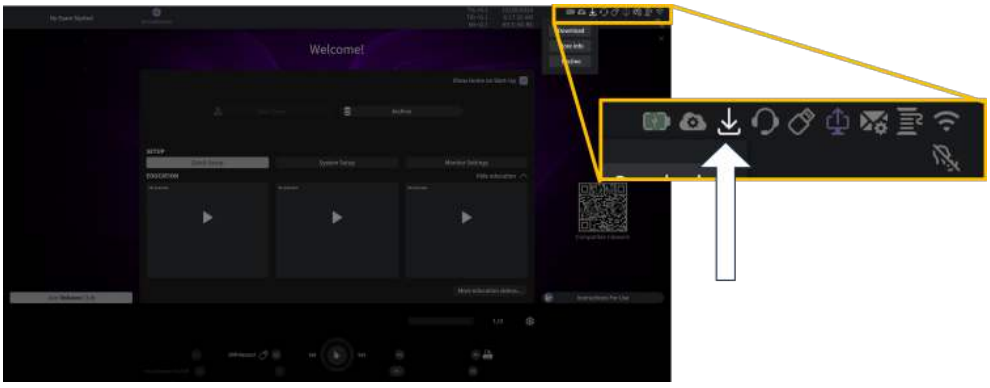


Figure 8-11: "SW Download - eDelivery" icon on right top of the screen

Download	starts the SW download process
More Info	displays detailed SW info
Decline	SW update is discarded and **not available anymore**. To reset a declined SW update package

- ***Download*** button at Shutdown menu on the screen.

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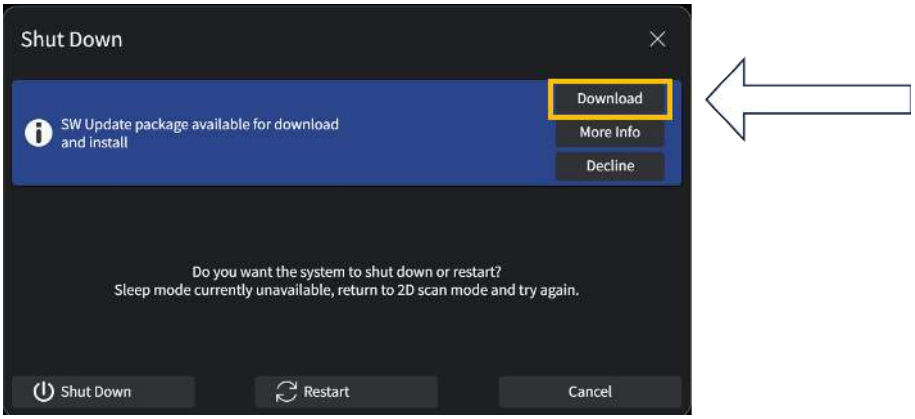


Figure 8-12: Download button at shutdown menu on screen

Note *If the option "Voluson eDelivery " is permanently activated, but the "Software Download - eDelivery" icon won´t appear/disappeared, perform troubleshooting as described in* *Section 7.8.10 on page 7-52*

Software Update Procedure

1. "Check/Collect vital System Setup data" *Section 8.2.1 on page 8-9*.
2. If not already done, disconnect any unessential external USB media devices (HDD and USB sticks). Please keep printers, LAN cable and Wi-Fi in case of usage active and connected.

Note *Software download (eDelivery) via wireless WPAx-Enterprise connection is NOT SUPPORTED. Please use wired network connection (use LAN-cable).*

3. Once assigned, press the ON/OFF standby button on the control console.
4. In the displayed screen, Click ***Download***.

Note *Alternatively, click the "SW Download - eDelivery" icon on the monitor screen followed by Download.*

5. If preferred, check mark Shut down after download is finished or Install after download is finished in the "SW Update Status" screen.

Note *If the Disk is encrypted (protected), the system needs to be unlocked by Password, Recovery key or USB device with unlock key. In this case, it is not recommended to check "Install after download is finished".*

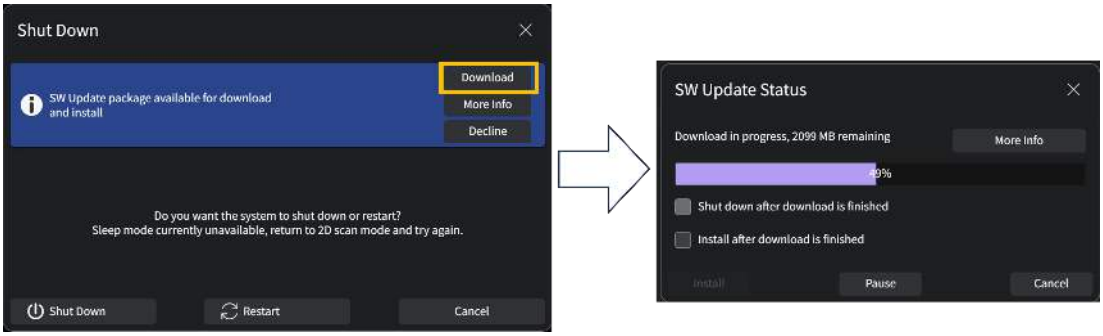
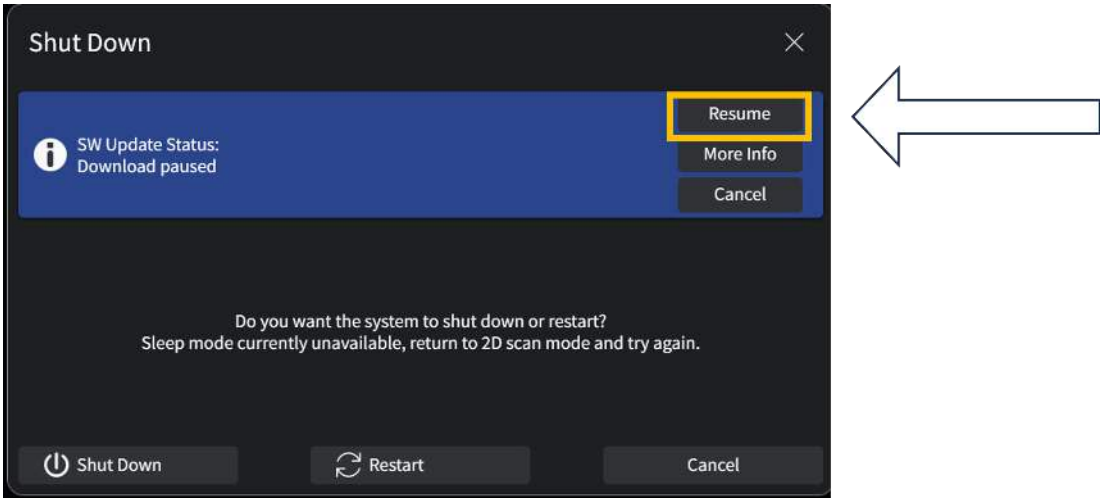


Figure 8-13: download SW update package

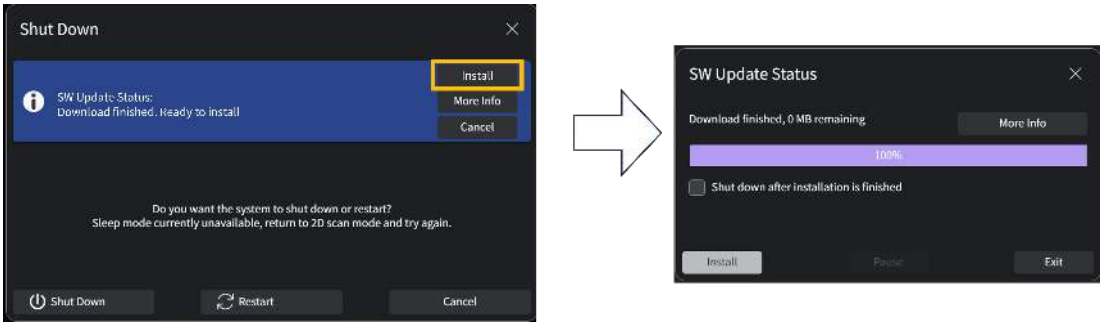
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6. Download may take up to one hour; please wait. (Download may be paused, but is not recommended, by means of the ***Pause*** button.)



7. When download is finished, click ***Install***.

Note *If it is preferred to install the new software later, click **Exit**. Installation can be resumed by clicking **Install** (in the Shutdown window).*



Note

DO NOT turn off the system or unplug power cord while SW installation is in progress! Power loss of the Voluson console may lead to issues with the Software configuration and result in a Software damage.

8. After clicking ***Install***, the SW update procedure starts.

   The system saves a Configuration Backup in silent mode on R:\.

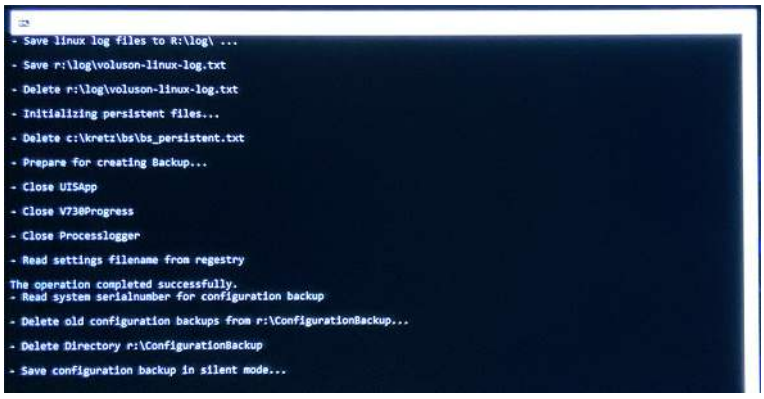


Figure 8-14: save configuration backup

9. Check disk is performed automatically - restart.

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

10. Updating will take some time ....

    First the image is saved to R:\ (*Saving NTSF to image ....*); then the image is restored from R:\ (*Restoring NTFS from image ....*).

11. Please wait until all processes are finished.

12. Finally, 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!***

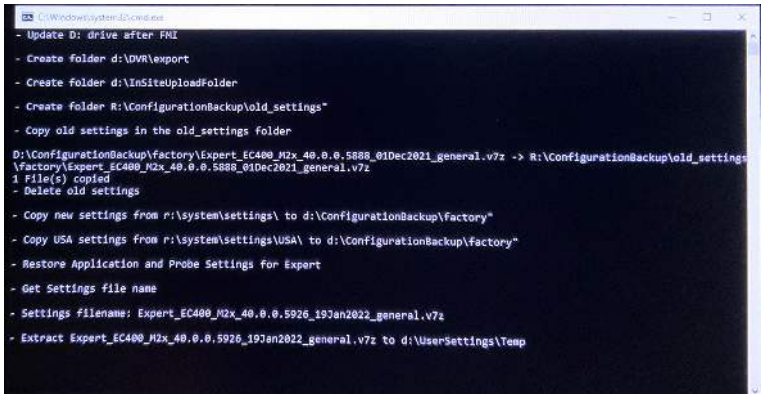
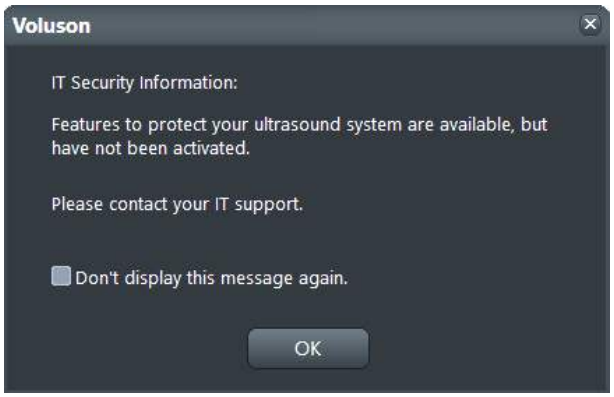


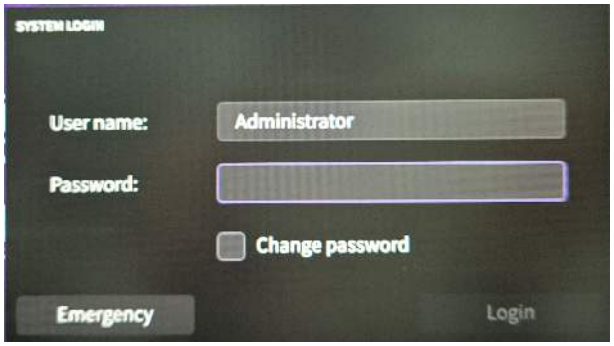
Figure 8-15: automatic processes are running

13. Please wait until all processes are finished.

14. If the message "IT Security information....."[5] appears, decide whether it is desired to display this message again, then click ***OK***.



15. If the "System Login" window appears during boot up, enter **User Name** and **Password** and click ***Login***.



16. Finally, the 2D screen is displayed on the monitor.

17. Perform Software and Functional checks as described in *Section 8.3 on page 8-18*.

If you are, for any reason, not satisfied with the new software, "**Rollback**" the installation (restore the previously used system configuration). For more detailed information, see *Section 5.17.4 on page 5-48*. After a "Rollback" the system is operable like before the software update.

[5] The message “IT Security information ...” appears at every bootup, as long as the option “Advanced Security Features” is enabled, but either “Whitelisting” or “Disk Encryption” or both, are not activated at the system.

8.3 Software and Functional Checks after Installation/Upgrade Procedure

1. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
3. Select ***Settings*** and then click the ***General*** tab to check/correct system Date & Time.
4. Select ***Administration*** and then click the ***Options*** tab.
5. Verify the correct settings of the *Options* page; see: .
6. Select the ***System Info*** tab.

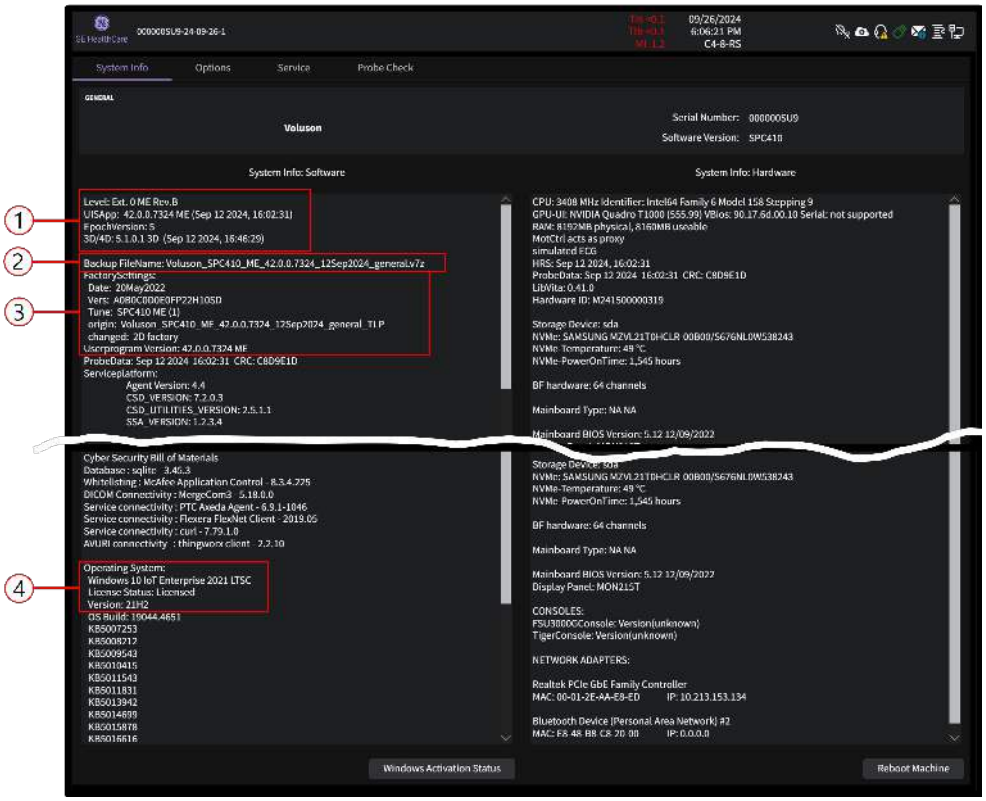


Figure 8-16: System Setup - Administration - System Info page (example)

1	Ultrasound **Application Software version**	3	Factory Settings such as Tune- and **User program version**
2	Backup File Name	4	Operating System and its License Status

7. Check that the Application Software version shows the correct Software Level Ext.**#**.
8. Check that the User program version match the Application Software version.

