



**GE**

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# Technical Publication

Vivid T9/Vivid T8

Basic Service Manual

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**Rev. 3**

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# Product Information

This manual is a reference for the Vivid T9, Vivid T8. It applies to all versions of the 203.x.x software for the Vivid T9/Vivid T8 ultrasound system.



**GE**

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market as GE Healthcare

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# Revision history

## Revision History

REV	DATE (YYYY/MM/DD)	REASON FOR CHANGE
Rev. 1	2018/02/06	Initial Release
Rev. 2	2018/08/15	Update software features
Rev. 3	2018/12/27	Update system figures

## List of Effected Pages (LOEP)

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# Important precautions

## Translation policy

### WARNING

English  
(EN)

This Service Manual is available in English only.

- If a customer's service provider requires a language other than English, it is the customer's responsibility to provide translation services.
- Do not attempt to service the equipment unless this Service Manual has been consulted and is understood.
- Failure to heed this Warning may result in injury to the service provider, operator or patient from electric shock, mechanical or other hazards.

### AVERTISSEMENT

Français  
(FR)

Ce manuel de maintenance est disponible en anglais uniquement.

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

### ADVERTENCIA

Español  
(ES)

Este Manual de servicio está disponible en idioma inglés únicamente.

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

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## WARNUNG

Dieses Wartungshandbuch ist nur auf Englisch verfügbar.

(DE) Deutsch

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

## AVVERTENZA

Il presente Manuale di assistenza è disponibile solo in inglese.

(E) italiano

- 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.

Deze servicehandleiding is alleen beschikbaar in het Engels.

(NL) Nederlands

- 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.

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## 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.

- 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

簡体中文  
(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。

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

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

## ПРЕДУПРЕЖДЕНИЕ

- 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.

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## 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.

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## VAROVANIE

Slovenčina  
(SK)

Táto servisná príručka je dostupná iba v anglickom jazyku.

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

## VÝSTRAHA

česky  
(CZ)

Tato servisní příručka je k dispozici pouze v angličtině.

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

## UYARI

Türkçe  
(TK)

Servis Kılavuzu yalnızca İngilizce olarak mevcuttur.

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

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## ADVARSEL

- Dansk  
(DA)
- Denne servicemanual fås kun på engelsk.
- Hvis en kundes tjenesteudbyder kræver et andet sprog end engelsk, er det kundens ansvar at sørge for oversættelsesydelse.
  - Forsøg ikke at udføre service på udstyret, medmindre denne servicemanual er læst og forstået.
  - Manglende overholdelse af denne advarsel kan medføre skade på serviceudbyderen, operatøren eller patienten som følge af elektrisk støt, 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, käänköspalveluiden 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

Româna  
(RO)

Acest manual de service este disponibil doar în engleză.

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

## UPOZORENJE

Hrvatski  
(HR)

Ovaj servisni priručnik dostupan je samo na engleskom jeziku.

- Ako klijentov serviser zahtijeva jezik koji nije engleski, odgovornost klijenta je pružiti usluge prijevoda.
- Nemojte pokušavati servisirati opremu ako niste pročitali i razumjeli servisni priručnik.
- Ako ne poštujete ovo upozorenje, može doći do ozljede servisera, operatera ili pacijenta prouzročene strujnim udarom, mehaničkim i drugim opasnostima.

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## ĮSPĖJIMAS

☒ Lietuvių k.

- 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.

## BRĪDINĀJUMS

☒ Latviski

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

## UPOZORENJE

☒ Srpski

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

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

## ПОПЕРЕДЖЕННЯ

Українська  
(UK)

Цей посібник із технічного обслуговування доступний лише англійською мовою.

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

## PERINGATAN

Bahasa  
Indonesia  
(ID)

Panduan Servis ini hanya tersedia dalam Bahasa Inggris.

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

## ЕСКЕРТУ

Қазақ тілінде  
(КК)

- 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.

## คำเตือน

ไทย  
(TH)

คู่มือซ่อมบำรุงนี้มีเฉพาะภาษาอังกฤษเท่านั้น

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

## BABALA

Tagalog  
(TL)

Available lamang sa Ingles ang Manwal ng Serbisyo ng ito.

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

---

## **Damage in transportation**

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

## **Certified electrical contractor statement - For USA Only**

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

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

---

## Omission and errors

If there are any omissions, errors or suggestions for improving this documentation, contact the GE Healthcare Global 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 Medical Systems (China) Co., Ltd.  
No. 19 Changiang Road  
Wuxi National Hi-Tech Dev. Zone  
Jiangsu  
P.R.China 214028

GE employees should use TrackWise to report service documentation issues.

These issues will then be in the internal problem reporting tool and communicated to the writer.

---

## Service Safety Considerations



**DANGER**

DANGEROUS VOLTAGES, CAPABLE OF CAUSING DEATH, ARE PRESENT IN THIS EQUIPMENT. USE EXTREME CAUTION WHEN HANDLING, TESTING AND ADJUSTING.



<sup>w</sup>

**WARNING**

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

For a complete review of all safety requirements, refer to Chapter 1 in the Service Manual.

---

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# Chapter 1

## Introduction

*This chapter describes important issues related to safely servicing the Ultrasound system. The service provider must read and understand all the information presented here before installing or servicing the units.*

# 1-1 Overview

## **1-1-1 Contents in this chapter**

- 1-1 'Overview' on *page 1-2*
- 1-2 'Manual Overview' on *page 1-3*
- 1-3 'Important conventions' on *page 1-6*
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- 1-10 'EMC, EMI and ESD' on *page 1-24*
- 1-11 'Customer assistance' on *page 1-26*

# 1-2 Manual Overview

This manual provides installation and service information for the Vivid T9/Vivid T8 Ultrasound system. It is divided in ten chapters as shown below.

This manual is for Vivid T8 and Vivid T8 Pro.

## 1-2-1 Contents in this manual

The manual is divided into ten chapters.

In the beginning of the manual, before chapter 1, you will find the *Revision overview*, the *Important precautions* including *Translation policy*, *Damage in transportation*, *Certified electrical contractor statement*, *Omission & errors*, *Service safety considerations* and *Legal notes*, and the *Table of Contents (TOC)*.

An Index has been included after Chapter 10.

Table 1-1: Contents in this manual

Chapter number	Chapter title	Description
1.	Introduction	Contains a content summary and warnings.
2.	Site preparations	Contains pre-setup requirements for the Vivid T9/Vivid T8.
3.	System Setup	Contains setup procedure with procedure checklist for the system.
4.	General Procedures and Functional Checks	Contains functional checks that must be performed as part of the installation, or as required during servicing and periodic maintenance.
5.	Components and Functions (Theory)	Contains block diagrams and functional explanations of the electronics.
6.	Service Adjustments	Contains instructions on how to make any available adjustments to the Vivid T9/Vivid T8.

Table 1-1: Contents in this manual (Continued)

Chapter number	Chapter title	Description
7.	Diagnostics/ Troubleshooting	Provides procedures for running diagnostic or related routines for the Vivid T9/Vivid T8.
8.	Replacement procedures	Provides disassembly procedures and reassembly procedures for all changeable FRU.
9.	Renewal Parts	Contains a complete list of replacement parts for Vivid T9/Vivid T8.
10.	Care & Maintenance	Provides periodic maintenance procedures for Vivid T9/Vivid T8.
N/A	Index	A quick way to the topic you're looking for.

### 1-2-2 Typical users of the Proprietary Service Manual

- GEHC Service Personnel (setup, maintenance, etc.)
- GEHC Online Center Personnel
- Licensed Hospital's Service Providers

## 1-2-3 Vivid T9/Vivid T8 models covered by this manual

Table 1-2: Vivid T9/Vivid T8 Model Designations

Model Number	Description	System SW
H48022BA	English version Vivid T8 R3 system with battery	203.x.x
H48022BB	English version Vivid T8 R3 system without battery	203.x.x
H48022BC	English version Vivid T9 system with battery	203.x.x
H48022BD	English version Vivid T9 system without battery	203.x.x

*NOTE: When not otherwise specified, the contents of this manual applies to all Vivid T9/Vivid T8 models.*

# 1-3 Important conventions

## **1-3-1 Conventions used in book**

Important conventions, used in this document, are described next.

### **1-3-1-1 Model designations**

This manual covers the Vivid T9/Vivid T8 Ultrasound systems listed in:

[1-2-3 'Vivid T9/Vivid T8 models covered by this manual' on page 1-5.](#)

### **1-3-1-2 Icons**

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

### 1-3-1-3 Safety precaution messages

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

- DANGER
- WARNING
- CAUTION



Danger is used to indicate the presence of a hazard that will cause severe personal injury or death if the instructions are ignored.



Warning is used to indicate the presence of a hazard that can cause severe personal injury and property damage if instructions are ignored.



Caution is used to indicate the presence of a hazard that will or can cause minor personal injury and property damage if instructions are ignored. Equipment damage possible.

*NOTE: Notes are used to provide important information about an item or a procedure.*

*NOTE: Be sure to read the notes; the information contained in a note can often save you time or effort.*

### 1-3-2 Standard hazard icons

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

Table 1-3: Standard hazard icons

	ELECTRICAL
	MECHANICAL
	RADIATION
	LASER
	HEAT
	PINCH

**NOTE:** *Even if a symbol isn’t used on the product or in this manual, it may be included for your reference.*

**1-3-2-1 Standard Icons that indicate that a special procedure is to be used**

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

Table 1-4: Standard Icons that indicates that a special procedure is to be used

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

Be sure to read the notes; the information contained in a note can often save you time or effort.

# 1-4 Product icons

It is important to refer to the current revision of the Ultrasound system's User Manual for a full list of product labels prior to servicing the system.

# 1-5 Labels locations

It is important to refer to the current revision of the Ultrasound system's User Manual for a full list of product labels prior to servicing the system.

Vivid T9/Vivid T8 labels are provided in English.

The labels are at the back of the system. The label content may be different for different regions. Please refer to the labels on the system for the actual content.

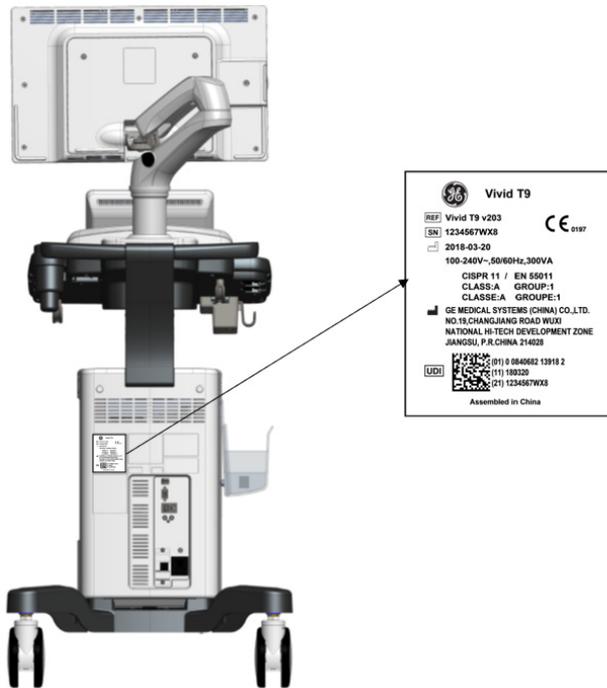


Figure 1-1. Rating Plate Location

Table 1-5: Label Icons

Label/Icon	Purpose/Meaning	Location
	<p>Every system has a unique marking for identification, the Unique Device Identification (UDI) Label. The UDI label consists of a series of alpha-numeric characters and barcode which uniquely identify the Vivid T9/Vivid T8 system as a medical device manufactured by General Electric. Scan or enter the UDI information into the patient health record as required by country-specific laws.</p>	<p>Rating plate</p>
	<p>Serial Number.</p>	<p>Rating plate</p>

**NOTE:** *If the new label is needed during the service activities, please click “Ask an Expert” to submit the case in the support central: [http://supportcentral.ge.com/products/sup\\_products.asp?prod\\_id=44177](http://supportcentral.ge.com/products/sup_products.asp?prod_id=44177).*

# 1-6 Safety considerations

## 1-6-1 Contents in this section

- 1-6-2 'Introduction' on *page 1-13*
- 1-6-3 'Human Safety' on *page 1-13*
- 1-6-4 'Mechanical safety' on *page 1-16*
- 1-6-5 'Electrical safety' on *page 1-19*

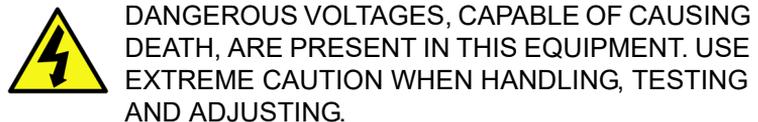
## 1-6-2 Introduction

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

## 1-6-3 Human Safety

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

Only personnel who have participated in a Vivid T9/Vivid T8 Training Seminar are authorized to service the equipment.



If the covers are removed from an operating Vivid T9/Vivid T8, some metal surfaces may be warm enough to pose a potential heat hazard if touched, even while in shutdown mode.

### 1-6-3 Human Safety(continued)



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



Have two people available to deliver and unpack the Vivid T9/ Vivid T8.

Attempts to move the Ultrasound system considerable distances or on an incline by one person could result in injury or damage or both.



Explosion Warning

DO NOT operate the equipment in an explosive atmosphere. Operation of any electrical equipment in such an environment constitutes a definite safety hazard.



DO NOT substitute parts or modify equipment

Because of the danger of introducing additional hazards, ONLY install GE approved parts. DO NOT perform any unauthorized modification of the equipment.



Ensure that the Ultrasound system is turned off and unplugged

Wait for at least 20 seconds for capacitors to discharge as there are no test points to verify isolation. The white light on the OP panel ON/OFF button will turn off.

Ultrasound system components may be energized. Always refer to the Ultrasound system's Proprietary Service Manual for LOTO warnings and cautions

### 1-6-3 Human Safety(continued)



Risk of electrical shock, Ultrasound system must be turned off and disconnected from power source. Cord must be controlled at all times.

Wait for at least 20 seconds for capacitors to discharge as there are no test points to verify isolation. The white light on the OP panel on/off button will turn off.

Ultrasound System components may be energized. Always refer to the Ultrasound system's Proprietary Service Manual for LOTO warnings and cautions



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



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.



Wear all PPE including gloves as indicated in the chemical MSDS.

## 1-6-4 Mechanical safety



While the software install procedure is designed to preserve data, you should save any patient data, images, system setups to removable media or hardcopy before doing a software upgrade.



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



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



When the Ultrasound system is raised for a repair or moved along any incline, use extreme caution since it may become unstable and tip over.



Take extra care when moving the system.

The Vivid T9/Vivid T8 weighs approximately 65 kg (144 lbs) or more, depending on installed peripherals, when ready for use. To avoid possible injury and equipment damage when transporting from one area of use to another:

- Be sure the pathway is clear.
- Limit movement to a slow careful walk.
- Use two or more persons to move the equipment on inclines or long distance.



Before you move or transport the Ultrasound system, make sure to lock the LCD monitor arm firmly and flip down the monitor to prevent damage to the Ultrasound system.

## 1-6-4 Mechanical safety(continued)



CAUTION

To avoid injury when you move the LCD monitor and the monitor arm, do not put your finger, hand, or object on the joint of the monitor or the monitor arm.



CAUTION

Ensure that nobody touches the console arm when moving the operator panel.



CAUTION

Do not move the Ultrasound system if the Operator Panel is in unlocked position.



CAUTION

Do not transport Vivid T9/Vivid T8 in a vehicle without locking the casters (wheels) and securing it as described in chapter 4.



CAUTION

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



CAUTION

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



## 1-6-4 Mechanical safety(continued)



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



Be careful not to pinch any of the cables.

**NOTE:** *Special care should be taken when transporting the Ultrasound system in a vehicle:*

- Before transporting, place the system in its special storage case.
- Lock the wheels (brake)
- Ensure that the system is firmly secured while inside the vehicle.
- Secure system with straps or as directed otherwise to prevent motion during transport.
- Prevent vibration damage by driving cautiously. Avoid unpaved roads, excessive speeds, and erratic stops or starts.

## **1-6-5 Electrical safety**

### **1-6-5-1 Safe practices**

Follow these guidelines to minimize shock hazards whenever you are using the Ultrasound system:

- To minimize shock hazard, the equipment chassis must be connected to an electrical ground.
- The Ultrasound 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



Connecting a Vivid T9/Vivid T8 to the wrong voltage level will most likely destroy it.

### **1-6-5-2 Probes**

Follow these guidelines before connecting a probe to the Ultrasound system:

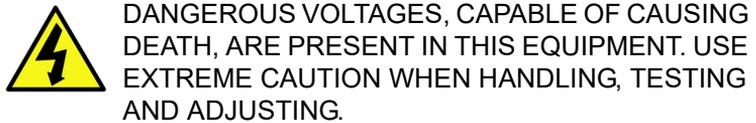
- Inspect the probe prior to each use for damage or degradation to the:
  - housing
  - cable strain relief
  - lens
  - seal
  - connector pins
  - locking mechanism
- Do not use a damaged or defective probe.
- Never immerse the probe connector or adapter into any liquid.
- The system has more than one type of probe port. Use the appropriate probe port designed for the probe you are connecting.

### **1-6-5-3 Peripherals**

Refer to the Patient Safety Environment section of the User's Manual for peripheral isolation information.

# 1-7 Dangerous procedure warnings

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



If the covers are removed from an operating Vivid T9/Vivid T8, some metal surfaces may be warm enough to pose a potential heat hazard if touched, even while in shutdown mode.



Explosion Warning

**DO NOT** operate the equipment in an explosive atmosphere. Operation of any electrical equipment in such an environment constitutes a definite safety hazard.



**DO NOT** substitute parts or modify equipment

Because of the danger of introducing additional hazards, **ONLY** install GE approved parts. **DO NOT** perform any unauthorized modification of the equipment.



**SHUT DOWN FORCEDLY OR PLUG IN/OUT ACDC INVALID MAY CAUSE THE DAMAGE OF SYSTEM FILES.**

# 1-8 Lockout/Tagout (LOTO) requirements

Follow 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. Remove/disconnect the battery, if present.
5. Apply Lockout/Tagout Devices.
6. Control all stored and residual energy.
7. Verify isolation.

All potentially hazardous stored or residual energy is relieved.



Energy Control and Power Lockout for Vivid T9/Vivid T8.

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

1. Follow LOCK OUT/TAG OUT procedures.
2. Turn off the breaker.
3. Unplug the Ultrasound system.
4. Maintain control of the Ultrasound system power plug.
5. Wait for at least 30 seconds for capacitors to discharge as there are no test points to verify isolation.
6. Remove/disconnect the battery, if present.

Ultrasound System components may be energized.

# 1-9 Returning probes and repair parts

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

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

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

# 1-10 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 to interference from its environment or when the device produces unacceptable levels of emission to its environment. This interference is often referred to as radio-frequency or electromagnetic interference (RFI/EMI) and can be radiated through space or conducted over interconnecting power or signal cables. In addition to electromagnetic energy, EMC also includes possible effects from electrical fields, magnetic fields, electrostatic discharge and disturbances in the electrical power supply.

## 1-10-2 CE Compliance

Vivid T9/Vivid T8 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.

For applicable standards, refer to the Safety Chapter of the Ultrasound system's User's Manual.

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

### 1-10-3 Electrostatic discharge (ESD) prevention



DO NOT touch any boards with integrated circuits prior to taking the necessary ESD precautions.

Always connect yourself, via an arm-wrist strap, to the advised ESD connection point located on the rear of the Ultrasound system (near the power connector).



Follow general guidelines for handling of electrostatic sensitive equipment.



Risk of electrical shock, 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.

# 1-11 Customer assistance

## 1-11-1 Contact information

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

Before you call, identify the following information, and acquire image (Alt+D) to send to the Customer Care team:

1. System ID serial number.
2. Software version.
3. Date and time of occurrence.
4. Sequence of events leading to issue.
5. Is the issue repeatable?
6. Imaging mode, probe, preset/application.
7. Media brand, speed, capacity, type.
8. Save secondary image capture, cine loop, 4D multi-volume loop.

**NOTE:** *Restart the application before resuming clinical scanning.*

## 1-11-2 Phone numbers for Customer Assistance

Table 1-6: Phone numbers for Customer Assistance

LOCATION	PHONE NUMBER	
USA GE Healthcare - GE Medical Systems Ultrasound Service Engineering 9900 Innovation Drive Wauwatosa, WI 53226	Service: On-site	1-800-437-1171
	Service Parts	1-800-558-2040
	Application Support	1-800-682-5327 or 1-262-524-5698
Canada	Phone:	1-800-668-0732
Latin America	Service Application Support	1-800-321-7937 1-262-524-5698
Europe (OLC-EMEA) GE Ultraschall Deutschland GmbH & Co. KG Beethovenstraße 239 Postfach 11 05 60, D-42655 Solingen Germany	OLC - EMEA Phone:	+49 (0) 212 2802 - 652 +33 1 3083 1300
	Fax:	+49 (0) 2122-8024-31
Online Services Ultrasound Asia	Phone: • Australia • China • India • Japan • Korea • Singapore	+ (61) 1-800-647-855 + (86) 800-810-8188 + (91) 1800-425-8025 + (81) 42-648-2940 + (82) 2620 13585 + (95) 6277-3444

## 1-11-3 System manufacturer

Table 1-7: System manufacturer

MANUFACTURER	PHONE NUMBER	FAX NUMBER
GE Medical Systems (China) Co., Ltd. No.19 Changjiang Road WuXi National Hi-Tech Development Zone Jiangsu P.R.China 214028	+86 510 85225888	+86 510 85226688

## 1-11-4 Authorized Representative

Table 1-8: Authorized Representative

AUTHORIZED REPRESENTATIVE	TELEPHONE / FAX NUMBER		
<p>The location of the CE marking is shown in the Safety chapter of the User manual.</p> <table border="1" data-bbox="150 428 322 498"><tr><td data-bbox="150 428 235 498">EC</td><td data-bbox="235 428 322 498">REP</td></tr></table> <p>GE Medical Systems SCS 283 rue de la Minière 78530 BUC, France</p>	EC	REP	
EC	REP		

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# Chapter 2

## Site Preparations

*This chapter provides the information required to plan and prepare for the setup of an Ultrasound system. Included are descriptions of the facility and electrical needs to be met by the purchaser of the units.*

# 2-1 Overview

## 2-1-1 Contents in this chapter

- 2-1 'Overview' on *page 2-2*
- 2-2 'General Ultrasound system requirements' on *page 2-3*
- 2-3 'Facility needs' on *page 2-12*
- 2-4 'Environmental Dangers' on *page 2-23*

# 2-2 General Ultrasound system requirements

## 2-2-1 Contents in this section

- 2-2-2 'Ultrasound system environmental requirements' on *page 2-3*
- 2-2-3 'Electrical requirements' on *page 2-6*
- 2-2-4 'EMI limitations' on *page 2-9*
- 2-2-5 'Probes environmental requirements' on *page 2-11*
- 2-2-6 'Time and manpower requirements' on *page 2-11*

## 2-2-2 Ultrasound system environmental requirements

### 2-2-2-1 If the Ultrasound system is very cold or hot

When unpacking the Ultrasound system, allow the temperature of the Ultrasound system to stabilize before powering up. The following table describes guidelines for reaching operational temperatures from storage or transport temperatures.



If the Ultrasound system is very cold or hot, do not turn on its power until it has had a chance to acclimate to its operating environment.

Table 2-1: System Acclimation Time Chart

<b>Degree C</b>	-4.5	-2	0.5	3	40	42.5	45	47.5	50	55	60
<b>Degree F</b>	23.9	28.4	32.9	37.4	104	108.5	113	117.5	122	131	140
<b>hours</b>	3	2	1	0	0	1	2	3	4	6	8

### 2-2-2-2 Environmental specifications for Ultrasound system

The system should be operated, stored, or transported within the parameters outlined below. Either its operational environment must be constantly maintained or the unit must be turned off.

Table 2-2: System Environmental Requirements

	<b>Operational</b>	<b>Storage</b>	<b>Transport (&lt;16hrs.)</b>
Temperature	3° - 40°C 38° - 104°F	-5° - 50°C 23° - 122°F	-5° - 50°C 23° - 122°F
Humidity	30 - 80% non-condensing	10 - 90% non-condensing	10 - 90% non-condensing
Pressure	700 - 1060hPa	700 - 1060hPa	700 - 1060hPa



° CAUTION

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



° CAUTION

The Vivid T9/Vivid T8 system and probe connector is not waterproof. Do not expose the device to water or any kind of liquid.

### 2-2-2-3 Cooling

The cooling requirement for a console Ultrasound system with monitor and on board peripherals, is up to 3800 BTU/h. 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.*

### 2-2-2-4 Lighting

Bright light is needed for Ultrasound 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.

## 2-2-3 Electrical requirements

### 2-2-3-1 General requirements

**NOTE:** *GE Healthcare 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 Ultrasound system.*

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.*

### 2-2-3-2 Electrical requirements for the Ultrasound system

In the table below, the electrical specifications for the Ultrasound system includes monitor and on board peripherals.

Table 2-3: Electrical Specifications for Vivid T9/Vivid T8 system

Voltage	Tolerance	Power Consumption	Frequency
100-240 VAC	±10%	Max. 400VA	50/ 60HZ

### **2-2-3-3 Site circuit breaker**



Power outage may occur. The Vivid T9/Vivid T8 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.

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



**POWER OUTAGE MAY OCCURE.**

The Vivid T9/Vivid T8 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.

### **2-2-3-4 Site power outlets**

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

### **2-2-3-5 Unit power plug**

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

**2-2-3-6 Power stability requirement**

Table 2-4: Power stability requirement

IEC 61000-4-11 Voltage dips, short interruptions and voltage variations on mains supply	< 5%T (> 95% dip) for 0.5 cycle;	< 5%T (> 95% dip) for 0.5 cycle;	Mains power quality should be that of a typical commercial or hospital environment.
	40%T (60% dip) for 5 cycles;	40%T (60% dip) for 5 cycles;	
	70%T (30 dip) for 25 cycles;	70%T (30 dip) for 25 cycles;	
	< 5%T (>95% dip) for 5 sec	< 5%T (>95% dip) for 5 sec	

## **2-2-4 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 Ultrasound system complies with limits as stated on the EMC label. However there is no guarantee that interference will not occur in a particular installation.

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

Electrical and electronic equipment may produce EMI unintentionally as the result of a defect. Some of these sources include:

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

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

See: [2-2-4-1 'EMI prevention/abatement'](#) on [page 2-10](#) for EMI prevention tips.

2-2-4-1 EMI prevention/abatement

Table 2-5: EMI prevention/abatement

EMI RULE	DETAILS
Be aware of Radio Frequency sources	<ul style="list-style-type: none"> <li>• Keep the Ultrasound system at least 5 meters (15 feet) away from other EMI sources.</li> <li>• Special shielding may be required to eliminate interference problems caused by high frequency, high powered radio or video broadcast signals.</li> </ul>
Ground the Ultrasound system	Poor grounding is the most likely reason an Ultrasound system will have noisy images. Check grounding of the power cord and power outlet.
Replace all screws, Radio Frequency gaskets, covers, cores	<ul style="list-style-type: none"> <li>• After you finish repairing or updating the Ultrasound system, replace all covers and tighten all screws.</li> <li>• Any cable with an external connection requires a magnet wrap at each end.</li> <li>• Install all covers. Loose or missing covers or Radio Frequency gaskets allow radio frequencies to interfere with the ultrasound signals.</li> </ul>
Replace broken Radio Frequency gaskets	If more than 20% or a pair of the fingers on an Radio Frequency gasket are broken, replace the gasket. Do not turn on the Ultrasound system until any loose metallic part is removed.
Do not place labels where Radio Frequency gaskets touch metal	Where applicable, never place a label where Radio Frequency gaskets meet the Ultrasound system. Otherwise, the gap created will permit Radio Frequency leakage. Or, if a label has been found in such a position, move the label.
Use GE specified harnesses and peripherals	The interconnect cables are grounded and require ferrite beads and other shielding. Also, cable length, material, and routing are all important; do not change from what is specified.
Take care with cellular phones	Cellular phones may transmit a 5 V/m signal; that could cause image artifacts.
Properly route peripheral cables	Where applicable, 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.

## 2-2-5 Probes environmental requirements

### 2-2-5-1 Operation, storage and transport temperatures for probes

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



CAUTION

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

Table 2-6: Probe Environmental Requirements

	Operational	Storage	Transport
<b>Temperature</b>	3° - 40°C 38° - 104°F	-5° - 50°C 23° - 122°F	-5° - 50°C 23° - 122°F
<b>Humidity</b>	30 - 80% non-condensing	10 - 90% non-condensing	10 - 90% non-condensing
<b>Pressure</b>	700 - 1060hPa	700 - 1060hPa	700 - 1060hPa



CAUTION

Check the room temperature before you use the probe.



CAUTION

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

**NOTE:** Refer to [Table 2-1 on page 2-3](#) to determine the needed settlement time.

## 2-2-6 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.

## 2-3 Facility needs

### 2-3-1 Contents in this section

- 2-3-2 'Purchaser responsibilities' on *page 2-13*
- 2-3-3 'Required facility needs' on *page 2-14*
- 2-3-4 'Desirable features' on *page 2-15*
- 2-3-5 'Minimal floor plan suggestion' on *page 2-16*
- 2-3-6 'Recommended floor plan suggestion' on *page 2-17*
- 2-3-7 'Suggested floor plan, Ultrasound system, and EchoPAC PC in same room' on *page 2-18*
- 2-3-8 'Networking setup requirements' on *page 2-18*

## 2-3-2 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. Purchaser responsibility includes:

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

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

The desire to use a non-listed or customer provided product or to place an approved product further from the Ultrasound 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 Ultrasound system. 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 Ultrasound system reliability.

### **2-3-3 Required facility needs**

*NOTE: GE Healthcare 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 Ultrasound system.*

*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.*

### 2-3-3 Required facility needs(continued)

*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 unit is only a conduit.*

- Dedicated single branch power outlet of adequate amperage meeting all local and national codes which is located less than 2.5 m (8 ft.) from the unit's proposed location
- Door opening is at least 76 cm (30 in) wide
- Proposed location for unit is at least 0.5m (1.5 ft.) from the wall for cooling
- Power outlet and place for any external peripheral are within 2 m (6.5 ft.) of each other with peripheral within 1 m of the unit to connect cables.
- Power outlets for other medical equipment.
- Power outlets for test equipment within 1 m (3.2 ft.) of Ultrasound 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)

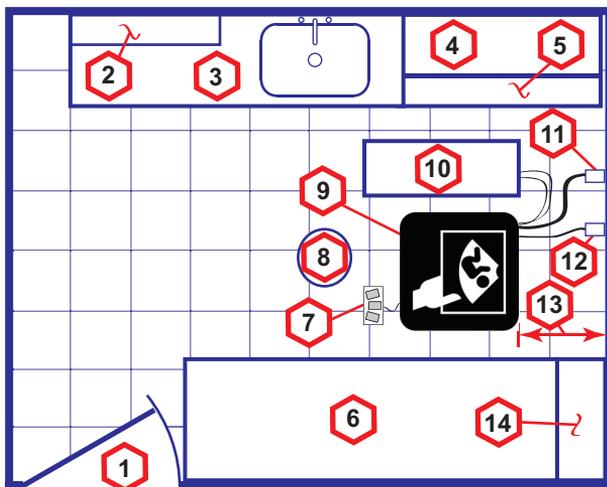
For the amperage requirements, see: [2-2-3 'Electrical requirements' on page 2-6.](#)

### 2-3-4 Desirable features

- Door is at least 92 cm (3 ft.) wide
- Circuit breaker for dedicated power outlet is easily accessible
- Sink with hot and cold water
- Receptacle for bio-hazardous waste, like used probe sheaths
- Emergency oxygen supply
- Storage for linens and equipment
- Nearby waiting room, lavatory, and dressing room
- Dual level lighting (bright and dim)
- Lockable cabinet ordered by GE for its software and proprietary manuals

## 2-3-5 Minimal floor plan suggestion

CSI 8x10



**Scale:**

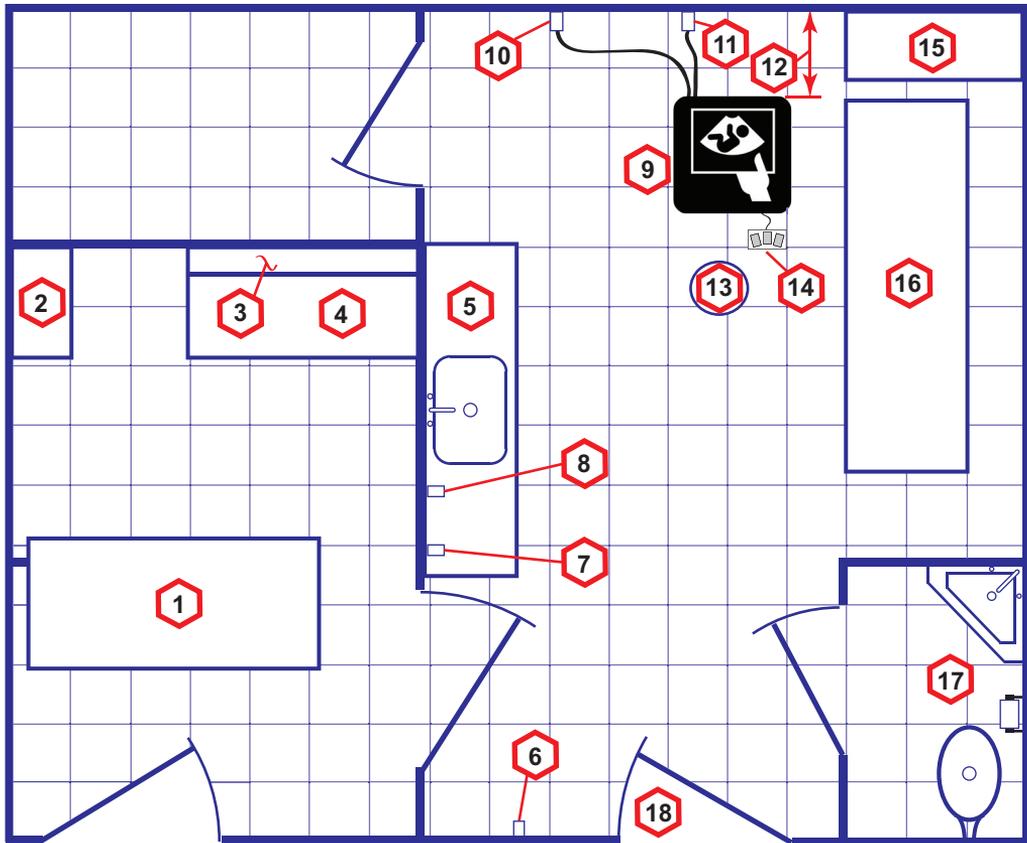
Each square equals one square foot (app. 31 x 31 cm)

- |   |  |   |
|---|--|---|
| 1. Door – at least 762 mm (30 inches)                             | 6. Examination Table – 1930 x 610 mm (76 x 24 inches)                        | 12. Network Interface   |
| 2. Film Viewer  | 7. Footswitch  | 13. 457 mm (18 inches) distance of Ultrasound system from wall or objects |
| 3. Counter Top, Sink with hot and cold water and Supplies Storage | 8. Stool   | 14. GE Cabinet for Software and Manuals                                   |
| 4. Linen Supply   | 9. Ultrasound system   |   |
| 5. Probes/Supplies  | 10. External Peripherals   |   |
|   | 11. Dedicated Power Outlet - Circuit Breaker protected and easily accessible |   |

Figure 2-1. Minimal floor plan, 2.5 m x 3 m (8 by 10 foot)

## 2-3-6 Recommended floor plan suggestion

CSI 14x17

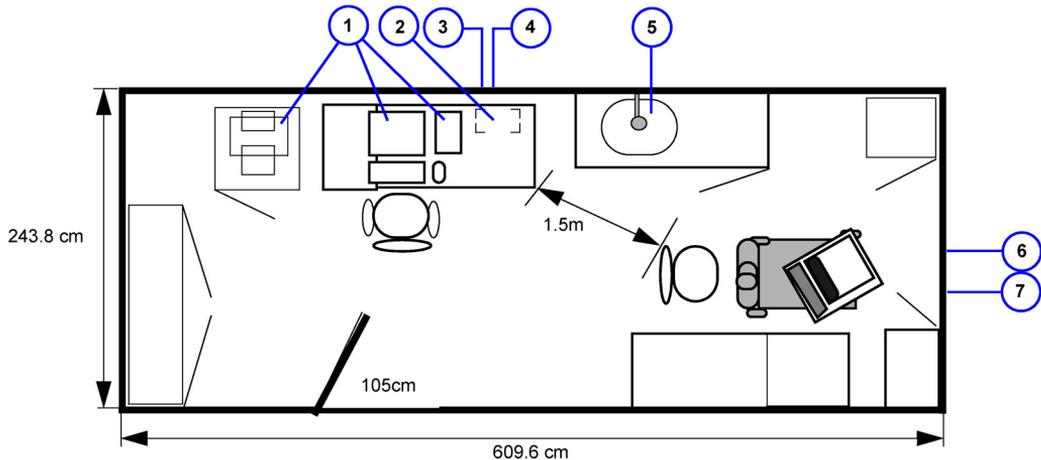


**Scale:** Each square equals one square foot (app. 31 x 31 cm)

- |  |  |  |
|--|--|--|
| 1. Secretaries or Doctors Desk                                   | 8. Suction Line  | 14. Footswitch   |
| 2. File Cabinet  | 9. Ultrasound system   | 15. Storage for Linens and Equipment                   |
| 3. Film Viewer   | 10. Dedicated Power Outlet - Circuit Breaker protected and easily accessible | 16. Examination Table – 1930 x 610 mm (76 x 24 inches) |
| 4. Counter Top   | 11. Network Interface  | 17. Lavatory and Dressing Room                         |
| 5. Counter Top and Sink with hot and cold water                  | 12. 457 mm (18 inches) distance of Ultrasound system from wall or objects    | 18. Door – at least 762 mm (30 inches)                 |
| 6. Overhead Lights Dimmer - Dual Level Lighting (bright and dim) | 13. Stool  |  |
| 7. Emergency Oxygen  |  |  |

Figure 2-2. A 14 by 17 foot recommended floor plan

### 2-3-7 Suggested floor plan, Ultrasound system, and EchoPAC PC in same room



- |                                 |                                 |                                 |
|---------------------------------|---------------------------------|---------------------------------|
| 1. EchoPAC PC workstation parts | 4. 3x mains power outlets       | 7. Ethernet network wall outlet |
| 2. UPS                          | 5. Hot and Cold water           |                                 |
| 3. Ethernet network wall outlet | 6. Dedicated mains power outlet |                                 |

Figure 2-3. Suggested Room with EchoPAC PC workstation and Ultrasound Scanner

### 2-3-8 Networking setup requirements

#### 2-3-8-1 Stand alone Ultrasound system (without network connection)

None.

#### 2-3-8-2 Scanner connected to hospital's network

**Supported networks:**

100/1000 Mbit Ethernet/DICOM network (option)

#### 2-3-8-3 InSite requirements

InSite requires an Ethernet connection via:

- 100/1000 Mbit Interface

#### **2-3-8-4 Purpose of the DICOM network function**

DICOM 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.

### 2-3-8-5 DICOM option setup requirements

To configure the Ultrasound system to work with other network connections, the site's network administrator must provide information to complete the form "Worksheet for DICOM Network Information". Ensure that there are no spaces in any field of the form.