Note *If the Tune version does not match the Application Software version, an important information appears whenever booting up the system. In this case, it is essential to load the **proper Application Settings**, adapted for the installed software version. Refer to: Section 5.15.3.16 "Load Application Settings" on page 5-46.*

9. Move the scroll bar downwards and check the Windows Operating System License Status.
   - License Status ***Licensed***: Windows is properly activated.
   - License Status ***Notification***: Windows is not activated.

     Physically connect the Voluson system to the internet; usually activation is done automatically. In the very rare case that license status is still not "Licensed" automatically, activate Windows as described in .
10. Check and match settings of all other system setup pages.
11. Click the ***Save&Exit*** button to store settings and exit the Setup desktop screen.
12. If the option “**Advanced Security Features**” is enabled, activate/re-activate its features.
    - “**Whitelisting**”: Select *System Setup - Security - Whitelisting* → enter user defined password, verify password and then click ***Activate***. Restart the system to finalize the activation of Whitelisting.
    - “**Disk Encryption**”: Select *System Setup - Security - Disk Encryption* → set unlock password and then click ***Create unlock keys***. Finally click the ***Start Encryption*** button.
13. Select ***Connectivity*** and then click the ***Device Setup*** tab.

14. Click the ***WLAN Configuration*** button.
15. Set Wi-Fi Auto Connect status as it was before the upgrade (e.g., check mark "Connect Automatically").
16. Perform basic checks of all modes and features to ensure system is functioning normally.
17. Check Service Connectivity; if required, perform Checkout. i.e., Service platform has to be configured properly; see *Section 3.13.6 "RSvP Agent Configuration" on page 3-98*.

Note *If a Network Color Laser Printer (e.g., HP LaserJet M454) was installed before the upgrade, it might be required to reinstall/readjust this printer as described in Section 3.6.3 on page 3-35. The printer driver is available on the internal hard disk (R:\system\periph\HP_Laserjet_400).*

8.4 System Configuration Backup - Loading Procedure

Introduction

The Configuration Backup contains "Imaging" and "Configuration" data and settings.

Note *For more detailed description of Configuration Backup items, see Section 4.4.2 "Load System Configuration Backup" on page 4-15.*

Loading Procedure

see: *Section 4.4.2 "Load System Configuration Backup" on page 4-15*

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8.5 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 4.4.4.2 "Load Image Archive" on page 4-21*

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8.6 Replacement or Activation of Options

Note *For a list of available SW options and detailed description, refer to* *Section 5.1.2 "Description of Software Options" on page 5-10*



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.

8.6.1 How to activate Options

1. Select the ***Home*** button at the Left Toolbar.
2. In the “Home” menu touch the ***System Setup*** button to invoke the setup desktop on the screen.
3. Select ***Administration*** and then click the ***Option*** tab.

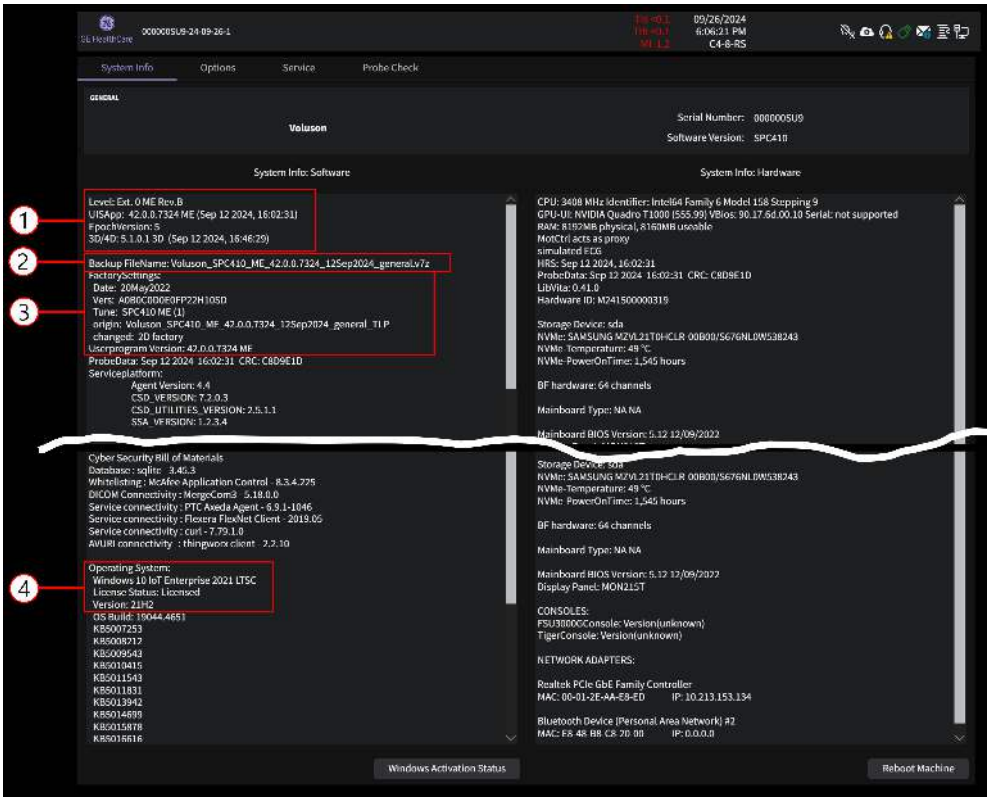


Figure 8-17: System Setup - Administration - Options page

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	Service Key
3	Demo Key
4	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 key.
6. Enter the encrypted 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 Performance 16/ Voluson Performance 18 system.*

Note ***How to check for Option Update***

*Click **Check for update** to establish a connection to OAC and check remotely if a new option key is available*

Option Update is only eligible for Permanent keys and not for Service or Demo keys. Service platform (RSvP connection) has to be configured and checked out, see: Section 3.13.6 "RSvP Agent Configuration" on page 3-98.

8.7 Replacement of a Probe

Manpower

One person, approx. 15 minutes

Tools

none

After the Probe Replacement

1. Inspect the new probe for wear or tear on the lens, housing, cable and locking mechanism. Look for bent or damaged connector pins on the connector.
2. Power On/Boot Up the system as described in *Section 4.2.1 on page 4-3*
3. Connect the new probe and verify that the Voluson Performance 16/ Voluson Performance 18 system properly recognizes the probe.
4. Verify that the issue with the old probe has been resolved. It is recommended to perform the following functional tests to confirm the new probe is operational.

Item	Functional Test & Expected Result
Probe Check	Perform **Probe Check** as described in *Section 3.7.2 on page 3-61*. Expected result: Probe Check passed.
2D Mode Quality	Start a proper program and record a 2D image. Expected result: Regular and homogenous 2D image.
Receiver Frequency	Switch the Receiver Frequency range. Expected result: No disturbances in the 2D image during changing the Receiver Frequency.
M Mode	Start a proper program, adjust the M cursor (vessel) and activate the M Mode. Change the M Mode sweep speed. After Freeze, move the Trackball to recall the stored sequence. Expected result: M Cursor agrees with vessel. Cine loop is displayed.
Triplex Mode	Start a proper program and switch on the CFM- and the PW Mode. Adjust the Doppler Cursor and press the Trackball key to activate the Triplex-Mode. Expected result: No disturbances in the 2D/Color and the Doppler image.
Volume Mode	Volume Probes only: Start 3D/4D Mode and perform Volume acquisition. Expected result: Continuous Volume Acquisition (without any “jumps”) and smooth echo shape with clearly defined image edge.

In case of any issues please contact your local service/sales representative.

8.8 Replacement of the BASE TRAY

Manpower

One person, 1 minutes

Tools

None

8.8.1 BASE TRAY - Removal Procedure

1. Remove the BASE TRAY by pushing out from the bottom.

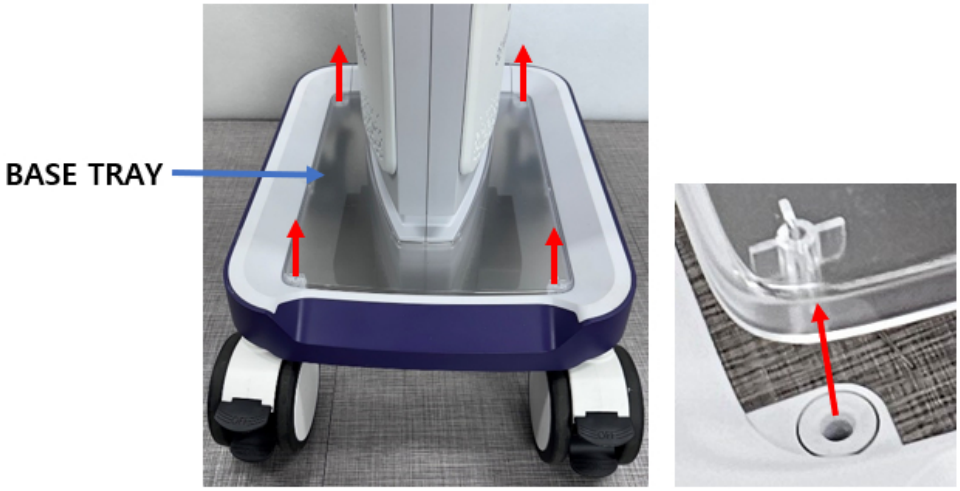


Figure 8-18: Removing the BASE TRAY

8.8.2 BASE TRAY - Installation Procedure

1. Parts to be installed in reverse order of removal
2. Perform : *"Functional Checks after FRU replacement (Debrief Guidelines)" on page 8-49*

8.9 Replacement of the BASE TRAY RUBBER

Manpower

One person, 5 minutes

Tools

None

Preparations

1. Remove the BASE TRAY as described *Section 8.8.1 "BASE TRAY - Removal Procedure" on page 8-25*

8.9.1 BASE TRAY RUBBER - Removal Procedure

1. Pull the BASE TRAY RUBBER to remove it from the BASE COVER ASSY.

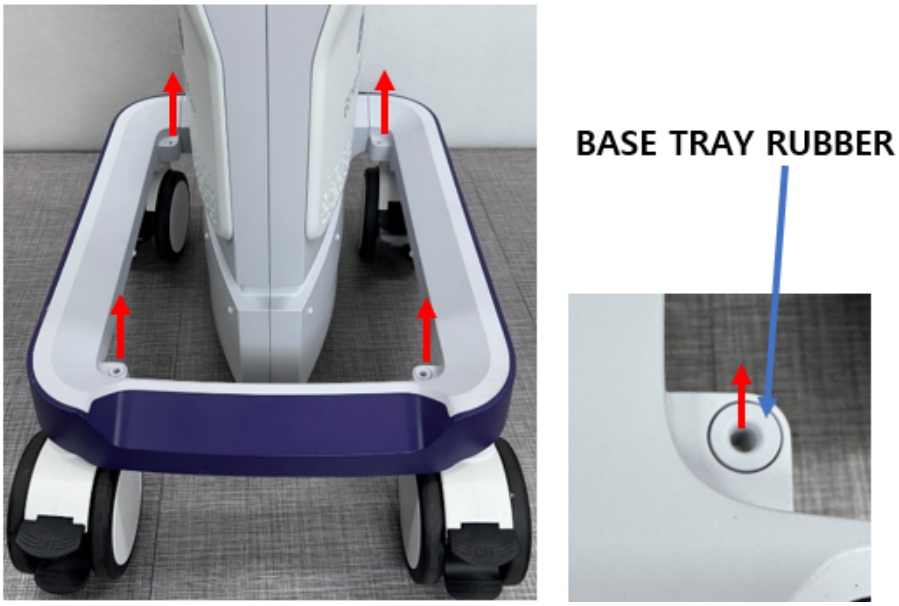


Figure 8-19: Removing the BASE TRAY RUBBER

8.9.2 BASE TRAY RUBBER - Installation Procedure

1. Parts to be installed in reverse order of removal
2. Perform : *"Functional Checks after FRU replacement (Debrief Guidelines)" on page 8-49*

8.10 Replacement of the IO TOP COVER ASSY-SP

Manpower

One person, 5 minutes

Tools

None

Preparations

1. Remove the BASE TRAY as described *Section 8.8.1 "BASE TRAY - Removal Procedure" on page 8-25*

8.10.1 IO TOP COVER ASSY-SP - Removal Procedure

1. Pull the IO TOP COVER ASSY-SP to remove it from the console.

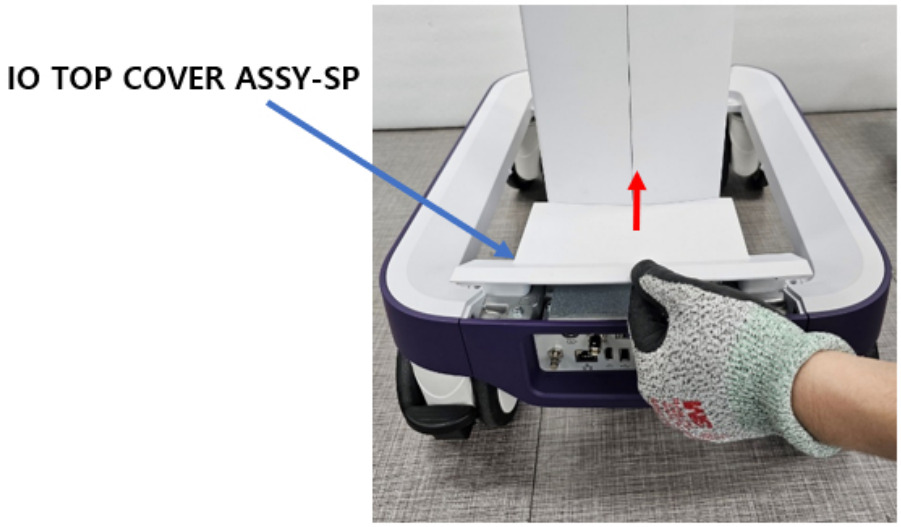


Figure 8-20: Removing the IO TOP COVER ASSY-SP

8.10.2 IO TOP COVER ASSY SP - Installation Procedure

1. Parts to be installed in reverse order of removal
2. Perform : *"Functional Checks after FRU replacement (Debrief Guidelines)" on page 8-49*

8.11 Replacement of the IO FRONT COVER ASSY-SP

Manpower

One person, 5 minutes

Tools

Philips Screwdriver

Preparations

1. Remove the POWER CORD FIX BRACKET as described *"#unique_450"*
2. Remove the BASE TRAY as described *Section 8.8.1 "BASE TRAY - Removal Procedure" on page 8-25*

8.11.1 IO FRONT COVER ASSY-SP - Removal Procedure

1. Pull the IO FRONT COVER ASSY-SP to remove it from the console.



Figure 8-21: Removing the IO FRONT COVER ASSY-SP

8.11.2 IO FRONT COVER ASSY-SP - Installation Procedure

1. Parts to be installed in reverse order of removal
2. Perform : *"Functional Checks after FRU replacement (Debrief Guidelines)" on page 8-49*

8.12 Replacement of the BASE COVER ASSY

Manpower

One person, 10 minutes

Tools

Philips Screwdriver

Preparations

1. Remove the POWER CORD FIX BRACKET as described *"#unique_450"*
2. Remove the BASE TRAY as described *Section 8.8.1 "BASE TRAY - Removal Procedure" on page 8-25*
3. Remove the IO TOP COVER ASSY-SP as described *Section 8.10.1 "IO TOP COVER ASSY-SP - Removal Procedure" on page 8-27*
4. Remove the IO FRONT COVER ASSY-SP as described *Section 8.11.1 "IO FRONT COVER ASSY-SP - Removal Procedure" on page 8-28*

8.12.1 BASE COVER ASSY - Removal Procedure

1. Release 8 snap fits and pull the BASE COVER ASSY from the console.



Figure 8-22: Removing the BASE COVER ASSY

8.12.2 BASE COVER ASSY - Installation Procedure

1. Parts to be installed in reverse order of removal
2. Perform : *"Functional Checks after FRU replacement (Debrief Guidelines)" on page 8-49*

8.13 Replacement of the BASE REAR COVER ASSY-SP

Manpower

One person, 1 minutes

Tools

None

Preparations

None

8.13.1 BASE REAR COVER ASSY-SP - Removal Procedure

1. Pull the BASE REAR COVER ASSY-SP to remove it from the console.



Figure 8-23: Removing the BASE REAR COVER ASSY-SP

8.13.2 BASE REAR COVER ASSY-SP - Installation Procedure

1. Parts to be installed in reverse order of removal
2. Perform : *"Functional Checks after FRU replacement (Debrief Guidelines)" on page 8-49*

8.14 Replacement of the CONSOLE SIDE COVER R ASSY

Manpower

One person, 1 minutes

Tools

None

Preparations

None

8.14.1 CONSOLE SIDE COVER R ASSY - Removal Procedure

1. Pull the CONSOLE SIDE COVER R ASSY to remove it from the console.

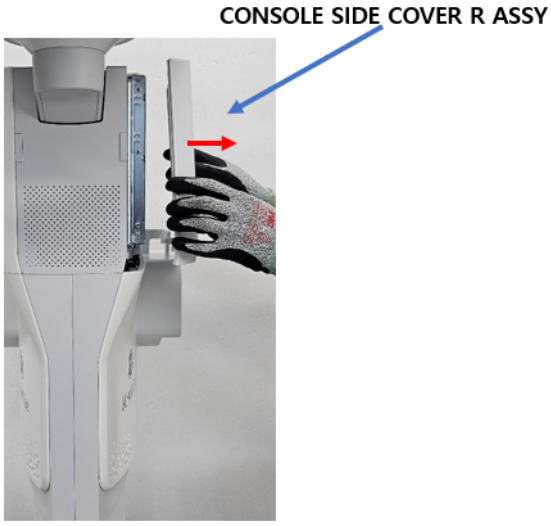


Figure 8-24: Removing the CONSOLE SIDE COVER R ASSY

8.14.2 CONSOLE SIDE COVER R ASSY - Installation Procedure

1. Parts to be installed in reverse order of removal
2. Perform : *"Functional Checks after FRU replacement (Debrief Guidelines)" on page 8-49*

8.15 Replacement of the CONSOLE SIDE COVER L ASSY

Manpower

One person, 1 minutes

Tools

None

Preparations

None

8.15.1 CONSOLE SIDE COVER L ASSY - Removal Procedure

1. Pull the CONSOLE SIDE COVER L ASSY to remove it from the console.

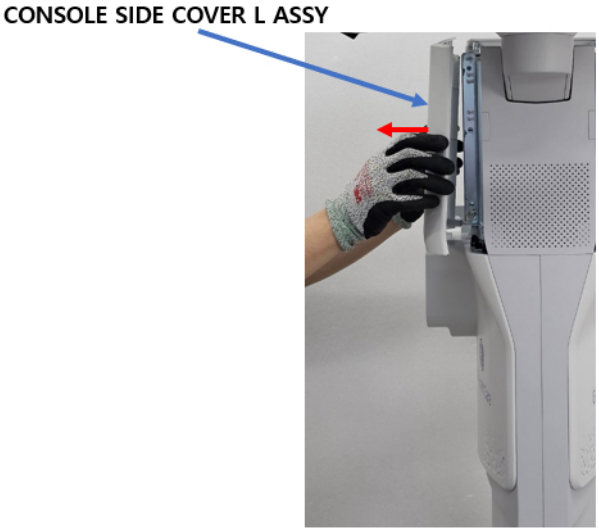


Figure 8-25: Removing the CONSOLE SIDE COVER L ASSY

8.15.2 CONSOLE SIDE COVER L ASSY - Installation Procedure

1. Parts to be installed in reverse order of removal
2. Perform : *"Functional Checks after FRU replacement (Debrief Guidelines)" on page 8-49*

8.16 Replacement of the CONSOLE FRONT COVER ASSY-SP

Manpower

One person, 5 minutes

Tools

None

Preparations

1. Remove the CONSOLE SIDE COVER R as described *Section 8.14.1 "CONSOLE SIDE COVER R ASSY - Removal Procedure" on page 8-31*

8.16.1 CONSOLE FRONT COVER ASSY-SP - Removal Procedure

1. Pull the CONSOLE FRONT COVER ASSY-SP from the console.



Figure 8-26: Removing the CONSOLE FRONT COVER ASSY-SP

8.16.2 CONSOLE FRONT COVER ASSY-SP - Installation Procedure

1. Parts to be installed in reverse order of removal
2. Perform : *"Functional Checks after FRU replacement (Debrief Guidelines)" on page 8-49*

Note *Make sure to assemble the AIR FILTER before assembling CONSOLE FRONT COVER ASSY-SP.*

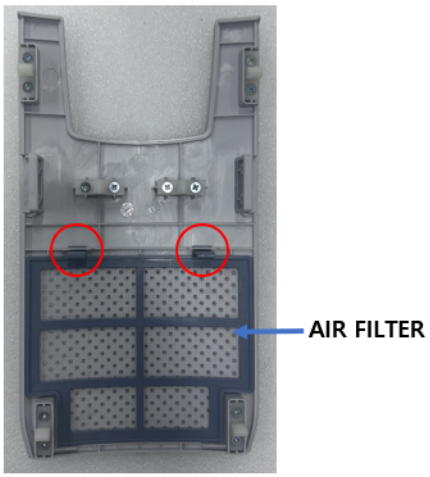


Figure 8-27: Assembling the AIR FILTER

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8.17 Replacement of the CONSOLE REAR COVER ASSY-SP

Manpower

One person, 5 minutes

Tools

None

Preparations

1. Remove the CONSOLE SIDE COVER R as described *Section 8.14.1 "CONSOLE SIDE COVER R ASSY - Removal Procedure" on page 8-31*

8.17.1 CONSOLE REAR COVER ASSY-SP - Removal Procedure

1. Pull the CONSOLE REAR COVER ASSY-SP from the console



Figure 8-28: Removing the CONSOLE REAR COVER ASSY-SP

8.17.2 CONSOLE REAR COVER ASSY-SP - Installation Procedure

1. Parts to be installed in reverse order of removal
2. Perform : *"Functional Checks after FRU replacement (Debrief Guidelines)" on page 8-49*

8.18 Replacement of the CONSOLE TOP COVER ASSY-SP

Manpower

One person, 5 minutes

Tools

None

Preparations

1. Remove the CONSOLE SIDE COVER R as described *Section 8.14.1 "CONSOLE SIDE COVER R ASSY - Removal Procedure" on page 8-31*

8.18.1 CONSOLE TOP COVER ASSY-SP - Removal Procedure

1. Pull the CONSOLE TOP COVER ASSY-SP from the console.



Figure 8-29: Removing the CONSOLE TOP COVER ASSY-SP

8.18.2 CONSOLE TOP COVER ASSY-SP - Installation Procedure

1. Parts to be installed in reverse order of removal
2. Perform : *"Functional Checks after FRU replacement (Debrief Guidelines)" on page 8-49*

8.19 Replacement of the USB COVER

Manpower

One person, 5 minutes

Tools

None

Preparations

1. Remove the CONSOLE SIDE COVER R as described *Section 8.14.1 "CONSOLE SIDE COVER R ASSY - Removal Procedure" on page 8-31*
2. Remove the CONSOLE TOP COVER ASSY as described *Section 8.18.1 "CONSOLE TOP COVER ASSY-SP - Removal Procedure" on page 8-36*

8.19.1 USB COVER - Removal Procedure

1. Pull the USB COVER from the CONSOLE TOP COVER ASSY.



Figure 8-30: Removing the USB COVER

8.19.2 USB COVER - Installation Procedure

1. Parts to be installed in reverse order of removal
2. Perform : *"Functional Checks after FRU replacement (Debrief Guidelines)" on page 8-49*

8.20 Replacement of the SIDE BASKET DUMMY COVER

Manpower

One person, 5 minutes

Tools

None

Preparations

1. Remove the CONSOLE SIDE COVER R as described *Section 8.14.1 "CONSOLE SIDE COVER R ASSY - Removal Procedure" on page 8-31*
2. Remove the CONSOLE TOP COVER ASSY as described *Section 8.18.1 "CONSOLE TOP COVER ASSY-SP - Removal Procedure" on page 8-36*

8.20.1 SIDE BASKET DUMMY COVER - Removal Procedure

1. Pull the SIDE BASKET DUMMY COVER from the CONSOLE TOP COVER ASSY.

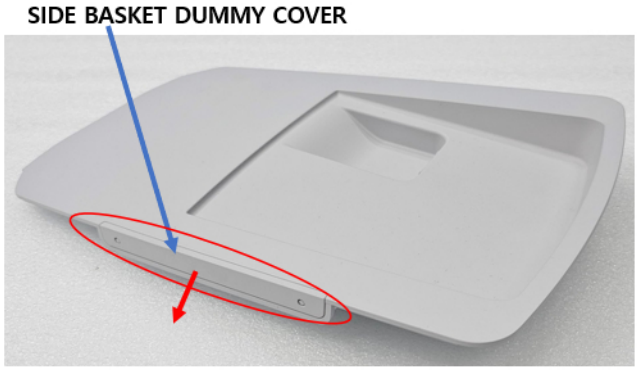


Figure 8-31: Removing the SIDE BASKET DUMMY COVER

8.20.2 SIDE BASKET DUMMY COVER - Installation Procedure

1. Parts to be installed in reverse order of removal
2. Perform : *"Functional Checks after FRU replacement (Debrief Guidelines)" on page 8-49*

8.21 Replacement of the FRONT DUMMY COVER

Manpower

One person, 5 minutes

Tools

None

Preparations

1. Remove the CONSOLE SIDE COVER R as described *Section 8.14.1 "CONSOLE SIDE COVER R ASSY - Removal Procedure" on page 8-31*
2. Remove the CONSOLE FRONT COVER ASSY as described *Section 8.16.1 "CONSOLE FRONT COVER ASSY-SP - Removal Procedure" on page 8-33*

8.21.1 FRONT DUMMY COVER - Removal Procedure

1. Release 4 snap fits to remove the FRONT DUMMY COVER from the CONSOLE FRONT COVER ASSY.

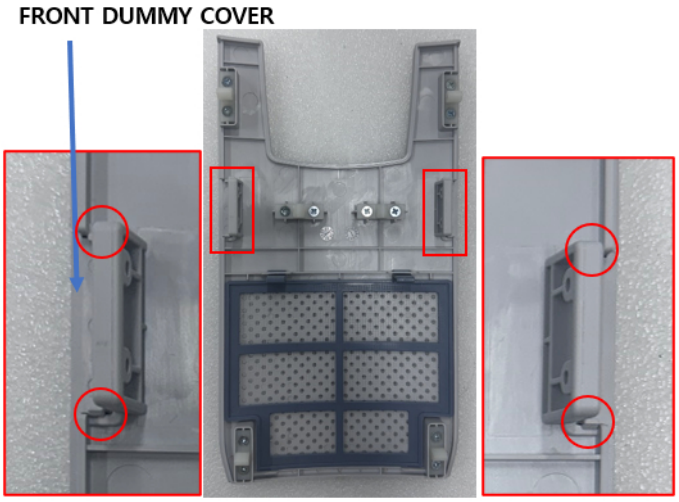


Figure 8-32: Removing the FRONT DUMMY COVER

8.21.2 FRONT DUMMY COVER - Installation Procedure

1. Parts to be installed in reverse order of removal
2. Perform : *"Functional Checks after FRU replacement (Debrief Guidelines)" on page 8-49*

8.22 Replacement of the AIR FILTER

Manpower

One person, 5 minutes

Tools

None

Preparations

1. Remove the CONSOLE SIDE COVER R as described *Section 8.14.1 "CONSOLE SIDE COVER R ASSY - Removal Procedure" on page 8-31*
2. Remove the CONSOLE FRONT COVER ASSY as described *Section 8.16.1 "CONSOLE FRONT COVER ASSY-SP - Removal Procedure" on page 8-33*

8.22.1 AIR FILTER - Removal Procedure

1. Release 2 snap fits to remove the AIR FILTER from the CONSOLE FRONT COVER ASSY.

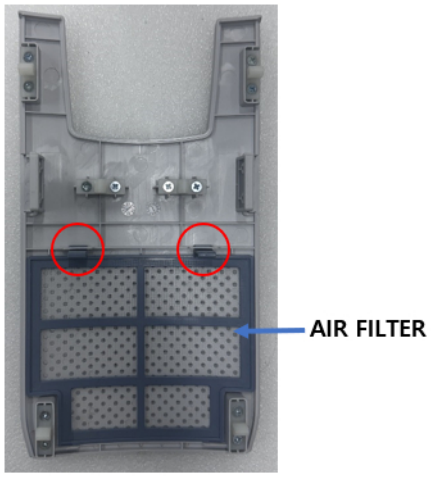


Figure 8-33: Removing the AIR FILTER

8.22.2 AIR FILTER - Installation Procedure

1. Parts to be installed in reverse order of removal
2. Perform : *"Functional Checks after FRU replacement (Debrief Guidelines)" on page 8-49*

8.23 Replacement of the OPIO TOP COVER SET-SP

Manpower

One person, 1 minutes

Tools

None

Preparations

None

8.23.1 OPIO TOP COVER SET-SP - Removal Procedure

1. Pull the OPIO TOP COVER L to remove from the console.



Figure 8-34: Removing the OPIO TOP COVER L

2. Pull the OPIO TOP COVER R to remove from the console.



Figure 8-35: Removing the OPIO TOP COVER R

8.23.2 OPIO TOP COVER SET-SP - Installation Procedure

1. Parts to be installed in reverse order of removal
2. Perform : *"Functional Checks after FRU replacement (Debrief Guidelines)" on page 8-49*

8.24 Replacement of the TV PROBE HOLDER INSERT

Manpower

One person, 1 minutes

Tools

None

Preparations

None

8.24.1 TV PROBE HOLDER INSERT - Removal Procedure

1. Pull the TV PROBE HOLDER INSERT from the TV PROBE HOLDER



Figure 8-36: Removing the TV PROBE HOLDER INSERT

8.24.2 TV PROBE HOLDER INSERT - Installation Procedure

1. Parts to be installed in reverse order of removal
2. Perform : *"Functional Checks after FRU replacement (Debrief Guidelines)" on page 8-49*

8.25 Replacement of the GEL WARMER CAP-S

Manpower

One person, 1 minutes

Tools

None

Preparations

None

8.25.1 GEL WARMER CAP-S - Removal Procedure

1. Twist the GEL WARMER CAP-S to remove it from the GEL WARMER.



Figure 8-37: Removing the GEL WARMER CAP-S

8.25.2 GEL WARMER CAP-S - Installation Procedure

1. Parts to be installed in reverse order of removal
2. Perform : *"Functional Checks after FRU replacement (Debrief Guidelines)" on page 8-49*

8.26 Replacement of the SIDE BASKET

Manpower

One person, 1 minutes

Tools

None

Preparations

None

8.26.1 SIDE BASKET - Removal Procedure

1. Pull theSIDE BASKET to remove it from the console.



Figure 8-38: Removing the SIDE BASKET

8.26.2 SIDE BASKET - Installation Procedure

1. Parts to be installed in reverse order of removal
2. Perform : *"Functional Checks after FRU replacement (Debrief Guidelines)" on page 8-49*

8.27 Replacement of the OPIO KNOB SET-SP

Manpower

One person, 10 minutes

Tools

None

Preparations

None

8.27.1 OPIO KNOB SET-SP - Removal Procedure

1. Pull the 12 knobs to remove from the console.



Figure 8-39: Removing the OPIO KNOB SET-SP

8.27.2 OPIO KNOB SET-SP - Installation Procedure

1. Parts to be installed in reverse order of removal
2. Perform : *"Functional Checks after FRU replacement (Debrief Guidelines)" on page 8-49*

8.28 Replacement of the VSCAN AIR CHARGER–ACCESSORY

Manpower

One person, 5 minutes

Tools

None

8.28.1 VSCAN AIR CHARGER-ACCESSORY - Removal Procedure

1. Disconnect the Wireless Probe Charger Cable R-TYPE and slide the VSCAN AIR CHARGER - ACCESSORY to remove from the WIRELESS PROBE CHARGER HOLDER.