See:

**Entries must include:**

- A host name, local port number, AE Title, IP address and Net Mask for the Ultrasound system.
- The IP addresses for the default gateway and other routers at the site for ROUTING INFORMATION.
- The host name, IP address, port and AE Title for each device the site wants connected to the Ultrasound system for DICOM APPLICATION INFORMATION. A field for the make (manufacturer) and the revision of the device, is also included. This information may be useful for error solving.

2-3-8-5 DICOM option setup requirements(continued)

**Vivid T8**

Host Name  IP Address  .  .  .  Local Port

AE Title  Net Mask  .  .  .

Network Speed  Default Gateway  .  .  .

DHCP

**DICOM APPLICATION**

	NAME	MAKE/	AE TITLE	IP	PORT	OTHER CONFIGURATION
Store 1	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/>	<input type="text"/>	<input type="checkbox"/> Raw Data <input type="checkbox"/> Allow Multiframe <input type="checkbox"/> Structured Reporting <input type="checkbox"/> Compression _____
Store 2	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/>	<input type="text"/>	<input type="checkbox"/> Raw Data <input type="checkbox"/> Allow Multiframe <input type="checkbox"/> Structured Reporting <input type="checkbox"/> Compression _____
Store 3	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/>	<input type="text"/>	<input type="checkbox"/> Raw Data <input type="checkbox"/> Allow Multiframe <input type="checkbox"/> Structured Reporting <input type="checkbox"/> Compression _____
DICOM Print	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/>	<input type="text"/>	Vendor: _____ Print Size: _____ Medium: _____ Copies: _____ Orientation: _____ Color _____
Worklist	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/>	<input type="text"/>	
Storage Commit	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/>	<input type="text"/>	Associated Storage AE _____
DICOM MPPS	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/>	<input type="text"/>	

Figure 2-4. Worksheet for DICOM Network Information

2-3-8-6 Installation Pre Checklist

Vivid T8 R2 Pre-Check List					
(This is a check list which is used for collecting/preparing for the system installation and configuraiton.)					
<b>Customer Site Information</b>					
Customer Site/Hospital:	<input style="width: 100%;" type="text"/>			Customer System SN:	<input style="width: 100%;" type="text"/>
Customer Site/Hospital Address:	<input style="width: 100%;" type="text"/>				
Customer Contact Information(This is used for installation contact window.):					
Name	Title	Phone	EMAIL		
<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>		
<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>		
<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>	<input style="width: 100%;" type="text"/>		
Please check with customer site IT team for below information.					
<b>TCP/IP Setting</b>					
HOST NAME:	<input style="width: 100%;" type="text"/>			IP Address:	<input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/>
AE TITLE:	<input style="width: 100%;" type="text"/>			Sub Net Mask:	<input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/>
DHCP:	<input type="checkbox"/> Enable <input type="checkbox"/> Disable			Default Gateway:	<input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/>
Wireless Network:					
SSID:	<input style="width: 100%;" type="text"/>			Authentication:	<input type="checkbox"/> Open <input type="checkbox"/> Shared Key <input type="checkbox"/> WPA <input type="checkbox"/> WPA2
Encryption:	<input type="checkbox"/> NONE <input type="checkbox"/> WEP <input type="checkbox"/> AES <input type="checkbox"/> TKIP				
<b>Insite Information Configuration</b>					
(We suggest that you could configure this section the first time you install the system. GE service team will be able to support remotely for the rest configuraitons if the network is connected and configured correctly.)					
*CRM#:	<input style="width: 100%;" type="text"/>	Note: CRM is from GE Service team.		Proxy IP Address:	<input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/>
CRM Description:	<input style="width: 100%;" type="text"/>	Proxy AUTHENTICATION:			<input type="checkbox"/> Enable <input type="checkbox"/> Disable
PROXY(option as need)	<input type="checkbox"/> Enable <input type="checkbox"/> Disable			PORT:	<input style="width: 100%;" type="text"/>
NAME	<input style="width: 100%;" type="text"/>				
PROXY USER:	<input style="width: 100%;" type="text"/>				
<b>DICOM Application Information</b>					
(In order to use this function, it is required to have the DICOM Software Option be activated.)					
NAME	Manufacturer	AE TITLE	IP Address	PORT	
DICOM STORAGE 1			<input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/>		
DICOM STORAGE 2			<input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/>		
DICOM STORAGE 3			<input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/>		
Query/Retrieve			<input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/>		
DICOM PRINT			<input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/>		
WORKLIST			<input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/> <input style="width: 25px;" type="text"/>		
<b>Other items need attention</b>					
<b>Key Items</b>			<b>Yes</b>	<b>No</b>	
Please arrange your time accordingly for the system installation, it may take around 3 hours for the setup of the system.					
Do you have the existence of any variances from the basic setup?					
Is it environmental cooling?					
<b>Please feel free to contact with GE service team if there are any problems or questions, we will be glad to serve you.</b>					
<b>GEHC - Americas</b>	<b>GEHC - Europe</b>	<b>GEHC - Asia</b>			
Online Services Ultrasound Phone: 1-800-321-7937 (USA/Canada) 1-262-524-5300 (Latin America)	EMEA Online Center Phone: +49 (0)212-2802-652 (- OLC) (English/German all segments incl. training); Fax: +49(0)212-2802-431  EAGM Online Center Egypt Service Center: 00202 2322 1252 UAE Service Center: 00971 8003646	Online Services Ultrasound Asia ANZ +(61) 1-800-647-855 China +(86) 800-810-8188 India +(91) 1800-425-8025 +(91) 1800-102-7750 +(91) 1800-425-7255 Japan +(81) 42-648-2940 Korea +(82) 2-1544-6119 Singapore +(65) 6291-8528 800 1012882 Toll free			

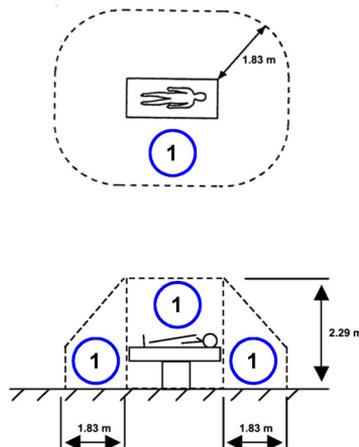
## 2-4 Environmental Dangers

Commercial devices such as laser cameras, printers, VCRs and external monitors, usually exceed allowable leakage current limits and, when plugged into separate AC outlets, are in violation of patient safety standards. Suitable electrical isolation of such external AC outlets, or providing the device with extra protective earth, will be required in order to meet UL60601-1 and IEC60601-1 / IEC60601-1-1 standards for electrical leakage.

### 2-4-1 Patient Vicinity UL60601-1 (USA)

#### 2.12.20DV (UL60601-1:2003)

In area in which patients are normally cared for, the patient vicinity is the space with surfaces likely to be contacted by the patient or attendant who can touch the patient. This encloses a space within the room 1.83 m (6 ft.) beyond the perimeter of the bed (examination table, dental chair, treatment booth, and the like) in its intended location, and extending vertically 2.29 m (7.5 ft.) above the floor.



1. Patient environment

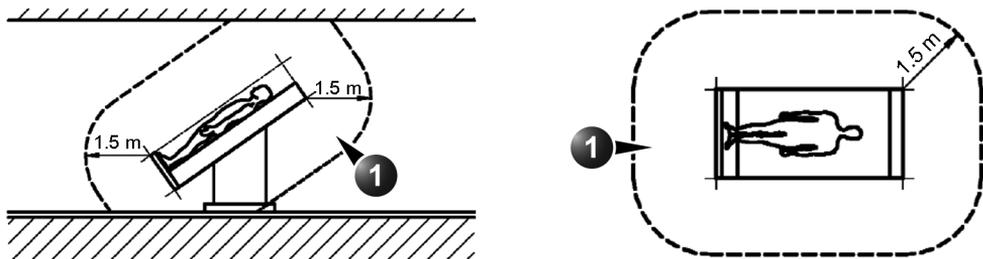
## 2-4-2 Patient Environment IEC60601-1 and ANSI AAMI ES60601-1

### Sub Clause 3.79 and figure A.9 (IEC60601-1:2005 and ANSI AAMI ES60601-1:2005)

Such an area is an environment in which medical diagnosis, monitoring or treatment is carried out. It is very difficult to attach unique dimensions to the PATIENT ENVIRONMENT.

In practice a distance of 2,5 m (8.2 ft.) above the floor on which the medical personnel stand and a horizontal distance of 1,5 m (4.9 ft.) have justified themselves as indicative of the dimensions of the Patient Environment.

The patient environment/vicinity will be depicted as a dashed line in this procedure. See example below.



1. Patient environment

Figure 2-5. Patient environment

---

# Chapter 3

## System Setup

*This chapter contains information needed to install Vivid T9/Vivid T8 system.*

*Included is a procedure that describes how to receive and unpack the equipment and how to file a damage or loss claim.*

*How to prepare the facility and unit of the actual installation, and how to check and test the unit, probes, and external peripherals for electrical safety are also included in this procedure.*

# 3-1 Overview

## 3-1-1 Contents in this chapter

- 3-1 'Overview' on *page 3-2*
- 3-2 'Setup reminders' on *page 3-3*
- 3-3 'Receiving and unpacking the equipment' on *page 3-6*
- 3-5 'Preparing for setup' on *page 3-18*
- 3-6 'Completing the setup' on *page 3-19*
- 3-7 'System Configuration' on *page 3-23*
- 3-8-3 'Peripherals Installation Instructions' on *page 3-27*
- 3-9 'Connectivity setup' on *page 3-43*
- 3-11 'Paperwork after setup' on *page 3-76*

## 3-2 Setup reminders

### 3-2-1 Average setup time

- Unpacking the Vivid T9/Vivid T8: 20 minutes
- Set up Vivid T9/Vivid T8 options: 15 minutes
- DICOM Network Configuration: 30 minutes or more, depending on the configuration
- Install Insite: 0.5 hour

The Vivid T9/Vivid T8 installation and functional checkout will take approximately 1 hour. Vivid T9/Vivid T8 consoles with optional equipment may take slightly longer.

### 3-2-2 Setup warnings



WHEN USING ANY TEST INSTRUMENT THAT IS CAPABLE OF OPENING THE AC GROUND LINE (I.E., METER'S GROUND SWITCH IS OPEN), DON'T TOUCH THE ULTRASOUND SYSTEM!



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



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



**DO NOT** operate this unit unless all board covers and frame panels are securely in place. System performance and cooling require this.

### 3-2-2 Setup warnings(continued)

1. There are no operator serviceable components. To prevent shock, do not remove any covers or panels. Should problems or malfunctions occur, unplug the power cord. Only qualified service personnel should carry out servicing.

**NOTE:** *For information regarding packing labels, refer to LABELS ON PACKAGE.*

2. After being transported, the unit may be very cold or hot. If this is the case, allow the unit to acclimate before you turn it on. It requires one hour for each 2.5°C increment it's temperature is below 3°C or above 40°C.



**DANGER**

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



**CAUTION**

If the Ultrasound system is very cold or hot, do not turn on its power until it has had a chance to acclimate to its operating environment.

The following table describes guidelines for reaching operational temperatures from storage or transport temperatures.

Table 3-1: System Acclimation Time Chart

<b>Degree C</b>	-4.5	-2	0.5	3	40	42.5	45	47.5	50	55	60
<b>Degree F</b>	23.9	28.4	32.9	37.4	104	108.5	113	117.5	122	131	140
<b>hours</b>	3	2	1	0	0	1	2	3	4	6	8

**3-2-2 Setup warnings(continued)**



Operator Manual(s)  
The User Manual(s) should be fully read and understood before operating the Vivid T9/Vivid T8 and kept near the Ultrasound system for quick reference.



Acoustic Output Hazard  
Although the ultrasound energy transmitted from the Vivid T9/Vivid T8 probe is within AIUM/NEMA standards, avoid unnecessary exposure. ultrasound energy can produce heat and mechanical damage.



# 3-3 Receiving and unpacking the equipment

## 3-3-1 Purpose of this section

This section describes how to receive and unpack Vivid T9/Vivid T8.

## 3-3-2 Contents in this section

- [3-3-3 'Warnings for receiving and unpacking' on page 3-6](#)
- [3-3-4 'The Tilt indicator' on page 3-7](#)
- [3-3-5 'Receiving the Vivid T9/Vivid T8' on page 3-7](#)
- [3-3-6 'Unpacking the Vivid T9/Vivid T8' on page 3-12](#)

## 3-3-3 Warnings for receiving and unpacking

GENERIC CRT  
VERSION



CAUTION

Two people are needed to unpack the Ultrasound system because of its weight. Attempts to move the Ultrasound system considerable distances or on an incline by one person could result in injury or damage or both.

Two people are required whenever a part weighing 16 KG (35 LBS) or more must be lifted.



CAUTION

Remember to use relevant personal protecting equipment (PPE) during packing and unpacking. Check with your local EHS representative.

### 3-3-4 The Tilt indicator

#### 3-3-4-1 Overview

Improper handling during transportation may harm the equipment inside the package even if the package itself is undamaged.

To make it easier to detect if the handling during transportation has been improper, a set of Tilt indicator has been attached to the transportation box.

Table 3-2: Tilt Watch

Description	Illustration
Tilt Watch	

### 3-3-5 Receiving the Vivid T9/Vivid T8

#### 3-3-5-1 Overview

Improper handling during transportation may harm the equipment inside the package even if the package itself is undamaged.

### 3-3-5-2 Examine all packages

Examine package closely at time of delivery, as described in the procedure below.

Table 3-3: Examine all packages

Step	Task	Illustrations
1.	<p>Is damage apparent?</p> <ul style="list-style-type: none"> <li>If <b>YES</b>; continue with the instructions in <a href="#">3-3-5-5 'Damage in transportation' on page 3-11</a>.</li> <li>If <b>NO</b>; continue with the next step.</li> </ul>	
2.	<p>Is the Tilt Indicator red colored inside the middle of the indicator?</p> <ul style="list-style-type: none"> <li>If <b>YES</b>: The Tilt Indicator has been activated. Continue with the instructions in <a href="#">3-3-5-5 'Damage in transportation' on page 3-11</a> before you continue with the next step.</li> <li>If <b>NO</b>: continue with the next step.</li> </ul>	 <p>1 - Red Color</p>
3.	<p>Continue with the instructions in <a href="#">3-3-6 'Unpacking the Vivid T9/Vivid T8' on page 3-12</a>.</p>	

### 3-3-5-3 Position of the Tilt indicator

The Tilt indicator has been attached to the transportation box as illustrated in the figure below.

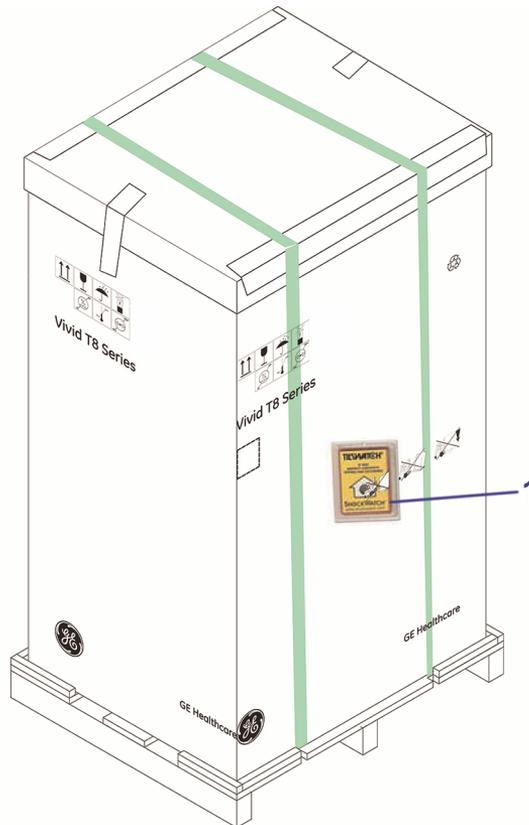


Figure 3-1. Tilt indicator

1. Tilt Indicator

**NOTE:** Before cutting the straps, check Tilt Tag to make sure it has not been triggered. If damaged, report it to the carrier. If not, then cut the straps around the crate.

### 3-3-5-4 If Tilt Indicator has triggered or is missing

The purpose of the tilt indicator label is to alert people handling a product that it is sensitive to tipping and it must remain upright at all times. It is basically an active "Up Arrow" that changes color if the package is tipped 89 degrees or more from horizontal. These labels can be false activated if tipped less than 89 degrees, and shocked or vibrated at the same time. This event does occur, but is considered uncommon. If a package is received with an activated tilt indicator label, there is high degree of certainty it tipped 89 degrees or more from horizontal during shipment.

An activated tilt indicator label does not indicate if the package was simply "Tipped" (laid down with no impact shock) or "Tipped Over" (free fall, with an impact shock). Using both shock indicator labels and tilt indicator labels will help identify if a Tip Over impact shock occurred.

Table 3-4: Tilt Indicator has triggered or is missing

Step	Task
1.	<b>If the Tilt Indicator is missing:</b> Note on the shipping papers at the time of receipt that the Tilt Indicator label is missing. <b>If the Tilt Indicator has triggered:</b> Note on the shipping papers at the time of receipt that the Tilt Indicator label was activated.
2.	Inspect the product for possible concealed damage.

### 3-3-5-5 Damage in transportation

Follow this procedure if damage is apparent:

1. Write "Damage In Shipment" on ALL copies of the freight or express bill **BEFORE** delivery is accepted or "signed for" by a GE representative or hospital receiving agent.
2. Report the damage to the carrier.
  - 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.

### 3-3-5-6 Vivid T9/Vivid T8 transportation box label

The Vivid T9/Vivid T8 transportation box label is located at the front of the transportation box.



Figure 3-2. Vivid T9/Vivid T8 transportation box label 1

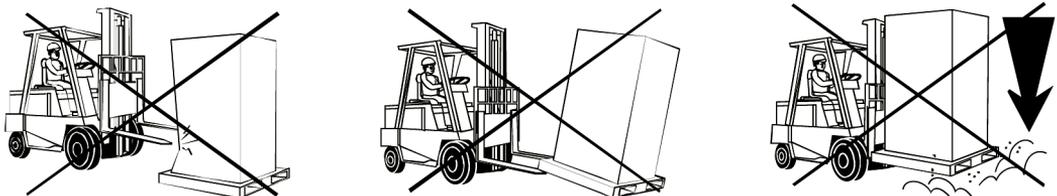


Figure 3-3. Vivid T9/Vivid T8 transportation box label 2

### 3-3-6 Unpacking the Vivid T9/Vivid T8

When a new system arrives, check that any components are not damaged and are not in short supply. If shipping damage or shortage occurs, contact the address shown in Chapter 1.



**CAUTION**

Please carefully unpack the system, and do not dispose the package of Vivid T9/Vivid T8 , so that it can be reused for service.

**NOTE:** Please check the Vivid T9/Vivid T8 console is well assembly after unpacking the system.

Table 3-5: Unpacking the Vivid T9/Vivid T8

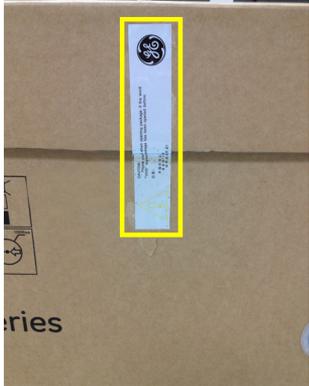
Step	Description	Corresponding Graphic
1.	Tear off the “stop open” mark.	
2.	Cut off the two packing straps around the crate.  <i>Note: To avoid injury, hold the strap clasp with one hand when cutting the strap.</i>	

Table 3-5: Unpacking the Vivid T9/Vivid T8

Step	Description	Corresponding Graphic
3.	Remove the top cover.	
4.	Remove the three plastic locks.  <i>Note: Rotate the inside plastic lock counterclockwise to remove it and then remove the outside lock.</i>	 
5.	Remove the outside shipping box.	

Table 3-5: Unpacking the Vivid T9/Vivid T8

Step	Description	Corresponding Graphic
6.	Remove the dust bag from the unit.	
7.	Remove the clear plastic (wrapped around the Vivid T9/Vivid T8 ) from the unit.  <i>Note: To avoid damaging the unit, please use a pair of scissors instead of the knife.</i>	

Table 3-5: Unpacking the Vivid T9/Vivid T8

Step	Description	Corresponding Graphic
8.	Unlock the strap.	
9.	Remove the foams beside the LCD monitor and the front wheels.	

Table 3-5: Unpacking the Vivid T9/Vivid T8

Step	Description	Corresponding Graphic
10.	Unlock the wheels, and then hold the control panel at the front side to move the system until the two front wheels are on the ground.	
11.	With one hand holding the control panel and the other hand holding the rear handle, move the whole system down to the ground.	
12.	Remove all the covers and foams from the unit.	

### 3-3-6-1 Moving into Position

Please refer to User Manual on how to move the system.

### 3-3-7 Packing the Equipment

Please pack Vivid T9/Vivid T8 in the reverse order of unpacking.

## 3-4 Packing materials - recycling information

The packing materials for Vivid T9/Vivid T8 are recyclable:

- The Transportation Box is made of spruce or similar material. ("PHYTOSANITARY CERTIFICATE" included in all shipments to The People's Republic of China.)
- Lever lockings (hinges) are made of zinc plated steel.
- The inner reinforcements are made of Ethafoam (Polyethylene foam).
- The plastic foil is made of LDPE (Low Density Polyethylene).

## 3-5 Preparing for setup

### 3-5-1 Verify customer order

Compare items received by the customer to that which is listed on the delivery order. Report any items that are missing, back ordered, or damaged.

### 3-5-2 Physical inspection

Verify that the system arrived intact (visual inspection).

If the system has been damaged, please refer to '[Damage in transportation](#)' on [page i-14](#) in the beginning of this manual.

### 3-5-3 EMI protection

The Vivid T9/Vivid T8 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 unit is put into operation.

See [2-2-4 'EMI limitations'](#) on [page 2-9](#) for more information about EMI protection.

# 3-6 Completing the setup

## 3-6-1 Purpose of this section

This section describes how to complete the installation of Vivid T9/Vivid T8.

## 3-6-2 Contents in this section

- [3-6-3 'System specifications' on page 3-19](#)
- [3-6-4 'Electrical specifications' on page 3-20](#)
- [3-6-5 'Connections on the I/O Rear Panel' on page 3-21](#)
- [3-6-6 'Connecting probes' on page 3-22](#)
- [3-6-7 'Powering the system' on page 3-22](#)

## 3-6-3 System specifications

### 3-6-3-1 System requirements verification

- Verify that the site meets the requirements listed in Chapter 2.  
(See: [2-3 'Facility needs' on page 2-12.](#))
- Verify that the specifications below don't conflict with any on-site conditions.

### 3-6-3-2 Physical dimensions

Table 3-6: Physical dimensions of Vivid T9/Vivid T8

Height	Width	Depth	Depth
1250	700	900	mm
49.3	27.6	35.5	Inches

### 3-6-3-3 Console Weight

- Weight: approx. 65 kg (144 lbs)

### **3-6-4 Electrical specifications**



<sup>w</sup> **WARNING**

Connecting a Vivid T9/Vivid T8 to the wrong voltage level will most likely destroy it.

#### **3-6-4-1 Verification of the system's voltage setting**

Verify that the mains voltage specified for the Vivid T9/Vivid T8 is available on-site.

Refer to the latest revision of the User Manual for a full list of product labels.

### 3-6-5 Connections on the I/O Rear Panel

**NOTE:** *Accessory equipment connected to the analog and digital interfaces must be certified according to the respective IEC standards (e.g. IEC60950 for data processing equipment and IEC60601-1 for medical equipment). Furthermore, all complete configurations shall comply with the valid version of the system standard IEC60601-1. Everybody who connects additional equipment to the signal input part or signal output part of Vivid T9/Vivid T8, configures a medical system, and is therefore responsible that the Ultrasound system complies with the requirements of the valid version of IEC60601-1. If in doubt, consult the technical service department or your local representative for GE Healthcare.*

#### 3-6-5-1 Connect Ethernet

Connect the network cable to the Ethernet connector on the I/O Rear Panel.

The connector is located on the rear side of Vivid T9/Vivid T8.

#### 3-6-5-2 Connect USB Flash Drive

**NOTE:** *USB Flash Drive approved for Vivid T9/Vivid T8 are verified for EMC performance according to EN55011 class B. The use of any other USB Flash Drive will compromise this verification, and may cause interference on Vivid T9/Vivid T8 itself, or on other electronic devices.*

For approved models, please refer to Chapter 9.

Insert the USB Flash Drive in one of the USB ports on the Vivid T9/Vivid T8.

### 3-6-5-3 Connect External Monitor through VGA port

Connect VGA cable to the system and the external monitor through VGA port. The screen displays on the external monitor. The external monitor resolution should be 1280 x 1024.

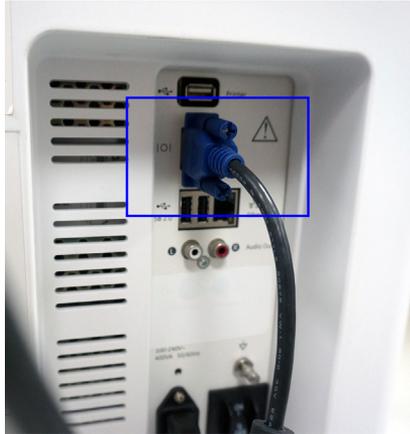


Figure 3-4. Connect with VGA cable

### 3-6-6 Connecting probes

Please refer to User Manual on how to connect/disconnect a probe.

### 3-6-7 Powering the system

Please refer to User Manual on how to power the system.

## 3-7 System Configuration

### 3-7-1 Purpose of this section

This section describes how to configure the Vivid T9/Vivid T8 .

### 3-7-2 Contents in this section

### 3-7-3 Vivid T9/Vivid T8 configuration

For complete instructions, refer to the latest revision of the Vivid T9/Vivid T8 Basic User Manual, Chapter 16.

Information includes Entering Location, Adjusting Date and Time, Selecting User interface Language, Selecting Online Manual Language, Selecting Unites of Measure.

# 3-8 Peripherals Installation

## 3-8-1 Overview

This section describes how to install and configure the peripherals validated for the Vivid T9/Vivid T8 .

About the operation check-out of peripherals, [See 4-3-32 'Peripheral checks' on page 4-35 for more information.](#)

Table 3-7: Vivid T9/Vivid T8 Peripherals

Description	Weight (kg)	Power	Control	Model
B/W USB Printer			USB Port	Sony UP-D898DC Printer
3-Pedal Footswitch			USB Port	Suns USB footswitch
USB Stick			USB Port	Keeber USB Stick
USB2.0 HDD			USB Port	USB HDD 1T
ECG			ECG Port	ECG Cable
Wireless USB Adapter			USB Port	NetGear A6210 USB Adapter

### 3-8-2 Furnished materials

This section describes the materials furnished with the Peripherals and with the system.

Retain the original carton and packing materials in case transport is needed in the future.

- B/W USB Printer

Table 3-8: Materials furnished with B/W Printer

Item	Description	Quantity	Note
1	Sony UP-D898DC Printer	1	
2	Paper Roll	1	
3	USB cable	1	

- USB Stick

Table 3-9: Materials furnished with USB Stick

Item	Description	Quantity	Note
1	Keeber USB Stick	1	
2	Paper Roll	1	
3	USB cable	1	

- USB 2.0 HDD

Table 3-10: Materials furnished with the USB 2.0 HDD

Item	Description	Quantity	Note
1	USB 2.0 HDD	1	
2	USB Cable	1	

- 3 Pedal Footswitch

Table 3-11: Materials furnished with the Footswitch

Item	Description	Quantity	Note
1	Suns USB Footswitch	1	

### 3-8-2 Furnished materials(continued)

- Wireless Interface USB Adapter

Table 3-12: Materials furnished with the Wireless Interface USB Adapter

Item	Description	Quantity	Note
1	Netgear Wireless Interface USB Adapter A6210	1	
2	USB-Docking for A6210	1	
3	Velcro tape strips for attaching USB-docking to the ultrasound system	1	
4	WiFi Label (Wireless Network Label)	1	

### 3-8-3 Peripherals Installation Instructions

#### 3-8-3-1 Sony UP-D898DC Printer Installation

##### 3-8-3-1-1 Tools

No special tools needed.

##### 3-8-3-1-2 Manpower

One person 5 min.

##### 3-8-3-1-3 Preparations

1. Unpack B/W Printer.

##### 3-8-3-1-4 Installation Procedure

**NOTE:** *The printer driver is customized for the Vivid T9/Vivid T8 at the factory; you do not need to change the settings.*

1. Place the device in a suitable place.
2. Connect the DC cable (a), printer USB cable (b) to the printer.
3. Connect the DC cable (1), printer USB cable (2) to the cable hub on the system.
4. Turn on the printer.

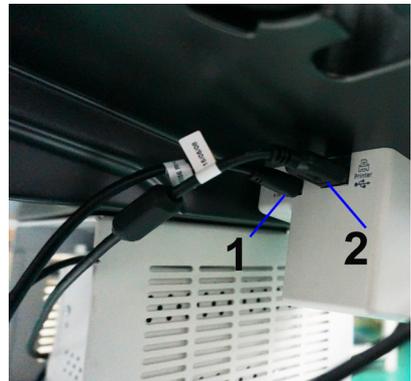
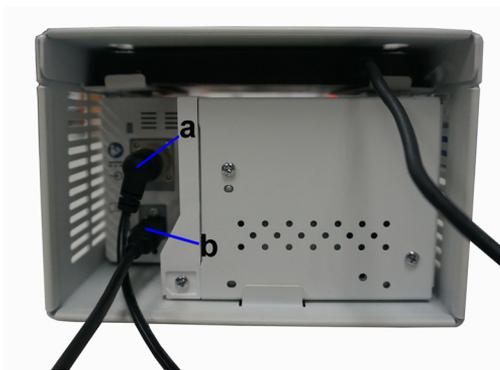


Figure 3-5. Connect UP-D898DC to Vivid T9/Vivid T8

### 3-8-3-1-4 Installation Procedure(continued)

5. Press **F2 (Config)** on the Control Panel.
6. Select **Connectivity-> Additional Outputs**, select the appropriate print key (Print1 or Print2) from the Button section.

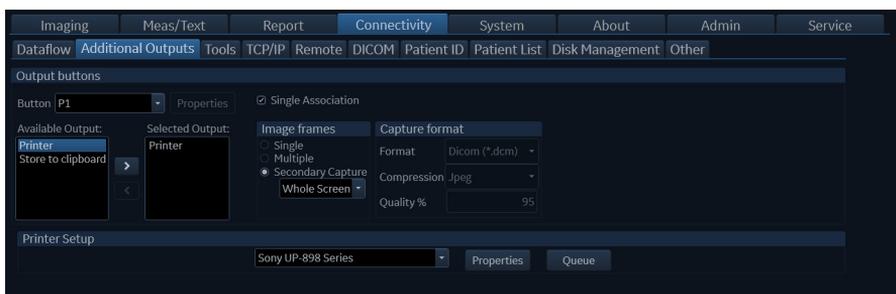


Figure 3-6. Connectivity->Additional Outputs

7. If Printer is not in the selected Devices menu, select it from the Available Devices in the left column and press “>>” to move to the selected Devices column.
8. A window will pop up.

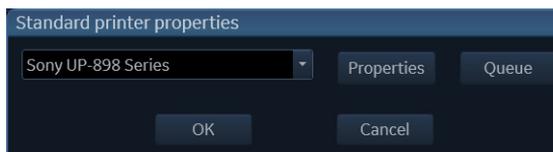


Figure 3-7. Standard printer properties

9. Select Sony UP 898 Series from the Name pull-down menu, then select **OK**.

### **3-8-3-2 Footswitch Installation**

#### **3-8-3-2-1 Tools**

No special tools needed.

#### **3-8-3-2-2 Manpower**

One person 5 min.

#### **3-8-3-2-3 Preparations**

1. Unpack the Footswitch.
2. Ensure no physical damage.

#### **3-8-3-2-4 Installation Procedure**

1. Connect the Footswitch to the USB port on the Vivid T9/  
Vivid T8 system.



Figure 3-8. Connect Footswitch to the system

### 3-8-3-2-5Configuring Footswitch

Footswitch supports these configurations: No Function, Select, Image Store, Cursor, Pointer, Previous Cycle, next Cycle, Freeze, 2D, Color, Print, Print Alt., Rec/Pause.

Enter **Config (F2) -> Imaging -> Application** to configure the Footswitch functions.

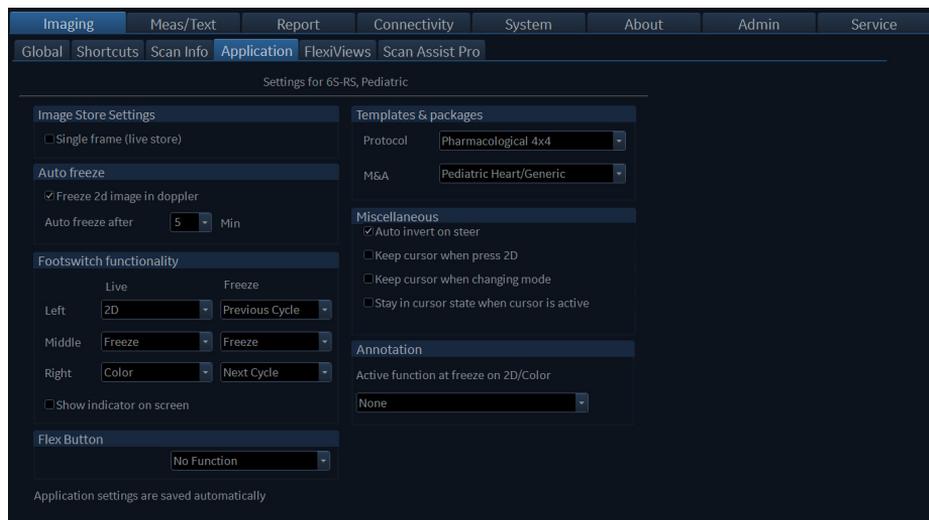


Figure 3-9. Configuring Footswitch Functions

### **3-8-3-3 USB2.0 HDD Installation**

#### **3-8-3-3-1 Tools**

No special tools needed.

#### **3-8-3-3-2 Manpower**

One person 5 min.

#### **3-8-3-3-3 Preparations**

1. Unpack the USB2.0 HDD.
2. Ensure no physical damage.

#### **3-8-3-3-4 Installation Procedure**

1. Connect the USB2.0 HDD to the USB port on the Vivid T9/  
Vivid T8 system.



Figure 3-10. Connect HDD to the system

### 3-8-3-4 ECG Installation

#### 3-8-3-4-1 Tools

No special tools needed.

#### 3-8-3-4-2 Manpower

One person 5 min.

#### 3-8-3-4-3 Preparations

1. Unpack the ECG.
2. Ensure no physical damage.

#### 3-8-3-4-4 Installation Procedure

1. Connect the ECG to the ECG cable on the Vivid T9/Vivid T8 system.



Figure 3-11. Connect ECG to the system

### 3-8-3-5 Wireless network adapter

#### 3-8-3-5-1 Tools

No special tools needed.

#### 3-8-3-5-2 Manpower

One person 10 min.

#### 3-8-3-5-3 Preparations

1. Unpack the wireless network adapter.
2. Ensure no physical damage.

#### 3-8-3-5-4 Connect the adapter using the USB-docking

1. Attach the Velcro tape strips to USB-docking and plastic cover:
  - a. Attach one piece of Velcro tape to the underside of the USB-dock.
  - b. Attach the other piece on the left or right side of plastic cover. Ensure that the Velcro tape is placed so it only covers front plastic cover, tape on plastic cover must also be placed as close to the right/left edge as possible, to avoid conflict with upper UI.
2. Insert the wireless network adapter into the USB-dock, place the dock onto the Velcro strip on plastic cover to fasten it. Connect docking USB-port to rear I/O USB-port on the ultrasound system.
3. Ensure that the wireless network adapter will not interfere with motion of UI by lowering it to bottom position and swivel to left/right. Reposition USB-dock if needed.

#### 3-8-3-5-5 Connect the adapter directly to the USB-port

Connect the wireless network adapter directly into rear I/O USB-port

**NOTE:** *Do not use any type of wireless adapter other than a GE-approved adapter.*

### 3-8-3-5-6 Configuring the Wireless Network Adapter

1. Press **Config (F2)** and log on as **Adm.**
2. Select **Connectivity** and the **TCP/IP** tab.



Figure 3-12. Connectivity - TCP/IP Tab

3. Click the **Wireless Settings** button.

**NOTE:** *If a wireless network adapter is not connected, or if the connected wireless network adapter is not the correct model, no wireless networks will be listed in the Wireless Settings page*

## 3-8-3-5 Wireless network adapter(continued)



Figure 3-13. Wireless Settings Main Screen

4. Either double-click or select the network you want to connect to, and press the **Connect** button. If this is the first time you attempt to connect to the network, a dialog will pop up on screen asking you to configure the network setting.

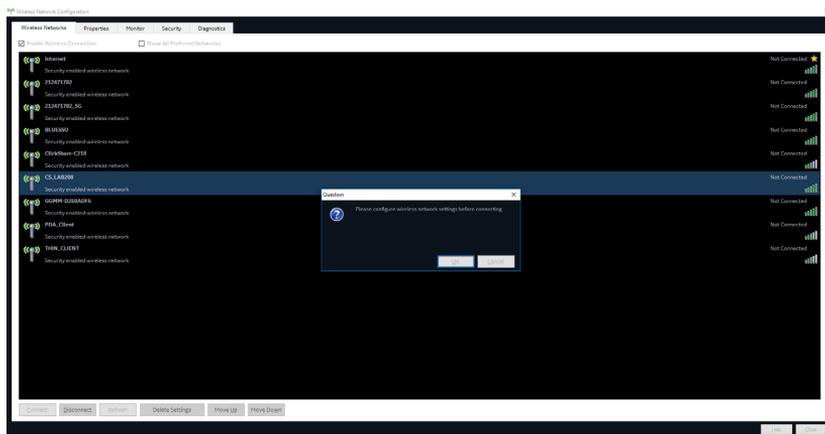


Figure 3-14. First Time Connection Dialog

5. Press **OK** in the dialog window.  
A new window for setting up your connection will open.

### 3-8-3-5 Wireless network adapter(continued)



Figure 3-15. Network Settings Window - Connection

6. Select check-boxes according to preference.  
If the **Connect automatically when this network is in range** setting is selected, then this network will auto-connect when available, without needing to enter the **Wireless Settings** page.
7. Setup security options in the **Security** tab of connection setup dialog.



Figure 3-16. Network Settings Window - Security

### 3-8-3-5 Wireless network adapter(continued)

8. If the wireless network is to be configured for WPA/WPA2 Enterprise and a customer specific certificate is to be installed on the system, this can be done by use of the certificate dialog available from the LDAP config page.
  - a. First go to LDAP config.

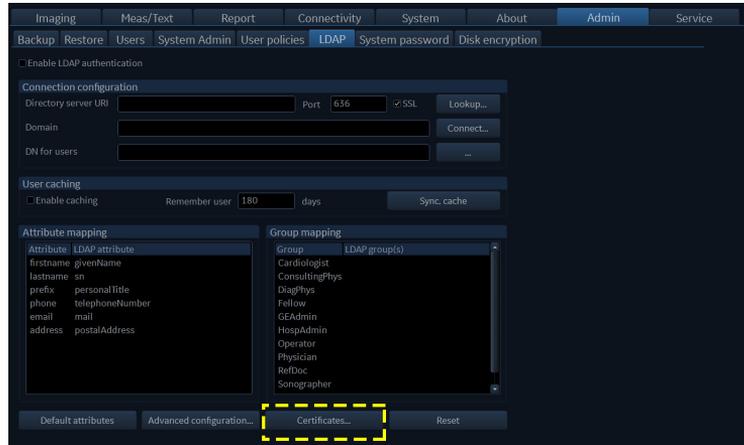


Figure 3-17. LDAP Config Screen

- b. Then click on the **Certificates...** button to open the Certificate dialog.

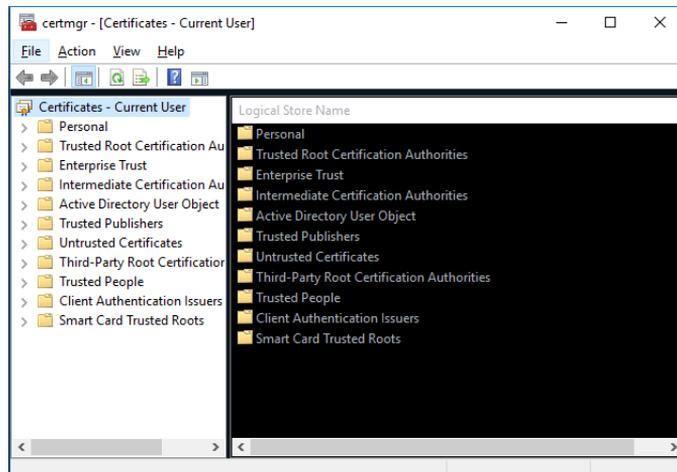


Figure 3-18. Certificate Dialog

### 3-8-3-5 Wireless network adapter(continued)

9. After you have finished setting up your connection, press **OK**.

The system will then try to establish a connection to your network. A dialog will be shown on screen while this is in progress.

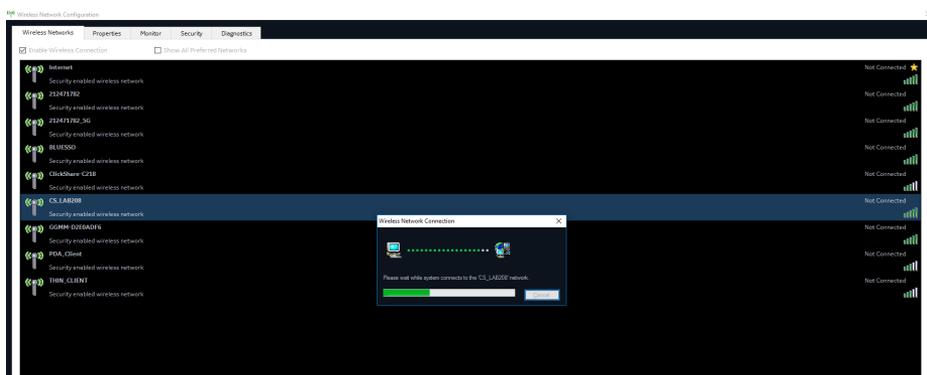


Figure 3-19. Connecting to Network Dialog

10. Once a connection has been established you will see the status **Connected** in the **Wireless Settings** page, next to the network you have connected to.

All network connections that are configured will also be displayed with a star icon.



Figure 3-20. Connection Established

**NOTE:** *Whenever connection to a new/different wireless network is required, it will be necessary to repeat all procedure steps above.*

### 3-8-3-6 Wireless settings - other options

#### 3-8-3-6-1 Reconfigure already configured network

To reconfigure an already configured network you can delete the configuration and reconfigure according to To delete configuration for a network, select the network in the list and press the **Delete Settings** button.

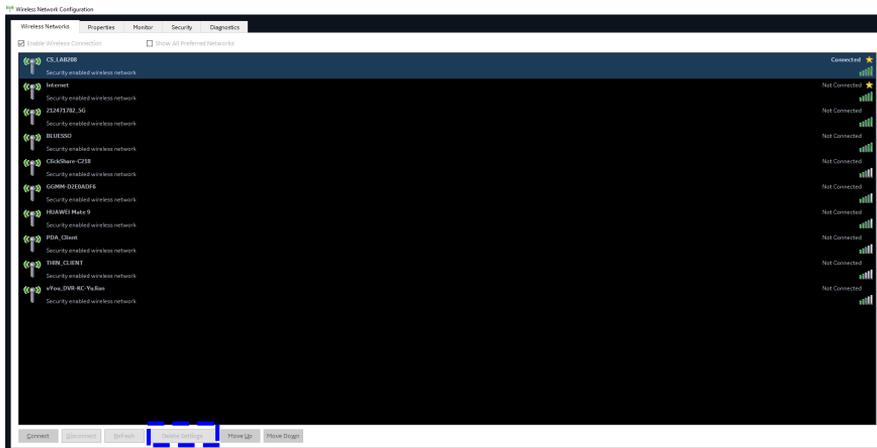


Figure 3-21. Delete Network Settings

It is also possible to edit the configuration for a network without deleting your settings. All configured networks are listed in the **Security** tab in the **Wireless Settings** window. Select the network for which you want to edit configuration and press **Customize** button.

### 3-8-3-6 Wireless settings - other options(continued)



Figure 3-22. Customize Network Settings

The window shown in [Figure 3-23](#) and [Figure 3-24](#) will open and you can edit your previously stored settings.

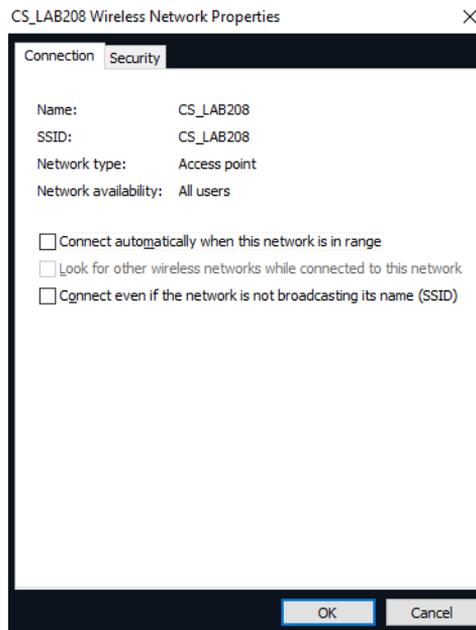


Figure 3-23. Network Settings Window - Connection

### 3-8-3-6 Wireless settings - other options(continued)

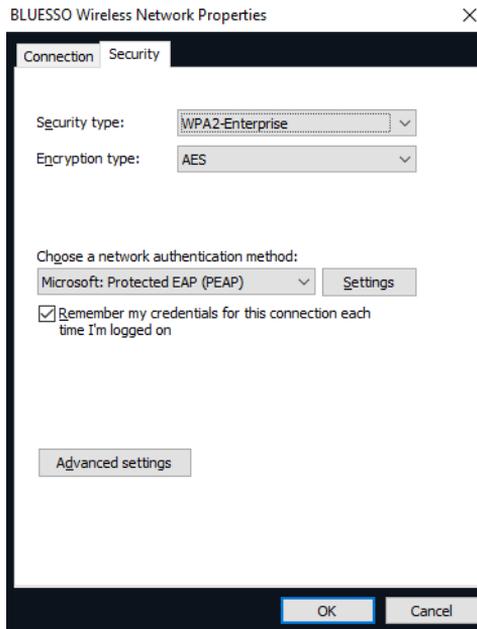


Figure 3-24. Network Settings Window - Security

#### 3-8-3-6-2 Properties

The **Properties** tab shows some basic status information, including connection status, IP address, connected network etc. It is also possible to view all available networks and some signal information for them by pressing **Available Channels...** button.

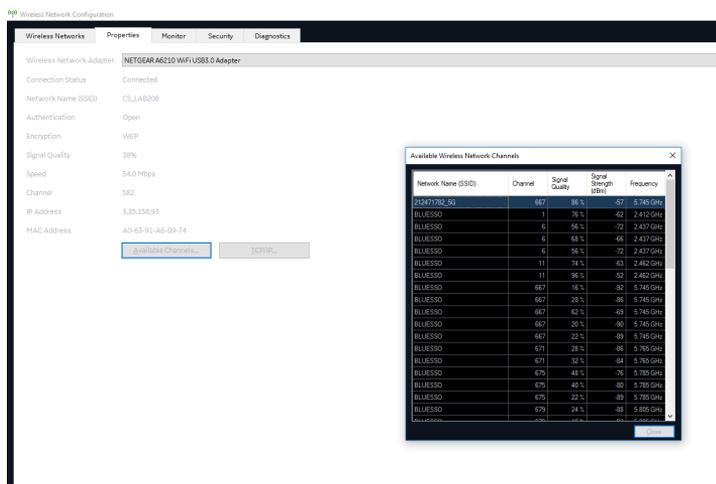


Figure 3-25. Properties Window - Available Channels

## 3-8-3-6-3 Monitor

The Monitor tab shows an error log.

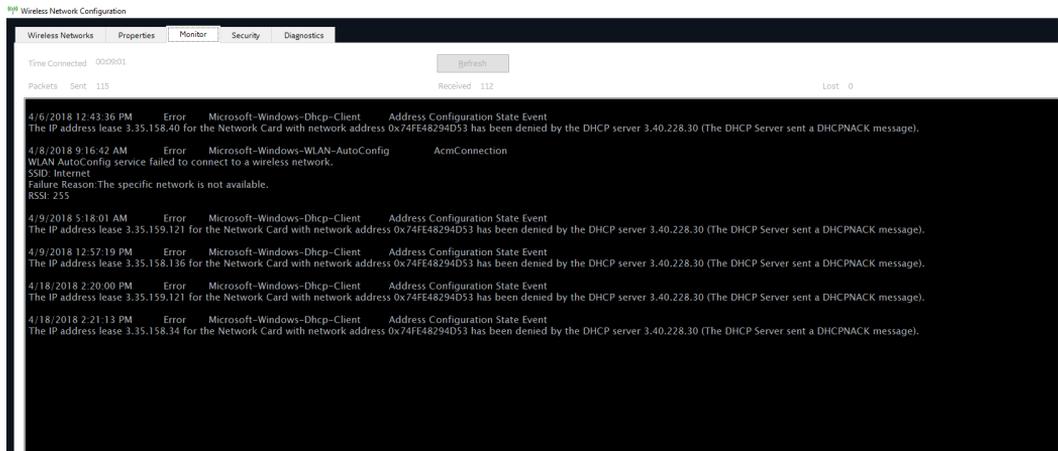


Figure 3-26. Monitor Window - Error Log

## 3-8-3-6-4 Diagnostics

The **Diagnostics** tab lets you run a test to check if your connection is working correctly.

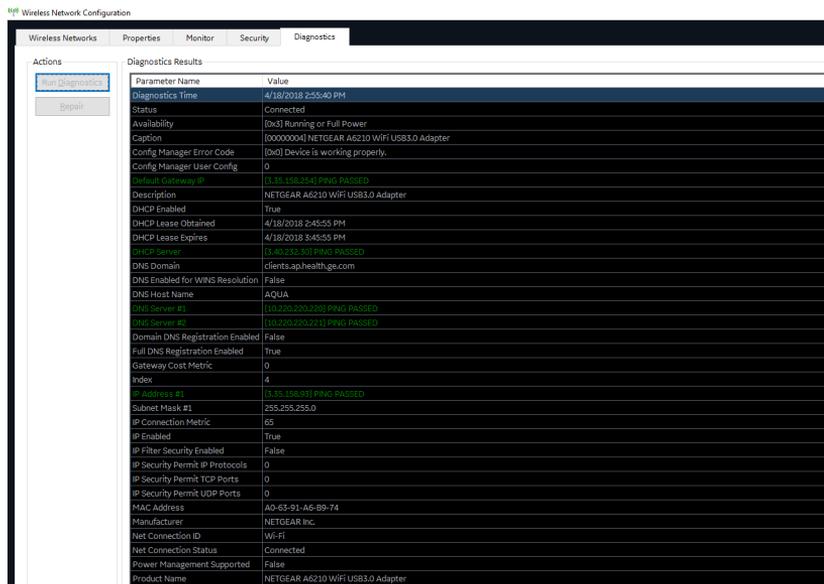


Figure 3-27. Diagnostic Window

## 3-9 Connectivity setup

### 3-9-1 TCP/IP Screen

1. Press **F2(Config)** on the control panel and login as admin, refer to 4-2-5 'Logging on to Vivid T9/Vivid T8 as "ADM" on page 4-10.
2. Select **Connectivity** on the screen.
3. Select **TCP/IP** tab, the screen gives an overview of the network settings for Vivid T9/Vivid T8.



Figure 3-28. TCP/IP Screen

- Computer Name: For Vivid T9/Vivid T8 , it is of this form: VIVIDX-00NNNN, NNNN is the system's serial number.
- IP Address.
- Server Config: List of servers and buttons to add, modify or remove servers.

### 3-9-1 TCP/IP Screen(continued)

- Saving Settings: Select to archive any changes that have been done to the TCP/IP Settings.
- Network Settings: Select to change the system's IP settings or turn DHCP on or off.
- Video Streaming: Select to configure the video streaming server and client.
- Wireless Settings: Select to configure WiFi network connection.

### 3-9-2 Set the Remote Archive's Network Information

To be able to connect to a remote archive on a remote computer or server, you must configure ultrasound system to communicate with it.

The configuration is done in the Server Config setup area on the TCP/IP screen.

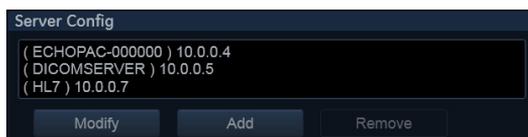


Figure 3-29. Server Config

#### 3-9-2-1 To Access the TCP/IP Screen

Follow this procedure to access the TCP/IP screen:

1. Log on as **ADM**.
2. Select **Connectivity > TCP/IP**.

#### 3-9-2-2 To Add a Server in the Server Config List

Follow this procedure to add a server in the list:

1. Select **Add**.

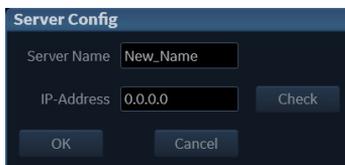


Figure 3-30. Server Config

### 3-9-2-2 To Add a Server in the Server Config List(continued)

2. Add the server's name in the *Server Name* field.
3. Add the server's IP address in the *IP-Address* field.
4. Select **Check** to verify that the server is found.

This check is a network Ping. A symbol to the right for the Check button indicates the result:

- A green check mark next to the Check button indicates that the IP-Address is found on the network.
- A red check mark indicates that the IP-Address can't be found.

Possible reasons:

- No network connection between the ultrasound system and the server.
- The wrong IP address.

### 3-9-2-3 To Modify the Setup for a Server in the List

*NOTE: Both the pre-defined servers and new servers can be modified.*

**Follow this procedure to modify the setup for a server in the list:**

1. Highlight the server you want to modify.
2. Select **Modify**.
3. Update the information as needed.
4. Select **Check** to verify that the server is found.

This check is a network Ping. A symbol to the right for the Check button indicates the result:

- A green check mark next to the Check button indicates that the IP-Address is found on the network.
- A red check mark indicates that the IP-Address can't be found.

Possible reasons:

- No network connection between the ultrasound system and the server.
  - The wrong IP address.
5. Select **OK** to confirm your new settings, or **Cancel** to leave without doing any changes.

### 3-9-2-4 To Delete a Server from the List

**Follow these steps to delete a server from the list:**

1. Highlight the server you want to delete from the list.

*NOTE: You can only delete extra servers. The predefined servers (listed on-screen) can be modified, but not deleted.*

2. Select **Remove**.

### 3-9-3 Save the New Settings

1. Press **Save Settings** to save the new settings.  
The new settings are saved to a common settings file. After a restart, the settings are also included in other screens.
2. Restart ultrasound system to activate the changes.

### 3-9-4 Setup connection to a DICOM server

Vivid T9/Vivid T8 is configured to work with DICOM servers in a network environment. 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 and to the local database, depending on dataflows.

To connect to the DICOM server, the following information has to be entered in the system.

- The DICOM server IP address
- The DICOM server port number
- The DICOM server AE title (the server application's name)

#### 3-9-4-1 DICOM Server IP address on the ultrasound system

1. Press **Config (F2)** and log on as **ADM**.
2. Select **Connectivity** and then select **Dataflow** tab.

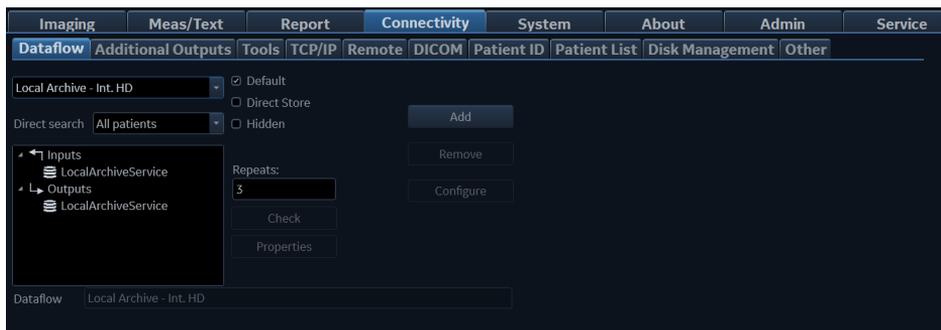


Figure 3-31. Select Dataflow

3. Open the **Dataflow** name pull-down menu.
4. Select the dataflow you want to configure.  
In this example, **Worklist/Local Archive - DICOM Server/Int.HD** is selected.

### 3-9-4-1 DICOM Server IP address on the ultrasound system(continued)

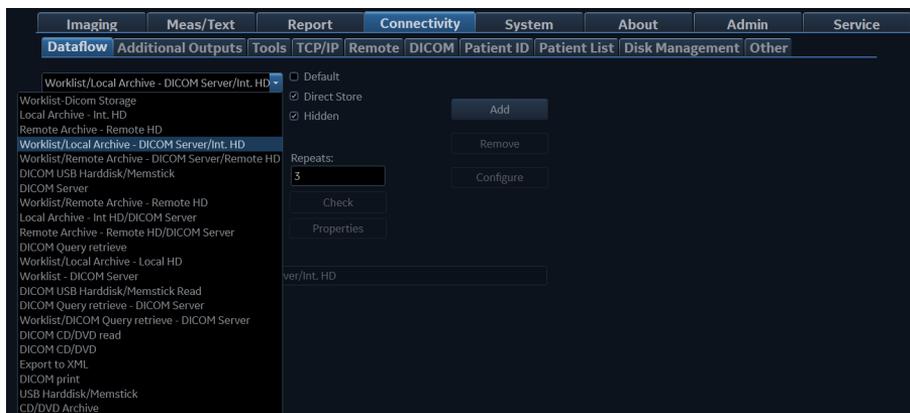


Figure 3-32. Select Dataflow Worklist/Local Archive - DICOM Server/Int.HD

The selected flow, **Worklist/Local Archive - DICOM Server/Int.HD**, is shown.

Setup of other dataflows are similar to this example.

- If **Default** is enabled, this will be the default dataflow.
- If **Direct Store** is enabled, the image will go to the DICOM server immediately after it is acquired. You will need to verify that the DICOM server is capable of keeping the connection open for the time it takes to complete an examination.
- If **Hidden** is enabled, the dataflow will be invisible in the **Search/Create Patient** screen. Uncheck **Hidden** to display the dataflow in the **Search/Create Patient** screen.

5. Select **DicomWorklist**.
6. Select **Properties** to display the “Properties” dialog.

### 3-9-4-1 DICOM Server IP address on the ultrasound system(continued)

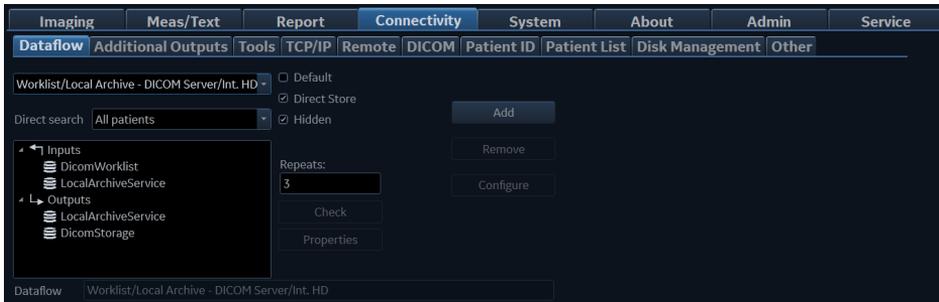


Figure 3-33. Select DicomWorklist > Properties

7. In the **Properties** dialog, select the *IP-address* dialog pull-down menu to select the Worklist Server. It is not possible to change the setting in the *IP-address* filed by editing it.

To change the IP-Address settings, refer to [3-9-2 'Set the Remote Archive's Network Information'](#) on [page 3-44](#).

- Enter the DICOM server's **AE Title**. This entry is case sensitive and must match exactly.
- Enter the DICOM server's **Port No.(Port number)**.
- For some DICOM servers, the default Time-out setting (30) is too low.
- Select **OK** to close the Worklist properties dialog and save changes.

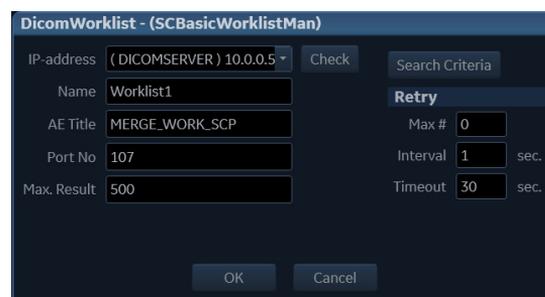


Figure 3-34. The DicomWorklist Properties Window

### 3-9-4-2 Verify the Network Connection to a Device

Follow the steps below to do a First Test (TCP-IP Ping) of the network connection:

1. Highlight the device to be verified and select **Properties**.

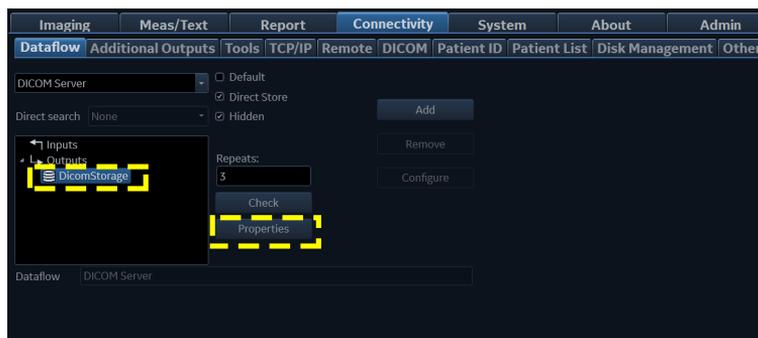


Figure 3-35. DICOM Server Properties dialog

2. Select the **"Check"** button to **Ping** the server.

**NOTE:**

*By selecting the "Check" button, a ping is sent to the remote server to see if it is accessible via the network. It is not a DICOM Echo (DICOM ping), so it does not check AE title or port number.*

3. If the network connection to the server is OK, it will be illustrated by the "Pass" sign, a white check mark on a green background .

The "Fail" sign  indicates that the network connection is failing.

Typical causes:

- Network cable not connected
- Configuration error(s)

### 3-9-4-3 Verify the Connection to a Device

1. Select (highlight) the device you want to verify the connection.

**NOTE:** You can only check one device at a time.

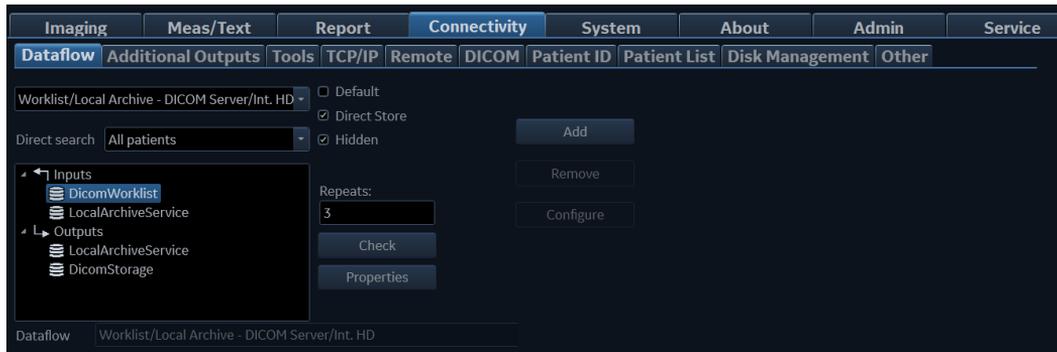


Figure 3-36. Verify Connection to a Device

2. Select **Check** to start the verification process of the connection to the device.

The verification process takes some time to run.

When done, a pop-up is displayed on the screen. It gives you the status for the check.

In the illustration below, the message indicates that the pinging of the server worked fine (line 1), but the application on the server didn't respond (line 2).



Figure 3-37. Information - Check Status

Select OK to close the pop-up window.

A sign is displayed next to the **Check** button, indicating if passed  or failed .

**NOTE:** If the Check button fails immediately, the AE Title is probably wrong. If the Check button fails after a long time (corresponding to the timeout), the IP address or Port Number is probably wrong.

### 3-9-4-3 Verify the Connection to a Device(continued)

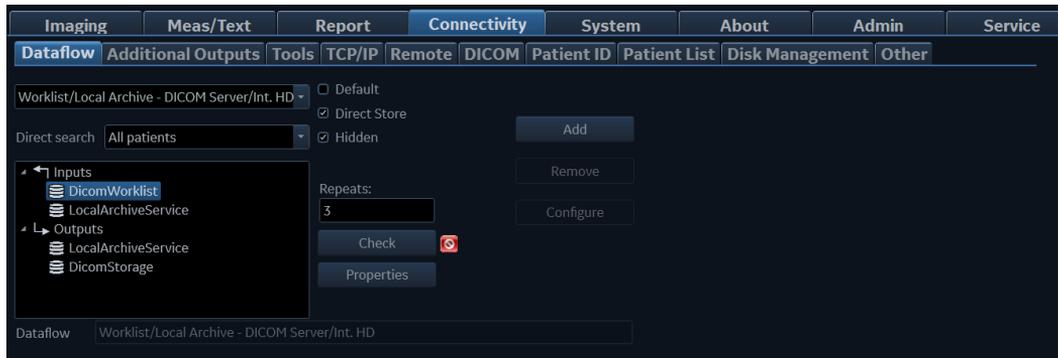


Figure 3-38. Verification Result

### 3-9-4-4 Dicom Storage Setup

1. Select **DICOM Storage**.

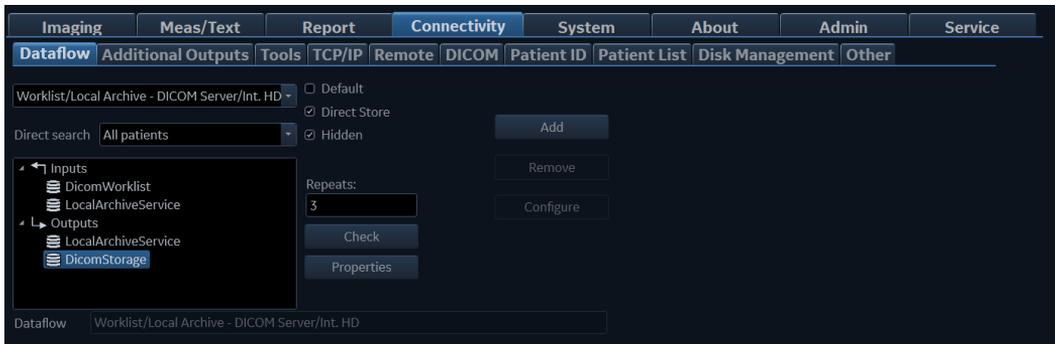


Figure 3-39. Select DICOM Storage

2. Select **Properties** to display the **DICOM Storage properties** screen.

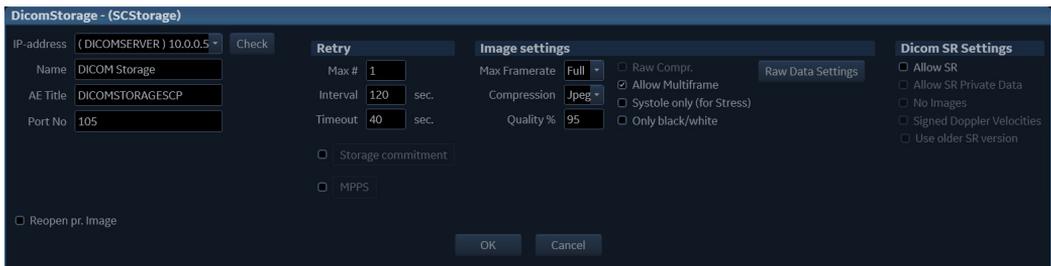


Figure 3-40. DICOM Storage Properties

### 3-9-4-4 Dicom Storage Setup(continued)

- **Image Settings**



In Image Settings, setting compression to None may lead to very long transfer time and loops larger than 500s frames will be truncated. In case it happens, a warning is displayed on the screen.

The pull-down menu gives these choices:

- Jpeg - JPEG/JPG compression (Default). JPEG is not lossless.
- None - (un-compressed data with huge files).

**NOTE:**

*If you are using compression None, it is strongly advised to reduce Frame Rate to 25 or 30 to avoid truncating loops.*

- Rle - Run Length Encoding. This is lossless compression.
- Quality % - Set the wanted quality %. Default value is 95%.

If files are stored with a quality lower than 95% they will occupy less space, but loose some quality.

**NOTE:**

*Setting the quality % too low may add too much artifacts to the images that they cannot be used for diagnosis. If files are stored with a quality above 95%, the files will grow much larger without almost no quality change.*

- **Retry**

Max# - The number of times the software will try to connect if the connection doesn't succeed the first time(s).

Interval - The interval in seconds between each attempt to connect.

Timeout- Adjust the time-out setting.

The retry settings can be used to make jobs retry on bad networks. There is no need to set retries for mobile (off-line) use.

### 3-9-4-4 Dicom Storage Setup(continued)

- **Storage Commitment**

If enable Storage Commitment, check the check-box and select *Storage commitment*. In the dialog, enter *IP address, Name, AE Title* and *port Number*.

Figure 3-41. Storage Commitment Properties

- **MPPS**

If enable MPPS, check the check-box and select **MPPS**. In the dialog, enter *IP address, Name, AE Title* and *port Number*.

Figure 3-42. MMPS Properties

### 3-9-4-5 DICOM SR

DICOM Structured Reporting (SR) is a standardized for medical results. Vivid T9/Vivid T8 supports the specialized form for Adult Echo Ultrasound (TID 5200 Echocardiography Procedure Report) and Vascular Ultrasound (TID 5100 Vascular Ultrasound Procedure Report) for M&A results.

With the DICOM SR support, M&A for an exam can be sent at the end of the exam or when exported from local archive. The destination can be either a server on the network or a removable media (DICOM Media), depending on the DICOM dataflow selected.

TID5200 Echocardiography Procedure Report is sent if the exam contains M&A from category Cardiac/Pediatric (heart) and Vascular/Abdominal categories, two SR documents are sent.

TID5200 Echocardiography Procedure Report and TID 5100 Vascular Ultrasound Procedure Report do not support all M&A results from Vivid T9/Vivid T8 . They are limited to the following:

- No unassigned measurement.
- Not modifies Simpson or Bullet methods.
- Basic derivations (Average, last, Min and Max), no references between the derived measurements and the ones they were made from.
- Wall Motion Scoring: individual segment scores only according to 16-segment model, no graded hypokinesis (only Hypokinesis is used).

DICOM SR must be activated for each DICOM device.

1. Press **Config (F2)** on the control panel and log on as admin.
2. Select **Connectivity-> Dataflow**, the dataflow sheet is displayed.
3. Select the DICOM dataflow to configure in the *Dataflow* pull-down menu.

### 3-9-4-5 DICOM SR(continued)

4. Select a DICOM storage device in the **Selected devices** and then select **Properties**. The *Properties* window for the selected DICOM storage device is displayed.

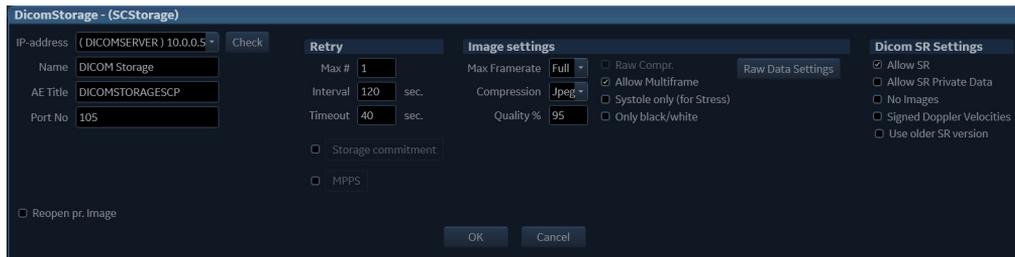


Figure 3-43. DICOM Storage Properties Window

5. Check the option **Allow SR** to enable DICOM SR. The following additional options are available:
  - **Allow SR Private Data:** send the current exam data in private format. This option is by default unchecked and should only be used with DICOM storage devices that can handle private data format.
  - **Signed Doppler Velocities:** send signed Doppler velocities.
  - **No images:**no images are sent, only M&A
  - **Use older SR version:**when checked a *Use older SR version* pull-down menu is displayed. The current exam data will be sent in the same format as the selected SR version. Details about format and content of the SR version can be found in the corresponding user manual of the selected version.
6. Select **OK**.

### 3-9-5 Export configuration

The destination for Export of patient records to Excel and MPEG must be configured prior to use.

#### 3-9-5-1 Setup on the Remote Share

Required setup on the remote share:

1. Add user/password
2. Set Share permissions
3. Set Security permissions

**NOTE:** *The User on the remote share must have all rights/controls for the shared folder.*

It is possible to set a secondary user if required by the remote share. For more information, see [3-9-5-2 'Configurable Remote Path User'](#) on [page 3-59](#).

### 3-9-5-2 Configurable Remote Path User

**NOTE:** The default User/Password is always used as primary log in credential. No attempt is made to use the secondary user if log in succeeds using the primary.

**NOTE:** The configurable User/Password is used for all remote paths configurable throughout the system as secondary log in credential.

**NOTE:** The User on the remote share must have all rights/controls for the shared folder.

Follow these steps to set up a Secondary Remote Path User:

1. Press **Config (F2)** on the control panel and log on as administrator if required.
2. Select **Connectivity -> Remote**.  
The *Remote* sheet is displayed.

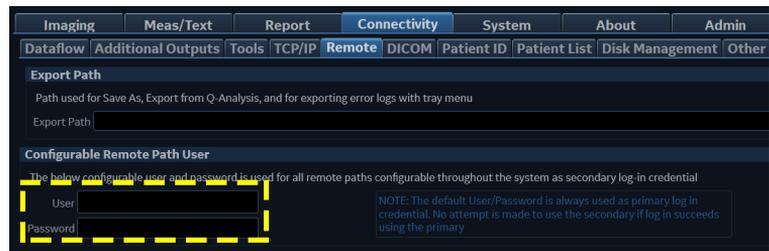


Figure 3-44. The Tools sheet

3. Enter the User and Password in the respective fields.

**NOTE:** The filed User can either be on the form of username or domain\username.

### 3-9-5-3 Display the XML Export Dataflow

Follow these steps to display the XML Export dataflow:

1. Press **Config (F2)** on the control panel and log on as administrator.
2. Select **Connectivity -> Dataflow**.  
The *Dataflow* sheet is displayed.
3. Select the dataflow **Export to XML** in the *Name* pull-down menu.

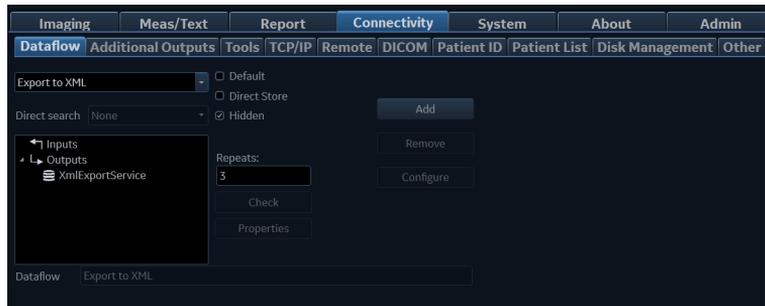


Figure 3-45. XML Export Dataflow

### 3-9-5-4 Export to Xml

1. Select the **Xml Export Service** device and press **Properties**.

The *Excel properties* window is displayed.



Figure 3-46. The XML Export Properties window

2. Select a removal media or a network volume as the destination in the Destination pull-down menu.

**NOTE:** *Remote paths of network volumes must be entered once in the Remote path field before they can be selected from the Destination pull-down menu. See 3-9-5 'Export configuration' on page 3-58 for more information.*

3. Select **OK**.

### 3-9-6 Query/Retrieve Setup

The Query/Retrieve function makes it possible to search and retrieve DICOM data from a DICOM server for further analysis on the Vivid T9/Vivid T8 .

*NOTE:* You may have to set up Vivid T9/Vivid T8 as a destination on the server.

#### 3-9-6-1 Query/Retrieve Setup on Vivid T9/Vivid T8

1. Press **Config (F2)** on the control panel and log on as administrator.
2. Select **Connectivity -> Dataflow**.  
The *Dataflow* sheet is displayed.
3. Select **Query retrieve** from the pull-down menu.

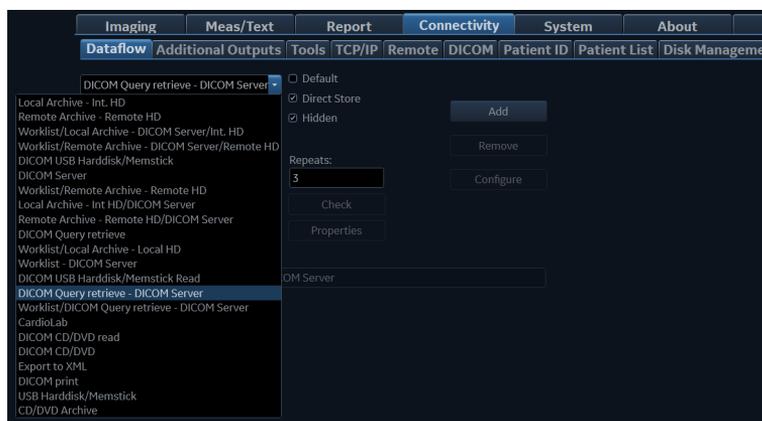


Figure 3-47. Select DICOM Query Retrieve - DICOM Server Dataflow

### 3-9-6-1 Query/Retrieve Setup on Vivid T9/Vivid T8(continued)

4. Select **DicomQR** in the **Selected** column and then select **Properties** to display the Properties dialog.

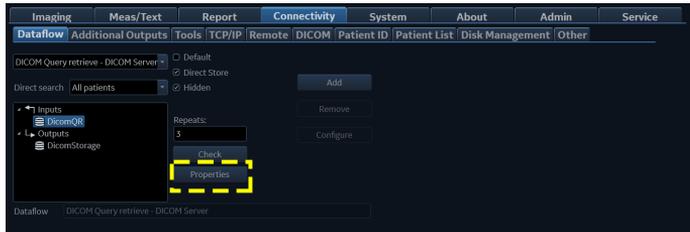


Figure 3-48. Select DicomQR Properties

5. Select the DICOM Query/Retrieve server from the IP-address pull down menu. In some cases, the server is the same as used for DICOM Storage.

If the server is missing from the list, select **Modify** from the pull down menu and edit the setup for one of the predefined servers.