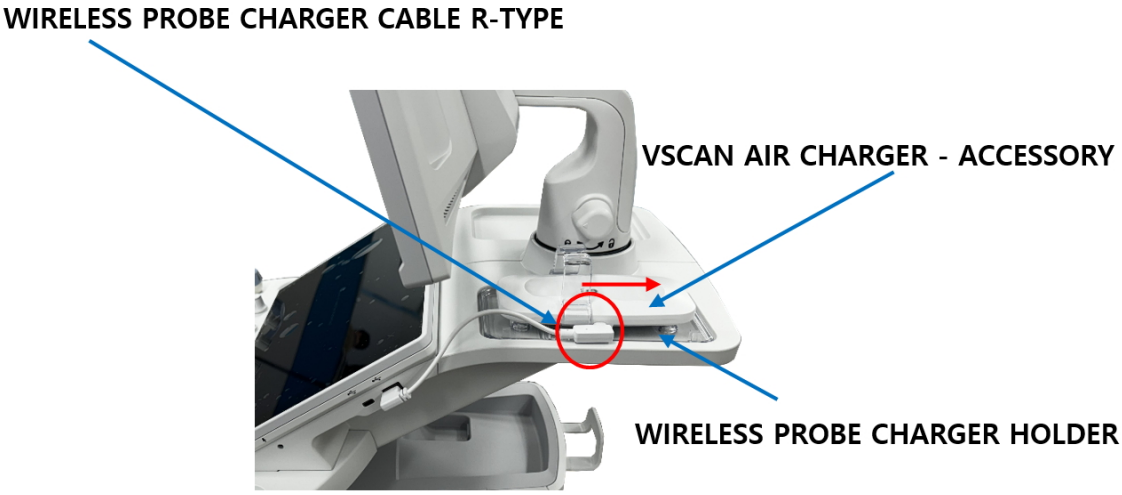


Figure 8-40: Removing the VSCAN AIR CHARGER - ACCESSORY

8.28.2 VSCAN AIR CHARGER-ACCESSORY - Installation Procedure

1. Parts to be installed in reverse order of removal
2. Perform : *"Functional Checks after FRU replacement (Debrief Guidelines)" on page 8-49*

Note *Make sure to install the Vscan Air Charger-Accessory in the direction shown below figure.*

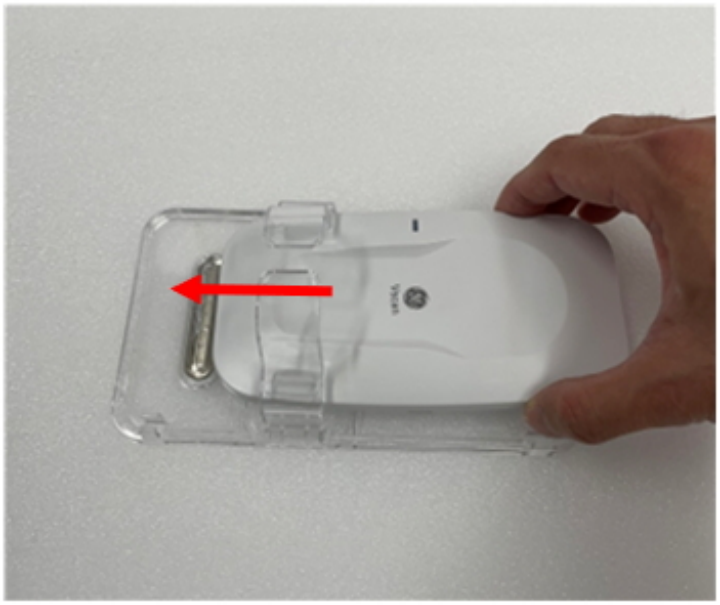


Figure 8-41: Direction when installing the Vscan Air Charger-Accessory

8.29 Replacement of the WIRELESS PROBE CHARGER HOLDER SET-S

Manpower
One persone, 5 minutes

Tools
None

Preparations
1. Remove the Vscan Air Charger - Accessory as described in *Section 8.28 on page 8-46*

8.29.1 WIRELESS PROBE CHARGER HOLDER SET-S - Removal Procedure

1. Disconnect the WIRELESS PROBE CHARGER CABLE to remove from the console.

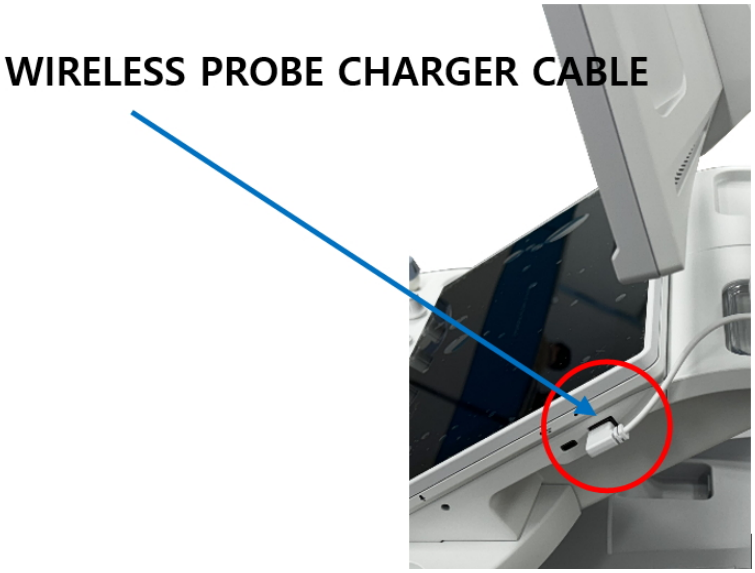


Figure 8-42: Disconnect the WIRELESS PROBE CHARGER CABLE to remove from the console

2. Lift the WIRELESS PROBE CHARGER HOLDER to remove from the console.



Figure 8-43: Lift the WIRELESS PROBE CHARGER HOLDER to remove from the console

8.29.2 WIRELESS PROBE CHARGER HOLDER SET-S - Installation Procedure

1. Parts to be installed in reverse order of removal.
2. Perform : *"Functional Checks after FRU replacement (Debrief Guidelines)" on page 8-49*

8.30 Replacement of the Trackball crane ring

Manpower

One Persone, 5 minutes

Tools

None

Preparation

None

8.30.1 Trackball crane ring - Removal Procedure

Remove the Trackball crane ring as described in *Section 7.8.6 "Trackball Malfunction" on page 7-50*

8.30.2 TrackbalCranring - Installation Procedure

1. Parts to be installed in reverse order of removal.
2. Perform : *"Functional Checks after FRU replacement (Debrief Guidelines)" on page 8-49*

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8.31 Functional Checks after FRU replacement (Debrief Guidelines)

1. Perform required Functional and/or Leakage Current tests based upon the FRU being replaced.
2. Clarify the scripts to debrief a Service Dispatch using your pole's dispatch tool. Use this script in the Service Comments when debriefing a Service Dispatch.

For a replaced FRU, use the following debrief script:

Service Manual, Direction , , 59997771 Revision 1, Equipment passed all required tests and is ready for use.

And, if testing leaking current, use the following text:

Service Manual, Direction ,, 59997771 Revision 1, *Section 10.6.5 on page 10-21* ~~ *Section 10.6.12 on page 10-27* Leakage Current meets allowable limits. Equipment passed all required tests and is ready for use.

Debrief Guidelines

FRU 8.2 "System Software - Installation/Upgrade procedure"

see Section	Functional and/or Leakage Current Test	Debrief Script
4.2.1	*"Power On / Boot Up"*	Service Manual, Direction , 59997771 , *Section 8.2 on page 8-8*. Equipment passed all required tests and is ready for use.
8.3	*"Software and Functional Checks after Installation/Upgrade Procedure"*	
#unique_513/unique_513_Connect_42_T-System-Checks	*"#unique_514"*	
4.2.2	*"Power Off / Shutdown"*	

FRU 8.3 "Software and Functional Checks after Installation/Upgrade Procedure"

see Section	Functional and/or Leakage Current Test	Debrief Script
4.2.1	*"Power On / Boot Up"*	Service Manual, Direction , 59997771 , *Section 8.3 on page 8-18*. Equipment passed all required tests and is ready for use.
#unique_513/unique_513_Connect_42_T-System-Checks	*"#unique_514"*	
4.2.2	*"Power Off / Shutdown"*	

FRU 8.4 "System Configuration Backup - Loading Procedure"

N/A

FRU 8.5 "Image Archive - Loading Procedure"

N/A

FRU 8.7 "Replacement of a Probe"

N/A

FRU 8.6 "Replacement or Activation of Options"

see Section	Functional and/or Leakage Current Test	Debrief Script
#unique_513/unique_513_Connect_42_T-System-Checks	"#unique_514"	Service Manual, Direction , , 59997771 , Section 8.6 on page 8-22. Equipment passed all required tests and is ready for use.

FRU 8.8 "Replacement of the BASE TRAY"

N/A

FRU 8.9 "Replacement of the BASE TRAY RUBBER"

N/A

FRU 8.10 "Replacement of the IO TOP COVER ASSY-SP"

N/A

FRU 8.11 "Replacement of the IO FRONT COVER ASSY-SP"

N/A

FRU 8.12 "Replacement of the BASE COVER ASSY"

N/A

FRU 8.13 "Replacement of the BASE REAR COVER ASSY-SP"

N/A

FRU 8.14 "Replacement of the CONSOLE SIDE COVER R ASSY"

N/A

FRU 8.15 "Replacement of the CONSOLE SIDE COVER L ASSY"

N/A

FRU 8.16 "Replacement of the CONSOLE FRONT COVER ASSY-SP"

N/A

FRU 8.17 "Replacement of the CONSOLE REAR COVER ASSY-SP"

N/A

FRU 8.18 "Replacement of the CONSOLE TOP COVER ASSY-SP"

N/A

FRU 8.19 "Replacement of the USB COVER"

N/A

FRU 8.20 "Replacement of the SIDE BASKET DUMMY COVER"

N/A

FRU 8.21 "Replacement of the FRONT DUMMY COVER"

N/A

FRU 8.22 "Replacement of the AIR FILTER"

N/A

FRU 8.23 "Replacement of the OPIO TOP COVER SET-SP"

N/A

FRU 8.24 "Replacement of the TV PROBE HOLDER INSERT"

N/A

FRU 8.25 "Replacement of the GEL WARMER CAP-S"

1. Insert gel bottle ino Gel Warmer
2. Power ON the Warmer
3. Check if the gel gets warm

FRU 8.26 "Replacement of the SIDE BASKET"

N/A

FRU 8.27 "Replacement of the OPIO KNOB SET-SP"

N/A

FRU 8.28 "Replacement of the VSCAN AIR CHARGER–ACCESSORY "

N/A

FRU 8.29 "Replacement of the WIRELESS PROBE CHARGER HOLDER SET-S"

N/A

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Chapter 9

Renewal Parts

This chapter gives an overview of replacement parts available for the Voluson Performance 16/ Voluson Performance 18 system.

Content in this chapter

*9.1 List of Abbreviations - - -

9.1 List of Abbreviations

AC	Alternating Current
ADC	Analog to Digital Converter
A/N Key	Alpha Numeric Keys
ASIC	Application Specific Integrated Circuit
Assy	Assembly
CPU	Central Processing Unit
CSI	Common Status Indicator module
CWDM	Continuous wave doppler module
CRU	Customer Replaceable Unit
DAC	Digital to Analog Converter
DC	Direct Current
DSP	Digital Signal Processing
DA64	Dachstein Beamformer Giga-bit
DBP	Backplane interface module
DVD	Digital Video Disc
DVI	Digital Visual Interface
DRFG	Dachstein Radio frequency Mid-processor GIGA-bit
ECGP	Electrocardiography module
FRU 1	Replacement part available in parts hub
FRU 2	Replacement part available from the manufacturer (lead time involved)
ITX	Information Technology Extended board
Int	Internal
IfU	Instructions for Use
I/O	Input/Output
LCD	Liquid Crystal Display
PPI	Probe Interface board
PCI	Peripheral Component Interconnect
PWA	Printed Wire Assembly
SOM	System On Module
SSD	Solid State Drive
USB	Universal Serial Bus

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9.2 Parts List Groups

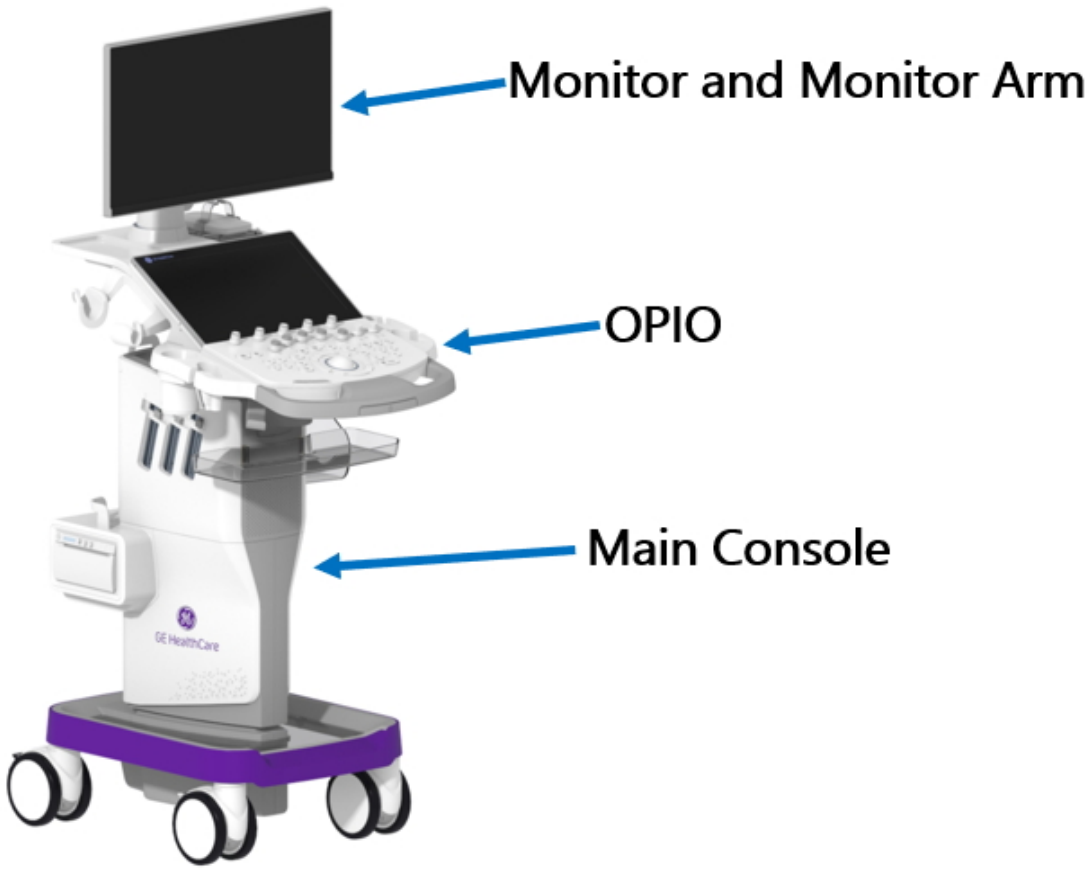


Table 9-1: Parts List Groups

Part Group Name	Table	Page Number
Monitor and Monitor Arm	*Table 9-2*	*Section 9.3 on page 9-4*
OPIO	*Table 9-3*	*Section 9.4 on page 9-5*
Main Console	*Table 9-4*	*Section 9.5 on page 9-10*
Front End Part	*Table 9-5*	*Section 9.6 on page 9-17*
Back End Part	*Table 9-6*	*Section 9.7 on page 9-18*
Main Power Cable	*Table 9-12*	*Section 9.13 on page 9-31*
Internal Cable	*Table 9-11*	*Section 9.12 on page 9-30*
Software	*Table 9-7*	*Section 9.8 on page 9-19*
Supported Probe	*Table 9-13*	*Section 9.16.1 on page 9-35*
Option	*Table 9-10*	*Section 9.11 on page 9-24*