Enter the correct AE Title and Port Number for the DICOM Query/Retrieve server in the respective fields in the DicomQR Properties screen.

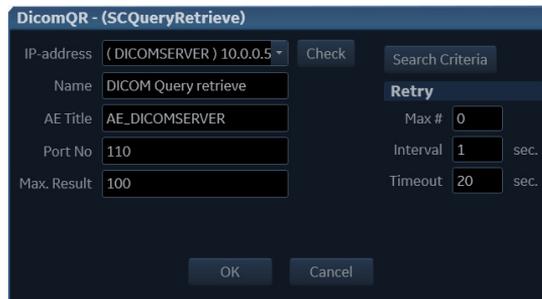


Figure 3-49. Dicom QR Properties

### 3-9-6-1 Query/Retrieve Setup on Vivid T9/Vivid T8(continued)

Follow the steps below to change the Search Criteria parameters:

- a. Select **Search Criteria**

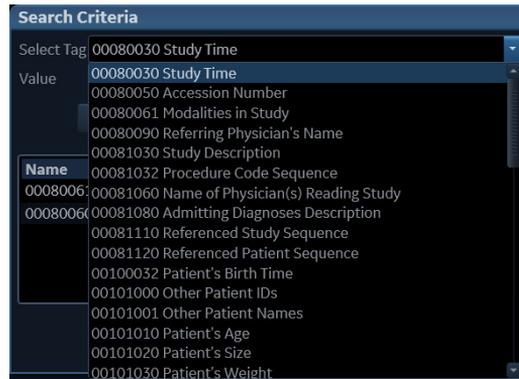


Figure 3-50. Select Search Criteria

- b. Select the correct tag from the pull down menu. If needed, type in the value. Then select **Add to List**.
- c. Select **OK** to close the window.

### 3-9-6-2 Query/Retrieve Verification

1. Follow the steps in 3-9-4-2 'Verify the Network Connection to a Device' on page 3-50 to verify the TCP/IP connection of the Query/Retrieve Server.
2. Follow the steps in 3-9-4-2 'Verify the Network Connection to a Device' on page 3-50 to verify the connection to the Query/Retrieve Server.

### 3-9-7 Network Configuration

#### 3-9-7-1 Wire-Lan Network

1. Connect system with network.
2. Select **Config > Connectivity > TCP/IP** and select **Network Settings**.

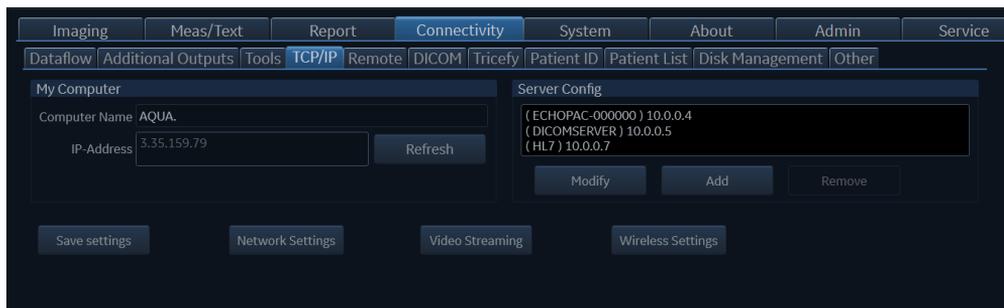


Figure 3-51. Network Settings

3. Select **Ethernet**.

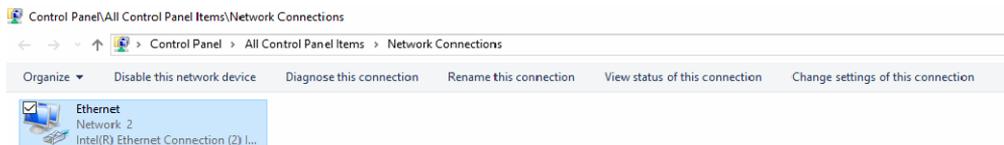


Figure 3-52. Network Connection

### 3-9-7-1 Wire-Lan Network(continued)

4. Select **Properties** in the Ethernet window.

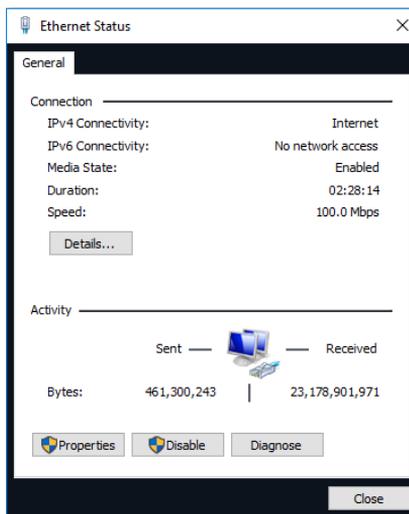


Figure 3-53. Connection Status

5. Select **Internet Protocol (TCP/IP)** from the terms, and then select **Properties**.

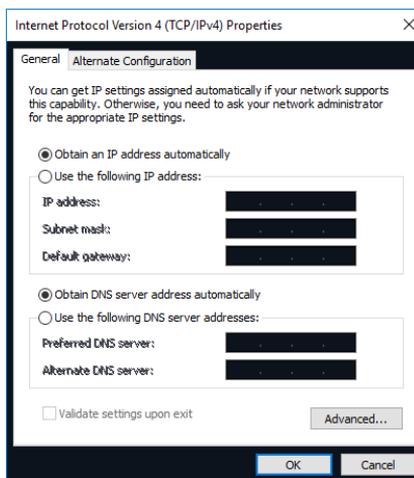


Figure 3-54. TCP/IP Protocol

### 3-9-7-1 Wire-Lan Network(continued)

6. Select **Properties** in the Ethernet window.

Select **Obtain an IP address automatically** and **Obtain DNS server address automatically**, and then select **OK**.

**NOTE:** *If user wants to setup static IP address, input static address in **IP-Address box, Subnet Mask and Default Gateway box**.*

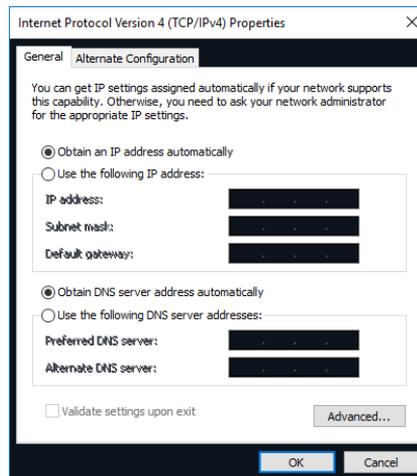


Figure 3-55. TCP/IP Protocol



### 3-9-7-2 Wireless-LAN Network(continued)

4. Press **OK** in the dialog window.  
A new window for setting up your connection will open.

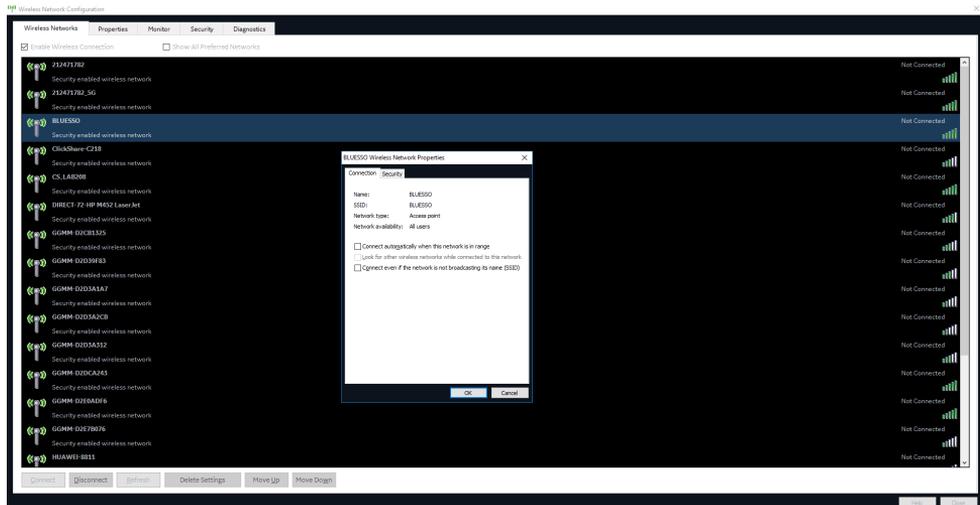


Figure 3-58. Network Settings Window - Connection

5. Select check-boxes according to preference.  
If the **Connect automatically when this network is in range** setting is selected, then this network will auto-connect when available, without needing to enter the **Wireless Settings** page.

### 3-9-7-2 Wireless-LAN Network(continued)

6. Set up security options in the Security tab of connection setup dialog.

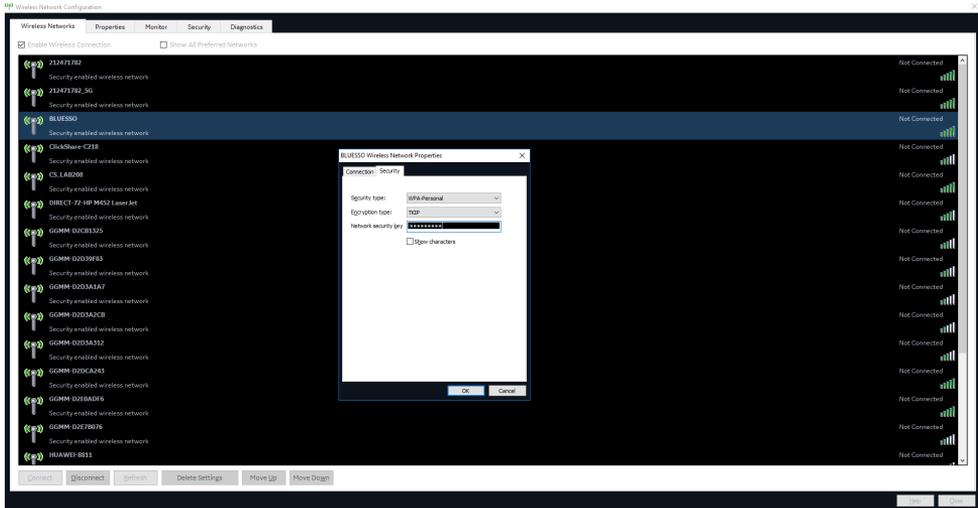


Figure 3-59. Network Settings Window - Security

7. If the wireless network is to be configured for WPA/WPA2 Enterprise and a customer specific certificate is to be installed on the system, this can be done by use of the certificate dialog available from the LDAP config page.
  - a. First go to LDAP config.

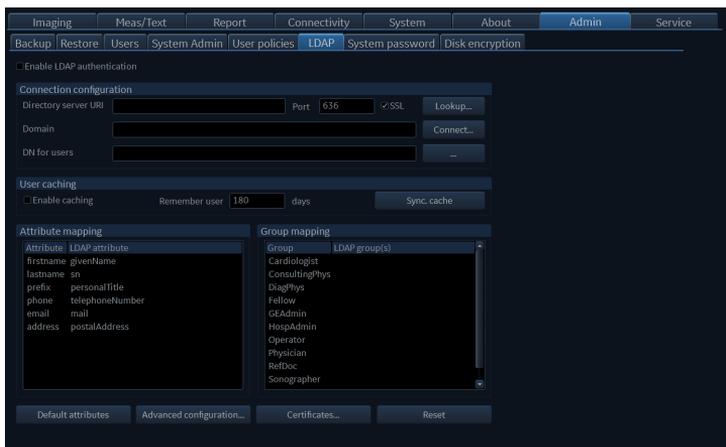


Figure 3-60. LDAP Config Screen

### 3-9-7-2 Wireless-LAN Network(continued)

- b. Then click on the **Certificates...** button to open the Certificate dialog (see Figure 3-57). This dialog is a standard Windows 10 Certificate Manager dialog.

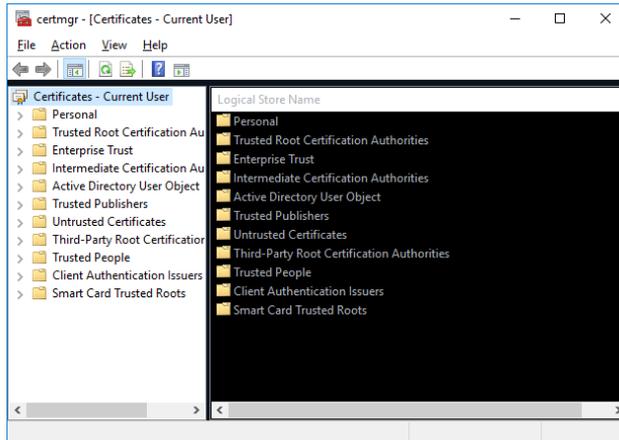


Figure 3-61. Certificate Diag

### 3-9-8 LDAP

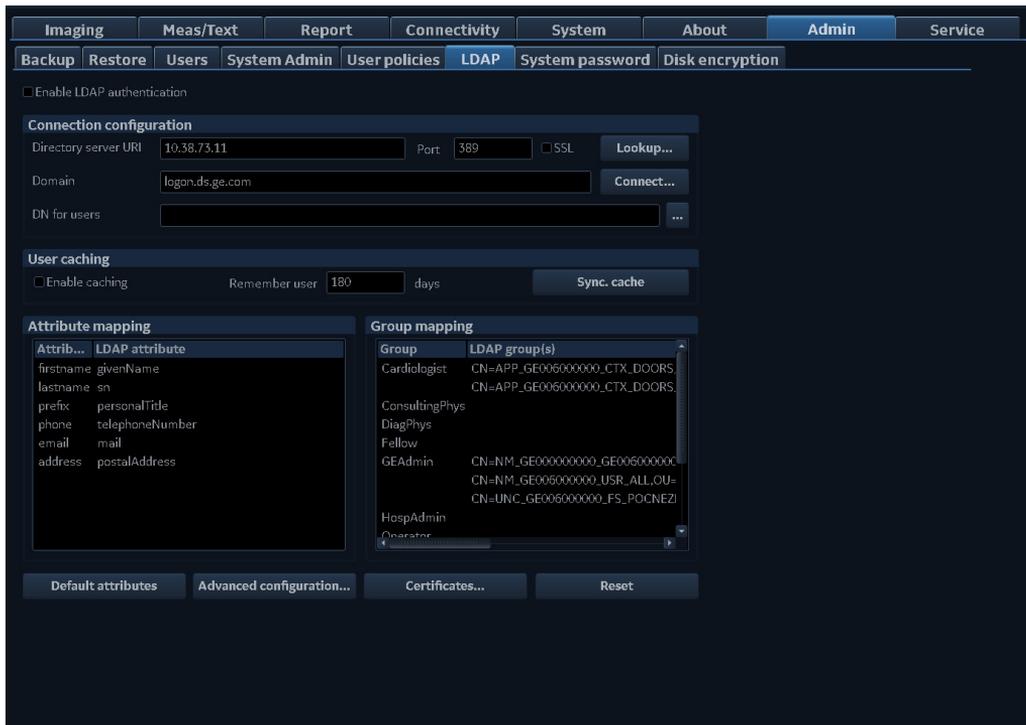


Figure 3-62. The LDAP sheet

Enable "LDAP authentication" to utilize services from an external Directory Server for authenticating users when logging in to the system. If enabled it will not be possible to login to the system with users defined as local users on the system, except for the ADM user.

**NOTE:** *If LDAP is configured, the log-in dialog indicates the log-in domain.*

The system can be configured to use authentication services from a Microsoft Active Directory server or from another LDAP compatible Directory Server.

	Definition
Connection configuration	Set directory server, domain, and DN for users.
User caching	Set number of days user will be remembered without needing to log in with network access. When disabling this option, the cached user data will be deleted
Attribute mapping	Map LDAP attributes to system user attributes.

	Definition
Group mapping	Map LDAP groups to system groups. An LDAP group can be mapped to zero or more system groups. Several LDAP groups can be mapped to the same system group.

To define the LDAP properties:

1. Enter the configuration properties.
2. Press **Connect** to test the connection and enter a valid user name and password for the LDAP server in the dialog that appears.
3. Define group mapping for the LDAP user groups that shall be grant users access to the system.

The user will be assigned one or more system groups according to the group mapping and which of these LDAP groups the user is a member of.

Figure 3-63. The Advanced LDAP configuration screen of the LDAP sheet

If the Directory Server does not support anonymous connection for the authentication service, two step authentication is needed. Then valid user credentials for a user with access to the Directory Server must be entered here.

**NOTE:** *The user credentials will be stored on the system unencrypted.*

# 3-10 Option Setup

## 3-10-1 Software Option Installation Procedure

**NOTE:** *Not all features described in this section may be available or cleared for sale in all markets. Please contact with your local GE Ultrasound representative to get the latest information.*

1. Power on the system.

**NOTE:** *Keep the power cord connection during the installation.*

2. After the power-up sequence is complete, press **Config (F2)** on the control panel, and then select **Admin**.



For software Option Installation, the operator must login as Administrator.

3. In **System Admin** tab, select **New**.

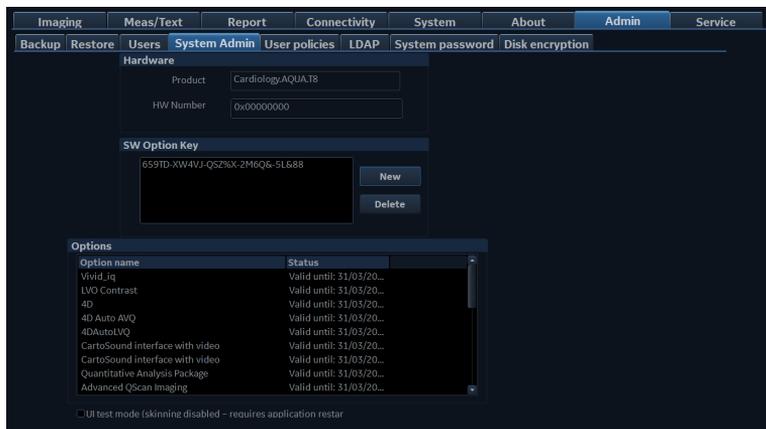


Figure 3-64. New Option Key

### 3-10-1 Software Option Installation Procedure(continued)

4. In the pop-up screen, input the new key and select **Save**.

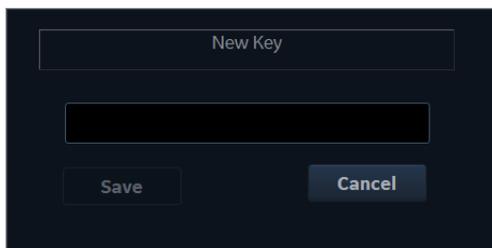


Figure 3-65. Dialog Window

**NOTE:** *There is no need to restart the system after each installation, if several option keys are installed at one time. Select Cancel for the first several times, and select OK after the last installation to activate all the changes.*

5. After the system is powered on, check the option status.  
The option status explanation:
  - Permanent: This option is enabled in the system.
6. Exit and check the function of the option installed.

## 3-11 Paperwork after setup

**NOTE:** *During and after setup, the documentation (i.e. CDs with documentation, User Manuals, Installation Manuals, etc.) for the Vivid T9/Vivid T8 and the peripherals must be kept as part of the original Ultrasound system documentation. This ensures that all relevant safety and user information is available during the operation and service of the complete Ultrasound system.*

### 3-11-1 Contents in this Section

- [3-11-2 'User's Manual\(s\)' on page 3-76](#)
- [3-11-3 'Product Locator Installation Card' on page 3-77](#)

### 3-11-2 User's Manual(s)

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

3-11-3 Product Locator Installation Card

NOTE: The Product Locator Installation Card shown may not be the same as the provided Product Locator card.

	<b>GE Medical Systems</b> Product Locator File P.O. Box 414 Milwaukee, WI 53201-0414	<b>General Electric CGR</b> Product Locator Adm. - DSE/SM 283 Route de la Miniere 78530 Buc, FRANCE	<b>Yokogawa Medical Systems Ltd.</b> GEMSA Service Administration 4-7-127 Asahigaoka Hino-shi Tokyo 191, JAPAN	
DESCRIPTION	FDA	MODEL	REV	SERIAL
SYSTEM LTD.	OCP	BS	ORD	EMPLOYEE NO.
	DISTRICT	ROOM	DATE (MO - DA - YR)	
<b>INSTALLATION</b>	CUSTOMER NO.			
	DESTINATION NAME AND ADDRESS			
	_____			
	_____			
	_____			
	_____			
46-303268 Rev 5	ZIP CODE			

Figure 3-66. Product Locator Installation Card (Example)



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## Chapter 4

# General Procedures and Functional Checks

*This chapter provides procedures for quickly checking major functions of the Vivid T9/Vivid T8 and diagnostics instructions using the built-in service software.*

# 4-1 Overview

## **4-1-1 Purpose of this chapter**

This chapter provides procedures for quickly checking major functions of the scanner and diagnostics instructions using the built-in service software.

## **4-1-2 Contents in this chapter**

- [4-1 'Overview' on page 4-2](#)
- [4-2 'General procedures' on page 4-3](#)
- [4-3 'Functional checks' on page 4-18](#)
- [4-4 'Power supply test & adjustments' on page 4-37](#)

## **4-1-3 Special Equipment required**

To perform these tests, you'll need any of the sector, linear, or convex probes. (Normally you should check all the probes used on the system).

## 4-2 General procedures



Ultrasound system requires all covers.

Operate this Ultrasound system only when all board covers and frame panels are securely in place. The covers are required for safe operation, good Ultrasound system performance and cooling purposes.



Energy Control and Power Lockout for Vivid T9/Vivid T8.

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

1. Follow LOCK OUT/TAG OUT procedures.
2. Turn off the breaker.
3. Unplug the Ultrasound system.
4. Maintain control of the Ultrasound system power plug.
5. Wait for at least 30 seconds for capacitors to discharge as there are no test points to verify isolation.
6. Remove/disconnect the battery, if present.



Ultrasound System components may be energized.

### **4-2-1 Overview**

Some procedures are used more often than other. The intention with this section is to keep the most used procedures in one place.

#### **4-2-1-1 Contents in this section**

- [4-2-2 'Power ON/Boot Up' on page 4-5](#)
- [4-2-3 'Power off' on page 4-8](#)
- [4-2-4 'LCD Monitor position adjustment' on page 4-9](#)
- [4-2-5 'Logging on to Vivid T9/Vivid T8 as "ADM" on page 4-10](#)
- [4-2-6 'Removable media' on page 4-11](#)
- [4-2-7 'Archiving and loading presets' on page 4-12](#)
- [4-2-8 'Data Management' on page 4-14](#)
- [4-2-9 'Backup' on page 4-14](#)
- [4-2-13 'Cleaning the Trackball' on page 4-16](#)

## 4-2-2 Power ON/Boot Up

### 4-2-2-1 Warnings



ALWAYS CONNECT THE ULTRASOUND SYSTEM TO A FIXED POWER SOCKET WHICH HAS THE PROTECTIVE GROUNDING CONNECTOR.



NEVER USE A THREE-TO-TWO PRONG ADAPTER; THIS DEFEATS THE SAFETY GROUND.



ENSURE THAT THE POWER CORD AND PLUG ARE INTACT AND THAT THE POWER PLUG IS THE PROPER HOSPITAL-GRADE TYPE (WHERE REQUIRED).



Ultrasound system requires all covers.

Operate this Ultrasound system only when all board covers and frame panels are securely in place. The covers are required for safe operation, good Ultrasound system performance and cooling purposes.



Use only power supply cords, cables and plugs provided by or designated by GE Healthcare.

**NOTE:** *Do not cycle the Circuit Breaker ON-OFF-ON in less than five (5) seconds. When turning OFF the Circuit Breaker, the Ultrasound system should de-energize completely before turning the circuit breaker ON.*

### **4-2-2-2 Connect AC (mains) Power to Vivid T9/Vivid T8**

Connecting AC Power to the Vivid T9/Vivid T8 ultrasound unit, involves preliminary checks of the power cord, voltage level and compliance with electrical safety requirements.

1. Ensure that the wall outlet is of appropriate type, and that the Circuit Breaker is turned off.
2. Uncoil the power cable, allowing sufficient slack so that the unit can be moved slightly.
3. Verify that the power cable is without any visible scratches or any sign of damage.
4. Verify that the on-site mains voltage is within the limits indicated on the rating label near the Circuit Breaker on the rear of the unit.
5. Connect the Power Cable's female plug to the Power Inlet at the rear of the unit.
6. Lock the plug in position with the Retaining Clamp (ACC Clamp).
7. Verify that the Mains Power Circuit Breaker is in OFF position, if not, switch it OFF.
8. Connect the Power Cable's other end (male plug) to a hospital grade mains power outlet with the proper rated voltage, and the unit is ready for Power ON/Boot Up.

### 4-2-2-3 Switch ON the AC Power to Vivid T9/Vivid T8

1. Switch ON the Mains Power Circuit Breaker at the rear of the unit.

You should hear a “click” from the relays in the AC Power and the unit is ready to boot.

2. Press once on the **On/Off** key on the Operator Panel to boot the unit.

During a normal boot, you may observe that:

- a. The unit’s ventilation fan starts on full speed, but slows down after a few seconds (listen to the fan sound).
- b. Power is distributed to the peripherals, Operator Panel (Console), Monitor, Front End Processor and Back End Processor.
- c. Back End Processor and rest of scanner starts with the sequence listed in the next steps:
- d. Back End Processor is turned ON and starts to load the software.
- e. The Start Screen is displayed on the monitor.
- f. A start-up bar indicating the time used for software loading, is displayed on the monitor.
- g. The software initiates and sets up the Front End electronics and the rest of the instrument.
- h. The backlight in the keyboard is lit.
- i. As soon as the software has been loaded, either a 2D screen is displayed on the screen, indicating that a probe has been connected, or a No Mode screen is displayed, indicating that no probe has been connected.

**NOTE:**

*Total time used for start-up is typical one and a half minutes or less. If starting after a power loss or a lock-up, the start-up time may be up to four minutes.*

### 4-2-3 Power off

When you switch off the unit, the system performs an automatic shutdown sequence.

The SYSTEM - EXIT menu, used when switching off the unit, gives you these choices:

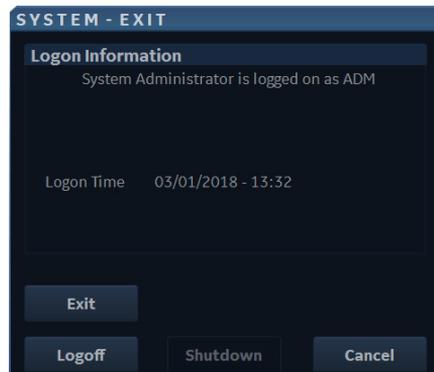


Figure 4-1. System Exit Window

- **Logoff**  
Use this button to log off the current user.  
The system remains ON and ready for a new user to log on.  
If the Logoff button is dimmed, it indicates that no user is logged on to the unit at the moment.
- **Shutdown**  
Use this button to shut down the system. The entire system will shut down. It is recommended to perform a full shutdown at least once a week.  
If the Shutdown button is dimmed, use the key-combination <Ctrl+Alt+Delete> to shut down the unit.  
*NOTE: To enable the key-combination <Ctrl+Alt+Delete>, the dongle should be connected to the system.*
- **Cancel**  
Use this button to exit from the System-Exit menu and return to the previous operation.

## 4-2-3 Power off (continued)

### 4-2-3-1 System shutdown

Disconnect the Mains Power Cable is necessary. *For example:*  
Relocating the scanner.



DO NOT unplug and/or transport the unit until after the power off sequence has been completed. Failure to do so may result in corrupted patient files.

### 4-2-4 LCD Monitor position adjustment

Refer to User Manual for LCD Monitor position adjustment.

### 4-2-5 Logging on to Vivid T9/Vivid T8 as “ADM”

Select **Utility** tab on the touch screen, then select **Config**.

It will bring up the **Operator Login** dialog where you must log on.

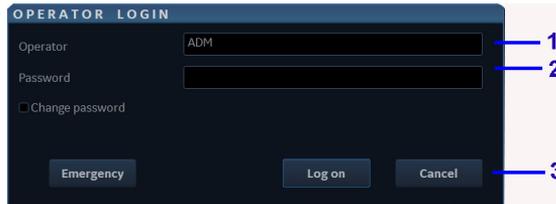


Figure 4-2. Operator Login Window

1. **Operator:** Select the operator.
2. **Password:** Enter Operator’s password (optional).
3. Select the type of Login or Cancel.
  - **Emergency:** Stores data only from current patient examination.
  - **OK:** Standard login.
  - **Cancel:** Cancel login.

As default, two users are defined, USR and ADM.

- USR

If you log on as **USR**, you will have access to do set-up tasks that a user may need to do during daily use.

As default, no password has been set for **USR**. Just type the name **USR**, and select **Login**.

- ADM

If you log on as **ADM**, you will have access to do general set-up, service adjustments, adjust network and connectivity settings.

As default, the password for **ADM** is **ulsadm**.

Select the name **ADM**, the password (**ulsadm**) and select **Login**.

It is possible for the administrator (*ADM*) to establish new users and set unique passwords for each user, including a new password for ADM. If the login as ADM fails, contact the responsible person in the hospital to get access.

## **4-2-6 Removable media**

Refer to the latest revision of the User Manual to perform the following tasks:

- Using Removable Media
- Labeling Removable Media
- Formatting Removable Media
- Verifying Removable Media

### 4-2-7 Archiving and loading presets

**NOTE:** Always save presets before any software reload. This ensures the presets loaded after the software reload are as up-to-date as possible.

All user presets except changes to Summary, Anatomy, and Biometry pages, can be saved on an DVD-R disk (or USB memory device) for reloading on the system.

**NOTE:** Presets should NOT be saved on the same USB memory device (or DVD-R disk) as images. The Archive Menu lists the images but does NOT list the presets stored on a USB memory device (or DVD-R disk).

#### 4-2-7-1 Archiving Presets to a USB memory device (or DVD-R Disk)

1. Connect the USB memory device to the system's USB port, or insert an empty (blank) DVD-R disk into the DVD-RW.
2. Access to the Config/Admin Menu, and select Backup. The Backup sheet will be shown on the LCD display.

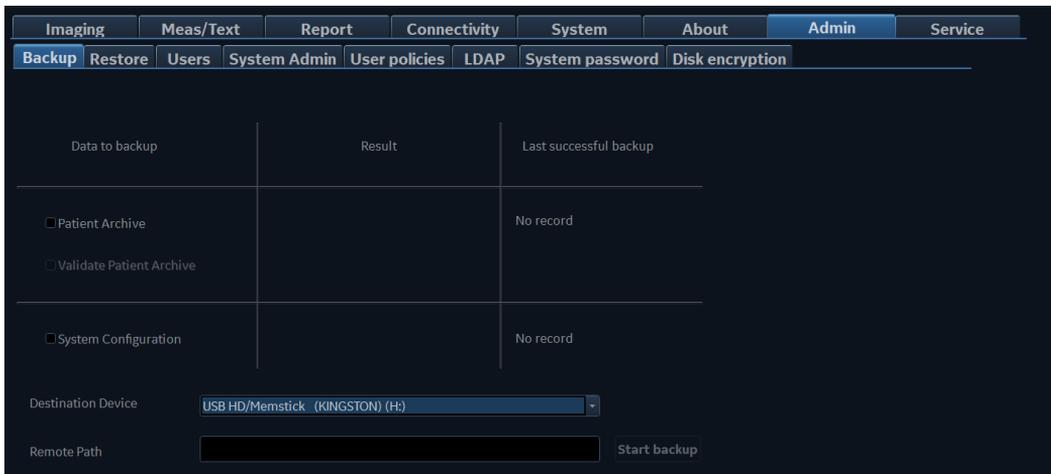


Figure 4-3. Backup Sheet

#### **4-2-7-1 Archiving Presets to a USB memory device (or DVD-R Disk)**

**(continued)**

3. Select the item to Backup.
4. Enter backup destination or browse through the disk to locate the destination.
5. Select Backup. The backup status for each item is displayed on the Result column.

#### **4-2-7-2 Loading Presets from a USB memory device (or DVD-R)**

1. Connect the USB memory device or DVD-R with the archived Presets to the system.
2. Access to the Config/Admin Menu, and select Restore. The Restore sheet will be shown on the LCD display. See [Figure 4-3 on page 4-12](#).
3. Select the items needed to be restored.
4. Select Restore. The system performs the restore and restarts.

### **4-2-8 Data Management**

Refer to the latest revision of the Vivid T9/Vivid T8 User Manual to perform the following tasks:

- Configuring the Disk Management Function
- Setting the Disk Management Schedule
- Configuring Data Management Settings
- Configuring Destination Device Setting
- Running the Disk Management Function
- Starting Disk Management Manually

### **4-2-9 Backup**

For more information, refer to the latest revision of the Vivid T9/Vivid T8 User Manual.

### **4-2-10 Installation and Setup Procedure for Peripherals**

Please refer to [3-8-3 'Peripherals Installation Instructions'](#) on [page 3-27](#).

## 4-2-11 Where are the User Manuals and the Service Manual?

Online versions of the User Manuals are available via the help function.

Both the User Manuals and the Service Manual are delivered as PDF files on a CD-ROM. Paper copies may be ordered from GE.

## 4-2-12 How to display or print the PDF files from the Manual CD?

1. Insert the CD-R disk (CD-ROM) into the CD-drive on a PC or Laptop with Adobe Acrobat Reader.



Do not try to use the Vivid T9/Vivid T8 to read these files, it will not work!

2. Follow the instructions on the screen to display the manual of choice.
3. Before printing the complete manual, or pages from the manual, select **File > Page Setup**.
4. Select the **paper size** and choose **Portrait**.
5. Select **File > Print** to start printing. In the pop up window, you may choose which pages to print and the number of copies you want to print (usually 1 copy).

### 4-2-13 Cleaning the Trackball



DO NOT touch any boards with integrated circuits prior to taking the necessary ESD precautions.

Always connect yourself, via an arm-wrist strap, to the advised ESD connection point located on the rear of the Ultrasound system (near the power connector).



Follow general guidelines for handling of electrostatic sensitive equipment.

#### 4-2-13-1 Manpower

One person, 10 minutes,

#### 4-2-13-2 Tools

- Antistatic brush and/or antistatic vacuum cleaner

#### 4-2-13-3 Preparations

To get access to the trackball for cleaning, you must perform the following steps:

1. Power down the system.
2. Disconnect the mains power cable from the wall outlet.

Follow these links if you need more information: [See 4-2-3 'Power off' on page 4-8 for more information.](#)

#### 4-2-13-4 Clean the Trackball

Dust is often building up behind the ball, so it interferes with the ball rotation and for optical trackballs the light used for sensing. To get access for cleaning, you need to remove the ball.

The ball is held in position by the Dust Gasket.

1. Power off the system.
2. Rotate the dust gasket counterclockwise until it can be removed from the keyboard.

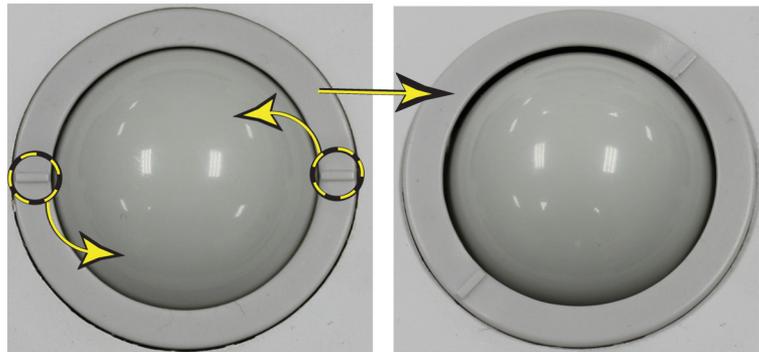


Figure 4-4. Remove the retainer

3. Separate the trackball and the gasket. Wipe off any oil or dust from the trackball, gasket and the trackball housing using a cleaner or cotton swab.
4. Assemble the trackball and gasket, then put it into the housing and rotate it clockwise until its notches are set in the position.



When cleaning, make sure not to spill or spray any liquid into the trackball housing (keyboard or system).

#### 4-2-13-5 Test the Trackball

Power up the and test that the trackball now works as intended.

## 4-3 Functional checks

### 4-3-1 Overview

In this section, the functional checks for are described. Functional checks are used to verify that the product works as intended. Functional checks may also be used during troubleshooting.

### 4-3-2 Contents in this Section

### 4-3-3 Preparation

Turn on power to Vivid T9/Vivid T8 . For detailed description, [See 4-2-2 'Power ON/Boot Up' on page 4-5 for more information.](#)

## 4-3-4 Basic Controls

### 4-3-5 Operator Panel

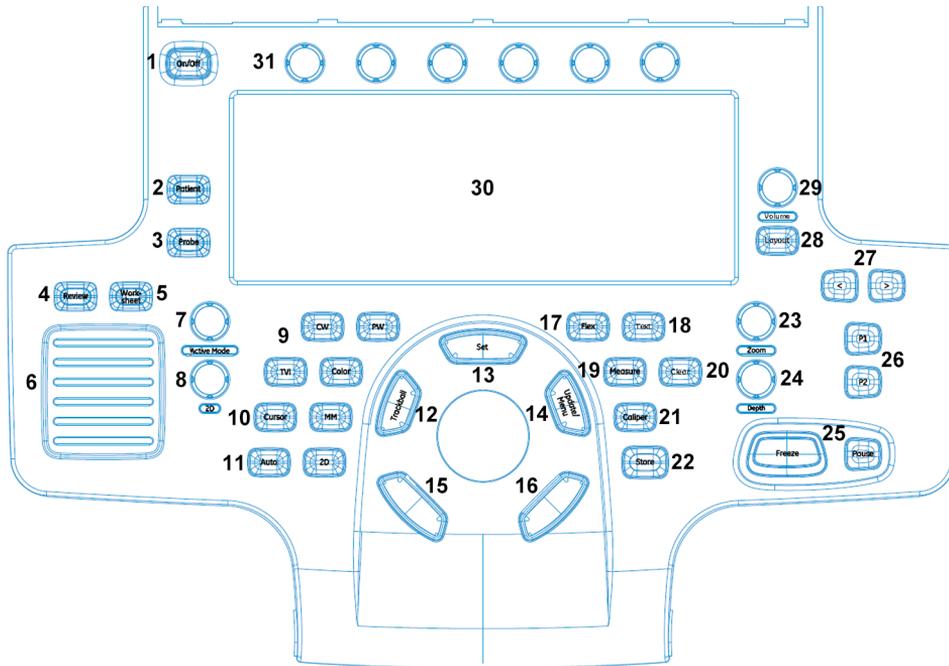


Figure 4-5. Control Panel Map

- |                        |                      |                          |
|------------------------|----------------------|--------------------------|
| 1. Power On/Off Switch | 11. Auto             | 21. Caliper key          |
| 2. Patient Key         | 12. Trackball        | 22. Store key            |
| 3. Probe Key           | 13. Set key          | 23. Zoom                 |
| 4. Image Review        | 14. Update/Menu key  | 24. Depth                |
| 5. Worksheet           | 15. User Defined key | 25. Freeze and Pause key |
| 6. TGC Sliders         | 16. User Defined key | 26. P1 and P2 print keys |
| 7. Active mode         | 17. Flex key         | 27. Left/Right key       |
| 8. 2D mode             | 18. Text key         | 28. Layout key           |
| 9. Scan mode Controls  | 19. Measurement      | 29. Volume               |
| 10. Cursor Key         | 20. Clear key        | 30. AN keyboard          |
|                        |                      | 31. Rotary buttons       |

### **4-3-6 Touch panel**

The Touch panel enables the access of context specific controls. The mode/function specific controls are organized in tabbed folders. Within each folder several pages may be accessed. Only the folders available in the current state are displayed and can be accessed by pressing the corresponding folder tab on the Touch panel.

At the bottom of the Touch panel, there are five combination rotary/push buttons. The functionality of these rotaries changes, depending upon the currently-displayed folder/page.

### **4-3-7 Performance Tests**

#### **4-3-7-1 Test Phantoms**

The use of test phantoms is only recommended if required by your facility's (customer's) QA program.

## 4-3-8 2D Mode (B mode) Checks

### 4-3-8-1 Introduction

The 2D Mode is the system's default mode.

### 4-3-9 2D Mode Screen Example

### 4-3-10 Preparations

- Connect one of the probes.
- Turn ON the scanner.

The 2D Mode is displayed (default mode).

### 4-3-11 Adjust the 2D mode controls

Press **2D** on the Operator Panel to access 2D mode.

These Image Controls are used to optimize the 2D picture.  
Verify that all the listed controls are working as intended:

- Use Gain and TGC controls to optimize the overall image together with the Power control.
- Use Depth to adjust the range to be imaged.
- Use Focus to center the focal point(s) around the region of interest.
- Use Frequency (move to higher frequencies) or Frame rate (move to lower frame rate) to increase resolution in image.
- Use Frequency (move to lower frequency) to increase penetration.
- Use the **Reject** control to reduce noise in the image.
- Use the DDP control to optimize imaging in the blood flow regions and make a cleaner, less noisy image.
- Use **UD Clarity** (Cardiac) or **UD Sp. Re.** (non-cardiac) to reduce image speckle. Extra care must be taken to select the optimal Speckle reduction level, as too much filtering of speckle can mask or obscure desired image detail.
- Use **Adaptive reject** (Cardiac) to reduce near field haze and blood pol artifact without diluting tissue appearance of moving structures.

## 4-3-12 M Mode Checks

### 4-3-12-1 Introduction

### 4-3-13 M-Mode Screen Example

### 4-3-14 Preparations

- Connect one of the probes to the scanner's left-most probe connector.
- Turn ON the scanner.  
The 2D Mode window is displayed (default mode).
- Press **MM** on the Operator panel to bring up an M-Mode picture on the screen.  
Use the trackball to position the cursor over the required area of the image.

### 4-3-15 Adjust the M Mode controls

These Image Controls are used to optimize the M mode picture. Verify that all the listed controls are working as intended:

- Adjust **Horizontal sweep** to optimize the display resolution.  
Adjust **Gain** and TGC controls to adjust the range to be imaged.  
Use the **Frequency** (move to higher frequencies) or the **Frame rate** control (move to lower frame rate) to increase resolution in image.  
Use the **Frequency** (move to lower frequency) to increase penetration.  
Adjust **Focus** to move the focal point(s) around the region of interest in the M-Mode display.  
Adjust **Dynamic range** to optimize the useful range of incoming echoes to the available grey scale.  
Adjust **Compress** and **Edge Enhance** to further optimize the display.  
Adjust **Reject** to reduce noise while taking care not to eliminate significant low-level diagnostic information.

## 4-3-16 Color Mode Checks

### 4-3-16-1 Introduction

Color Flow screens are 2D or M Mode screens with colors representing blood or tissue movement.

Color Flow may be selected both from 2D mode or from M mode or a combination of these.

### 4-3-16-2 Preparations

- Connect one of the probes to the scanner's left-most probe connector.
- Turn ON the scanner.

The 2D Mode window is displayed (default mode).

### 4-3-17 Select Color 2D Mode

1. From an optimized 2D image, press **Color**.
2. Use the trackball to position the ROI frame over the area to be examined.
3. Press **Select**. The instruction **Size** should be highlighted in the trackball status bar. Use the trackball to adjust the dimension of the ROI.

### 4-3-18 Adjust the Color 2D Mode controls

- Adjust the **Active mode gain** to set the gain in the color flow area.

Adjust **Scale** to the highest setting that provides adequate flow detection.

*NOTE: The scale value may affect FPS, Low Velocity Reject, and Sample Volume.*

Adjust **Low Velocity Reject** to remove low velocity blood flow and tissue movement that reduces image quality.

Adjust **Variance** to detect flow disturbances.

Adjust **Sample volume** (SV) to a low setting for better flow resolution, or a higher setting to more easily locate disturbed flows.

Adjust **Frequency** to optimize the color flow display. Higher settings improve resolution. Lower settings improve depth penetration and sensitivity. This does not affect the frequency used for 2D and M-Mode.

*NOTE: Frequency setting may affect FPS, SV and Low Velocity Reject.*

Adjust **Power** to obtain an acceptable image using the lowest setting possible.

*NOTE: The Power setting affects all other operating modes.*

Adjust the following settings to further optimize display of the image:

- Use **Invert** to reverse the color assignments in the color flow area of the display.

Use **Tissue priority** to emphasize either the color flow overlay, or the underlying grey scale tissue detail.

Use **Baseline** to emphasize flow either toward or away from the probe.

Use **Radial** and **Lateral Averaging** to reduce noise in the color flow area. Radial and Lateral Averaging smooths the image by averaging collected data along the same horizontal line. An increase of the lateral averaging will reduce noise, but this will also reduce the lateral resolution.

### **4-3-19 Select Color M Mode**

1. Select M Mode.
2. Use the trackball to position the ROI frame over the area to be examined.
3. Press **Select**. The instruction **Size** should be highlighted in the trackball status bar. Use the trackball to adjust the dimension of the ROI.

### 4-3-19-1 Adjust the Color M Mode controls

- Adjust the Active mode gain to set the gain in the color flow area.

Adjust **Scale** to the highest setting that provides adequate flow detection.

*NOTE: The scale value may affect FPS, Low Velocity Reject, and Sample Volume.*

Adjust **Low Velocity Reject** to remove low velocity blood flow and tissue movement that reduces image quality.

Adjust **Variance** to detect flow disturbances.

Adjust **Sample volume** (SV) to a low setting for better flow resolution, or a higher setting to more easily locate disturbed flows

Adjust **Frequency** to optimize the color flow display. Higher settings improve resolution. Lower settings improve depth penetration and sensitivity. This does not affect the frequency used for 2D and M-Mode.

*NOTE: NOTE: Frequency setting may affect FPS, SV and Low Velocity Reject.*

Adjust **Power** to obtain an acceptable image using the lowest setting possible.

*NOTE: The Power setting affects all other operating modes.*

Adjust the following settings to further optimize display of the image:

- Use **Invert** to reverse the color assignments in the color flow area of the display.

Use **Tissue priority** to emphasize either the color flow overlay, or the underlying grey scale tissue detail.

Use **Baseline** to emphasize flow either toward or away from the probe.

Use **Radial** and **Lateral Averaging** to reduce noise in the color flow area. Radial and Lateral Averaging smooths the image by averaging collected data along the same horizontal line. An increase of the lateral averaging will reduce noise, but this will also reduce the lateral resolution.

## 4-3-20 PW/CW Doppler Mode Checks

### 4-3-20-1 Introduction

PW and CW Doppler are used to measure velocity (most often in blood).

Doppler mode can be done with a special pencil probe or with an ordinary probe. By using an ordinary probe, you can first bring up a 2D picture for navigation purpose and then add PW/ CW Doppler.

### 4-3-20-2 Preparations

- Connect one of the probes to the scanner.
- See [4-3-25 'Probe/Connectors Check' on page 4-31](#) for info about connecting the probes.

For available probes, see [9-3-2 'Probe' on page 9-5](#): \_

- Turn ON the scanner  
The 2D Mode window is displayed (default mode).
- If needed, adjust the Display's Brightness and Contrast setting.

Press **PW** or **CW** to start Pulsed Wave Doppler (PW) or Continuous Wave Doppler (CW).

Use the trackball to select the Area of Interest (Sample Volume) in PW or direction of interest in CW.

## 4-3-21 Adjust the PW/CW Doppler Mode controls

Adjust the **Active mode gain** to set the gain in the spectral Doppler area.

- Adjust **Low velocity reject** to reduce unwanted low velocity blood flow and tissue movement.

In PW mode, adjust **Sample volume** to low setting for better resolution, or higher setting to more easily locate the disturbed flows.

Adjust the **Compress** setting to balance the effect of stronger and weaker echoes and obtain the desired intensity display.

Adjust **Frequency** to optimize flow display. Higher setting will improve resolution and the lower setting will increase the depth penetration.

Adjust **Frame rate** to a higher setting to improve motion detection, or to a lower setting to improve resolution.

*NOTE: Frequency and Frame rate settings may affect the Low Velocity Reject.*

Adjust **Power** to obtain an acceptable image using the lowest setting possible. This is particularly important in CW mode, as the energy duty cycle is 100% (constant).

*NOTE: The Doppler Power setting affects only Doppler operating modes.*

Adjust the following settings to further optimize the display of the image.

Use the **Horizontal sweep** to optimize the sweep speed.

To view signal detail, adjust **Scale** to enlarge the vertical spectral Doppler trace.

Use **Invert** to reverse the vertical component of the spectral Doppler area of the display.

Use **Angle correction** to steer the ultrasound beam to the blood flow to be measured.

## 4-3-22 Tissue Velocity Imaging (TVI) Checks

### 4-3-22-1 Introduction

TVI calculates and color codes the velocities in tissue. The tissue velocity information is acquired by sampling of tissue Doppler velocity values at discrete points. The information is stored in a combined format with grey scale imaging during one or several cardiac cycles with high temporal resolution.

### 4-3-22-2 Preparations

- Connect one of the probes, to the scanner's left-most probe connector.
- See [4-3-25 'Probe/Connectors Check'](#) on [page 4-31](#) for info about connecting the probes.  
For available probes, see [9-3-2 'Probe'](#) on [page 9-5](#).
- Turn ON the scanner.  
The 2D Mode window is displayed (default mode).
- If needed, adjust the Display's Brightness and Contrast setting.

Press **TVI**.

Use the trackball (assigned function: Pos) to position the ROI frame over the area to be examined.

Press **Select**. The instruction Size should be highlighted in the trackball status bar.

*NOTE: If the trackball control pointer is selected, press **trackball** to be able to select between Position and Size controls.*

Use the trackball to adjust the dimension of the ROI.

### 4-3-23 Adjust the TVI Controls

- To reduce quantification noise (variance), the Nyquist limit should be as low as possible, without creating aliasing. To reduce the Nyquist limit: Reduce the **Scale** value.

*NOTE: The Scale value also affects the frame rate. There is a trade off between the frame rate and quantification noise.*

TVI provides velocity information only in the beam direction. The apical view typically provides the best window since the beams are then approximately aligned to the longitudinal direction of the myocardium (except near the apex). To obtain radial or circumferential tissue velocities, a parasternal view must be used. However, from this window the beam cannot be aligned to the muscle for all the parts of the ventricle.

*NOTE: PW will be optimized for Tissue Velocities when activated from inside TVI.*

### 4-3-24 Basic Measurements

*NOTE: The following instructions assume that you first scan the patient and then press **Freeze**.*

#### 4-3-24-1 Check Distance and Tissue Depth Measurement

1. Press **Measure** once to display an active caliper.
2. Move the trackball to position the active caliper at the start point (distance) or the most anterior point (tissue depth).
3. Press **Set** to fix the start point.
4. The system fixed the first caliper and displays a second active caliper.
5. Move the trackball to position the second active caliper at the end point (distance) or the most posterior point (tissue depth).
6. Press **Set** to complete the measurement. The system displays the distance or tissue depth value in the measurement results window.

*NOTE: To toggle between active calipers, rotate **Cursor Select** button.*

### 4-3-25 Probe/Connectors Check

**NOTE:** Probes can be connected at any time, whether the unit is ON or OFF.

#### 4-3-25-1 To connect a Probe

1. Place the probe's carrying case on a stable surface and open the case.
2. Carefully remove the probe and unwrap the probe cable.
3. Put the probe in the probe holder.



DO NOT allow the probe head to hang free. Impact to the probe head could result in irreparable damage.

4. Hold the probe connector vertically with the cable pointing upward.
5. Slide the connector lock to the left (unlocked position).
6. Align the connector with the probe port and carefully push into place.
7. Slide the connector lock to the right position to secure the probe connector.
8. Carefully position the probe cable in the probe cord holder spot so it is free to move, but not resting on the floor.



TAKE THE FOLLOWING PRECAUTIONS WITH THE PROBE CABLES:

- KEEP AWAY FROM THE WHEELS
- DO NOT BEND
- DO NOT CROSS CABLES BETWEEN PROBES

Table 4-1: Probe and Connectors Checks

Step	Task	Expected Results
1	Select the appropriate connected probe from the probe indicators on the Touch Panel.	The probe activates in the currently-selected operating mode. The probe's default settings for the mode and selected exam are used automatically.
2	Launch the application. To change application, press <b>Probe</b> key on the Control Panel.	The selected application starts.
3	Verify there's no EMI/RFI or artifacts specific to the probe.	No EMI/RFI or artifacts.

Table 4-1: Probe and Connectors Checks

Step	Task	Expected Results
4	Test the probe in each active connector slot.	It will display pictorial data each time.
5	Do a leakage test on the probe, <a href="#">See 10-7 'Electrical safety tests' on page 10-19 for more information.</a>	It passes the test.
6	Repeat this procedure for all available probes.	

Not all the types of RS probe connector can match the Vivid T9/ Vivid T8 system.



Figure 4-6. RS type probe connector

1. Not match
2. Match
3. Match
4. Match

### 4-3-26 ECG Check

#### 4-3-26-1 Introduction

The ECG capability on this unit, is intended as use as a trigger for measurements, but can also be viewed on the screen.

#### 4-3-26-2 Parts needed

- ECG Pads (3 pc)
- ECG Cable Europe Kit (5505585) or US Kit (5505577)

#### 4-3-26-3 Preparations

None

**4-3-26-4 ECG Check**

Table 4-2: ECG Checks

Step	Task	Expected Result(s)
1	Connect the ECG harness to the connector under the control panel.	The unit displays a straight curve along the bottom edge of the image sector on the screen.
2	Connect the three leads to an ECG simulator, or Fasten the three ECG Pads to your body and connect the three leads to respective ECG Pad.	When connecting, the signal on the screen will be noisy. When the connection is completed, a typical clean ECG signal is displayed.

### 4-3-27 Cine loop Check

#### 4-3-27-1 Introduction

A cine loop is a sequence of images recorded over a certain time frame. When using ECG the time frame can be adjusted to cover one or more heart cycles. When frozen, the System automatically displays the cine loop boundary markers on either side of the last detected heart cycle.

#### 4-3-28 Preparation

- Connect one of the probes to the scanner.
- See [4-3-25 'Probe/Connectors Check' on page 4-31](#) for info about connecting the probes  
For available probes, see [9-3-2 'Probe' on page 9-5](#).
- Turn ON the scanner. The 2D Mode is displayed (default mode).

#### 4-3-29 Adjust the Cine loop controls

- Press Freeze.  
The left and right markers are displayed on either side of the last detected heart cycle on the ECG trace.
- Press Freeze.  
The selected heart beat is played back.
- Press **Freeze** to freeze the cine loop.  
Use the trackball to scroll through the acquisition and find the sequence of interest.
- Adjust **Cycle** select to move from heart beat to heart beat and select the heart cycle of interest.  
Adjust **Num cycles** to increase or decrease the number of heart beats to be played back.  
Adjust **Left marker** and **Right marker** to trim or expand the cine loop boundaries.

### 4-3-30 Back End Processor checks

- If all the previous tests have been passed successfully, the Back End Processor is most likely OK.

If the system seems to be operating erratically, please refer to ['Diagnostics/Troubleshooting'](#) on [page 7-1](#).

### 4-3-31 Operator Panel Test

- The Operator Panel is tested when the is powered up as part of the start-up scripts, run at every start-up.

For more info, please refer to ['Diagnostics/Troubleshooting'](#) on [page 7-1](#).

### 4-3-32 Peripheral checks

#### 4-3-32-1 Printer checks

The internal printer is controlled from the **P1** and **P2** keys on the Vivid T9/Vivid T8 's Operator Panel.

The factory default is:

- **P1** for the UP-D711MD printer  
**P2** for the whole screen secondary capture to clipboard

### 4-3-33 Turn OFF Power to Vivid T9/Vivid T8

[See 4-2-3 'Power off'](#) on [page 4-8](#) for more information.

### 4-3-34 Mechanical Functions Checks

#### 4-3-34-1 Operator Panel Movement

Please refer to:

- [4-2-4 'LCD Monitor position adjustment'](#) on [page 4-9](#)

**4-3-34-2 Casters (Wheels) and Brakes Checks**

Examine the wheels frequently for defects to avoid breaking or jamming.

Table 4-3: Wheel Characteristics

Wheel	Characteristics
Front and Rear	Swivel and Brake

## 4-4 Power supply test & adjustments

### **4-4-1 Power Supply Test Procedure**

There is no need to do any special tests on the Power Supplies if there don't seem to be a problem that may be related to the Power Supply.

### **4-4-2 Power Supply Adjustment**

There are no adjustments on the power supply. The DC Power is self-regulated. If a voltage is outside the specified range, it means that something is wrong, either with the power supply itself or with a unit connected to that specific power outlet. When an error occurs, the power will be turned off immediately.

# 4-5 Application Turnover Check List

Complete these checks before returning the scanner to customer for use:

## 4-5-1 Software Configuration Checks

Table 4-4: Software Configuration Checks

Step	Task to do	Notes
1	Verify Date and Time is correct.	
2	Verify that Location (Hospital Name) is correct.	
3	Verify Language settings are correct.	
4	Verify assignment of Print Keys.	
5	Verify all of the customer's options are set up correctly.	Demo Option strings turn on

# 4-6 Site Log

Table 4-5: Site Log

DATE	SRVICE PERSON	PROBLEM	COMMENTS



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## Chapter 5

# Components and Functions (Theory)

*This chapter explains Vivid T9/Vivid T8's system concepts, component arrangement, and subsystem functions.*

*It also describes the power distribution and the Common Service Desktop interface.*

# 5-1 Overview

## **5-1-1 Contents in this chapter**

- 5-1 'Overview' on *page 5-2*
- 5-2 'Block Diagram and Theory' on *page 5-3*
- 5-3 'Power Diagram' on *page 5-6*
- 5-4 'Service Desktop' on *page 5-8*

# 5-2 Block Diagram and Theory

## 5-2-1 General Information

Vivid T9/Vivid T8 is an ultrasound imaging scanner.

The system can be used for:

- 2D Gray Scale
- 2D Color Flow imaging
- M-Mode Gray Scale imaging
- Color M-Mode
- Doppler
- Different combinations of the above

Signal flow from the Probe Connector Panel to the Front End, to the Mid Processors and Back End Processor and finally to the LCD and peripherals.

System configuration is stored on a hard disk drive and all necessary software is loaded from the hard disk drive on power up.

## 5-2-2 Top Console

The Top Console includes a Standby/On switch, a keyboard, different controls for manipulating the picture quality, controls for use in Measure & Analyze (M&A), and loudspeakers for stereo sound output (used during Doppler scanning).

## 5-2-3 Block Diagram

### 5-2-3-1 System Diagram

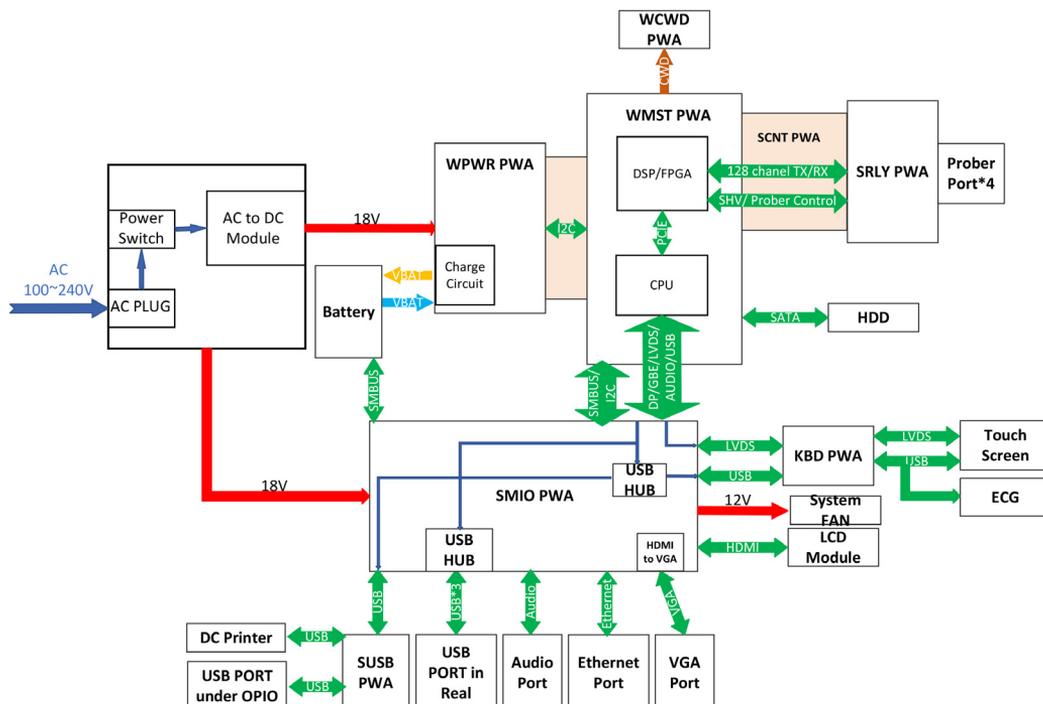


Figure 5-1. Vivid T9/Vivid T8 System Block Diagram

### **5-2-3-2 Introduction**

PWMST provides the main control function, 128 channels transmitting/receiving and related signal processing. It is also connects to CWD board.

PMIO board receives MISC signals from PWMST board and make necessary processing. And then, PMIO sends to Rear Panel and KBDTRSF board.

KBDTRSF board receives MISC signals from PMIO board. It makes necessary processing and then sends to LCD monitor, touch panel, main KBDboard, SoftKBD board and system speakers.

APSTRSF is a power supply board in Vivid T9/Vivid T8 , it accepts power from APS module and ACDC adapter. Under the PWMST's control, it generates all kinds of voltages to meet the power requirements of PWMST.

Power Control PWA is assembled in the power box. It provides an interface for AC power input and provides isolated AC power output for the system.

Relay board provides an interface for PWMST and four probes. It transmit/receives signals from PWMST and provides an interface for drive the LED board.

Rear Panel and BNC Board will receive MISC signals from PMIO board and make necessary processing. It provides MISC user interface.

## 5-3 Power Diagram

### 5-3-1 Overview

The AC Power assy's main tasks are to isolate and output to the DC/DC unit which is inside the system console. The input of AC power pack will be the AC outlet and it's universal, the range is AC 90V-264V, 47-63Hz. And no main power switch located on this power pack.

### 5-3-2 AC Power

The mains cord has plugs in one side end. A male plug connects to the mains outlet on site.

The mains voltage is routed to the AC power pack through a Circuit Breaker located on the site.

The Circuit Breaker is of the auto fuse type, if for some reason the current grows to high, the switch will automatically break the power.

From the Main Circuit Breaker, the AC power is routed via an Inrush Current Limiter to a internal outlet connector for the Mains Transformer.

5-3-2 AC Power(continued)

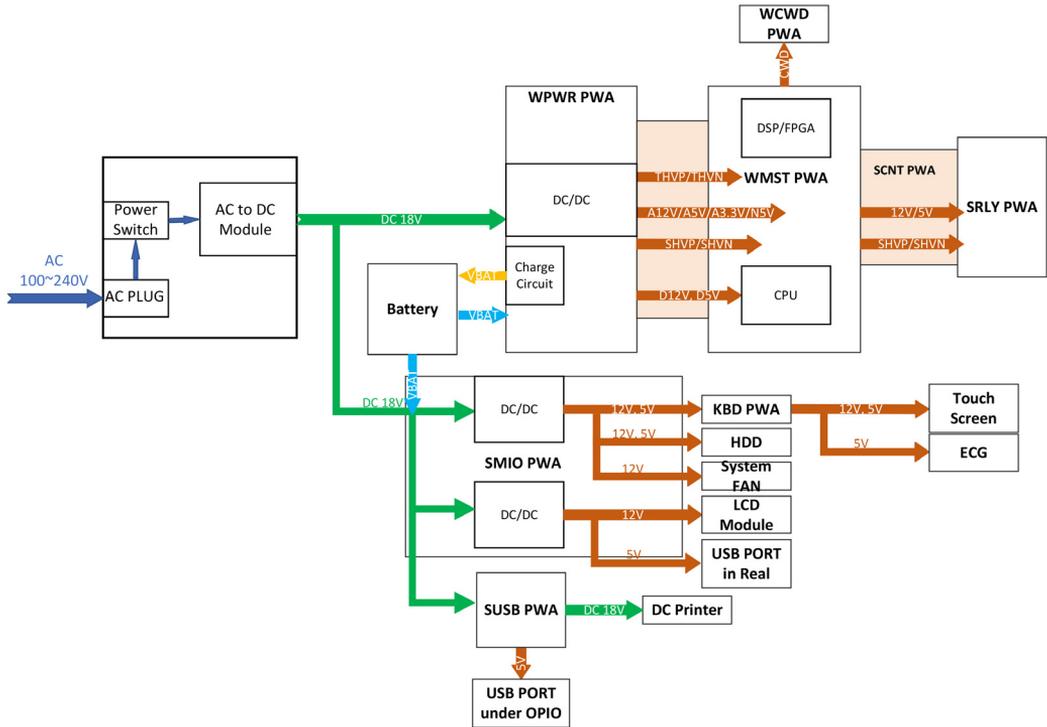


Figure 5-2. Power Block Diagram

## 5-4 Service Desktop

### 5-4-1 Overview

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. The access level is determined by the user profile as well as the service options enabled on the Vivid T9/ Vivid T8.

- Basic view is the standard view, restricted only by the user through the user profile settings. Administrator default user has access to the Service Desktop. Any user with "local Service access" in their user profile can have access to this view.
- Class C view is the view enabled by the service options purchased.
  - Service Advanced
  - Service Expert (requires Service Advanced)
  - Service Pro (requires Service Advanced)

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# Chapter 6

## Service Adjustments

*This chapter describes how to test and make adjustments to the Vivid T9/Vivid T8. You can use these to test the system for errors.*

# 6-1 Overview

## **6-1-1 Contents in this chapter**

- [6-1 'Overview' on page 6-2](#)
- [6-2 'LCD Monitor adjustments' on page 6-3](#)

## 6-2 LCD Monitor adjustments

### **6-2-1 Purpose of this section**

This section describes how to test and adjust the scanner. These tests are optional. You may use them to check the system for errors.

### **6-2-2 Monitor Adjustments**

Please refer to User Manual for how to adjust the LCD Monitor Position, Brightness and Contrast.



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## Chapter 7

# Diagnostics/Troubleshooting

*This chapter describes Vivid T9/Vivid T8 how to setup and run the tools and software that help maintain image quality and system operation. Very basic host, system and board levels are run whenever power is applied. Some Service Tools may be run at the application level.*

# 7-1 Overview

## **7-1-1 Contents in this chapter**

- 7-1 'Overview' on *page 7-2*
- 7-2 'Gathering Trouble Data' on *page 7-3*
- 7-3 'Screen Capture' on *page 7-5*
- 7-4 'Common Service Desktop' on *page 7-11*
- 7-5 'Common Diagnostics' on *page 7-35*

## 7-2 Gathering Trouble Data

### 7-2-1 Overview

There may be a time when it would be advantageous to capture trouble images and system data (logs) for acquisition to be sent back to the manufacturer for analysis. There are different options to acquire this data that would give different results

### 7-2-2 Collect Vital System Information

The following information is necessary in order to properly analyze data or images being reported as a malfunction or being returned to the manufacturer:

Product Name = Vivid T9/Vivid T8

From the **Config (F2) > About** screen:

#### **Applications Software**

- Software Version
- Software Part Number

#### **System Image Software**

- Image Date
- Image Part Number

## 7-2-3 Collect a Trouble Image with Logs

If the system should malfunction, press the Alt+D keys simultaneously. This will collect a screen capture of the image monitor, system presets and several log files in a date and time stamped “.zip” file.

*NOTE: This function may also be used to make a Print Screen.*

This **Alt+D** function is available at all times.

When **Alt+D** is pressed, a menu box appears that allows for:

- a place to enter a description of the issue
- a checkbox to indicate a System lockup
- a choice to Export a pre-formatted CD-R/DVD-R or save to the Export directory D: drive (for remote viewing through InSite)

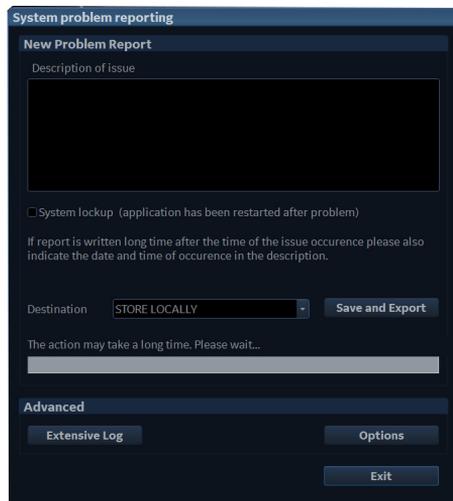


Figure 7-1. Alt+D Dialog Box

### 7-2-3-1 Advanced log options

- **Extensive Log** enables the creation of a log file containing additional information for the selected functionality.
- **Options** enables creation of a log file based on a selected bookmark or for a user configurable time frame. Different type of information can be selected to be part of the log file.

## 7-3 Screen Capture

There may be times when the customer or field engineer will want to capture a presentation on the screen. This is accomplished by first saving the image(s) to the clipboard using a Print Key.

There's no factory default print key to accomplish a secondary screen capture. However, customer may have customize Print Keys or Store key function. Therefore, screen capture should involve the following steps:

1. Check and record any custom settings for the Print/Store button
2. Set the Print/Store button to Whole Screen, Secondary Capture.
3. Capture the required screens to the Hard Disk Drive or DVD-R.
4. Restore the Print/Store button to it's original settings.

Below is an example on how to assign P1 key to screen capture.

### 7-3-1 Capturing a screen with P2 Key

There may be times when the customer or field engineer will want to capture a presentation on the screen. This is accomplished by first saving the image(s) to the clipboard using a Print Key.

Check the function of the P2 Key in the event that the customer may have made some custom settings.

1. Press **Config (F2)** on the Control Panel.
2. Select **Connectivity** from the Utilities Menu.
3. Select the **Additional Outputs** tab on the Connectivity screen.
4. In the **Button** field, select **P2**.

If P2 is not set to Whole Screen, proceed to step 5 to record the customer's customized settings.



Figure 7-2. Connectivity/Button screen

5. In the Destinations section, record the service that is displayed.
6. In the **Button** section, record the parameters related to the service.

### 7-3-1-1 Setting the P2 Key to Screen Capture

If the P2 Key is not set to screen capture:

1. While on the Connectivity screen, with the Buttons tab displayed, go to the *Destinations* list.
2. From the list select **Store to clipboard**. Press [>>] to add the selection to the **Selected devices** section.
3. Ensure that the **Button** section for **Image frames** is set to Whole Screen, secondary Capture and No Image Compression.
4. The P2 Key should now be set up for whole screen capture, sending the screens to the image buffer (clipboard).

### 7-3-1-2 Capturing a Screen

The following is a generic process to capture any screen from the scanner:

1. Navigate to and display the image/screen to be captured.
2. Press **P2**. This will place a snapshot of the screen on the “clipboard” displayed on the left of the scan image display.

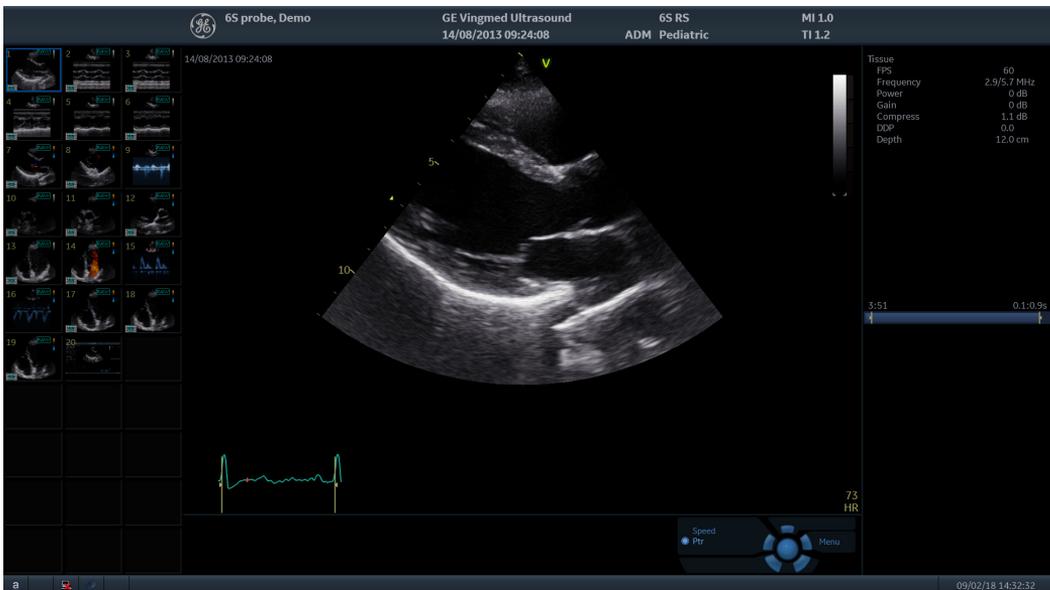


Figure 7-3. Select Image to Capture

### 7-3-1-2 Capturing a Screen(continued)

3. Select and highlight the snapshot to be stored.
4. Press **Update/Menu** key on the control panel and the system menu is displayed. Select **Save as**.

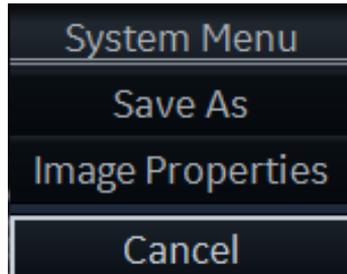


Figure 7-4. Menu > Save As

5. A Save dialog box will be opened. Choose the archive location to save image on the USB Drive or CD/DVD.

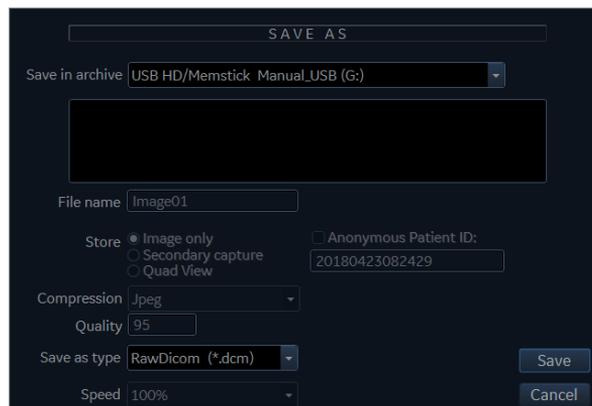


Figure 7-5. Save Dialog Box

**NOTE:** *It is better to save the image in Jpeg format. Image of this format can be easily reviewed in the computer.*

### 7-3-1-3 Reset the P2 Key to Customer's Functionality

If the customer had programmed the P2 Key to a function other than screen capture, restore that functionality recorded in section 7-3-1-1 'Setting the P2 Key to Screen Capture' on page 7-7. Refer to Figure 7-2 on page 7-6.

1. Select **Config (F2)** on the control panel.
2. Select Connectivity -> Additional Outputs.
3. In the **Button** field, select Print2.
4. In the *Destinations* list, select the service(s) recorded in step 5, See 7-3-1-1 'Setting the P2 Key to Screen Capture' on page 7-7.
5. In the *Physical Print Buttons* section, select the parameters related to the service recorded in step 6, see 7-3-1-1 'Setting the P2 Key to Screen Capture' on page 7-7.

## 7-4 Common Service Desktop

### 7-4-1 Purpose of this section

This section describes the features of the Service desktop. These are the different levels of access to the Service desktop:

- Service Basic access (Class A) - a user locally logged into the machine with Local Service Access privilege. This level provides limited access to Service desktop widgets and utilities.
- Service Expert, Pro, and Advanced access (Class C) Local - Depending on the purchase level, includes an option string to control access.
- GE Service access (Class M) and an SSA key. For users with local Service Access privileges, this level provides unrestricted access to all Service desktop widgets and utilities.
- Remote access - a user remotely accessing the Vivid T9/ Vivid T8. This level provides unrestricted access to all Service desktop widgets and utilities. Disruptive mode is limited to the user access privileges to Remote Service Access.

### 7-4-2 Disruptive mode

Disruptive mode is a way to control interruptions to operation of the Vivid T9/Vivid T8 . Disruptive mode is required whenever service performs a function that may disrupt a normal scan. Activating Disruptive mode results in a red message displayed on the task bar. This message indicates that the Vivid T9/Vivid T8 needs to be restarted once the service activity is complete. The message remains until the Vivid T9/Vivid T8 is restarted. This prevents patient scanning while the Vivid T9/Vivid T8 is not operating at an optimal status. For example, running a diagnostic may leave the Vivid T9/Vivid T8 in a state that is not good for imaging.

Specifically, Disruptive mode is required to run diagnostics, clean presets, and reset the patient database, and turn on Virtual Console Observation (VCO).

- When Disruptive mode is On, all service functionality on the Service desktop is allowed but user operation of the Vivid T9/Vivid T8 may be limited.
- When Disruptive mode is Off, some service functionality on the Service desktop is not available and user operation of the Vivid T9/Vivid T8 is normal.

Additionally, the ability to enable Disruptive mode depends on the logged in user.

- Local user - a user locally logged into the machine will be able to set the Vivid T9/Vivid T8 to Disruptive mode or allow a Disruptive mode request from a remote user through the Service desktop. The local user must have Authorize Remote Service Access to allow Disruptive mode. If the local user does not have this right, the remote user's request will be automatically denied
- Remote user - a user remotely accessing the Vivid T9/Vivid T8 will not be able to automatically switch Disruptive mode to On. The logged in user (user actually logged on to the Vivid T9/Vivid T8 ) needs to have the ability to grant remote access. The logged in user will be notified through a dialog box and asked to allow Disruptive mode.

**NOTE:** *Change Password and Disk Defragment are not available for the remote user whether Disruptive mode is On or Off.*

**For more information, see:** [7-4-2 'Disruptive mode' on page 7-12](#)

### 7-4-3 Color statuses

Throughout the Service desktop, colors indicate the following:

- Green - Status is normal
- Orange - Status is a warning
- Red - Status is an error

### 7-4-4 Licenses

With Service Basic Access (Class A), these are the available options:

- HOME
- Utilities
  - Change Password
  - Delete Files
  - Gather Logs
  - Network Capture
  - SSA License
  - Thirty Party Licenses
- Options
- Agent Configuration

With Service Advanced (Class C), these are the available options:

*NOTE: With a Class C license, options display according to these purchased level of access.*

- HOME
- Diags
- DICOM
- Utilities
  - Change Password
  - Checkpoints
  - Delete Files
  - Disk Defragment
  - Disruptive Mode Utility
  - Gather Logs
  - Network Capture
  - SSA License
  - System Shutdown

#### **7-4-4 Licenses(continued)**

- Thirty Party Licenses
- Virtual Console Observation
- Options
- Agent Configuration

With Service Advanced plus Service Expert (Class C), the Clean Userdefs, Reset Patient Database, and Software Reload utilities are added to the Service Advanced options listed.