9.3 Monitor and Monitor Arm

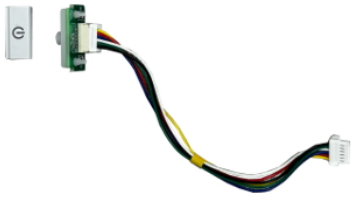
Table 9-2: Monitor and Monitor Arm

Part Name	Part Number	Description	Qty	CRU	FRU
SPC410 FIXED ARM ASSY	*5958695*		1	N	Y
21.5inch LCDMON for SPC410	*5946743*		1	N	Y
MONITOR COVER SET-SP	*S5972042*		1	N	Y

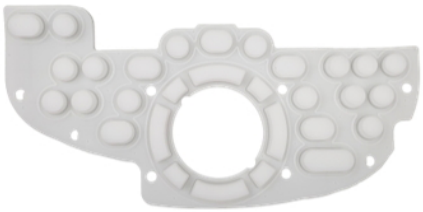
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9.4 OPIO

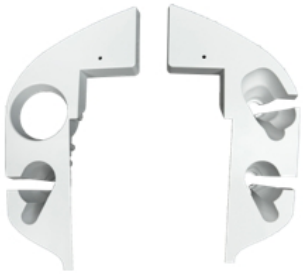
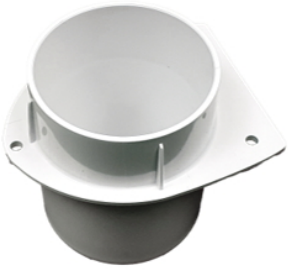
Table 9-3: OPIO

Part Name	Part Number	Description	Qty	CRU	FRU
SPC410 OPIO Assy	*5960940*		1	N	Y
SPC410 Lower OPIO Assy	*5959579*		1	N	Y
SPC410 Upper OPIO Assy	*5959578*		1	N	Y
Power Button Set-SP	*S5972046*		1	N	Y

Part Name	Part Number	Description	Qty	CRU	FRU
TASK LAMP SET-SP	*S5955126*		1	N	Y
TOUCH PANEL JOYCODER SET-SP	*S5972055*		1	N	Y
OPIO MODE ENCODER SET-SP	*S5972056*		1	N	Y
OPIO Joycoder Set-S	*S5942950*		1	N	Y
OPIO KNOB SET-SP	*S5972045*		1	N	Y

Part Name	Part Number	Description	Qty	CRU	FRU
OPIO BUTTON SET-SP	S5972044		1	N	Y
OPIO LOWER COVER SET-SP	S5972054		1	N	Y
SPC410 OPIO KEY RUBBER	5965842		1	N	Y
SPC410 OPIO CABLE HOOK	5957055		1	N	Y
OPIO TOP COVER SET-SP	S5972047		1	Y	Y

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Part Name	Part Number	Description	Qty	CRU	FRU
PROBE HOLDER SET-SP	*S5972051*		1	N	Y
PROBER HOLDER DUMMY SET-SP	*S5972050*		1	N	Y
SPC410 SIDE PROBE HOLDER L	*5957064*		1	N	Y
UNITY GEL WARMER CABLE COVER	*5918944*		1	N	Y
GEL HOLDER GE N9	*5923967*		1	N	Y

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Part Name	Part Number	Description	Qty	CRU	FRU
SPC410 OPIO HANDLE COVER	*5957054*		1	N	Y
UPDOWN BUTTON SET-SP	*S5972053*		1	N	Y
MIC SET-VP	*S5955124*		1	N	Y
EXTERNAL USB SET-VP	*S5955122*		1	N	Y
Trackball Assy-U	*5945174*		1	N	Y
OPIO-SP PWA	*5972455*		1	N	Y
Trackball crane ring	S5981354		1	Y	Y

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9.5 Main Console

Table 9-4: Main Console

Part Name	Part Number	Description	Qty	CRU	FRU
SPC410 BASE COVER ASSY	*5967824*		1	N	Y
BASE TRAY	*5830938*		1	Y	Y
BASE REAR COVER ASSY-SP	*5972027*		1	Y	Y
IO TOP COVER ASSY-SP	*S5972029*		1	Y	Y
IO FRONT COVER ASSY-SP	*S5972030*		1	Y	Y

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Part Name	Part Number	Description	Qty	CRU	FRU
BW PRINT DUMMY COVER SET-SP	S5972039		1	N	Y
AIR FILTER	5830997		1	Y	Y
CONSOLE REAR COVER ASSY-SP	S5972036		1	Y	Y

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Part Name	Part Number	Description	Qty	CRU	FRU
CONSOLE FRONT COVER ASSY-SP	*S5972034*		1	Y	Y
BASE COLUMN COVER L ASSY-SP	*S5972033*		1	N	Y
BASE COLUMN COVER R ASSY-SP	*S5972031*		1	N	Y

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Part Name	Part Number	Description	Qty	CRU	FRU
SPC410 COLUMN SIDE COVER L ASSY	*5967825*		1	Y	Y
SPC410 COLUMN SIDE COVER R ASSY	*5967826*		1	Y	Y
CONSOLE SIDE COVER L ASSY	*S5841993*		1	Y	Y

Part Name	Part Number	Description	Qty	CRU	FRU
CONSOLE SIDE COVER R ASSY	*S5841994*		1	Y	Y
CONSOLE TOP COVER ASSY-SP	*S5972038*		1	Y	Y
SMALL RUBBER PART SET-SP	S5972048		1	N	Y
CONSOLE DUMMY COVER SET-SP	*S5972040*		1	Y	Y
SPC410 REAR HANDLE DUMMY COVER	*5957111*		1	N	Y

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Part Name	Part Number	Description	Qty	CRU	FRU
SPC410 OPIO BASE BASAL COVER	5957126		1	N	Y
BW PRINTER COVER L ASSY	S5841957		1	N	Y
BW PRINTER COVER R ASSY	S5841961		1	N	Y
RS LEVER SET-SP	S5972041		1	N	Y
CASTOR TOTAL LOCK N9	5746120		1	N	Y

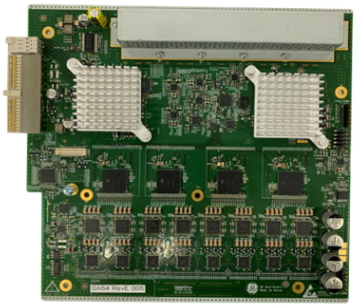
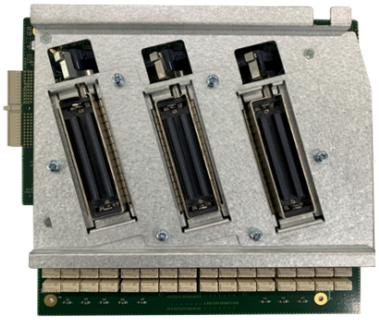
Part Name	Part Number	Description	Qty	CRU	FRU
CASTOR DUAL LOCK N9	*5746121*		1	N	Y
POWER CORD FIX BRKT SET	*S5842006*		1	N	Y
LATCH SET	S5843139		1	N	Y

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9.6 FrontEnd Components

Note *QTY is the number used on the Voluson Performance 16/ Voluson Performance 18 (and not the amount for the part number)*

Table 9-5: FrontEnd Components

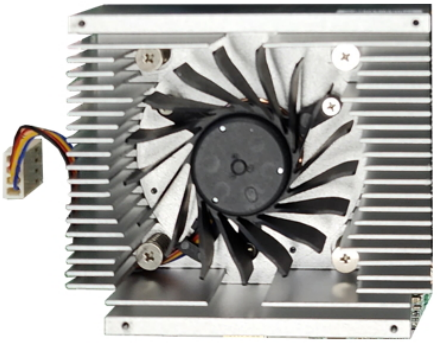
Part Name	Part Number	Description	Qty	CRU	FRU
DA64-MX29	*5971191*		1	N	Y
PPI Board Assy with Bracket	*S5830466-2*		1	N	Y

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9.7 BackEnd Components

Note *QTY is the number used on the Voluson Performance 16/ Voluson Performance 18 (and not the amount for the part number)*

Table 9-6: BackEnd Components

Part Name	Part Number	Description	Qty	CRU	FRU
ITX PWA with Bracket	*S5932849*		1	N	Y
T1000 MXM	5967146		1	N	Y
ITX T1000 set with Bracket	6932851		1	N	Y
Coin Cell Battery	S5978686		1	N	Y

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9.8 Options and Upgrades

Table 9-7: Software Options and Upgrades

Part Name	Part Number	Description	Qty	CRU	FRU
Voluson Performance 16/18 Software Thumb Drive Assembly Ext.X	TBD	bootable USB for System SSD recovery Content: SP with newest MS patches, Linux rescue partition, System C: Image (Windows 10), UISApp, Backup, eIfU, Database Repair Tool, Scan Assistant Configurator, etc. Note: Refer to SN79009, which is the best source for the latest revision.	1	N	Y
Radiantflow™	H46052BF	encrypted Software Option string (password)	-	N	N
Volume Imaging Package	H46052BG	encrypted Software Option string (password)	-	N	N
HDlive	H46052BH	encrypted Software Option string (password)	-	N	N
OmniView	H46052BJ	encrypted Software Option string (password)	-	N	N
VOCAL II	H46052BK	encrypted Software Option string (password)	-	N	N
Inversion	H46052BL	encrypted Software Option string (password)	-	N	N
SonoCNS	H46052BM	encrypted Software Option string (password)	-	N	N
fetalHS	H46052BN	encrypted Software Option string (password)	-	N	N
SonoGYN	H46052BP	encrypted Software Option string (password)	-	N	N
SonoPelvicFloor 3.0	H46052BR	encrypted Software Option string (password)	-	N	N
SonoNT/IT	H46052BS	encrypted Software Option string (password)	-	N	N
SonoLyst IR/X/live	H46072BJ	encrypted Software Option string (password)	-	N	N
SonoLyst IR/X – 2nd Trimester	H43252LR	encrypted Software Option string (password)	-	N	N
SonoLystlive – 2nd Trimester	H46052BW	encrypted Software Option string (password)	-	N	N
Follicle Monitoring Package	H46052BY	encrypted Software Option string (password)	-	N	N
Labor & Delivery Package	H46052BZ	encrypted Software Option string (password)	-	N	N
Coded Contrast Imaging	H43252LP	encrypted Software Option string (password)	-	N	N
Elastography	H43262LZ	encrypted Software Option string (password)	-	N	N
Voice Command “Hey Voluson“	H46062BC	encrypted Software Option string (password)	-	N	N
Software DVR - USB Recorder	H46062BD	encrypted Software Option string (password)	-	N	N
Voluson eDelivery – Performance Series	H46062BE	encrypted Software Option string (password)	-	N	N
Voluson Remote Updates	H43272LF	encrypted Software Option string (password)	-	N	N
Advanced Security	H43272LT	encrypted Software Option string (password)	-	N	N
Premium Security	H43272LW	encrypted Software Option string (password)	-	N	N
Verisound™ Fleet Management (Previously known as AVURI)	H46062BJ	encrypted Software Option string (password)	-	N	N

Part Name	Part Number	Description	Qty	CRU	FRU
Vscan Air SW Activation	H46062BK	encrypted Software Option string (password)	-	N	N
Russian Language Support (RLS)	H43252LY	encrypted Software Option string (password)	-	N	N
RAB6-RS Probe Activation*	H46062BM	encrypted Software Option string (password)	-	N	N
C1-5-RS Probe Activation*	H46062BN	encrypted Software Option string (password)	-	N	N
Voluson Performance 18/16 – Latest SW update	H46062BY	encrypted Software Option string (password)	-	N	N

Note *A sales order has to be obtained for item 2-38!*

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

Software Options (item 2-38): 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 5.1.2 "Description of Software Options" on page 5-10.*

Note *Not every feature is released in every country. Please contact Sales & Marketing in your region for information on feature availability.*

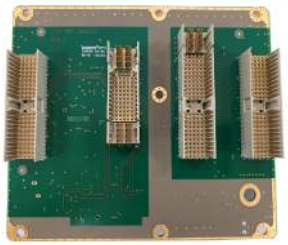
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9.9 Nest Box Components

Note *For detailed description see: "#unique_568"*

Note *QTY is the number used on the Voluson Performance 16/ Voluson Performance 18 (and not the amount for the part number)*

Table 9-8: Nest Box Components

Part Name	Part Number	Description	Qty	CRU	FRU
PPS PWA with Bracket	S5830544-3		1	N	Y
ITC Assy	*5830464*		1	N	Y
PLI PWA with cable	*S8701144*		1	N	Y
Main Fan Rear 4ea cable with FAN guard	*5828888*		1	N	Y

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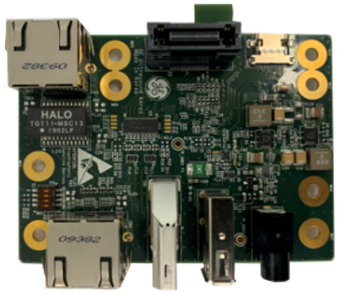
Part Name	Part Number	Description	Qty	CRU	FRU
Main Fan front 2ea cable	*5828889*		1	N	Y
Speaker With Cable	*5828883*		1	N	Y
M.2 SSD 512GB	*5904512*		1	N	Y
M.2 SSD 1TB	*5904513*		1	N	Y
ACDC ASSY	*5835337-2*		1	N	Y

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9.10 IO BOX Components

Note *QTY is the number used on the Voluson Performance 16/ Voluson Performance 18 (and not the amount for the part number)*

Table 9-9: ***IO BOX Components***

Part Name	Part Number	Description	Qty	CRU	FRU
PEP ASSY	*5830462*		1	N	Y
AC Inlet Assy	*S5831584*		1	N	Y
AC Inlet Fuse 2EA	*S5831586*		1	N	Y
IO MAIN BAKT Assy for INDIA	S5830931		1	N	Y

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9.11 Option

Table 9-10: Option

Part Name	Part Number	Description	Qty	CRU	FRU
FRONT SHELF	*5830998*		1	Y	Y
SIDE BASKET	*5830999*		1	Y	Y
SC400 GEL WARMER	*5928485*		1	N	Y
GEL WARMER CAP-S	*S5942957*		1	Y	Y
SPC410 TV PROBE HOLDER	*5957059*		1	N	Y
SC400 TV PROBE HOLDER INSERT	*5919134*		1	Y	Y

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Part Name	Part Number	Description	Qty	CRU	FRU
WIRELESS PROBE CHARGER HOLDER SET-S	S5942965		1	Y	Y
VSCAN AIR CHARGER - ACCESSORY	GP200307-S		1	Y	Y
3 Button footswitch Rev.1.1	5380960-2		1	Y	Y
Norav German Version ECG Module	5800116		1	Y	Y
ECG USB cable for Mini B to C type	5843351		1	Y	Y
Battery Pack	5808900-4		1	N	Y

Part Name	Part Number	Description	Qty	CRU	FRU
BIP PWA with battery power cable	*S5835584*		1	N	Y
BMS PWA with cable	*S5830469*		1	N	Y
Printer power cable (5828907) & Printer signal cable (5828884)	S5828907		1	N	Y
LAN ISOLATOR Assy	5507798		1	N	Y
USB ISOLATOR Assy	5507797		1	N	Y
EMI filter Assy	5589104		1	N	Y

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Part Name	Part Number	Description	Qty	CRU	FRU
VSC ASSY	*5829819*		1	N	Y
CWC Piggy Assy	*5829754*		1	N	Y
SPC410 GEL WARMER PIGGY WITH CABLE	*5955129*		1	N	Y
WLAN_USB A Cable	5828885		1	N	Y
WLAN & Bluetooth USB Stick_S	S5977031		1	N	Y
Ethernet protection cable	5863421		1	Y	Y

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Part Name	Part Number	Description	Qty	CRU	FRU
Network Color Laser Printer (Lexmark CS632)	KTZ304296 (For 230V, H48701EZ) KTZ304295 (For 110V, H48711MZ)		1	Y	Y
Color Printer Digital (SONY, UP-D25MD)	H44642LW, 5389822		1	N	N
Norav ECG Patient Cable IEC Type	5192623		1	N	Y
ECG Patient cable for US	5178978 (H46102LW)		1	Y	Y
External Keyboard	KTZ304176 (H48711KF)		1	Y	Y

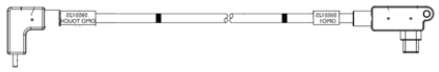
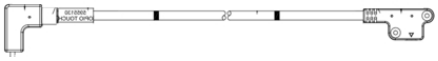
Part Name	Part Number	Description	Qty	CRU	FRU
Barcode Scanner	H48701JH		1	Y	Y

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9.12 Internal cable parts

Note *QTY is the number used on the Voluson Performance 16/ Voluson Performance 18 (and not the amount for the part number)*

Table 9-11: Internal cable parts

Part Name	Part Number	Description	Qty	CRU	FRU
SPC410 TYPE C ITX TO TOUCH PANEL CABLE	*5955125*		1	N	Y
SPC410 TYPE-C ITX TO MONITOR CABLE	*5955127*		1	N	Y
PEP TO ITX cable and cable clamp	*S5828878*		1	N	Y
LAN cable	*5828882*		1	N	Y
SPC410 USB3.0 TYPE-C COLUMN TO TOUCH PANEL CABLE	*5955130*		1	N	Y

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9.13 Miscellaneous Cables

Table 9-12: Miscellaneous Cables

Part Name	Part Number	Description	Qty	CRU	FRU
Power Cord for Canada/USA	6736114-3				
Power Cord for UK	6736107-3				
Power Cord for South Afirca	6736112-3				
Power Cord for Argentina	6736101-3				
Power Cord for Israel	6736109-3				
Power Cord for Switzerland	6736113-3				
Power Cord for Denmark	6736115-3				
PWR SPLY CRD ST DENMARK NON-HOSPITAL GRADE STD PLUG 10A 250V	6736106-12				
Power Cord for Japan/Taiwan	6736111-3				
Power Cord for ANZ	6736102-3				
Power Cord for China	6736104-3				
Power Cord for India	6736108-3				
Power Cord for Italy	6736110-3				
Power Cord for Brazil	6736103-3				
Power Cord for EU/Korea	6736105-3				

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9.15 System Manuals

Manuals & Documentation (Instructions for Use, 6000016)	
Voluson Performance 16/Performance 18 Doc kit_English	H46032BJ
Voluson Performance 16/Performance 18 Doc kit_French	H46032BK
Voluson Performance 16/Performance 18 Doc kit_Spanish	H46032BL
Voluson Performance 16/Performance 18 Doc kit_German	H46032BM
Voluson Performance 16/Performance 18 Doc kit_Italian	H46032BN
Voluson Performance 16/Performance 18 Doc kit_Dutch	H46032BP
Voluson Performance 16/Performance 18 Doc kit_Brazilian Portuguese	H46032BR
Voluson Performance 16/Performance 18 Doc kit_Estonian	H46032BS
Voluson Performance 16/Performance 18 Doc kit_Slovenian	H46032BT
Voluson Performance 16/Performance 18 Doc kit_Japanese	H46032BW
Voluson Performance 16/Performance 18 Doc kit_Swedish	H46032BY
Voluson Performance 16/Performance 18 Doc kit_Chinese_Traditional	H46032BZ
Voluson Performance 16/Performance 18 Doc kit_Korean	H46042BA
Voluson Performance 16/Performance 18 Doc kit_Russian	H46042BB
Voluson Performance 16/Performance 18 Doc kit_Polish	H46042BC
Voluson Performance 16/Performance 18 Doc kit_Greek	H46042BD
Voluson Performance 16/Performance 18 Doc kit_Hungarian	H46042BE
Voluson Performance 16/Performance 18 Doc kit_Slovakian	H46042BF
Voluson Performance 16/Performance 18 Doc kit_Czech	H46042BG
Voluson Performance 16/Performance 18 Doc kit_Turkish	H46042BH
Voluson Performance 16/Performance 18 Doc kit_Danish	H46042BJ
Voluson Performance 16/Performance 18 Doc kit_Norwegian	H46042BK
Voluson Performance 16/Performance 18 Doc kit_Finnish	H46042BL
Voluson Performance 16/Performance 18 Doc kit_Bulgarian	H46042BM
Voluson Performance 16/Performance 18 Doc kit_Romanian	H46042BN
Voluson Performance 16/Performance 18 Doc kit_Croatian	H46042BP
Voluson Performance 16/Performance 18 Doc kit_Lithuanian	H46042BR
Voluson Performance 16/Performance 18 Doc kit_Latvian	H46042BS
Voluson Performance 16/Performance 18 Doc kit_Serbian	H46042BT
Voluson Performance 16/Performance 18 Doc kit_European Portuguese	H46042BW
Voluson Performance 16/Performance 18 Doc kit_Ukrainian	H46042BX
Voluson Performance 16/Performance 18 Doc kit_Indonesian	H46042BZ
Voluson Performance 16/Performance 18 Doc kit_Vietnamese	H46052BA
Voluson Performance 16/Performance 18 Doc kit_Kazakhstan	H46052BB
Service Manuals	
Voluson Performance 16/Performance 18 Basic Service Manual	H46052BE
Voluson Performance 16/Performance 18 Privacy & Security Manual	DOC3038775

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Advanced Reference Manual	
Voluson Performance 16/Performance 18 Advanced Reference Manual_English	H46052BC
Voluson Performance 16/Performance 18 Advanced Acoustic Output Reference_English	H46052BD

9.16 Probes

Content in this chapter

9.16.1 2D-Probes - Curved Array Probes - 9-35
9.16.2 2D-Probes - Linear Array Probes - 9-36
9.16.3 2D-Probes - Phased Array Probes - 9-37
9.16.4 Real-Time 4D Volume Probes - 9-38
9.16.5 Handheld Probe (Wireless) - 9-39

Note *Please observe that some probes are not applicable on all Voluson Performance 16/ Voluson Performance 18 systems (depending on system type). Check with your local distributor or GE HealthCare sales representative for availability.*

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9.16.1 2D-Probes - Curved Array Probes

Table 9-13: 2D Curved Array Transducers

Part Name	Part Number	Description	Qty	CRU	FRU
C1-5-RS	*5499608 H40462LA*	broadband curved array transducer 2.0 - 5.0 MHz, 192 Elements Applications: Abdominal, Obstetrics, Gynecology 	-	Y	Y
4C-RS	*5488477H40 00SR*	broadband curved array transducer 2.0 - 5.0 MHz, 128 Elements Applications: Abdominal, Obstetrics, Gynecology 	-	Y	Y
IC9-RS	*5722023 H48691PJ*	Micro Convex transducer 2.9 - 9.7 MHz, 192 Elements Applications: Obstetrics, Gynecology, Transrectal 	-	Y	Y
IC9B-RS	*5842848 H48062AK*	Micro Convex transducer 2.9 - 9.7 MHz, 128 Elements Applications:Obstetrics, Gynecology, Transrectal 	-	Y	Y

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9.16.2 2D-Probes - Linear Array Probes

Table 9-14: 2D Linear Array Transducers

Part Name	Part Number	Description	Qty	CRU	FRU
9L-RS	*5499511* *H40402LL*	Broadband linear array transducer, 3.0-8.0 MHz, 192 ElementsApplications: Small parts, Obstetrics, Peripheral Vascular, Pediatrics,MSK 	-	Y	Y
12L-RS	*5499501* *H40402LY*	Small and lightweight linear-array transducer 4.0 - 10.0 MHz, 192 Elements Applications: Small Parts, Peripheral Vascular, Pediatrics,Orthopedics 	-	Y	Y

9.16.3 2D-Probes - Phased Array Probes

Table 9-15: 2D Phased Array Transducers

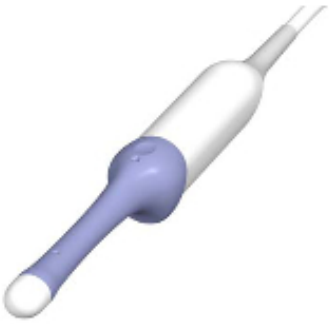
Part Name	Part Number	Description	Qty	CRU	FRU
3Sc-RS	*5433833 H45041DL*	Broadband phased array transducer, 1.0 - 4.0 MHz, 64 Elements Applications: Abdominal, Cardiology, Obstetrics, Pediatrics, Cephalic 	-	Y	Y
12S-RS	*5499321H44 901AB*	Broadband phased array transducer, 4.0-12.0 MHz, 96 Elements Applications: Small Parts, Cardiology, Pediatrics 			

9.16.4 Real-Time 4D Volume Probes

Table 9-16: Real-Time 4D Volume Probes

Item	Part Name	Part Number	Description	Qty	CRU	FRU
908	RAB6-RS	*KTZ303302* *H48691LP*	Ultra-Light Real-time 4D broadband electronic curved-array transducer 2.0 - 8.0 MHz, 192 Elements Applications: Abdominal, Obstetrics, Gynecology, Pediatrics 	-	Y	Y
909	RAB2-6-RS	*KTZ303982* *H48681WR*	Real-time 4D broadband electronic curved-array transducer 2.0 - 5.0 MHz, 128 Elements Applications: Abdominal, Gynecology, Obstetrics 	-	Y	Y

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Item	Part Name	Part Number	Description	Qty	CRU	FRU
909	RIC5-9A-RS	*KTZ304128H 48701EJ*	Real-time 4D endocavity broadband electronic curved array transducer 3.8 - 9.3 MHz, 192 Elements, field of view: max. 180°Applications: Gynecology, Obstetrics, Transrectal 	-	Y	Y

9.16.5 Handheld Probe (Wireless)

Table 9-17: Real-Time 4D Volume Probes

Part Name	Part Number	Description	Qty	CRU	FRU
Vscan Air CL	refer to the Vscan Air Proprietary Service Manual (GP091012)	Handheld wireless probe with dual transducer. Convex and Linear side of the probe for ultrasound scanning. Curved array transducer with center frequency of 3.3 MHz, 128 elements. Linear array transducer with center frequency of 7.7 MHz, 192 elements. 	1	Y	Y
Vscan Air SL		Handheld wireless probe with dual transducer. Convex and Linear side of the probe for ultrasound scanning. Curved array transducer with center frequency of 3.3 MHz, 128 elements. Sector array transducer with center frequency of 2.65 MHz, 64 elements. 			

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9.17 Biopsy Needle Guides

Table 9-18: 2D Curved Array Transducers

Part Name	Part Number	Description	Qty	CRU	FRU
9L-RS Multi-angle bracket	H4906BK	Non-Sterile Multi Angle Bracket needle guide for probe **9L-RS** needle diameter: 8.5FR, 14-23GA (gauge); > 0.6 mm - < 2.1 mm 	-	-	N
12L-RS Multiangle bracket	H40432LC	Non-Sterile Multi Angle Bracket needle guide for probe **12L-RS** needle diameter: > 0.6 mm - < 2.1 mm 	-	-	N
C1-5-RS Biopsy guide	H40432LE	Non-Sterile Multi Angle Bracket needle guide for probe **C1-5-RS** needle diameter: 8.5FR, 14-23GA (gauge); > 0.6 mm - < 2.1 mm 	-	-	N
4C-RS Multiangle bracket	E8385NA	Non-Sterile Multi Angle Bracket needle guide starter kit for probe **4C-RS** needle diameter: > 0.6 mm - < 2.1 mm 	-	-	N
IC9-RS Biopsy guide (disposable)	H48691YW	disposable Biopsy needle guide for probe **IC9-RS** needle diameter: < 1.65 mm 	-	-	N
IC9-RS Biopsy guide	H48701MN	Reusable Biopsy needle guide for probe **IC9-RS**. 	-	-	N
IC9B-RS Biopsy guide (disposable)	E8385MJ	disposable Biopsy needle guide for probe **IC9B-RS** needle diameter: < 1.65 mm 	-	-	N

Part Name	Part Number	Description	Qty	CRU	FRU
IC9B-RS Biopsy guide (disposable)	E8013AT	disposable Biopsy needle guide for probe **IC9B-RS** needle diameter: < 1.65 mm 	-	-	N
IC9B-RS Biopsy guide (reusable)	H40412LN	Reusable Biopsy needle guide for probe **IC9-RS**: needle diameter: < 1.65 mm 	-	-	N
3Sc-RS Multiangle bracket	H46222LC	Non-Sterile Multi Angle Bracket needle guide for probe **3Sc-RS** needle diameter: > 0.6 mm - < 2.1 mm 	-	-	N
RAB6-RS Biopsy Starter Kit	H48681ML	Biopsy Starter Kit for Ultralight probe **RAB6-RS** needle diameter: 8.5FR, 14-23GA (gauge); > 0.6 mm - < 2.1 mm 	-	-	N
PEC63	H46721R	Reusable Biopsy needle guide for probe **RIC5-9-RS**: needle diameter: < 1.8 mm 	-	-	N
RIC Single-angle bracket	H48681GF	disposable Biopsy needle guide for probe **RIC5-9A-RS** needle diameter: 16-18GA (gauge); 1.2 - 1.6 mm 	-	-	N
RIC Single-angle bracket +Latex Cover	H48691Z	Disposable Biopsy needle guide for probe **RIC5-9A-RS** needle diameter: 16-18GA (gauge); 1.2 - 1.6 mm 	-	-	N

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Chapter 10

Care and Maintenance

*This chapter describes **Care and Maintenance** on the Voluson Performance 16/ Voluson Performance 18 system and its peripherals. These procedures are intended to **maintain the quality** of the Voluson Performance 16/ Voluson Performance 18 **systems performance**. Read this chapter completely and familiarize yourself with the procedures before performing a task.*

Content in this chapter

*10.1 Why do Maintenance - - -

Caution



To ensure the mutual protection and safety of GE HealthCare 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.