With Service Advanced and Service Expert plus Service PRO (Class C), the probe assessment tool (ePAT) diagnostic is added to the Service Advanced and Service Expert options listed.

With GE Service access (Class M) and an SSA key, these are the available options:

- HOME
- Diags
- DICOM
- Utilities
  - Change Password (not available through a remote connection)
  - Checkpoints
  - Clean Userdefs
  - Delete Files
  - Disk Defragment (not available through a remote connection)
  - Disruptive Mode Utility
  - Gather Logs
  - Network Capture
  - Reset Patient Database
  - Software Reload
  - SSA License
  - SSH
  - System Shutdown
  - Thirty Party Licenses
  - Virtual Console Observation
- Options
- Agent Configuration

## 7-4-5 Home

Home configurations vary depending upon the purchased service level.

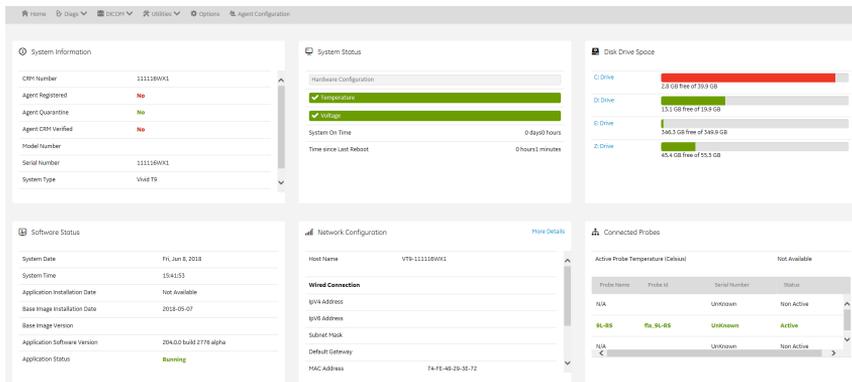


Figure 7-6. Home with Class C and Class M Access

### For more information, see:

- [7-4-5-1 'System Information' on page 7-16](#)
- [7-4-5-2 'Software Status' on page 7-18](#)
- [7-4-5-3 'System Status' on page 7-20](#)
- [7-4-5-10 'Disk Drive Space' on page 7-30](#)
- [7-4-5-11 'Network Configuration' on page 7-32](#)
- [7-4-5-12 'Connected Probes' on page 7-34](#)

### 7-4-5-1 System Information

**System Information** displays general information about the Vivid T9/Vivid T8 . When the Vivid T9/Vivid T8 has been successfully configured with the back office, these elements will have the corresponding values:

- **Agent Registered** will be **Yes**
- **Agent Quarantine** will be **No**
- **Agent CRM Verified** will be **Yes**

The information on **System Information** is available to all service class licenses.

To access **System Information**, navigate to **Utility > Service > Home**.

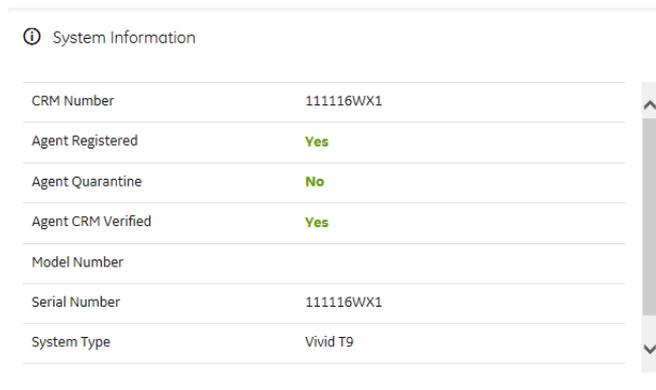


Figure 7-7. System Information

This table shows all the elements available on **System Information** with descriptions.

Table 7-1: System Information

Element	DESCRIPTION
CRM Number	Customer Relationship Management (CRM) number. System identifier assigned to the customer unit by the service region.
Agent Registered	Registered status of the agent. Valid values are: <ul style="list-style-type: none"> <li>• Yes - The agent is registered in the back office.</li> <li>• No - The agent is not registered in the back office.</li> <li>• Not Available - The agent is not running or has not been configured.</li> </ul>

Table 7-1: System Information

Agent Quarantine	<p>Quarantine status of the agent. Valid values are:</p> <ul style="list-style-type: none"> <li>• Yes - The agent has more than one device registered with the same CRM Number in the back office.</li> <li>• No - The agent has one device registered with the listed CRM Number in the back office.</li> <li>• Not Available - The agent is not running or has not been configured.</li> </ul>
Agent CRM Verified	<p>CRM verified status of the agent. Valid values are:</p> <ul style="list-style-type: none"> <li>• Yes - The agent is verified in the back office.</li> <li>• No - The agent is not verified in the back office.</li> <li>• Not Available - The agent is not running or has not been configured.</li> </ul>
Model Number	GE part number for the Vivid T9/Vivid T8 . The same number as listed on the rating plate.
Serial Number	Serial number of the Vivid T9/Vivid T8 . The same number as listed on the rating plate.
System Type	Product name of the Vivid T9/Vivid T8 .
Facility	Name of the hospital or facility where the Vivid T9/ Vivid T8 is installed

**For more information, see:** [7-4-5 'Home' on page 7-15](#)

### 7-4-5-2 Software Status

Use **Software Status** to view general information about the software installed on the Vivid T9/Vivid T8 .

The information on **Software Status** is available to all service class licenses.

To access **Software Status**, navigate to **Utility > Service > Home**.

Software Status	
System Date	Wed, Jun 6, 2018
System Time	20:07:54
Application Installation Date	Not Available
Base Image Installation Date	2018-05-07
Base Image Version	
Application Software Version	204.0.0 build 2776 alpha
Application Status	<b>Running</b>

Figure 7-8. Software Status

This table shows all the elements available on **Software Status** with descriptions.

Table 7-2: Software Status

Element	DESCRIPTION
System Date	Current date in the format <day>, <month> <date> <year>.
System Time	Local time based on the last time the system desktop was refreshed in the format <hh:mm:ss>.
Application Installation Date	Date the application software was installed. The application software includes the Vivid T9/Vivid T8 product-specific software.
Base Image Installation Date	Date the base image software was installed. The base image software includes the Windows operating system and other supporting software.
Base Image Version	Version number of the base image software
Application Software Version	Version number of the application software
Application Status	Status of the application. Valid values are <ul style="list-style-type: none"> <li>• Running</li> <li>• Stopped</li> </ul>

## **7-4-5-2 Software Status(continued)**

**For more information, see:**

- [7-4-5 'Home' on page 7-15](#)

### 7-4-5-3 System Status

Use **System Status** to view status information on the Vivid T9/ Vivid T8 . Specifically, do the following:

- View the hardware configuration file
- View temperatures for FRUs, fans, and a graphical representation of the monitored temperatures
- View voltages for FRUs and AC
- View the amount of time the Vivid T9/Vivid T8 has been running
- View the amount of time since the Vivid T9/Vivid T8 has last been rebooted

The information on **System Status** is available to Class C and Class M licenses.

To access System Status, navigate to **Utility > Service > Home**.

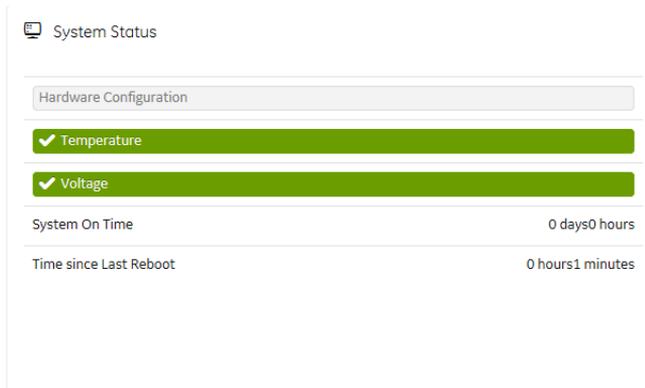


Figure 7-9. System Status

This table shows all the elements available on **System Status** with descriptions.

Table 7-3: System Status

Element	DESCRIPTION
Hardware Configuration	Displays the contents of the hardware configuration file.

Table 7-3: System Status

<p>Temperature</p>	<p>Displays the temperature monitoring of the Vivid T9/ Vivid T8 as normal, warning, or error using the standard colors and icons. Includes temperature out-of-spec events including an overall count of event warnings and errors for the last 30 days or the last status checkpoint whichever is sooner. Temperature displays temperature a graph for the configured monitoring points.</p>
<p>Voltage</p>	<p>Displays the voltage monitoring of the Vivid T9/Vivid T8 as normal, warning or error using the standard colors and icons. Includes voltage out-of-spec events including an overall count of the event warnings and errors for the last 30 days or last status checkpoint whichever is sooner.</p>
<p>System On Time</p>	<p>Displays the time the Vivid T9/Vivid T8 was turned on.</p>
<p>Time Since Last Reboot</p>	<p>Displays the time the Vivid T9/Vivid T8 was last rebooted.</p>

## 7-4-5-4 Hardware Configuration

**Hardware Configuration** displays the contents of the hardware configuration file which includes all the vital product data (VPD).

To access **Hardware Configuration**, navigate to **Utility > Service > Home**, and then under **System Status**, select **Hardware Configuration**.

Component	Item	Value
BEP	COMPUTERNAME	VT9-111116WX1
BF	VPD revision field	3
BF	Pole that owns the design	dragon
BF	Functional revision	
BF	System Platform	Wukong
BF	Part number (GE format)	5794538
BF	Revision Number	1
BF-FPGA	version	0x2023
COMEXP	VPD revision field	3
COMEXP	Pole that owns the design	dragon
COMEXP	Functional revision	
COMEXP	System Platform	Wukong
COMEXP	Part number (GE format)	5794538

Figure 7-10. Hardware Configuration

This table shows all the elements available on **Hardware Configuration** with descriptions.

Table 7-4: Hardware Configuration

Element	DESCRIPTION
Component	Hardware component.
Item	Parameter with the vital product data (VPD).
Value	Actual value of the Item.

**For more information, see:**

- [7-4-5-3 'System Status' on page 7-20](#)
- [7-4-5 'Home' on page 7-15](#)

## **7-4-5-5 Temperature**

Use **Temperature** to troubleshoot problems with monitored FRUs and the fans. Specifically, use these pages:

- FRU Status
- Graphs

To access **Temperature**, navigate to **Utility > Service > Home**, and then under **System Status**, select **Temperature**.

**For more information, see:**

- [7-4-5-5 'FRU Status' on page 7-24](#)
- [7-4-5-6 'Graphs' on page 7-26](#)
- [7-4-5-3 'System Status' on page 7-20](#)
- [7-4-5 'Home' on page 7-15](#)

### 7-4-5-6 FRU Status

**FRU Status** displays a summary of the FRUs being monitored and the details for each FRU.

To access this page, under **System Status**, select **Temperature** and then select **FRU Status**.

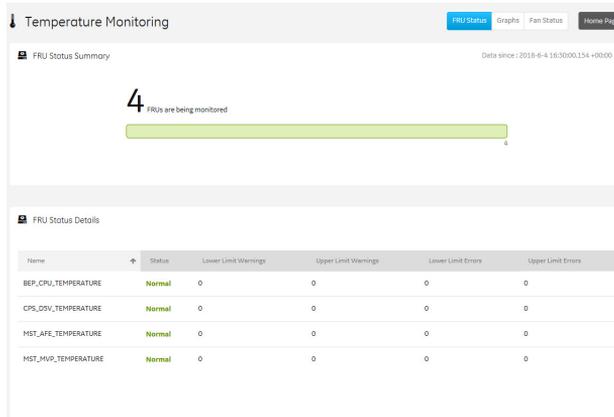


Figure 7-11. FRU Status

This table shows all the elements available on **FRU Status** with descriptions.

Table 7-5: FRU Status

Element	DESCRIPTION
FRU Status Summary	Number of the FRUs being monitored.
FRU Status Details	
Name	Name of the FRU. <ul style="list-style-type: none"> <li>ETX3 - Represents the ETX 64 transmitter board.</li> <li>ETX4 - Represents the ETX 128 transmitter board.</li> </ul>
Status	Status of the FRU. Valid values are: <ul style="list-style-type: none"> <li>Normal - Indicates that the FRU is operating within the allowable range.</li> <li>Warning - Indicates that the FRU is operating close to the limit of the allowable range.</li> <li>Error - Indicates that the FRU is operating outside the allowable range.</li> </ul>
Low Level Warning	Number of low temperature warnings.
High Level Warning	Number of high temperature warnings.
Low Level Errors	Number of low temperature errors.
High Level Errors	Number of high temperature errors.

#### **7-4-5-5 FRU Status(continued)**

For more information, see:

- ['Temperature' on page 7-23](#)
- [7-4-5 'Home' on page 7-15](#)

### 7-4-5-7 Graphs

**Graphs** displays trend graphs for selected elements which have been selected as key indicators of overall temperature status inside the card rack.

To access this page, under **System Status**, select **Temperature** and then select **Graphs**.

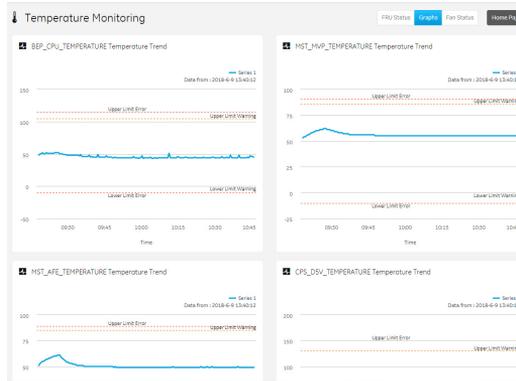


Figure 7-12. Graphs

**For more information, see:**

- [‘Temperature’ on page 7-23](#)
- [7-4-5 ‘Home’ on page 7-15](#)

## **7-4-5-8 Voltage**

Use **Voltage** to troubleshoot problems with monitored FRUs and the AC voltage of the Vivid T9/Vivid T8 .

Specifically, use these pages:

- FRU Status
- AC Voltage

To access **Voltage**, navigate to **Utility > Service > Home**, and then under **System Status**, select **Voltage**.

**For more information, see:**

- [7-4-5-5 'FRU Status' on page 7-24](#)
- [7-4-5-9 'AC Voltage' on page 7-29](#)
- [7-4-5-3 'System Status' on page 7-20](#)
- [7-4-5 'Home' on page 7-15](#)

### 7-4-5-9 FRU Status

**FRU Status** displays a summary of the voltages for the FRUs being monitored and the details for each FRU.

To access this page, under **System Status**, select **Voltage** and then select **FRU Status**.

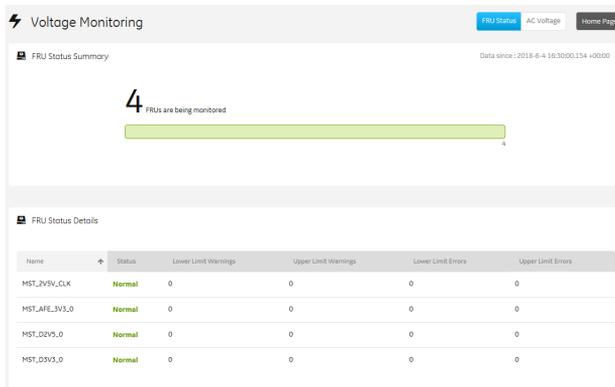


Figure 7-13. FRU Status

This table shows all the elements available on **FRU Status** with descriptions.

Table 7-6: FRU Status

Element	DESCRIPTION
Name	Name of the FRU.
Status	Status of the voltage for the FRU. Valid values are: <ul style="list-style-type: none"> <li>• Normal - Indicates that the fan is within the allowable range.</li> <li>• Warning - Indicates that the voltage is close to the limit of the allowable range.</li> <li>• Error - Indicates that the voltage is outside the allowable range.</li> </ul>
Lower Limit Warnings	Number of low limit voltage warnings.
Upper Limit Warnings	Number of high limit voltage warnings
Lower Limit Errors	Number of low limit voltage errors
Upper Limit Errors	Number of high limit voltage errors

**For more information, see:**

- [7-4-5-7 'Voltage' on page 7-27](#)
- [7-4-5 'Home' on page 7-15](#)

## 7-4-5-10 AC Voltage

AC Voltage graphically displays the voltage input over a period of time to help identify instabilities, or fault conditions, over time.

To access this page, under **System Status**, select **Voltage** and then select **AC Voltage**.

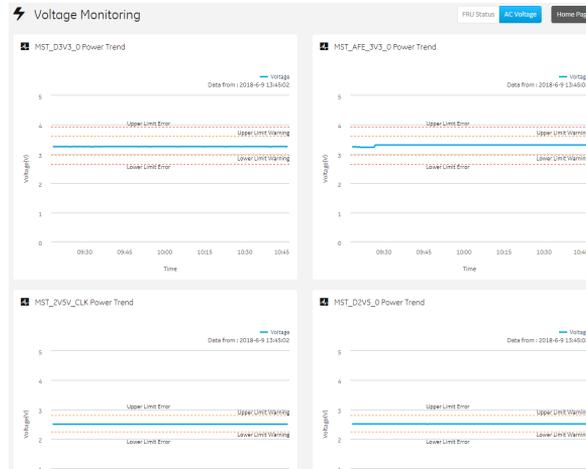


Figure 7-14. AC Voltage

**For more information, see:**

- [7-4-5-7 'Voltage' on page 7-27](#)
- [7-4-5 'Home' on page 7-15](#)

### 7-4-5-11 Disk Drive Space

Use **Disk Drive Space** to view the hard drive partitions including total size and available free space in GB. Includes the overall health of the drive in one of these colors:

- Red - Available free space is less than 10% of the total size.
- Orange - Available free space is more than 10% and less than 20% of the total size.
- Green - Available free space is more than 20% of the total size.

The information on **Disk Drive Space** is available to Class C and Class M licenses.

To access **Disk Drive Space**, navigate to **Utility > Service > Home**.

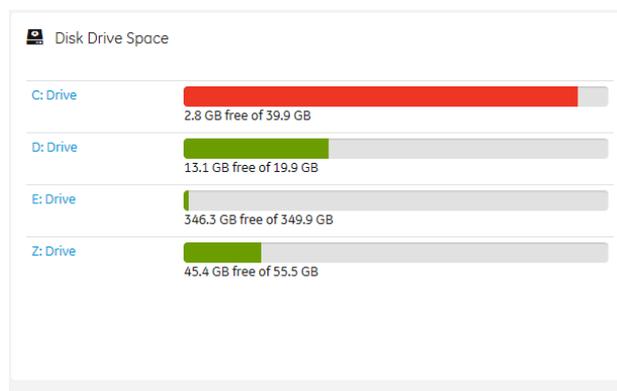


Figure 7-15. Disk Drive Space

This table shows all the elements available on **Disk Drive Space** with descriptions.

Table 7-7: Disk Drive Space

Element	DESCRIPTION
C: Drive	C: partition shows the graphical representation of the following: <ul style="list-style-type: none"> <li>• Used space in GB</li> <li>• Available free space in GB</li> </ul>

Table 7-7: Disk Drive Space

D: Drive	D: partition shows the graphical representation of the following: <ul style="list-style-type: none"><li>• Service</li><li>• Logs.</li><li>• Temp</li><li>• Export</li><li>• Service configuration</li><li>• Misc</li><li>• Available free space in GB</li></ul>
E: Drive	E: partition shows the graphical representation of the following: <ul style="list-style-type: none"><li>• Printer spooler</li><li>• Clipboard</li><li>• Dicom spooler</li><li>• Misc</li><li>• Available free space in GB</li></ul>
Z: Drive	Z: partition shows the graphical representation of the following: <ul style="list-style-type: none"><li>• Package repository</li><li>• Misc</li><li>• Available free space in GB</li></ul>

**For more information, see:**

- [7-4-5 'Home' on page 7-15](#)

### 7-4-5-12 Network Configuration

Use **Network Configuration** to view network (wired and wireless) information (the full ipconfig details) for the network configured with the Vivid T9/Vivid T8 .

The information on **Network Configuration** is available to Class C and Class M licenses.

To access **Network Configuration**, navigate to **Utility > Service > Home**.

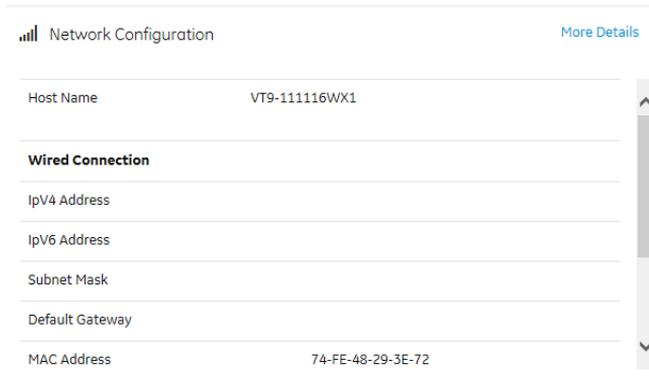


Figure 7-16. Network Configuration

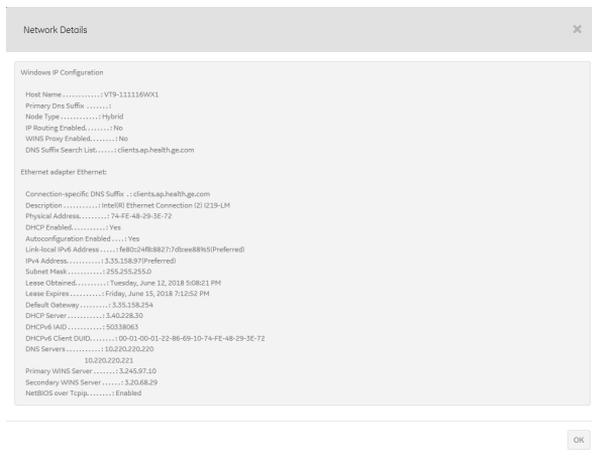


Figure 7-17. Network Configuration with More Details

**7-4-5-11 Network Configuration(continued)**

This table shows all the elements available on **Network Configuration** with descriptions.

Table 7-8: Network Configuration

Element	DESCRIPTION
Host Name	Name of the local host for the Vivid T9/Vivid T8 .
More Details	Displays the ipconfig details
<b>Wired Connection</b>	
IpV4 Address	Local IP address for the wired network connection.
IpV6 Address	Local IP address for the wired network connection.
Subnet Mask	Local subnet mask for the wired network.
Default Gateway	Default gateway for the wired network.
MAC Address	Address for the MAC for the wired network.
Speed (Mbps)	Speed of the wireless connection.
<b>Wireless Connection</b>	
IP Address	IP address for the wireless network connection.
Subnet Mask	Subnet mask for the wireless connection.
Default Gateway	Default gateway for the wireless connection.
MAC Address	Address for the MAC for the wireless connection.
Speed (Mbps)	Speed of the wireless connection
Status	Current status of the wireless connection.

**For more information, see:**

- [7-4-5 'Home' on page 7-15](#)

### 7-4-5-13 Connected Probes

**Connected Probes** shows probes connected to the Vivid T9/ Vivid T8 . The order on the user interface is top down matching the left-to-right order on the Vivid T9/Vivid T8 .

The information on **Connected Probes** is available to all service class licenses.

To access **Connected Probes**, navigate to **Utility > Service > Home**.

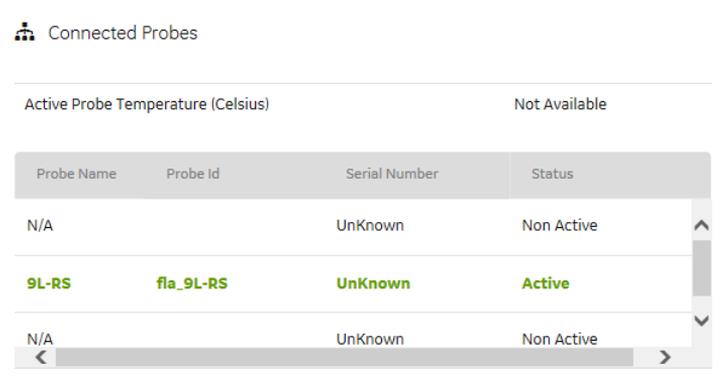


Figure 7-18. Connected Probes

This table shows all the elements available on **Connected Probes** with descriptions.

Table 7-9: Connected Probes

Element	DESCRIPTION
Active Probe Temperature (Celsius)	When available, temperature of the active probe. Not all probes report temperature. The most common probe to report temperature is the TEE probe.
Probe Name	Name of the probe connected to the Vivid T9/Vivid T8 .
Probe ID	Identifier of the probe connected to the Vivid T9/Vivid T8 .
Serial Number	Serial number of the probe connected to the Vivid T9/Vivid T8 . If the serial number of the probe is not available, then N/A displays.
Status	Statuses of the probe connected to the Vivid T9/Vivid T8 . Valid values are: <ul style="list-style-type: none"> <li>• Active</li> <li>• Non Active</li> </ul>

For more information, see: [7-4-5 'Home' on page 7-15](#)

# 7-5 Common Diagnostics

## 7-5-1 Remote Access

Remote Access is a feature designed to enable OLE's access to customer's desktop remotely, service engineers don't have to be on site to connect the physical dongle to exit to desktop, it's doable remotely by using this feature.

1. In the server side, type the CRM No. of the system which the OLE would remotely connect to, and select **Get Started**.

**NOTE:** Remote server link: <https://stg-ffa.am.health.ge.com/#/di/home>.

Start Remote Troubleshooting

Workflow Type

Standard (Includes Insite1, Insite2, and RSVP)

Enter System or Service ID

System ID

Devices using RSVP may utilize [Advanced Search](#) for filtering.

CRMNo

Service Request ID (Optional)

Service Request ID

Country of System

Get Started

Figure 7-19. Input System ID

## 7-5-1 Remote Access(continued)

2. Select **Connect**. Then the **Connect** page is displayed.

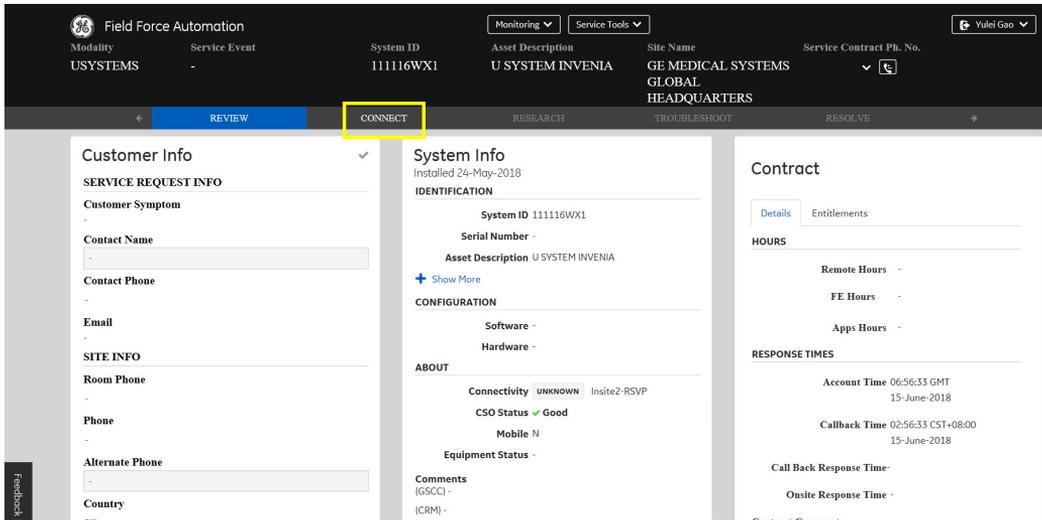


Figure 7-20. Connect Page

3. Select **HTTPS** to **Connect**. Then the OLE is remotely connected to the system.

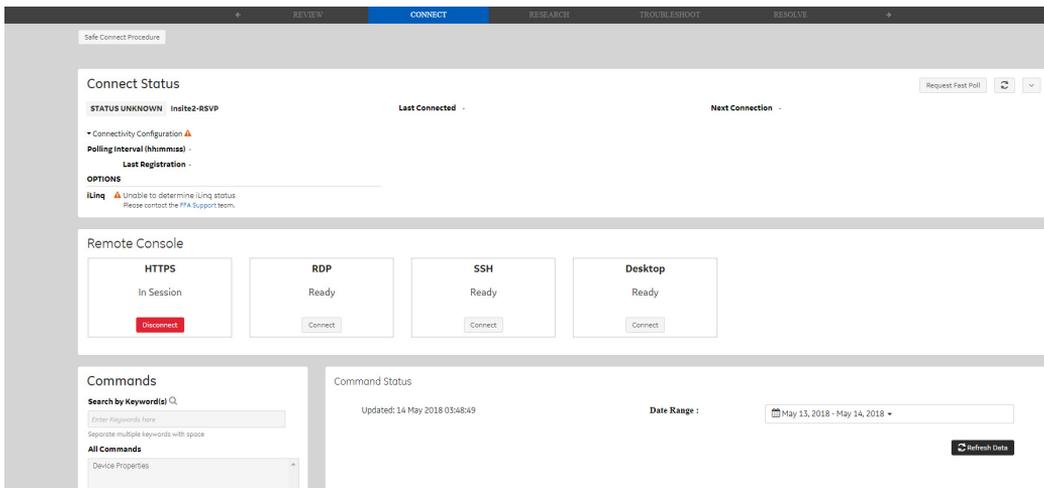


Figure 7-21. Select HTTPS to Connect

## 7-5-1 Remote Access(continued)

4. Enter **Options** to add service option key.

**NOTE:** Please delete the added service option key when your service work is done.

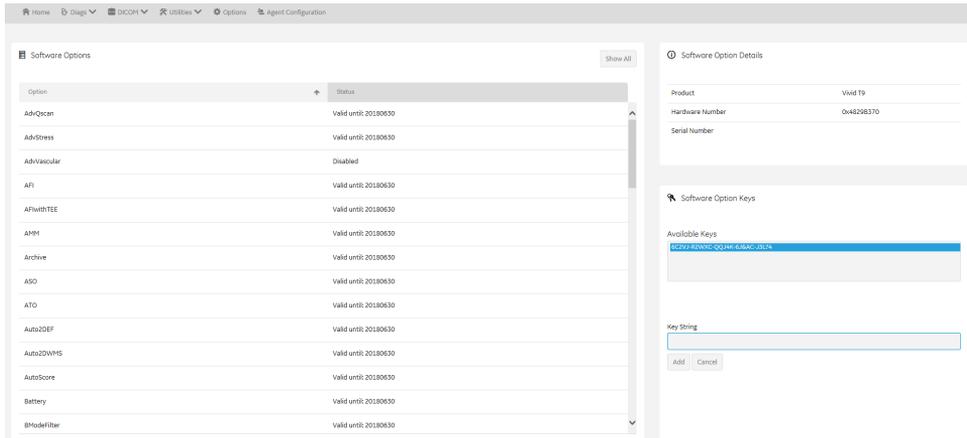


Figure 7-22. Add Service Option Key

5. Enter **Utility-> Disruptive Mode Utility**, select **Enable**.

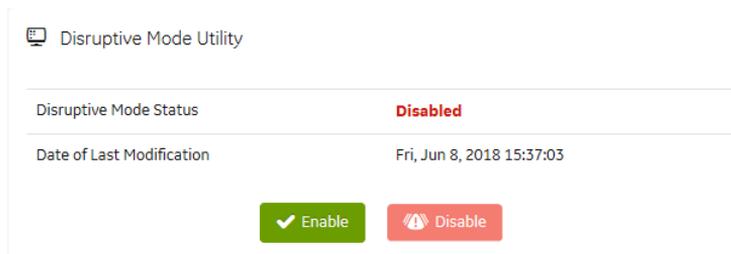


Figure 7-23. Enable Disruptive Mode

6. If we want to see the Scan screen or have control of the unit, we have to go to Virtual Console Observation and start it. Enter **Utility-> Virtual Console Observation**, select **Start**.

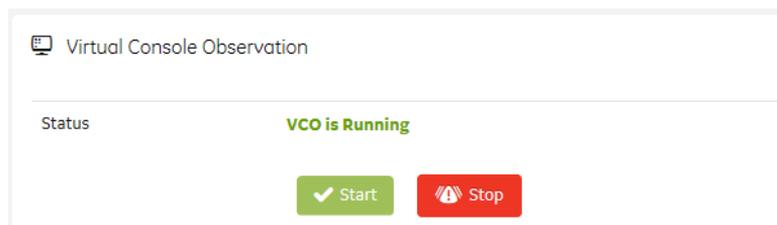


Figure 7-24. Start VCO

## 7-5-1 Remote Access(continued)

7. Select Desktop to Connect. Then the OLE is remotely connected to the system.

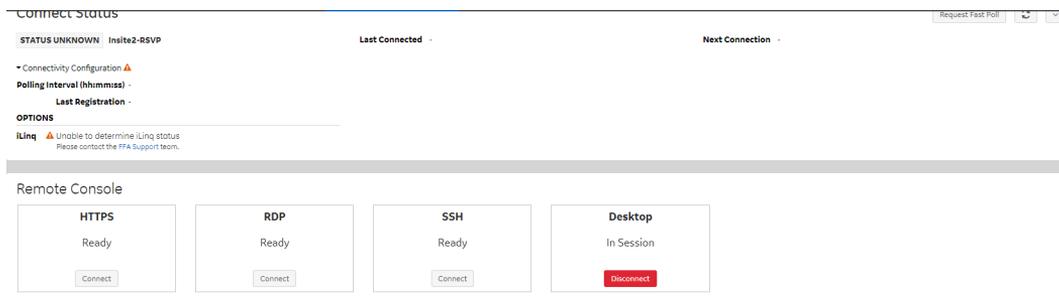


Figure 7-25. Select Desktop to Connect

**NOTE:** *You need to reboot the system before clinical scanning is resumed.*

## 7-5-2 Service Diagnostics

BF, COMEXP and GFS modules are on the Vivid T9/Vivid T8 WMST PWA.

CPS is WPWR/DCDC PWA.

IOS is SMIO PWA.

PID is SLRY 4-Probe PWA.

### 7-5-2-1 GFS

- GFS Swept Demodulator Test performs a signal path test of the swept demodulator FPGA on the GFS.
- GFS Front-End Interface Test tests that the GFS can access Front-End boards.
- GFS Analog Test.
- GFS Memory Access Test tests that GFS can access to the internal, external, external cache memory spaces.
- Front End Interface FPGA Test reads the version of the GFE FPGA.
- GFS Fixed Demo Test: GFS Fixed Demodulator signal path test.
- DSP Master Clock Test tests DSP Master Clock.
- GFS Swept Demodulator Long Test.

### 7-5-2-2 System

- CPU Temperature Test.
- CPS Temperature Test.
- WMST Temperature Test.
- WMST Voltage Test.
- CPS Voltage Test.
- FPGA Version Test.
- HV\_STOP Test tests HV-STOP mechanism and checks each board is able to assert HV\_STOP using its HV\_STOP source.

## **7-5-2 Service Diagnostics(continued)**

### **7-5-2-3 Memory**

- Callisto Memory Test.

*NOTE: The Callisto Memory test may fail if it is performed with other tests at the same time.*

### **7-5-2-4 AnalogReceive**

- Noise Floor Test.

### **7-5-2-5 AnalogCW**

- aCW IQ Symmetry Test

### **7-5-2-6 Digital Receive**

- AFE IF Test
- Complex Mixer Test
- CE Decoder Test

### **7-5-2-7 ECG Tests**

- ECG Tests

### **7-5-2-8 Doppler Tests**

- Doppler Audio Test runs the tests for Doppler.

## 7-5-2 Service Diagnostics(continued)

### 7-5-2-9 PC

- Essential Test tests: PCI, PCI Express, CPU, Memory, HD Disk and Video.
- Hard Drive Long tests functionality of the hard drive.
- Hard Drive Short tests functionality of the hard drive.
- Memory tests the memory on the mother board.
- Network Adapter: Network cable must be connected.
- System board tests the real time clock.
- Video tests functionality of video adapters.

### 7-5-2-10 PC Interactive

- **AVI playback** tests playing back an AVI file.
  - Click “Play” to run the test. If the test is successful, you will see a brief video clip with audio. For more information about the test, click “More Information”.
  - Click “Pass” if the test successfully reproduces the video clip.
  - Click “Fail” if the test is unable to successfully reproduce the video clip.
  - Click “Cancel” button to quit the test without recording a test result.
- **Keyboard**
  - Press each key on the keyboard and it will be added to the History. Hold down a key to test the repeat of that key. To cancel, click Cancel or press Alt-X.
  - Special purpose keys like volume control or Internet access keys may not be detected. To test the Fn key of a notebook computer, hold down the Fn key while pressing another key.
  - Note: This diagnostic is intended to verify keyboard keys are in good working order. It is not intended to verify that keyboards produce desired characters.
- **Monitor Test Patterns**
  - This test is composed of various elements that verify a monitor functions correctly. To test a monitor feature, click the appropriate button. You can return to this dialog by clicking the mouse button or pressing any key.

### **7-5-2 Service Diagnostics(continued)**

- The Combination Test helps you verify your monitor is properly aligned, and set at the correct color depth and resolution. Use the crosshair pattern in each corner of the screen to visually determine if the monitor aligns correctly. If the crosshairs appear distorted or out of focus, a problem may exist with the monitor alignment. Use the color spectrum array for visually verifying the monitor color depth capacity. If the colors in the color spectrum do not blend smoothly together, a problem may exist with the monitor color depth. Use the graduated horizontal and vertical alignment bars to determine the monitor resolution capabilities. The better you can discern individual lines as they move closer together, the higher the resolution capabilities of the monitor.
- The Solid Color Test helps point out malfunctioning or dysfunctional pixels using five basic colors: red, green, blue, black, and white. Fill the screen with an appropriate color by clicking the associated button. If a pixel is malfunctioning, the pixel color will contrast with the color of all other pixels.
- The VESA Test Patterns allow you to test the monitor for proper luminance, geometry and focus. Click the appropriate button to fill the screen with the associated test pattern. You can return to this dialog by clicking the mouse button or pressing any key.

## 7-5-2 Service Diagnostics(continued)

- **Trackball**
  - The Mouse Status Test verifies the cursor position and mouse button state. When a mouse button is pressed, the corresponding button on the picture will change color. If the mouse is a wheel or scroll mouse, an arrow will indicate the direction the wheel is being rotated. Clicking the wheel will flash the picture of the mouse in the Mouse Status Test area.
  - The Drag and Drop Test verifies a mouse can successfully perform drag and drop operations. Left click the picture of the CD and drag it onto the picture of the drive. If successful, the picture will change.
  - The Double Click Test verifies a mouse can successfully perform double-click operations. Double-click on the picture of the monitor. If successful, the picture will change.
- **Sound Test** generates sounds for testing the speakers.
- **USB Ports Test** lists USB Devices.

## 7-5-2 Service Diagnostics(continued)

### 7-5-2-11 Assessment Utility

#### Probe Assessment

**NOTE:** *The probe assessment is only available for the probe connected in the first probe port.*

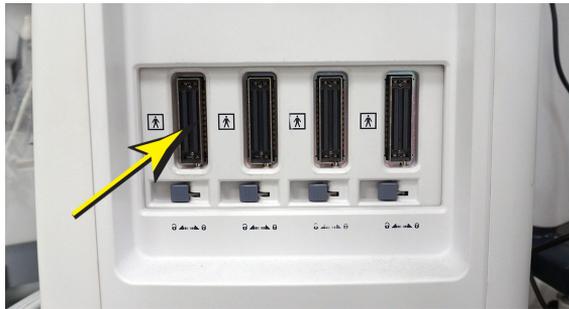


Figure 7-26. The first probe port

**NOTE:** *P2D probe is not supported in Probe Assessment.*

1. Place the probe's carrying case on a stable surface and open the case.
2. Carefully remove the probe and unwrap the probe cord.
3. Put the probe in the probe holder.