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10.1 Why do Maintenance

10.1.1 Preventive Maintenance Inspections

It has been determined by engineering that your Voluson Performance 16/ Voluson Performance 18 system does not have any high wear components that fail with use, therefore no Preventive 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 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 HealthCare 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 10-4*) specifies how often your Voluson Performance 16/ Voluson Performance 18 should be serviced and outlines items requiring special attention.

Note *It is the customer's responsibility to ensure that the Voluson Performance 16/ Voluson Performance 18 care and maintenance is performed as scheduled in order to retain its high level of safety, dependability and performance.*

Your GE HealthCare Service Representative has an in-depth knowledge of your Voluson Performance 16/ Voluson Performance 18 ultrasound system and can best provide competent, efficient service. Contact GE HealthCare 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 Performance 16/ Voluson Performance 18 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 care and maintenance frequencies.*

Abbreviations used in the Customer Care Schedule *"Table 10-1" on page 10-4*:

- 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, front cover 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!
Monitor, Touch Panel and Probe holder	Clean 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 handle, and monitor holder. Remove dust and coupling gel.			•		mobile systems check daily
Control Console movement	Check 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 7.8.6 on page 7-50*). 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

Item	Service at indicated Time	D	W	M	A	Notes
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
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. *NOTE! The use of a Phantom is not required during Care and Maintenance. Customer may use it as part of their Quality Assurance Program tests.*				•	also after corrective maintenance or as required by your facilities QA program
Functional Checks of all probes *Section 10.4.2 on page 10-8*					•	also after corrective maintenance or as required by your facilities QA program

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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/ESI 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 care and 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	*NOTE! The use of a Phantom is not required during Care and Maintenance. Customer may use it as part of their Quality Assurance Program tests.*
external USB-Media	USB-stick or external hard disk drive
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 Gloves	•

10.4 System Maintenance

10.4.1 Preliminary Checks

The preliminary checks take about 15 minutes to perform. Refer to the Voluson Performance 16/ Voluson Performance 18 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	• 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 Monitor and Touch Panel (when present).
5	Presets	Backup all customer presets onto appropriate media (see: *Section 4.4.1 "Save System Configuration Backup" on page 4-13*).
6	Image Archive	Backup the Image Archive onto appropriate media (see: *Section 4.4.4.1 "Save Image Archive" on page 4-19*).

10.4.2 Functional Checks

The functional checks take about 60 minutes to perform. Refer to the Voluson Performance 16/ Voluson Performance 18 user documentation whenever necessary.

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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	Console Test	Perform the Test Procedure to verify that all controls are OK.
10	Monitor	Verify basic 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 10-10*

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 3-80* 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	Foot Switch	Verify that the foot switch is functioning as programed. Clean as necessary.
7	ECG	Verify basic operation with customer.

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.

10.4.2.4 Optional Diagnostic Checks

To complete the Voluson Performance 16/ Voluson Performance 18 checks, view the error logs and run desired diagnostics.

10.4.2.5 View the Logs

1. Review the ultrasound system error log for any problems.
2. Check the temperature log to see if there are any trends that could cause problems in the future.

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	Inspect the control console. Record any damaged or missing items. (Replace faulty components, as required).
4	Control Console Movement	• 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	Monitor	Inspect the Display for scratches and bad pixels. Verify proper operation of Contrast and Brightness controls. Where applicable, confirm that the monitor arm allows: • swiveling the screen to the left and to the right • folding the screen to the locked position *Note: Monitor arm movement may vary and is not applicable to all ultrasound systems.*
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 foot switch 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	• 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 Instructions for Use of the Voluson Performance 16/ Voluson Performance 18 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 Performance 16/ Voluson Performance 18 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 Instructions for Use of the Voluson Performance 16/ Voluson Performance 18 system.

10.4.4.1 General Cleaning

Frequent and diligent cleaning of the Voluson Performance 16/ Voluson Performance 18 ultrasound system reduces the risk of spreading infection from person to person and 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	Monitor + Touch Panel	Clean Monitor surface and Touch Panel with cleaning agent on a soft, non-abrasive, damp cloth. **Caution:** DO NOT spray any liquid directly onto Voluson Performance 16/ Voluson Performance 18 covers, Monitor, keyboard, etc.

10.4.5 Probe Maintenance

10.4.5.1 Probe related Checks

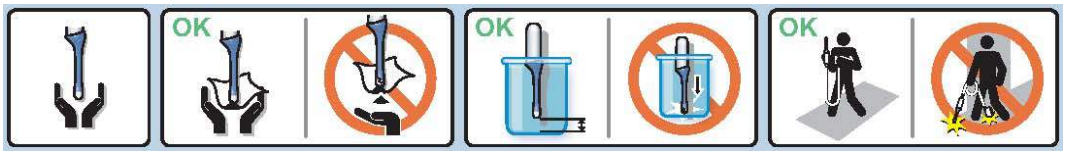
Table 10-9: probe related checks

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 Performance 16/ Voluson Performance 18 system Instuction for Use 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 ultrasound probes.

Ultrasound probes can be easily damaged by improper handling. Review the Instructions for Use of Voluson Performance 16/ Voluson Performance 18 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 Instructions for Use of the Voluson Performance 16/ Voluson Performance 18 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 Performance 16/ Voluson Performance 18 Instructions for Use 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.

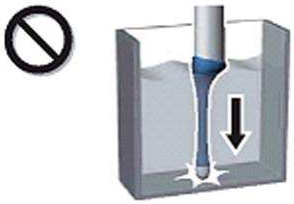
Caution

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

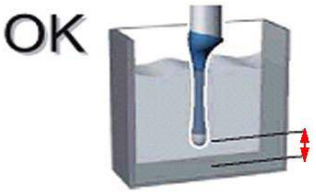
Note *For the latest list of compatible cleaning solutions and disinfectants refer to: *** 3https://www.gehealthcare.com/products/ultrasound/ultrasound-transducers.*



Please be aware of the sensitive probe head. TAKE EXTREME CARE!



NEVER place or store a probe on its scan head!



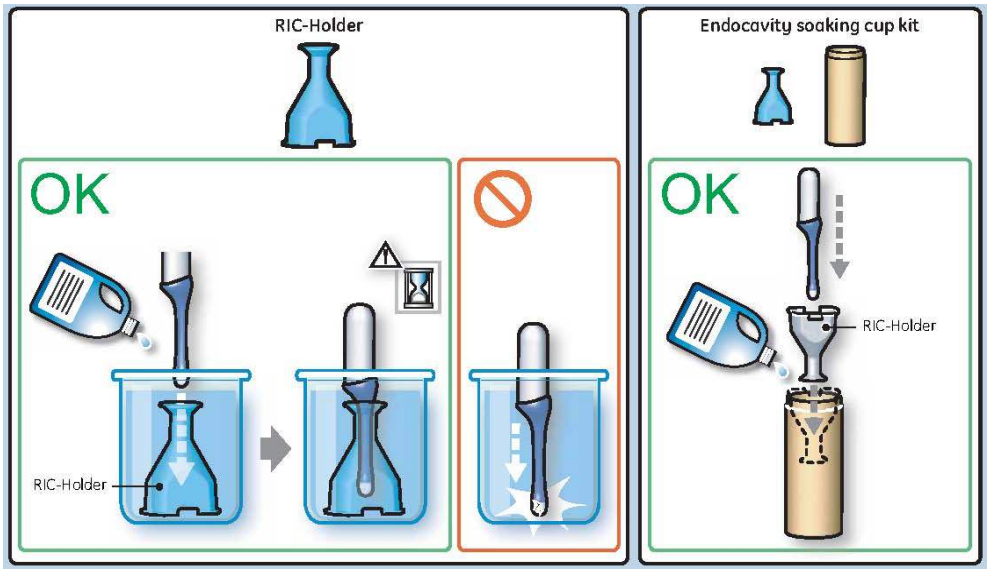
When disinfecting a probe, ensure that there is sufficient space between the probe and the container bottom!

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 Care and Maintenance. Customer may use it as part of their Quality Assurance Program tests.

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10.6 Electrical Safety Tests

Content in this chapter

*10.6.1 Safety Test Overview - - -



Warning

To minimize the risk and to avoid an electric shock, only trained persons are allowed to perform the electric safety inspections and tests.



Warning

To avoid electrical shock, the system under test must not be connected to other electrical equipment. Remove all interconnecting cables and wires. The system under test must not be contacted by users or patients while performing these tests.



Caution

Compare all safety-test results with safety-test results of previously performed safety tests (e.g., last year etc.). In case of unexplainable abrupt changes of safety-test results consult experienced authorized service personnel or GE HealthCare for further analysis.



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 Medical Electrical Equipment - Recurrent test and test after repair of medical electrical equipment.

Measurement limits per ANSI/AAMI ES60601-1 standard including national deviations.

Table 10-10: Enclosure Leakage Current Limits - Accessible Surfaces not protectively earthed

Conditions	Country	
	USA	Others
Close Protective earth and close neutral with normal polarity	0.1 mA*	0.1 mA***
Close Protective earth and close neutral with reverse polarity	0.1 mA*	0.1 mA***
Open Protective earth and close neutral with normal polarity	0.3 mA**	0.5 mA***
Open Protective earth and close neutral with reverse polarity	0.3 mA**	0.5 mA***
Open neutral and cose Protective earth with normal polarity	0.5 mA*	0.5 mA***
Open neutral and cose Protective earth with reverse polarity	0.5 mA*	0.5 mA***

Table 10-11: Earth Leakage Current Limits

Conditions	Country	
	USA	Others
Close Protective earth and close neutral with normal polarity	0.3 mA**	0.5 mA***
Close Protective earth and close neutral with reverse polarity	0.3 mA**	0.5 mA***
Open neutral and cose Protective earth with normal polarity	1 mA*	1 mA***
Open neutral and cose Protective earth with reverse polarity	1 mA*	1 mA***

Table 10-12: Type BF Patient Leakage Limits - Non-Conductive Surface

Conditions	Country	
	USA	Others
Close Protective earth and close neutral with normal polarity	0.1 mA*	0.1 mA***
Close Protective earth and close neutral with reverse polarity	0.1 mA*	0.1 mA***
Open Protective earth and close neutral with normal polarity	0.5 mA*	0.5 mA***
Open Protective earth and close neutral with reverse polarity	0.5 mA*	0.5 mA***
Open neutral and cose Protective earth with normal polarity	0.5 mA*	0.5 mA***
Open neutral and cose Protective earth with reverse polarity	0.5 mA*	0.5 mA***

Table 10-13: Type CF Patient Leakage Limits - ECG leads

Conditions	Country	
	USA	Others
Close Protective earth and close neutral with normal polarity	0.01 mA*	0.01 mA***
Close Protective earth and close neutral with reverse polarity	0.01 mA*	0.01 mA***
Open Protective earth and close neutral with normal polarity	0.05 mA*	0.05 mA***
Open Protective earth and close neutral with reverse polarity	0.05 mA*	0.05 mA***
Open neutral and cose Protective earth with normal polarity	0.05 mA*	0.05 mA***
Open neutral and cose Protective earth with reverse polarity	0.05 mA*	0.05 mA***

Table 10-14: Type CF Patient Auxiliary Limits

Conditions	Country	
	USA	Others
Close Protective earth and close neutral with normal polarity	0.01 mA*	0.01 mA***
Close Protective earth and close neutral with reverse polarity	0.01 mA*	0.01 mA***
Open Protective earth and close neutral with normal polarity	0.05 mA*	0.05 mA***
Open Protective earth and close neutral with reverse polarity	0.05 mA*	0.05 mA***
Open neutral and cose Protective earth with normal polarity	0.05 mA*	0.05 mA***
Open neutral and cose Protective earth with reverse polarity	0.05 mA*	0.05 mA***

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*Table 10-15: Isolation between Mains and Applied Limits**** - Patient Leakage Main to Type BF Applied part*

Conditions	Country	
	USA	Others
Close Protective earth and close neutral with normal polarity	5 mA*	5 mA***
Close Protective earth and close neutral with reverse polarity	5 mA*	5 mA***

*Table 10-16: Isolation between Mains and Applied Limits**** - Patient Leakage Main to Type CF Applied part*

Conditions	Country	
	USA	Others
Close Protective earth and close neutral with normal polarity	0.05 mA*	0.05 mA***
Close Protective earth and close neutral with reverse polarity	0.05 mA*	0.05 mA***

Table 10-17: Total Patient leakage current: Type CF probe to ground (Only for Europe)

Conditions	Limitation
	USA
Close Protective earth and close neutral with normal polarity	0.05 mA*****
Close Protective earth and close neutral with reverse polarity	0.05 mA*****
Open Protective earth and close neutral with normal polarity	0.1 mA*****
Open Protective earth and close neutral with reverse polarity	0.1 mA*****
Open neutral and cose Protective earth with normal polarity	0.1 mA*****
Open neutral and cose Protective earth with reverse polarity	0.1 mA*****

Table 10-18: Total Patient leakage current: Type CF porbe to Mains (Only for Europe)

Conditions	Limitation
Close Protective earth and close neutral with normal polarity	0.01 mA******
Close Protective earth and close neutral with reverse polarity	0.01 mA******

Note **Measurement limits per ANSI/AAMI ES60601-1 Medical Electrical Equipment Safety Standards, Table IV*

Note ***Measurement limits per ANSI/AAMI ES60601-1 Medical Electrical Equipment Safety Standards,Table 19.5DV.1*

Note ****Measurement limits per IEC 60601-1 Ed 2. Medical Electrical Equipment Safety Standards,Table IV*

Note *****Isolation between Mains and Applied Limits refer to the measurement of leakage current flow which would flow from mains to patient if the patient were to come into contact with mains voltage.*

Note ******Measurement limits per IEC 60601-1 Ed 3. and ANSI/AAMI ES60601-1, Medical Electrical Equipment Safety Standards, Table 3*

Note *******Measurement limits per IEC 60601-1 Ed 3. and ANSI/AAMI ES60601-1, Medical Electrical Equipment Safety Standards, Table 4*

The following tests are performed at the factory and should be performed at the customer site as well.

- Grounding Continuity
- Earth Leakage Current
- Enclosure Leakage Current

- Patient Leakage Current

All measurements should be made with an electrical safety analyzer.

Note *Open Grounding is also known as "Lift Ground".*

*Table 10-19: ISO and Mains Applied limits**

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

** **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.*

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Table 10-20: 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.

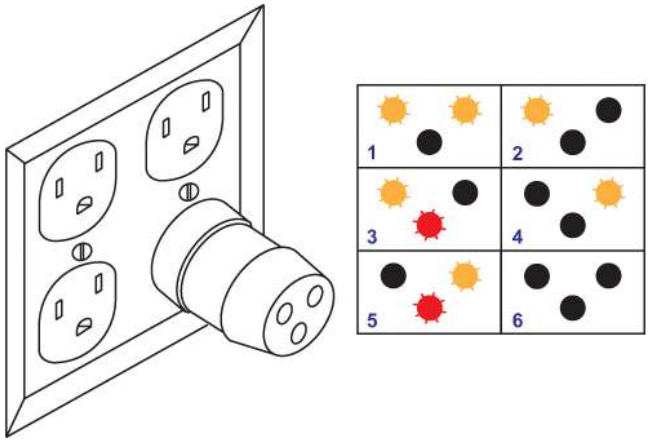


Figure 10-1: Typical Alternate Outlet Tester

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 defined exposed metal parts, see *#unique_624/unique_624_Connect_42_T-grounding-test-conditions* below. The ground wire resistance should be less than 0.2 / 0.3 Ohms. Reference the procedure in the IEC 60601-1 and/or IEC 62353. In case of a setup as a ME system with an additional protective device according to IEC 60601-1 (medical electric system), the ground wire resistance should be less than 0.4 / 0.5 Ohms, measured from the AC Mains wall plug to the ultrasound console. Reference the procedure in IEC 60601-1 and/or IEC 62353. Examples of a ME system are e.g., setup with an UPS (uniterruptable power supply) or setup with an EMI-filter (electromagnetic immunity filter), etc. In some countries/regions differing acceptance limits and differing test conditions may apply.