**DO NOT** allow the probe head to hang free. Impact to the probe head could result in irreparable damage.

4. Prior to inserting the probe, ensure that the connector locking handle is positioned to the left.
5. Align the connector with the probe port and carefully push into the left-most probe port.
6. Turn the connector locking handle to the right to secure the probe connector.
7. Carefully position the probe cord so it is free to move and is not resting on the floor.
8. Press **Probe** button on the control panel and select the first probe from the probe indicators.
9. Enter global service user interface as GE service.

## 7-5-2 Service Diagnostics(continued)

10. In the **Diags-> Run Diags-> S\_ProbeAssessment** to check the probe.

If there is no broken element and the probe is acceptable for diagnostic, the following result window displays.

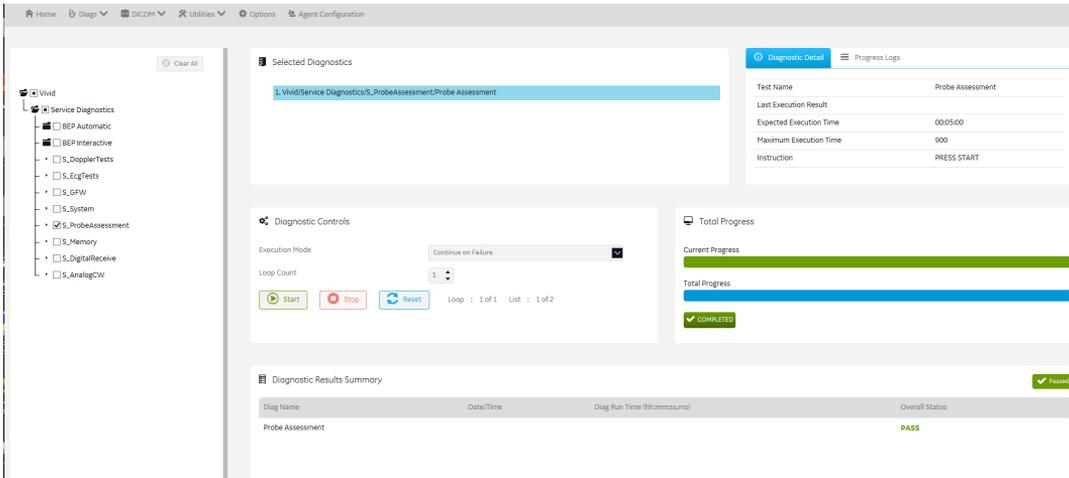


Figure 7-27. Probe Assessment Pass

11. In the **Diags-> Run Diags->Diags History** to check the probe diagnostic results.

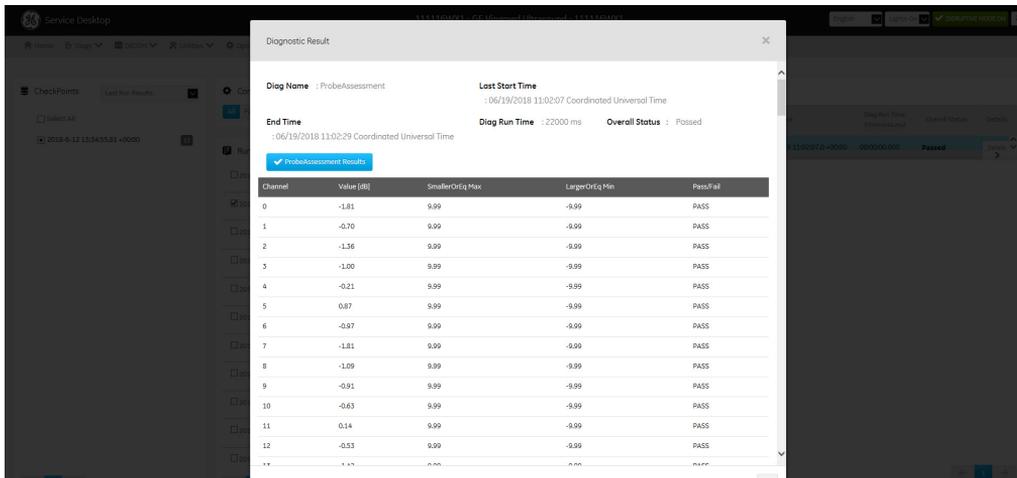


Figure 7-28. Probe Assessment Result

## 7-5-2 Service Diagnostics(continued)



CAUTION

Reboot the system after the probe assessment.

### 7-5-2-11-1 Probe Pass/Fail Criteria

Pass

- No dead element
- Dead elements on the edge (#0, #1 or #end-1, #end)

Fail

- Max 2 weak elements on the scan line:  $-3\text{dB} < \text{elements} < -2\text{dB}$
- Any one of the elements in one scan line:  $\text{element} < -3\text{dB}$

# 7-6 Troubleshooting

## 7-6-1 Console Troubleshooting Trees

### 7-6-1-1 System Doesn't Boot

This is an overall diagram showing a recommended sequence for troubleshooting a no-boot situation.

**NOTE:** This troubleshooting tip is for online engineer.

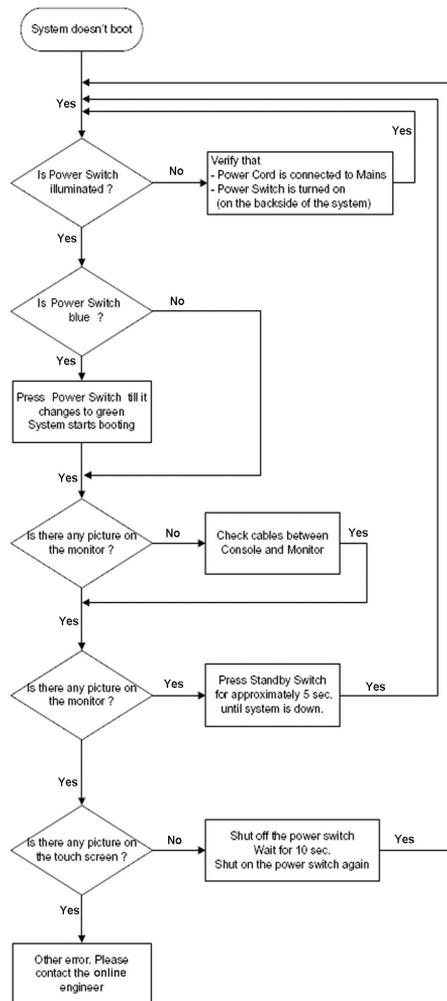


Figure 7-29. System Doesn't Boot



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## Chapter 8

# Replacement Procedures

*This chapter describes how to remove and install, or replace, modules and subsystems in the Vivid T9/Vivid T8. It also includes instructions for installing and re-installing the software.*

# 8-1 Overview

## **8-1-1 Contents in this chapter**

- [8-1 'Overview' on page 8-2](#)
- [8-2 'Warnings and important information' on page 8-3](#)
- [8-3 'Disassembly/Re-assembly' on page 8-5](#)
- [8-4 'Loading the software' on page 8-20](#)

# 8-2 Warnings and important information

## 8-2-1 Warnings



Energy Control and Power Lockout for Vivid T9/Vivid T8.

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

1. Follow LOCK OUT/TAG OUT procedures.
2. Turn off the breaker.
3. Unplug the Ultrasound system.
4. Maintain control of the Ultrasound system power plug.
5. Wait for at least 30 seconds for capacitors to discharge as there are no test points to verify isolation.
6. Remove/disconnect the battery, if present.



Ultrasound System components may be energized.



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



DO NOT touch any boards with integrated circuits prior to taking the necessary ESD precautions.

Always connect yourself, via an arm-wrist strap, to the advised ESD connection point located on the rear of the Ultrasound system (near the power connector).



Follow general guidelines for handling of electrostatic sensitive equipment.

### 8-2-1 Warnings(continued)

**NOTE:** Use an ESD compatible work space or the ESD-kit during parts replacement.



The waste of electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately.



Please contact the manufacturer or other authorized disposal company to decommission your equipment.

### 8-2-2 Returning/shipping probes and repair parts

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 an 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 that 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 purposes and must be transported as a hazardous material.*

## 8-3 Disassembly/Re-assembly

### 8-3-1 Warning and Caution



*ONLY QUALIFIED SERVICE PERSONNEL SHOULD REMOVE ANY COVERS OR PANELS. ELECTRICAL HAZARDS EXISTS AT SEVERAL POINTS INSIDE. BECOME THOROUGHLY FAMILIAR WITH ALL HAZARDOUS VOLTAGES AND HIGH CURRENT LEVELS TO AVOID ACCIDENTAL CONTACT*



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

### 8-3-2 Tools needed for servicing Vivid T9/Vivid T8

Table 8-1: Standard tools list for Vivid T9/Vivid T8

No	Part Name	Part No.	QTY	Screw Description	Screwdriver Description
1	screw	2159632	2	Screw BH M4x6	Common Phillips Screwdriver
2	screw	2159634	4	Screw BH M4x10 WHT	Common Phillips Screwdriver
3	screw	2327793	135	D2 Screw SJ2836-87 M3x8	Common Phillips Screwdriver
4	screw	2373562	3	Screw M4x10	Common Phillips Screwdriver
5	screw	5138465	10	Screw FH M2.5x5(NL)	Common Phillips Screwdriver
6	screw	5176890	6	Screw DIN965A M4x8	Small Phillips Screwdriver
7	screw	5244775	2	Screw GB T820-2000 M3x8	Common Phillips Screwdriver
8	screw	5342274	4	Inch SScrew #6-32UNC	Common Phillips Screwdriver
9	screw	5439265	246	Screw-M4x10	Common Phillips Screwdriver
10	screw	5445720	12	GB 818-2000 M4x30	Common Phillips Screwdriver
11	screw	2337572	2	Screw FH M3x6	Common Phillips Screwdriver
12	screw	5476381	20	Bolt M8x18 with Washer	6# Inner Hexangular Set
13	screw	5476387	34	Bolt M6x15 with Washer	5# Inner Hexangular Set
14	screw	5476394	5	Bolt M8x30	6# Inner Hexangular Set
15	screw	5476438	14	Bolt M8x36 With Washer	6# Inner Hexangular Set
16	screw	5476440	17	Bolt M6x24 With Washer	5# Inner Hexangular Set
17	screw	5477579	2	Screw_DIN912 M6_20	5# Inner Hexangular Set
18	screw	5490719	4	Screw PM SW4x8	Common Phillips Screwdriver
19	screw	5491747	1	Screw Pan Head M4x4	Common Phillips Screwdriver
20	screw	5491847	2	Hand Screw M2p5x5	by hand

**NOTE:** Please use the correct Screwdrivers listed in [Table 8-1](#)

### 8-3-3 Overview of Vivid T9/Vivid T8

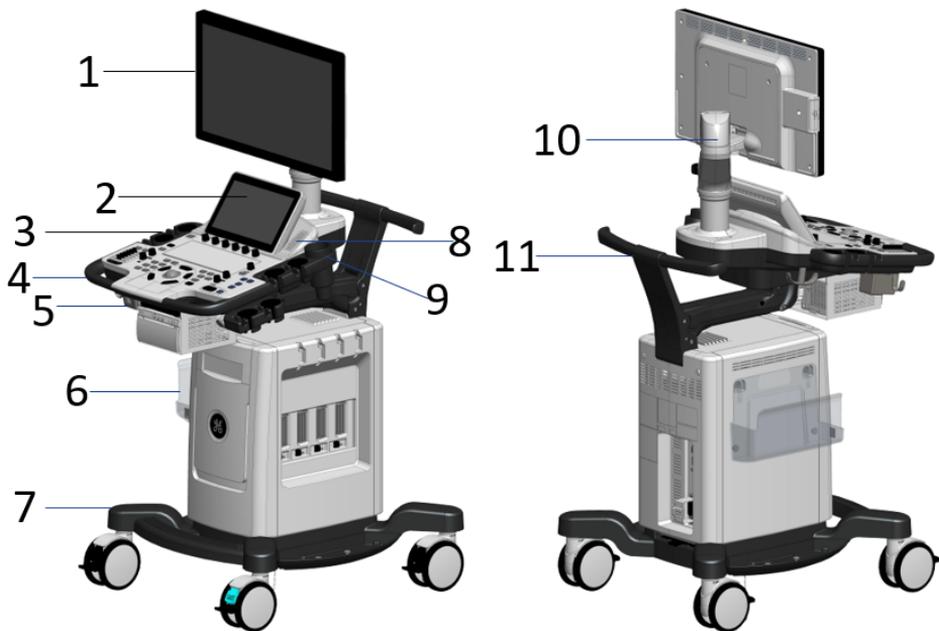


Figure 8-1. System Overview (Vivid T9)

- |                              |                              |
|------------------------------|------------------------------|
| 1. T9 LCD                    | 8. AQUA R3 Speaker           |
| 2. AQUA R3 TP Module         | 9. T9 Gel Holder             |
| 3. AQUA Probe Holder         | 10. ErgotronFlexible Arm Kit |
| 4. AQUA T9 Main Top Cover    | 11. AQUA T9 Rear Handle      |
| 5. ECG Cable                 |                              |
| 6. AQUA R3 Printer Shelf Kit |                              |
| 7. Vivid T9 Base             |                              |

### 8-3-3 Overview of Vivid T9/Vivid T8(continued)

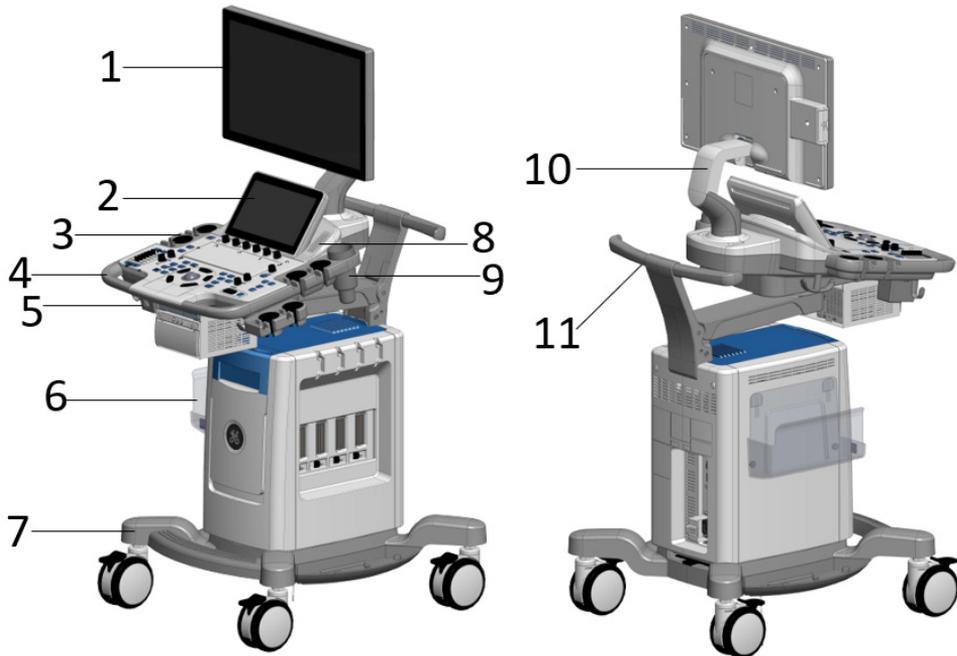


Figure 8-2. System Overview (Vivid T8)

- |                               |                                  |
|-------------------------------|----------------------------------|
| 1. Vivid T8 R2 21.5" LCD Assy | 8. AQUA R3 Speaker               |
| 2. AQUA R3 TP Module          | 9. AQUA Gel Holder               |
| 3. AQUA Probe Holder          | 10. Arm Support Kits for Aqua R2 |
| 4. Vivid T8 R3 KBD Top Assy   | 11. AQUA R3 Rear Handle          |
| 5. ECG Cable                  |                                  |
| 6. AQUA R3 Printer Shelf Kit  |                                  |
| 7. T8 R3 Base Chassis         |                                  |

### 8-3-3 Overview of Vivid T9/Vivid T8(continued)



Figure 8-3. Peripheral Panel(Vivid T9)

- |   |                     |
|---|---------------------|
| 1. USB Printer port: For AC Printer ONLY. | 6. Equipotentiality |
| 2. VGA Video out port                     | 7. Circuit breaker  |
| 3. USB 2.0 ports                          | 8. AC Inlet         |
| 4. Ethernet                               |                     |
| 5. Audio Out port                         |                     |

8-3-3 Overview of Vivid T9/Vivid T8(continued)



Figure 8-4. Peripheral Panel(Vivid T8)

- |   |                     |
|---|---------------------|
| 1. USB Printer port: For AC Printer ONLY. | 6. Equipotentiality |
| 2. VGA Video out port                     | 7. Circuit breaker  |
| 3. USB 2.0 ports                          | 8. AC Inlet         |
| 4. Ethernet                               |                     |
| 5. Audio Out port                         |                     |

## **8-3-4 Internal Battery**

Purpose: This is a description on how to remove and replace the Internal Battery.

### **8-3-4-1 Tools**

- Common Phillips screwdrivers

### **8-3-4-2 Preparation**

- Shut down the system and disconnect the power cord.

### **8-3-4-3 Needed Manpower**

- 1 person, 5 minutes + travel

### 8-3-4 Internal Battery(continued)

#### 8-3-4-4 Removal Procedure

Table 8-2: Removal Procedure for Internal Battery (For R2.0.3 and above)

No.	Steps	Corresponding Graphic
1.	Pull out the body front cover with hands.	 A photograph showing a person's hands pulling out the front cover of a white medical device. The cover is being lifted away from the main body of the device.
2.	Unscrew the 2 screws and remove the bracket.	 A close-up photograph of the front cover of the device. Two screws are highlighted with yellow circles, indicating they need to be removed.
3.	Unscrew 1 screw with hand, then remove the battery bracket. Then take out the battery.	 A close-up photograph of the battery compartment. A hand is shown unscrewing one of the screws from the battery bracket, which is highlighted with a yellow circle.

### **8-3-4-5 Mounting Procedure**

1. Install the new parts in the reverse order of removal.

### **8-3-4-6 Functionality checks**

Perform the checks.

- Try to move the battery bracket and the battery bracket is securely fixed and is not loose.
- Battery status displays on the screen.

### 8-3-5 Cleaning the Trackball



DO NOT touch any boards with integrated circuits prior to taking the necessary ESD precautions.

Always connect yourself, via an arm-wrist strap, to the advised ESD connection point located on the rear of the Ultrasound system (near the power connector).

Follow general guidelines for handling of electrostatic sensitive equipment.

#### 8-3-5-1 Manpower

One person, 10 minutes,

#### 8-3-5-2 Tools

- Antistatic brush and/or antistatic vacuum cleaner

#### 8-3-5-3 Preparations

To get access to the trackball for cleaning, you must perform the following steps:

1. Power down the system.
2. Disconnect the mains power cable from the wall outlet.

Follow these links if you need more information: [See 4-2-3 'Power off' on page 4-8 for more information.](#)

### 8-3-5-4 Clean the Trackball

Dust is often building up behind the ball, so it interferes with the ball rotation and for optical trackballs the light used for sensing. To get access for cleaning, you need to remove the ball.

The ball is held in position by the Dust Gasket.

1. Power off the system.
2. Rotate the dust gasket counterclockwise until it can be removed from the keyboard.

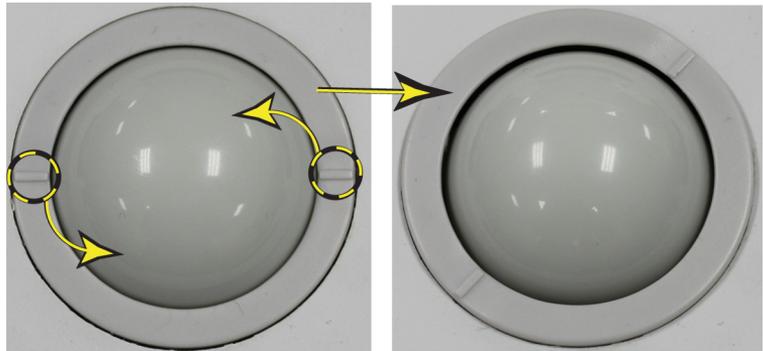


Figure 8-5. Remove the retainer

3. Separate the trackball and the gasket. Wipe off any oil or dust from the trackball, gasket and the trackball housing using a cleaner or cotton swab.
4. Assemble the trackball and gasket, then put it into the housing and rotate it clockwise until its notches are set in the position.



When cleaning, make sure not to spill or spray any liquid into the trackball housing (keyboard or system).

### 8-3-5-5 Test the Trackball

Power up the and test that the trackball now works as intended.

### **8-3-6 Cleaning the Air Filter**

#### **8-3-6-1 Manpower**

One person, 5 minutes,

#### **8-3-6-2 Tools**

- None

#### **8-3-6-3 Preparations**

To get access to the air filter for cleaning, you must perform the following steps:

1. Power off the system.
2. Disconnect the mains power cable from the wall outlet.

Follow these links if you need more information: [See 4-2-3 'Power off' on page 4-8 for more information.](#)

### **8-3-6-4 Clean the Air Filter**

1. Power off the system.
2. Pull out the air filter from the rear panel.



Figure 8-6. Remove the Air Filter

3. Dust the filter with a vacuum cleaner and/or wash it with a mild soapy solution.  
If washed, rinse and dry the filter before re-installation.
4. Pull back the air filter.

### 8-3-6-5 Cleaning the metal filter

Clean the system's metal filter to ensure that a clogged filter does not cause the system to overheat and reduce system performance and reliability. It is recommended the filters be cleaned every two weeks, but the requirements will vary due to your system use.



Be sure to lock the wheels before cleaning the metal filter to avoid injury by any unexpected movement of the system.

DO NOT operate the unit without the metal filter in place.

Allow the metal filter to dry thoroughly before re-installing them on the unit.

1. Pull out the air filter.



Figure 8-7. Pull Out the Air Filter

### 8-3-6-5 Cleaning the metal filter(continued)

2. Pull out the metal filter. The metal filter is located under the air filter at the bottom of the system.

Put the hand under the bottom of the system and use fingers to slide out the metal filter slowly, then use the hand to pull it out.

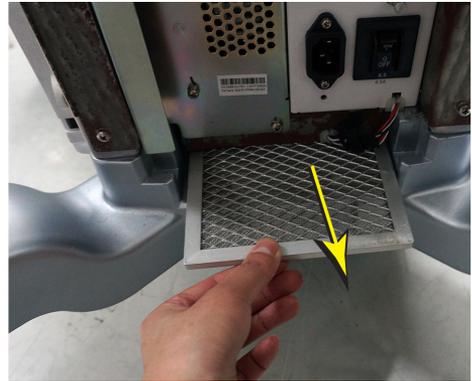


Figure 8-8. Pull out the Metal Filter

3. Dust the filter with a vacuum cleaner and/or wash it with a mild soapy solution.  
If washed, rinse and dry the filter before re-installation.
4. Put back the metal filter
5. Put back the air filter.

## 8-4 Loading the software

### 8-4-1 Purpose of this section

This section describes how to reinstall software on Vivid T9/  
Vivid T8.

### 8-4-2 Customer provided prerequisite

- Formatted and labelled media for Images storage.
- Formatted and labelled media for Patient Archive and Presets (User Defined Settings).
- Password for the user ADM.

### 8-4-3 Data Management - moving all images



An error, or a power loss may occur.

Always backup the Patient Archive and the Presets (System Configurations) before loading the software!

In order to complete a successful restore of the Patient Database, as needed after a hard disk replacement, or if all the content on the hard disk has been erased, the images must be moved away from Vivid T9/Vivid T8 before doing backup of the Patient Database.

Depending on the location set-up, either move the images to a remote server or to removable media like DVD or CD discs.

- Move the images to a remote server or to removable media.  
For instructions, please see “Disk management” in the User Manual/User Guide.

## 8-4-4 Backing up the Patient Archive and System Configurations



### CAUTION

An error, or a power loss may occur.

Always backup the Patient Archive and the Presets (System Configurations) before loading the software!

In order to complete a successful restore of the Patient Database, as needed after a hard disk replacement, or if all the content on the hard disk has been erased, the images must be moved away from Vivid T9/Vivid T8 before doing backup of the Patient Database.

Depending on the location set-up, either move the images to a remote server or to removable media like DVD or CD discs.

- Backup the Patient Archive and System Configurations.

For instructions, please see “Data Backup and Restore” in the User Manual/User Guide.

**NOTE:** *The system supports back up the presets remotely.*

## 8-4-5 Restoring up the Patient Archive and System Configurations

- Restore the Patient Archive and System Configurations.

For instructions, please see “Data Backup and Restore” in the User Manual/User Guide.

**NOTE:** *The system supports restore the presets remotely.*

## 8-4-6 Recording important settings and parameters

### 8-4-6-1 Overview



### CAUTION

An error, or a power loss may occur.

It is considered to be best practice to always keep a record on paper of the settings for the Vivid T9/Vivid T8. Verify if it is current before you start to load software!

Always keep a record of the settings for the Vivid T9/Vivid T8 on paper. Verify if it is current before starting a software loading! If needed, record the settings.

This subsection includes descriptions for recording data from the following screens:

## 8-4-7 Loading the System Software



**WARNING**

*While the software install procedure is designed to preserve data, you should save any patient data, images, system setups and customer presets to CD, DVD, USB Flash Drive, or USB Hard Disk before doing a software upgrade.*

**NOTE:** *Before loading the system software, please ensure that the power can be continuously supplied and there is no risk of power cut off during loading procedure.*

There is one method to load the system software:

- Load the system software with USB memory stick.

### 8-4-7-1 Loading the System Software with USB memory stick

**NOTE:** *While it is believed to be unnecessary, it would not hurt to disconnect the system from the network and remove all transducer.*

**NOTE:** *Please ensure AC adapter is connected during system upgrade!*

**NOTE:** *Serial number and option key are needed to be input after loading the complete disk. The serial number about option key **MUST** be the same as the ones before installation. Please record the serial number and option key before installation.*

1. Insert the USB memory stick labeled "System & Application Software" to the system.

**NOTE:** *Do not load the system software using the USB port dedicated for printer.*

2. Properly turn off the scanner by momentarily pressing the Power On/Off Switch. In System-Exit window, select **Shutdown** to shutdown the system.

**NOTE:** *If the system will not shutdown normally, hold down the Power On/Off Switch until the light turns off.*

3. Press Power button to power on the system and press F7 on the control panel immediately.

### 8-4-7-1 Loading the System Software with USB memory stick(continued)

4. Input the BIOS password **Renm@c5**.

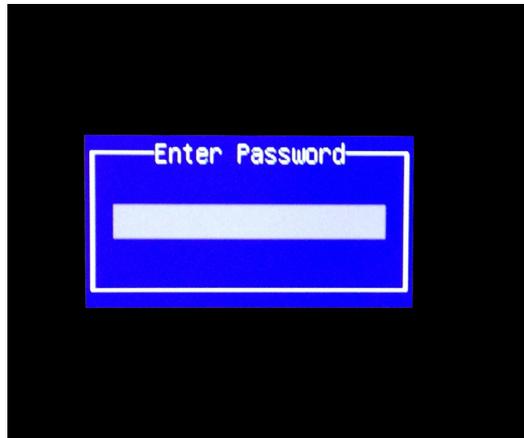


Figure 8-9. Input Password

5. From the page appearing, select USB as the boot device and press **Enter** key to finish the setting.

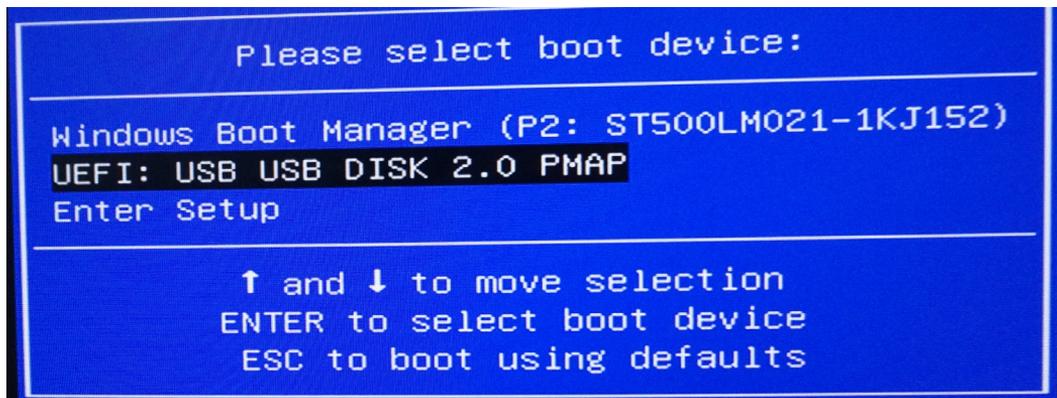


Figure 8-10. Select Product Type

### 8-4-7-1 Loading the System Software with USB memory stick(continued)

6. The system will detect the USB automatically and a window will pop up. Select the product type properly.

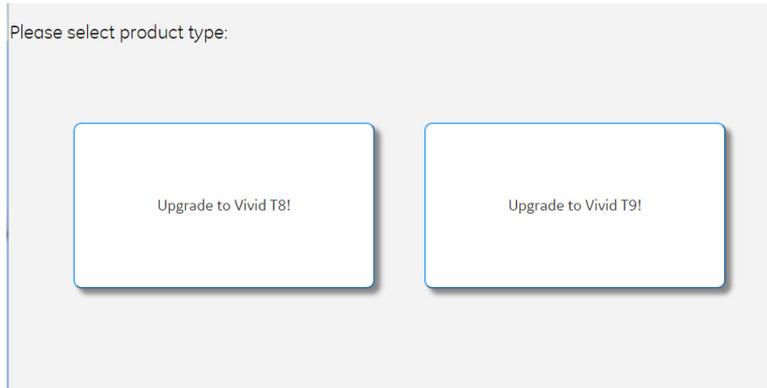


Figure 8-11. Select Product Type

7. Press **Confirm** if the product type is properly selected.

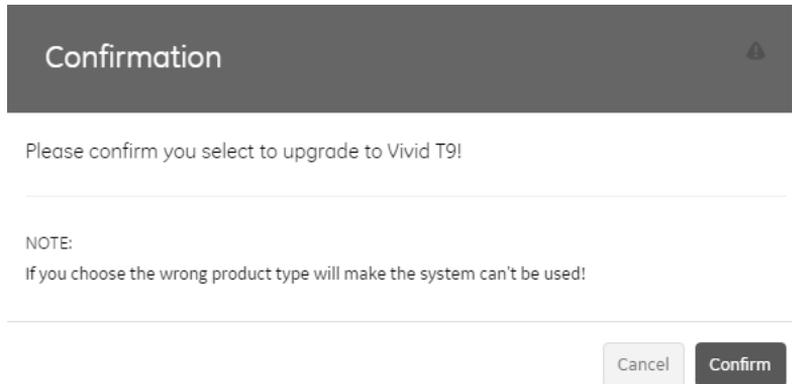


Figure 8-12. Confirmation Page

## 8-4-7-1 Loading the System Software with USB memory stick(continued)

8. Select one of the options from the following page to load the system.

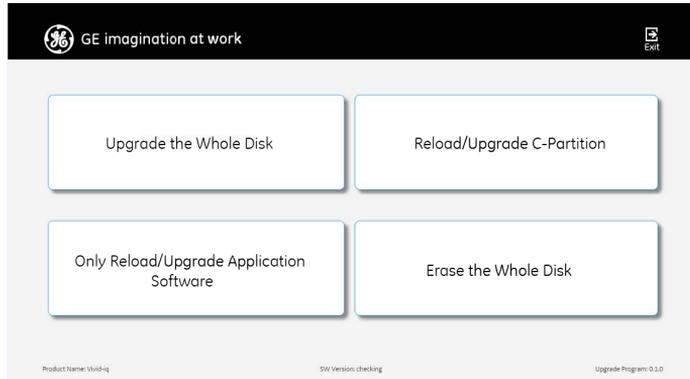


Figure 8-13. Disk Selection



If you select Upgrade the Whole Disk, ALL existing software and data will be erased. If backup has not been performed, all data like Patient Database, System Configuration and User Configurations (Customer Presets) will be lost.

**NOTE:**

- To select Upgrade the Whole Disk, the complete disk will be loaded. This option is recommended for application software upgrade.
- *When selecting Load The Complete Disk to load complete disk, please ensure that any patient data on the disk has been backed up.*
- To select Reload/Upgrade C-Partition, only the bootable C-partition is loaded. This option is intended for recovery of a system that will not boot up. It is not recommended for application software upgrade because during upgrade process, the data on the system would possibly be impacted.
- To select Only Reload/Upgrade Application Software. This option will only upgrade the application software and will not backup the system.
- To select Erase the Whole Disk. This option will destroy all patient data.

### 8-4-7-1 Loading the System Software with USB memory stick(continued)



*While the software install procedure is designed to preserve data, you should select choice [b] to format disk C only.*

**NOTE:** *If selected to load C Disk only when loading the system software, the system will display a screen to restore Computer name before entering the scanning screen.*

9. If **Load The Complete Disk** is selected, a confirmation page is displayed, then select **Execute** to continue.

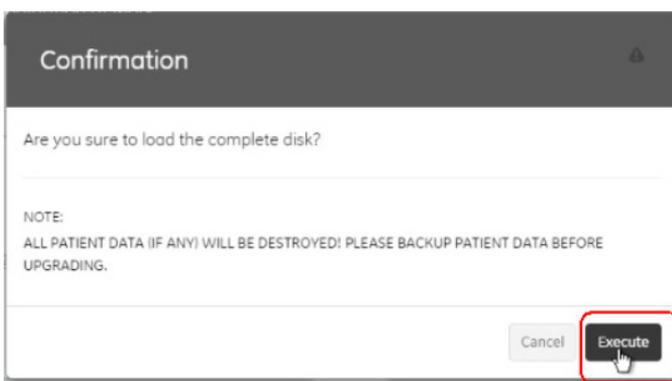


Figure 8-14. Data Backup Confirmation



*Please make sure the system configuration have been backed up first, then upgrade the system.*

10. System USB memory stick will be loading. Wait for the software installation to complete. Status bar on the screen indicates the progress.

**NOTE:** *It will need about 27 minutes to finish the upgrading process.*



*Do not interrupt the software loading at any time..*

### 8-4-7-1 Loading the System Software with USB memory stick(continued)

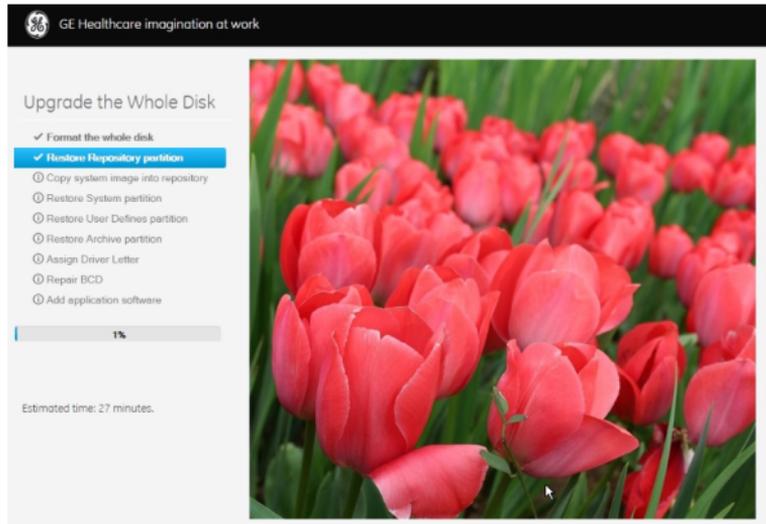


Figure 8-15. Loading Process

11. After the upgrade process is completed, remove the upgrade USB stick and click the **Reboot** button.

**NOTE:**

*If you do not remove the USB memory stick, the software system loading process repeats when the system boots up.*

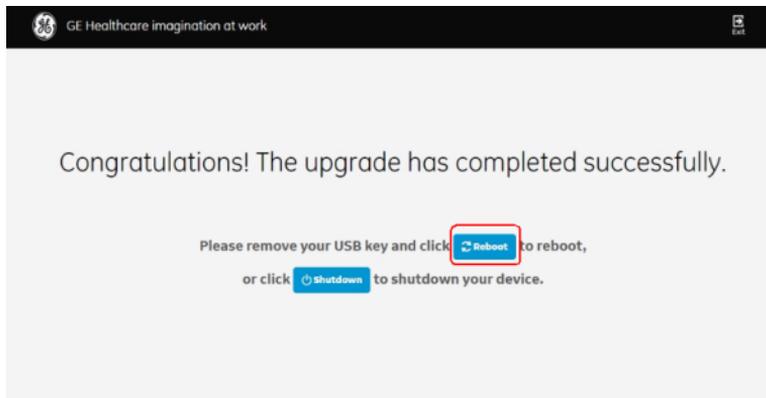


Figure 8-16. Finish Upgrading

### 8-4-7-1 Loading the System Software with USB memory stick(continued)

12. When the system reboots, the **Installation Wizard** page shows. You can configure the system settings or exit. For detailed process, please refer to [8-4-13 'Installation Wizard' on page 8-34](#).
13. If **Upgrade the Whole Disk** is selected, you are required to input the serial number when you reboot the system. After you press **OK**, the system will shut down automatically.

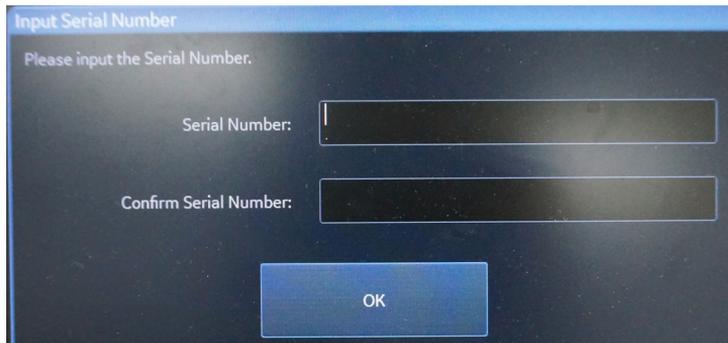


Figure 8-17. Input Serial Number

14. After you power on the system, it will need you to input the backup option key, and then press **OK**.

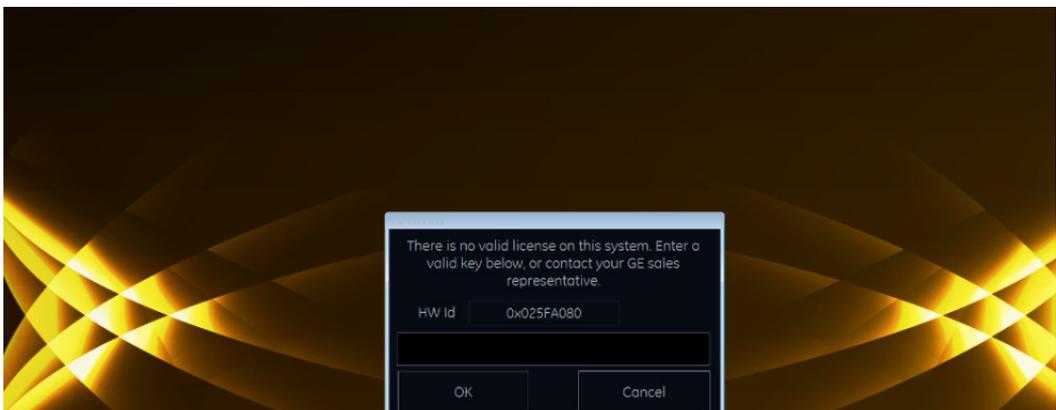


Figure 8-18. Input Option Key

### **8-4-7-2 Rewrite the Serial Number**

If selected to load the complete disk during the software loading process, when powering the system, the system will indicate to rewrite the serial number.