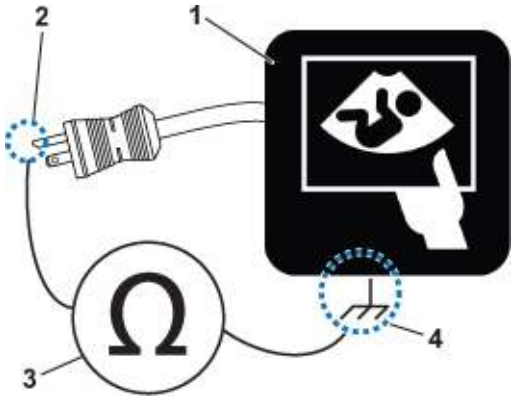


Figure 10-2: Ground Continuity Test

1	Ultrasound System	3	Ohmmeter
2	Ground Pin	4	defined accessible Metal Parts: • Monitor housing • Probe connector

Table 10-21: defined accessible metal parts

		
Equipotential	**Monitor housing**	**Probe connector**

Caution

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

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10.6.5 Enclosure Leakage Current Test



Warning: Electric Shock Hazard!

When the meter's ground switch is OPEN, DO NOT touch the Voluson Performance 16/ Voluson Performance 18 system!



Caution: Equipment damage possibility!

Never switch the Polarity and the status of Neutral when the Voluson Performance 16/ Voluson Performance 18 system is powered ON. Power off the Voluson Performance 16/ Voluson Performance 18 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 measures the current that would flow in an grounded person who touched accessible non-protectively-earthed parts of equipment if the ground wire were to break. The test verifies the isolation of the power line from the chassis.

The meter is connected from accessible non-protectively-earthed parts of the case to ground. Measurements should be made with the ground open and closed, with power line polarity normal and reversed, and with the neutral open and closed. Record the highest reading.

10.6.5.2 Generic Procedure

The test verifies the isolation of the power line from the enclosure. The testing meter is connected from accessible non-protectively-earthed parts of the case to ground. Measurements should be made with the ground open and closed, with power line polarity normal and reversed, and with the neutral open and closed.

Record the highest reading of current.

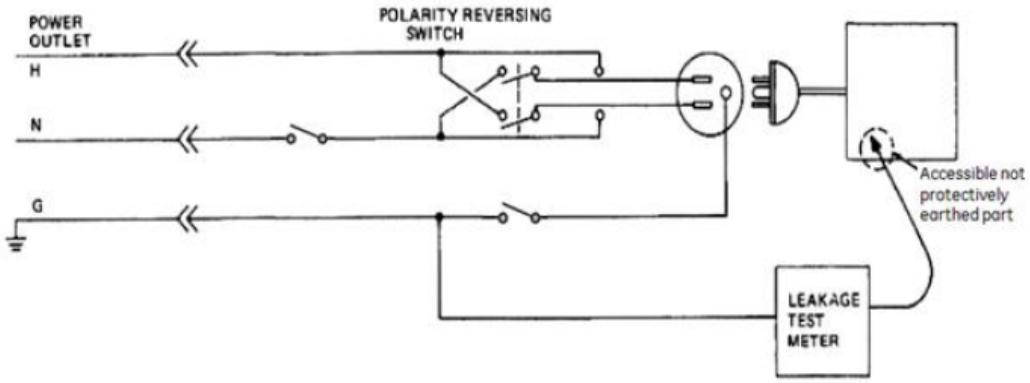


Figure 10-3: Set Up for Test of Enclosure Leakage Current, IEC 60601-1 Clause 19

Note *Color of Power outlet cable*

- *USA and Canada*
  - *Hot : Black*
  - *Neutral: White*
  - *Ground: Green or Green-yellow*
- *Others*
  - *Hot: Brown*
  - *Neutral: Blue*
  - *Ground: Green-yellow*

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.

When using a test instrument, its power plug may be inserted into the wall outlet and the equipment under test is plugged into the receptacle on the panel of the meter. This places the meter in the grounding

conductor and the current flowing from the case to ground will be indicated in any of the current ranges. The maximum allowable limit for chasis source leakage is shown in *Table 10-10 on page 10-15*

10.6.5.3 Data Sheet for Enclosure Leakage Current

Table 10-22 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.

The following acceptance limits and test conditions are summarized from IEC 60601 including national deviations and IEC 62353 Medical Electrical Equipment - Recurrent test and test after repair of medical electrical equipment.

Table 10-22: Typical Data sheet for recording Enclosure Leakage Current

Unit under Test:					Date of Test:	
Test Conditions			Measurement/Test Point Location			
System Power	Grounding/PE	Limit µA	*Grounding socket*	*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				

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10.6.6 Earth Leakage Current Test

10.6.6.1 Definition

This test measures the current that would flow to a grounded person who touched accessible protectively-earthed parts of equipment if the ground wire should break.

The meter is connected from accessible protectively-earthed parts of the equipment to ground.

Measurements should be made with power line polarity normal and reversed, and with the neutral open and closed Record the highest reading.

Equipment damage possibility, Never switch the Polarity and the status of Neutral when the unit is powered ON. Be sure to turn the unit power OFF before switching them using the POLARITY switch and/or the NEUTRAL switch. Otherwise, the unit may be damaged.

10.6.6.2 Generic Procedure

The testing meter is connected from accessible protectively-earthed parts of the equipment to ground. Measurements should be made with power line polarity normal and reversed, and with the neutral open and closed. Record the highest reading of current.

Record the highest reading of current.

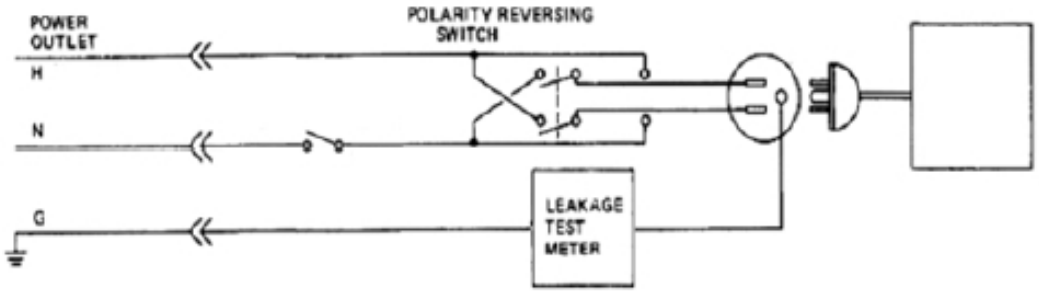


Figure 10-4: Set Up for Test of Earth Leakage Current, IEC 60601-1 Clause 19

Note *Color of Power outlet cable*

- *USA and Canada*
  - *Hot : Black*
  - *Neutral: White*
  - *Ground: Green or Green-yellow*
- *Others*
  - *Hot: Brown*
  - *Neutral: Blue*
  - *Ground: Green-yellow*

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.

When using a test instrument, its power plug may be inserted into the wall outlet and the equipment under test is plugged into the receptacle on the panel of the meter. This places the meter in the grounding conductor and the current flowing from the case to ground will be indicated in any of the current ranges. The maximum allowable limit for chasis source leakage is shown in *Table 10-11 on page 10-15*

Table 10-23: Typical Data Sheet for Earth Leakage Current

Tester Neutral	Tester Polarity Switch	Measured Earth Leakage Current
Enter Name of tested peripheral here		
Closed	Normal	
Closed	Reversed	
Open	Normal	
Open	Reversed	

10.6.7 Type CF Patient Leakage Current Test - ECG Leads

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 ECG 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 neutral open and closed. For each combination, the operating controls, such as the lead switch, should be operated to find the worst case condition.

Caution: Equipment damage possibility!

Never switch the Polarity and the status of Neutral when the Voluson Performance 16/ Voluson Performance 18 system is powered ON. Power off the Voluson Performance 16/ Voluson Performance 18 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.

10.6.7.1 Generic Procedure

Measurements should be made with the ground open and closed, with power line polarity normal and reversed, and with the neutral open and closed. For each combination, the operating controls such as the lead switch, should be operated to find the worst case condition.

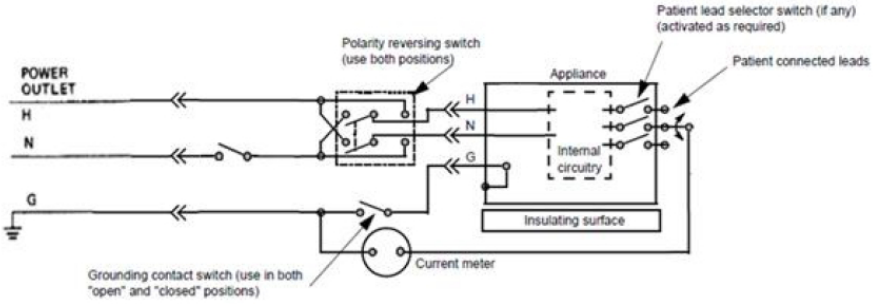


Figure 10-5: Test Circuit for Measuring Leakeage current between patient lead and Ground - Isolated

Note *Color of Power outlet cable*

- *USA and Canada*
  - *Hot : Black*
  - *Neutral: White*
  - *Ground: Green or Green-yellow*
- *Others*
  - *Hot: Brown*
  - *Neutral: Blue*
  - *Ground: Green-yellow*

Table 10-24: Typical Data Sheet for Type CF Patient Leakage Current Test - ECG Leads

Tester Neutral	Tester Polarity Switch	Ground Switch	Measured Earth Leakage Current
Closed	Normal	Closed	
Closed	Normal	Open	
Closed	Reversed	Closed	
Closed	Reversed	Open	
Open	Normal	Closed	
Open	Reversed	Closed	

10.6.8 Type BF Patient Leakage Current Test - Probe

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 *Some leakage current is expected on each probe, depending 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.*

Caution: Equipment damage possibility!



Never switch the Polarity and the status of Neutral when the Voluson Performance 16/ Voluson Performance 18 system is powered ON. Power off the Voluson Performance 16/ Voluson Performance 18 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.

10.6.8.1 Generic Procedure on Leakage Current

Measurements should be made with the ground open and closed, with power line polarity normal and reversed, and with neutral open and closed.

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

Note *Saline water pod should be insulated from floor and earth ground.*

Table 10-25: Typical Data Sheet for Type BF Patient Leakage Current Test

Test Neutral	Test Polarity Switch	Ground Switch	Measured Leakage Current
Closed	Normal	Closed	
Closed	Normal	Open	
Closed	Reversed	Closed	
Closed	Reversed	Open	
Open	Normal	Closed	
Open	Reversed	Closed	

10.6.9 Type CF Patient Auxiliary current - ECG Lead to Probe

Reference the procedure in the IEC 60601-1. Measure current flow from Probe to all ECG leads connected together. The maximum allowable limit for earth leakage current is shown in *Table 10-13 on page 10-16*

Caution: Equipment damage possibility!

Never switch the Polarity and the status of Neutral when the Voluson Performance 16/ Voluson Performance 18 system is powered ON. Power off the Voluson Performance 16/ Voluson Performance 18 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.

Table 10-26: Typical Data Sheet for Type BF Patient Auxiliary Current Test

Tester Neutral	Tester Polarity Switch	Ground Switch	Measured Earth Leakage Current
Closed	Normal	Closed	
Closed	Normal	Open	
Closed	Reversed	Closed	
Closed	Reversed	Open	
Open	Normal	Closed	
Open	Reversed	Closed	

10.6.10 Type BF Patient Leakage current - Mains to Probe

Reference between the procedure in the IEC 60601-1. Measure leakage current flow from mains to Probe.

Warning: Electric Shock Hazard!

When the meter's ground switch is OPEN, DO NOT touch the Voluson Performance 16/ Voluson Performance 18 system!

Caution: Equipment damage possibility!

Never switch the Polarity and the status of Neutral when the Voluson Performance 16/ Voluson Performance 18 system is powered ON. Power off the Voluson Performance 16/ Voluson Performance 18 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.

Table 10-27: Typical Data Sheet for Type BF Patient Leakage Current Test - Mains to Probe

Tester Neutral	Tester Polarity Switch	Ground Switch	Measured Earth Leakage Current
Closed	Normal	Closed	
Closed	Reversed	Closed	

10.6.11 Total Probe Leakage Current : Type CF probe to ground (Only for Europe)

Definition

This test measures the current that would flow to ground from all ECG leads through a patient who is being scanned and becomes grounded by touching some other grounded surface.

Caution: Equipment damage possibility!

Never switch the Polarity and the status of Neutral when the Voluson Performance 16/ Voluson Performance 18 system is powered ON. Power off the Voluson Performance 16/ Voluson Performance 18 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.

Generic Procedure for measurement

Put all ECG leads into saline water and measure leakage current with the ground open and closed, with power line polarity normal and reversed, and with neutral open and closed. For each combination, ECG leads must be active simultaneously. Please, refer to "Type CF Patient Leakage Current Test - ECG Leads" part for detail.

Table 10-28: Typical Data Sheet for Total Patient Leakage Current - Type CF probes to ground

Tester Neutral	Tester Polarity Switch	Ground Switch	Measured Earth Leakage Current
Closed	Normal	Closed	
Closed	Normal	Open	
Closed	Reversed	Closed	
Closed	Reversed	Open	
Open	Normal	Closed	
Open	Reversed	Closed	

10.6.12 Total Patient Leakage Current : Mains to Type CF probe (Only for Europe)

Reference the procedure in the IEC 60601-1 Ed.3 Measure leakage current flow from main to all ECG leads connected together.



Warning: Electric Shock Hazard!

When the meter's ground switch is OPEN, DO NOT touch the Voluson Performance 16/ Voluson Performance 18 system!



Caution: Equipment damage possibility!

Never switch the Polarity and the status of Neutral when the Voluson Performance 16/ Voluson Performance 18 system is powered ON. Power off the Voluson Performance 16/ Voluson Performance 18 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.

Table 10-29: Typical Data Sheet for total Patient Leakage Current - Mains to Type CF Probes

Tester Neutral	Tester Polarity Switch	Ground Switch	Measured Earth Leakage Current
Closed	Normal	Closed	
Closed	Reversed	Closed	

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 with a new one if any portion is defective.

10.7.2 Earth and/or Enclosure Fails

Follow the below checklist in case of earth and/or enclosure leakage current failure.

- Confirm the ground of the power cord and plug for continuity.
- Ensure the ground is not broken, frayed or intermittent. If that, replace any defective part.
- Inspect wiring for bad cripms, poor connections, or damage.
- Test the wall outlet. Verify it is grounded and is free of other wiring abnormalities. If any deviation is found, notify the user or owner to correct it. In this case, this should be suspected as a possible cuase and the outlet wiring should be visually inspected.

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 determine 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 determine 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, internal peripherals, 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 Performance 16/ Voluson Performance 18 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 system

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

10.7.7 ECG fails

Inspect cables for damage or poor connections.

10.8 Ultrasound Equipment Quality Check

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

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