### 8-4-8 Software Version check out

#### 8-4-8-1 Functional Check-out

1. Power on Vivid T9/Vivid T8 system and wait until system booting to scanning screen.

**NOTE:** *If selected to load C Disk only when loading the system software, the system will display a screen to restore Computer name before entering the scanning screen.*

2. Press **Config (F2)** on the control panel.
3. Select the **About -> System version** and check whether the software version is right.

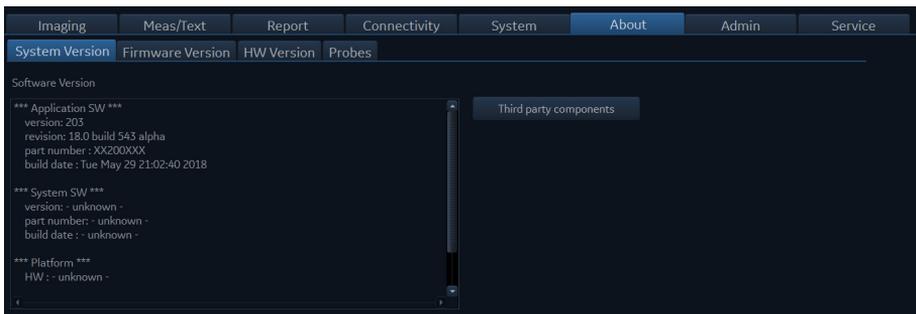


Figure 8-19. Software version

## 8-4-9 Option Strings Check

**NOTE:** After the system software loading completion, please check the option strings to ensure that the options are activated and working.

1. Reboot the system.
2. Press **Config (F2)** on the control panel.
3. Select **Admin -> System Admin**.
4. Ensure that all the installed option keys are displayed and the status of Options are valid.
  - The status “Valid” means the option keys are activated and working.
  - The status “disabled” means the option keys are not activated and not working. Check if the option is installed and if the serial number and option key are correct.

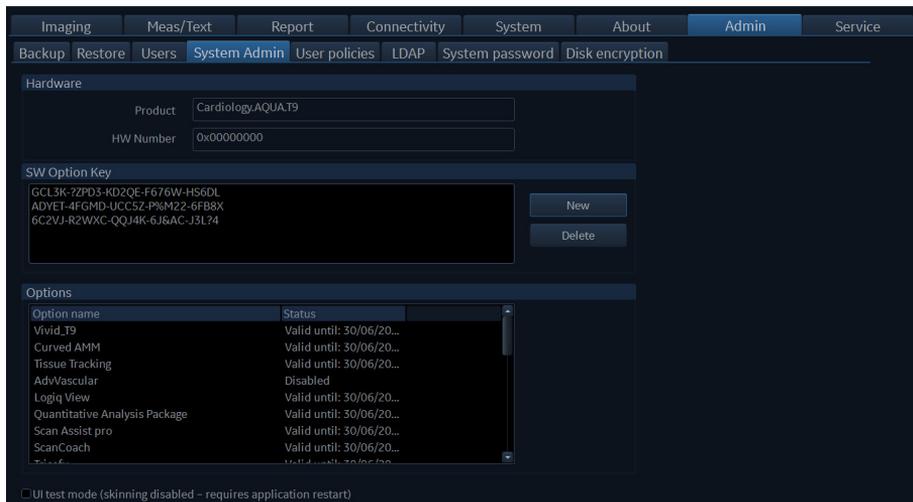


Figure 8-20. Software Option

### 8-4-10 Probe Recognition Check

**NOTE:** After the system software loading completion, please check to ensure that the system can recognize the probes.

Plug in the probe. In scanning mode, the probe information is displayed on the **right top** location of the screen. About the probe specification for intended use on Vivid T9/Vivid T8.

Plug in at least one of each type of the probes and check if each of the probes is recognized and the probe information is displayed correctly.

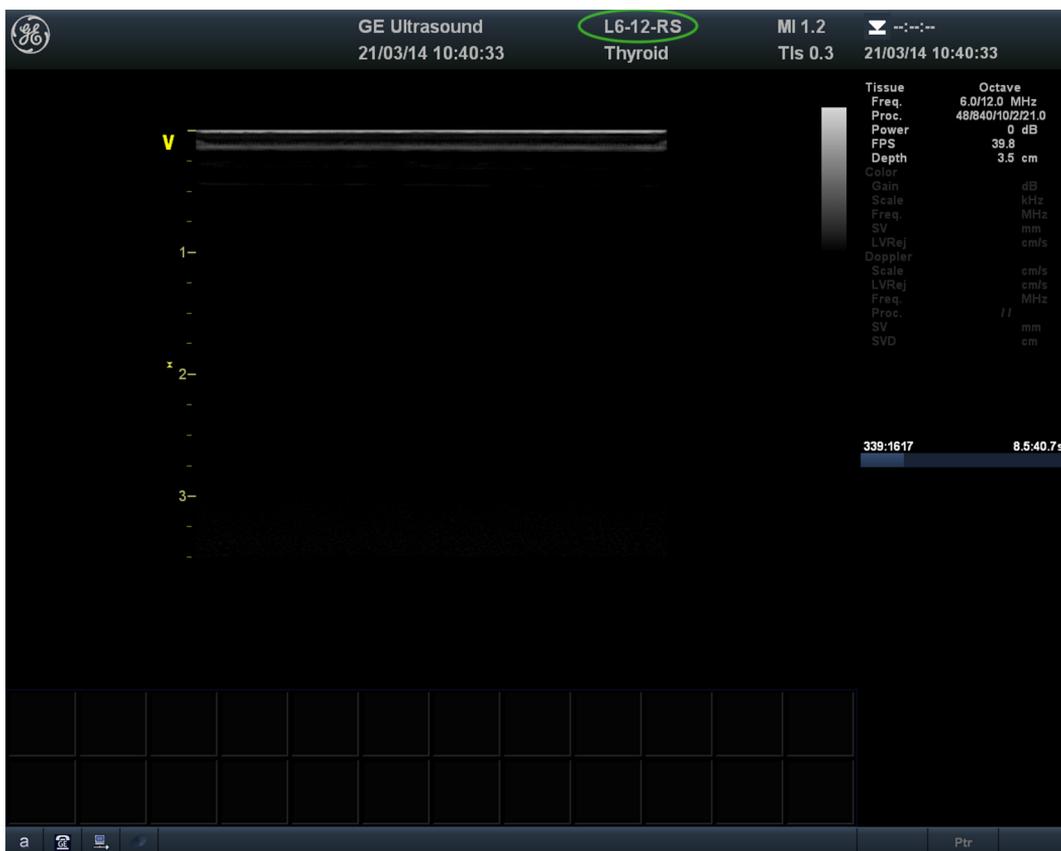


Figure 8-21. Probe identification

### 8-4-11 Peripheral Device Check

Check to ensure that all the peripheral devices work properly.

For instruction of peripheral device check, [See 4-3-32 'Peripheral checks' on page 4-35 for more information.](#)

## **8-4-12 Reinstall DICOM Devices**

Reinstall any DICOM devices used by the customers and check to ensure these DICOM devices work properly.

The instruction about installing DICOM devices is not incorporated in this manual. To access the instruction about installing DICOM devices please refer to another manual **Basic User Manual**. Please use the latest revision of this document.

### 8-4-13 Installation Wizard

Installation wizard is a function to enable the operator to configure some common system settings when turning on the system for the first time after the software installation.

For Vivid T8, you can also enter Installation Wizard by clicking the **IW** icon at the bottom.

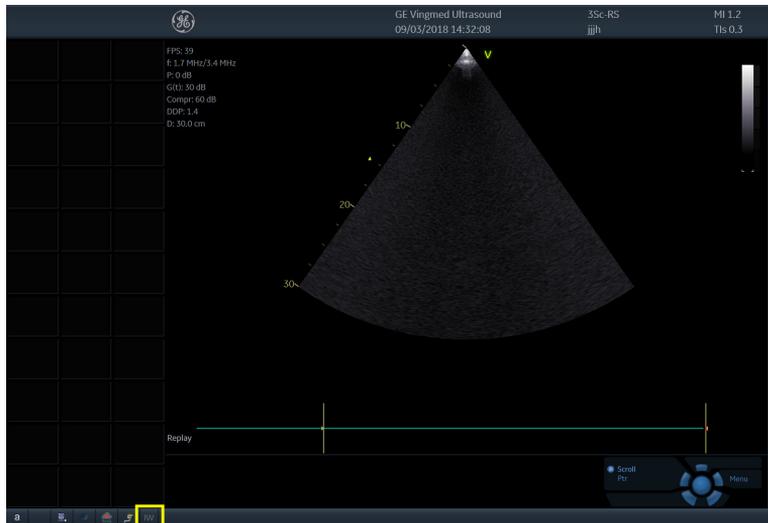


Figure 8-22. Enter Installation Wizard

## 8-4-13 Installation Wizard(continued)

1. Select the appropriate language for system language and keyboard language from the drop-down list.

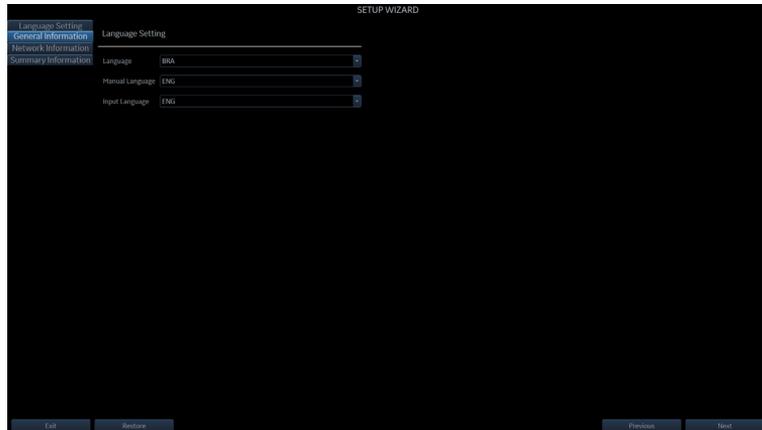


Figure 8-23. System Language settings (1)

- If you do not change the language, press **Next** to continue.
- If you change the language setting, press **OK** to restart the system.

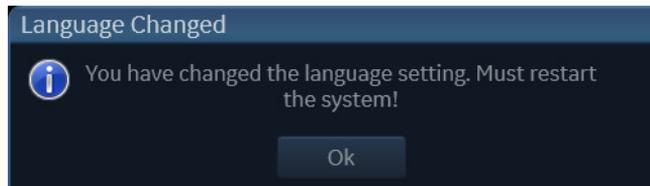


Figure 8-24. System Language settings (2)

**NOTE:** If you press **Previous**, you will go to the previous page.

## 8-4-13 Installation Wizard(continued)

- This screen shows the hospital and time information, and you can set the system date and time here.

The screenshot shows the 'SETUP WIZARD' interface with the 'General Information' tab selected. The interface is divided into three main sections: Hospital Information, Time Information, and Other Information. The Hospital Information section includes fields for Hospital (GE Vingmed Ultrasound), Department, and Echobab. The Time Information section includes fields for System Date (05/03/2018), System Time (14:44:16), Time Format (24), Date Format (EU), and Default Century (1900). A 'Sync Time' button is located at the bottom right of the Time Information section. The Other Information section includes a field for Units (Metric). A sidebar on the left contains navigation options: Language Setting, General Information (selected), Network Information, and Summary Information.

Figure 8-25. General Information

- Press **Next** to continue.

## 8-4-13 Installation Wizard(continued)

- The **Network Information** screen shows the configuration of wireless and local network:

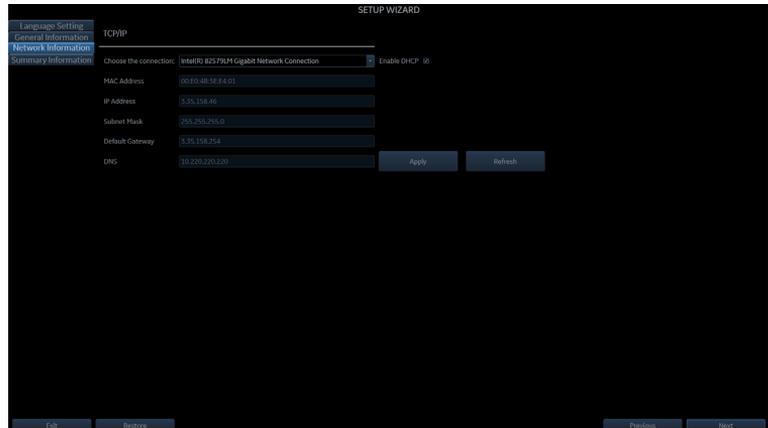


Figure 8-26. Network Information (1)

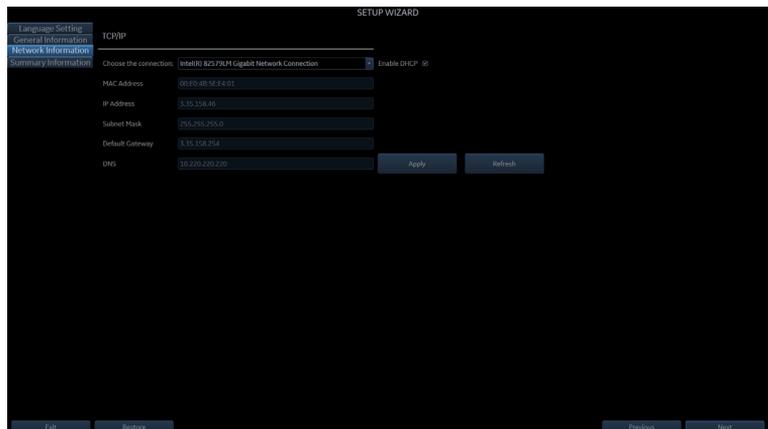


Figure 8-27. Network Information (2)

### 8-4-13 Installation Wizard(continued)

Table 8-3: Network settings

Preset Parameter	Description
Enable DHCP	Select to enable DHCP.

5. Press **Next** to continue.
6. This screen shows the report of the previous settings. You can export it to the database.

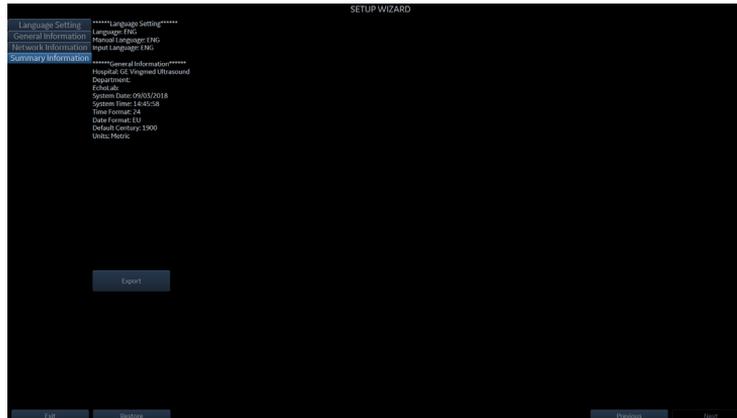


Figure 8-28. Summary Information

Press **Export** and select the location where you want to store the report.

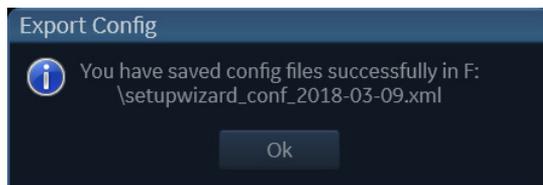


Figure 8-29. Export Summary

7. Press **Exit** to exit Installation Wizard.

---

# Chapter 9

## Renewal Parts

*This chapter lists the renewal parts available for the Vivid T9/Vivid T8.*

# 9-1 Overview

## **9-1-1 Contents in this chapter**

- [List of Abbreviations](#)
- [Renewal Parts Lists](#)

## 9-2 List of Abbreviations

Table 9-1: List of Abbreviations

<b>ABBREVIATION</b>	<b>DESCRIPTION</b>
3D	THREE DIMENSIONAL
Assy	ASSEMBLY
FRU 1	Replacement part available in part hub
FRU 2	Replacement part available from the manufacturer (lead time involved)
KBD	Keyboard
LCD	Liquid Crystal Display
BnV	Brightness and Volume
TMST	Master Board
HW	Hardware
SW	Software
ME	Mechanical

# 9-3 Renewal Parts Lists

## 9-3-1 AC Power Cord

Table 9-2: AC Power Cord

Item	Part Number	Part Name	Quantity	FRU
001	6736105-2	PWR SPLY CRD EUROPE KOREA 10A 250V STRAIGHT 2.5M	1	1
002	6736104-2	PWR SPLY CRD CHINA 10A 250V STRAIGHT 2.5M	1	1
003	6736108-2	PWR SPLY CRD INDIA 10A 250V STRAIGHT 2.5M	1	1
004	6736101-2	PWR SPLY CRD ARGENTINA 10A 250V STRAIGHT 2.5M	1	1
005	6736107-2	PWR SPLY CRD UK IRELAND 10A 250V STRAIGHT 2.5M	1	1
006	6736106-2	PWR SPLY CRD DENMARK 10A 250V STRAIGHT 2.5M	1	1
007	6736113-2	PWR SPLY CRD SWITZERLAND 10A 250V STRAIGHT 2.5M	1	1
008	6736101-2	PWR SPLY CRD ARGENTINA 10A 250V STRAIGHT 2.5M	1	1
009	6736114-2	PWR SPLY CRD UNITED STATES - CANADA 10A 125V STRAIGHT 2.5M	1	1
010	6736103-2	PWR SPLY CRD BRAZIL 10A 250V STRAIGHT 2.5M	1	1
011	6736109-2	PWR SPLY CRD ISRAEL 10A 250V STRAIGHT 2.5M	1	1
012	6736111-2	PWR SPLY CRD JAPAN 12A 125V STRAIGHT 2.5M	1	1

9-3-2 Probe

Table 9-3: Probes for Vivid T9/Vivid T8

Item	Part Name	Part Number	Illustration	Center Image Frequency (MHz)	Qty	FRU
700	4C-RS	5488477		1.8 - 6.0	1	1
701	L6-12-RS	5454332		6 - 13	1	1
702	E8C-RS	5499516		4.0 - 11.0	1	1
703	3Sc-RS	5433833		1.3 - 4.0	1	1
704	8C-RS	5499508		4.0 - 11.0	1	1
705	6S-RS	5499316		2.7-8.0	1	1
706	P2D-RS (RS type connector)	5729436		2.0	1	1

Table 9-3: Probes for Vivid T9/Vivid T8

Item	Part Name	Part Number	Illustration	Center Image Frequency (MHz)	Qty	FRU
707	6Tc-RS	5729431		2.9 - 8.0	1	1
708	12S-RS	5462248		4.5 -12	1	1
709	9L-RS	5499511		4 - 9	1	1
710	12L-RS	5499501		4 - 13	1	1
711	9T-RS	5729433		3.6 - 10.0	1	1
712	8Cs-RS (for Vivid T9 only)	5670375		3.5-10.0	1	1
713	C1-5-RS (for Vivid T9 only)	5499608		1.5-5.0	1	1
714	L8-18i-RS	5499609		4.5-18.0	1	1

9-3-3 Peripheral

Table 9-4: Peripherals for Vivid T9/Vivid T8

Item	Part Number	Description	Qty
ECG cable			
800	164L0029	ECG cable, neo, AHA	1
801	164L0030	ECG cable, neo, IEC	1
802	164L0025	ECG Cable Adult, AHA	1
803	164L0027	412682 001 Multi Link Leadwire Set	1
804	164L0026	ECG CABLE, IEC	1
805	164L0028	412682-003 Multi-Link Leadwire Set	1
806	R2420410	ECG EXTERNAL CABLE-VIVID-S5,S6	1
Footswitch			
807	5718360	Suns USB footswitch	1
USB Stick			
808	5446638	Keeber USB Stick 8GB	1
809	5434317-3	1TB USB mobile HDD	1
Printer			
810	5778615	SONY UP-D898DC B/W Printer	1
Printer Supported by Vivid T9/Vivid T8			
811		SONY UP-D25 Color Printer	1
812		SONY UP-D898MD B/W Printer	1
813		SONY UP-D897MD B/W Printer	1
814		SONY UP-D711MD B/W Printer	1
815		HP Universal Driver	1
Biopsy Kit			
816	5160703	4C-RS Biopsy Kit	1
817	2398164	E8CS reusable Biopsy Kit	1
818	E8385MJ	E8CS Biopsy Kit	1
819	5176499	L6-12-RS Biopsy Kit	1
820	5329137	3Sc-RS Biopsy Kit	1
821	5178413	9L-RS Multi-angle Biopsy Kit	1
822	5176499	12L-RS Multi-angle Biopsy Kit	1

Table 9-4: Peripherals for Vivid T9/Vivid T8

Item	Part Number	Description	Qty
823	5368619	12L-RS Transverse Biopsy Kit	1
824	5370742	12L-RS Infinite Biopsy Kit	1
Wireless network adapter			
825	5728576	NetGear Wireless USB Adapter A6210 Kit	1

## 9-3-4 Manuals

Table 9-5: Manuals for Vivid T9/Vivid T8

Item	Part Number	Description	Qty	FRU
1001	5802089	AQUA R3 e-Manual Kit	1	N
1002	5796326-100	Vivid T9/Vivid T8 Advanced Reference Manual	1	N
1003	5795591-100	Vivid T9/Vivid T8 Basic Service Manual	1	N
1004	5790782-100	Vivid T9/Vivid T8 User Manual English version	1	N
1005	5790782-101	Vivid T9/Vivid T8 User Manual French version	1	N
1006	5790782-106	Vivid T9/Vivid T8 User Manual Spanish version	1	N
1007	5790782-108	Vivid T9/Vivid T8 User Manual German version	1	N
1008	5790782-111	Vivid T9/Vivid T8 User Manual Italian version	1	N
1009	5790782-121	Vivid T9/Vivid T8 User Manual Dutch version	1	N
1010	5790782-127	Vivid T9/Vivid T8 User Manual Brazilian Portuguese version	1	N
1011	5790782-129	Vivid T9/Vivid T8 User Manual Estonian version	1	N
1012	5790782-131	Vivid T9/Vivid T8 User Manual Slovenian version	1	N
1013	5790782-140	Vivid T9/Vivid T8 User Manual Japanese version	1	N
1014	5790782-141	Vivid T9/Vivid T8 User Manual Simplified Chinese version	1	N
1015	5790782-142	Vivid T9/Vivid T8 User Manual Swedish version	1	N
1016	5790782-144	Vivid T9/Vivid T8 User Manual Korean version	1	N
1017	5790782-145	Vivid T9/Vivid T8 User Manual Russian version	1	N
1018	5790782-150	Vivid T9/Vivid T8 User Manual Polish version	1	N
1019	5790782-151	Vivid T9/Vivid T8 User Manual Greek version	1	N
1020	5790782-153	Vivid T9/Vivid T8 User Manual Hungarian version	1	N
1021	5790782-154	Vivid T9/Vivid T8 User Manual Slovakian version	1	N
1022	5790782-155	Vivid T9/Vivid T8 User Manual Czech version	1	N
1023	5790782-159	Vivid T9/Vivid T8 User Manual Turkish version	1	N
1024	5790782-160	Vivid T9/Vivid T8 User Manual Danish version	1	N
1025	5790782-161	Vivid T9/Vivid T8 User Manual Norwegian version	1	N
1026	5790782-162	Vivid T9/Vivid T8 User Manual Finnish version	1	N
1027	5790782-165	Vivid T9/Vivid T8 User Manual Bulgarian version	1	N
1028	5790782-167	Vivid T9/Vivid T8 User Manual Romanian version	1	N
1029	5790782-168	Vivid T9/Vivid T8 User Manual Croatian version	1	N

Table 9-5: Manuals for Vivid T9/Vivid T8

Item	Part Number	Description	Qty	FRU
1030	5790782-174	Vivid T9/Vivid T8 User Manual Lithuanian version	1	N
1031	5790782-175	Vivid T9/Vivid T8 User Manual Latvian version	1	N
1032	5790782-176	Vivid T9/Vivid T8 User Manual Serbian version	1	N
1033	5790782-177	Vivid T9/Vivid T8 User Manual European Portuguese version	1	N
1034	5790782-181	Vivid T9/Vivid T8 User Manual Indonesian version	1	N
1035	5790782-183	Vivid T9/Vivid T8 User Manual Vietnamese version	1	N
1036	5790782-184	Vivid T9/Vivid T8 User Manual Kazakh version	1	N

### 9-3-5 CRU List

Table 9-6: CRU List

Item	Part Number	Description	Part Type	Can Replace Part#	Can Be Replaced by Part#	Compatible With				Repl Proc
						Vivid T8 R1	Vivid T8 R2	Vivid T8 R3	Vivid T9	
1101	5457733	AQUA Probe holder 	ME			Y	Y	Y	Y	
1102	5794763-S	T9 Gel Holder 	ME			N	N	N	Y	

Table 9-6: CRU List

Item	Part Number	Description	Part Type	Can Replace Part#	Can Be Replaced by Part#	Compatible With				Repl Proc
						Vivid T8 R1	Vivid T8 R2	Vivid T8 R3	Vivid T9	
1103	5450377-S	T9 Gel Holder 	ME			N	N	N	Y	
1104	5782245-S	AQUA R3 Speaker Top Cover Assy 	ME			N	N	Y	Y	
1105	5483123-S	Spark Body Front Cover Assy 	ME			N	N	N	Y	
1106	5451284-2	R2 Battery Pack 	HW			N	Y	Y	Y	
1107	5456424-S	Spark Air Filter 	ME			N	N	Y	Y	



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# Chapter 10

## Care and Maintenance

*This chapter describes **Care and Maintenance** on the Ultrasound system and peripherals. These procedures are intended to **maintain the quality** of the Ultrasound **system's performance**. Read this chapter completely and familiarize yourself with the procedures before performing a task.*

# 10-1 Overview

## 10-1-1 Contents in this chapter

- 10-1 'Overview' on *page 10-2*
- 10-2 'Warnings' on *page 10-3*
- 10-3 'Why do maintenance' on *page 10-4*
- 10-4 'Maintenance task schedule' on *page 10-6*
- 10-5 'Tools required' on *page 10-8*
- 10-6 'System maintenance' on *page 10-12*
- 10-7 'Electrical safety tests' on *page 10-19*
- 10-8 'When there's too much leakage current ...' on *page 10-30*
- 10-9 'Inspection Paperwork' on *page 10-32*
- 10-10 'Electrical Safety Tests Log' on *page 10-34*

## 10-2 Warnings



BE SURE TO DISCONNECT THE ULTRASOUND SYSTEM POWER PLUG AND OPEN THE MAIN CIRCUIT BREAKER BEFORE YOU REMOVE ANY PARTS. BE CAUTIOUS WHENEVER POWER IS STILL ON AND COVERS ARE REMOVED.



Practice good ESD prevention. Wear an anti-static strap when handling electronic parts and even when disconnecting/connecting cables.



Do not pull out or insert circuit boards while power is on.



Do not operate this Ultrasound system unless all board covers and frame panels are securely in place. System performance and cooling require this.

## 10-3 Why do maintenance

### 10-3-1 Periodic maintenance inspections

It has been determined by engineering that your Vivid T9/Vivid T8 does not have any high wear components that fail with use, therefore no Periodic Maintenance inspections are mandatory.

However, some customers' Quality Assurance Programs may require additional tasks and or inspections at a different frequency than listed in this manual.

### 10-3-2 Keeping records

It is good business practice that ultrasound facilities maintain records of periodic and corrective maintenance. The Ultrasound Periodic Maintenance Inspection Certificate provides the customer with documentation that the Ultrasound system is maintained on a periodic basis.

A copy of the *Ultrasound Periodic Maintenance Inspection Certificate* should be kept in the same room or near the Ultrasound system.

### **10-3-3 Quality assurance**

In order to gain accreditation from organizations such as the American College of Radiology (USA), it is the customer's responsibility to have a quality assurance program in place for each Ultrasound system. The program must be directed by a medical physicist, the supervising radiologist/physician or appropriate designee.

Routine quality control testing must occur regularly. The same tests are performed during each period so that changes can be monitored over time and effective corrective action can be taken.

Testing results, corrective action and the effects of corrective action must be documented and maintained on the site.

Your GE service representative can help you with establishing, performing and maintaining records for a quality assurance program. Contact GE for coverage and/or price for service.

# 10-4 Maintenance task schedule

## 10-4-1 How often should maintenance tasks be performed?

The Care and Maintenance task schedule (provided in [Table 10-1 on page 10-6](#)) specifies how often your Vivid T9/Vivid T8 should be serviced and outlines items requiring special attention.

**NOTE:** *It is the customer's responsibility to ensure the Vivid T9/Vivid T8 care and maintenance is performed as scheduled in order to retain its high level of safety, dependability and performance.*

Your GE Service Representative has an in-depth knowledge of your Vivid T9/Vivid T8 and can best provide competent, efficient service. Contact GE for coverage information and/or price for service.

The service procedures and recommended intervals shown in the Care and Maintenance Task Schedule assumes that you use your Vivid T9/Vivid T8 for an average patient load (10-12 per day) and not use it as a primary mobile Ultrasound 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 periodic maintenance frequencies.*

Table 10-1: Customer Care Schedule

Service at Indicated Time	Daily	Weekly	Monthly	Per Facilities QA Program	Notes
Clean Probes	•*				* or before each use
Inspect AC Mains Cable			•		Mobile Ultrasound system: Check Weekly
Inspect Cables and Connectors			•		
Clean Console			•		
Clean LCD			•		

Table 10-1: Customer Care Schedule (Continued)

Service at Indicated Time	Daily	Weekly	Monthly	Per Facilities QA Program	Notes
Console Leakage Current Checks				See Notes	Twice Annually
Peripheral Leakage Current Checks				See Notes	Twice Annually
Surface Probe Leakage Current Checks				See Notes	Twice Annually
Endocavity Probe Leakage Current Checks				See Notes	Quarterly Annually
Surgical Probe Leakage Current Checks				See Notes	Quarterly Annually
Measurement Accuracy Checks				See Notes	Twice Annually
Functional Checks				See Notes	also after corrective maintenance

*NOTE: The maintenance may require specialized equipment to complete.*

*NOTE: The periodic maintenances are not mandatory. The table above is for reference only.*

# 10-5 Tools required

**NOTE:** For a list of required tools for servicing the Vivid T9/Vivid T8, refer to chapter 8.

## 10-5-1 Standard GE tool kit

The following is a description of the “Standard” GE tool kit in the USA. Not all tools are required.

Table 10-2: Overview of GE-1 tool kit contents

Tool ID	Description	Tool ID	Description
9-45358	Pliers Retaining Ring	9-XL9971MM	Xcelite-hex Blade 1.27mm
9-4078	Scribe	9-XL9972MM	Xcelite-hex Blade 1.5mm
9-44572	Wrench Open End 3/8 - 7/16	9-XL9973MM	Xcelite-hex Blade 2 mm
9-44579	Wrench Open End 1/2 - 9/16	9-XL9974MM	Xcelite-hex Blade 2.5mm
9-44579	Wrench Open End 1/2 - 9/16	9-XL9975MM	Xcelite-hex Blade 3mm
9-45385	Pliers, Arc Joint 7 inch	9-XL9976MM	Xcelite-hex Blade 4mm
9-45378	Pliers, Slip Joint	9-XL9977MM	Xcelite-hex Blade 5mm
9-4518	Pliers, Long Nose, Miniature	9-XL991CM	Handle
9-4518	Pliers, Long Nose, Miniature	C2356E	Screw starter - Kedman Quick Wedge
9-44776	Ignition Wrench Set, 10 pc.	BLBO	Box - 18 Compartment
9-44601	Wrench, Adj., 4 inch	DWL4283T	Box - 5 Compartment
9-4151	Screwdriver, Blade, Stubby	9-41322	Pickup Tool, Claw type
9-41421	Screwdriver, Blade, Pocket clip	9-6757	6 pc Needle File Set
9-41594	Screwdriver, Blade 1/8 in. × 4 in.	9-9487	Utility Knife
9-41581	Screwdriver, Blade 3/16 in. × 4 in.	9-45341	Pliers Vice Grip 10 inch
9-39451	20' Steel Tape, locking Spring load	9-3001	Xacto Pen Knife

Table 10-2: Overview of GE-1 tool kit contents (Continued)

Tool ID	Description	Tool ID	Description
9-GH807	Ratchet, Offset, Slotted	9-HT62002	Solder Aid, Fork and Hook
68-412	Ratchet, Offset, Phillips	9-4099	Mirror, Round, Telescoping
9-GH130	Tapered Reamer	9-GH3001	Steel Rule Decimal 6 inch
9-41584	Screwdriver, slotted 1/4 in. × 6 in.	9-GH300ME	Steel Rule Metric 6 inch
9-4118	Screwdriver, Phillips #2, Stubby	9-XL9920	Xcelite-hex Blade.050 inch
9-41293	Screwdriver, Phillips #0	9-XL9921	Xcelite-hex Blade 1/16 inch
9-41294	Screwdriver, Phillips #1	9-XL9922	Xcelite-hex Blade 5/16 inch
9-41295	Screwdriver, Phillips #2	9-XL9923	Xcelite-hex Blade 3/32 inch
9-46677	Hex Keys, 20 pc., Metric	9-XL9924	Xcelite-hex Blade 1/8 inch
9-34701	1/4 in. Standard Socket set (19 pc)	9-XL9925	Xcelite-hex Blade 5/32 inch
9-43499	1/2 inch Socket 1/4 inch drive	9-XL9926	Xcelite-hex Blade 3/16 inch
9-4355	Flex Spinner	9-XL99764	Xcelite-hex Blade 7/64
9-43523	Breaker	9-XL99964	Xcelite-hex Blade 9/64
9-43531	6 inch Ext.	9-XLM60	Mini-screwdriver kit
9-65283	Case 8.5 in. × 4.5 in. × 2 in. Deep	9-45072	Pliers 6 inch Diagonal
9-46696	Hex Keys	9-XL100X	Wire Stripper/Cutter 5 inch - 100X
9-39829	Torpedo Level, Magnetic	9-XL87CG	Pliers - very fine needle nose-87CG
9-38461	Hammer, Ball Peen, 4 oz.	9-WEWDT-07	Weller-Soldering-Replacement Tip(1)
9-4280	Universal Joint 1/4 inch	9-WS175-E	Wiss - Surgical Scissors
9-WEW60P3	Weller - Soldering Iron, 3 wire	KH174	Hemostat 5 inch Straight
9-WECT5B6	Weller - Soldering Iron Tip	KH175	Hemostat 5 inch curved
9-WEWDP12	Weller - Desoldering Pump	9-Z9480121	Alignment tool (red)
93383	Flashlight Mini-Mag Lite (AAA Bat.)		
9-GH408	Tweezers		
21576	Brush - Bristle		

Table 10-2: Overview of GE-1 tool kit contents (Continued)

Tool ID	Description	Tool ID	Description
9-4516	Pliers 4 1/4 inch Diagonal		

### 10-5-2 GE-2 tool kit

Table 10-3: Overview of GE-2 tool kit contents

GE-2 Sears Kit (#99034)			
Tool ID	Description	Tool ID	Description
9-45381	Pliers, Arc Joint 9 1/2 inch	9-44067	Socket 1 1/16 in. for 1/2 in. drive
9-45092	Pliers, Linesman 8 1/2 inch	9-42679	Socket 10MM Hex for 1/2 in. drive (2273333)
9-42882	Punch, Pin 3/32 inch	9-44262	Extension 10 inch for 1/2 in. drive (2273405)
9-42884	Punch, Pin 5/32 inch	9-4258	3/8 inch to 1/2 inch Adapter
9-42886	Punch, Pin 1/4 inch	9-34374	3/8 inch Metric Socket Set - 12 PT
9-42973	Cold Chisel 1/2 inch	9-44311	16mm Socket 12 pt.
9-GH77	Center Punch Automatic	9-33485	Metal Socket Tray
9-GH890	File Handle, Adj.	9-33484	Metal Socket Tray
9-31276	File, Round, Bastard 8 inch	9-33484	Metal Socket Tray
9-31277	File, Half Round, Bastard 8 inch	9-52068	Tap and Drill Set
9-31263	File, Flat Mill 8 inch	9-52722	#6 Tap
21045C	Close Quarter Saw	9-52723	#8 Tap
9-44604	Wrench, Adj. 10 inch		High Speed Drill Set
9-41587	Screwdriver 5/16 inch × 8 inch		#36 Drill
9-41586	Screwdriver, Stubby 5/16 inch		#29 Drill
9-GH19512	Countersink 1/2 inch	9-44046	3/8 inch Socket Set
9-44741	12 PC Combination Wrench Set		

### 10-5-3 Special tools, supplies and equipment used for maintenance

Table 10-4: Overview of tool requirements for periodic maintenance

Tool / kit	Comments
Digital Volt Meter (DVM)	
Anti Static Kit	Kit includes anti-static mat, wrist strap and cables for 200 to 240V system 3M #2204 Large adjustable wrist strap 3M #2214 Small adjustable wrist strap 3M #3051 conductive ground cord
Anti Static Vacuum Cleaner	120V 230V
Safety Analyzer	The safety Analyzer tool should be calibrated and compliant with AAMI/ESI 1993 or IEC 60601 or AS/NZS 3551.
QIQ Phantom	RMI Grayscale Target Model 403GS <b>NOTE! The use of a Phantom is not required during Preventive Maintenance. Customer may use it as part of their Quality Assurance Program tests.</b>
B/W Printer Cleaning Sheet	See printer user manual for requirements
Color Printer Cleaning Sheet	See printer user manual for requirements
Disposable Gloves	

# 10-6 System maintenance

## 10-6-1 Preliminary checks

The preliminary checks take about 15 minutes to perform. Refer to the Ultrasound system user documentation whenever necessary.

Table 10-5: System preliminary checks

Step	Item	Description
1.	Ask and Listen	Ask the customer if they have any problems or questions about the equipment.
2.	Paperwork	Fill in the top of Ultrasound Inspection Certificate (see <a href="#">Figure 10-5 on page 10-32</a> ). Record all probes and Ultrasound system options.
3.	Power up	<ul style="list-style-type: none"> <li>• Turn the Ultrasound system power on and verify that all fans and peripherals turn on.</li> <li>• Watch the displays during power up to verify that no warning or error messages are displayed.</li> <li>• Where applicable, confirm that the battery is charged. If no AC Input present, use the internal battery.</li> </ul>
4.	Probes	Verify that the Ultrasound system properly recognizes all probes.
5.	Displays	Verify proper display on the monitor.
6.	InSite	Where applicable, for Warranty and Contract Customers only: <ul style="list-style-type: none"> <li>• Verify that InSite is functioning properly.</li> <li>• Ensure two-way remote communications.</li> </ul>
7.	Review Error Logs	Where applicable, Error Logs can be reviewed via system diagnostics.
8.	Diagnostics	Optional.
9.	Presets	Backup all Customer Presets to an appropriate media.
10.	Image Archive	Back up the Image Archive onto appropriate media.

## 10-6-2 Functional checks

**NOTE:** See also Chapter 4

The functional checks take about 60 minutes to perform. Refer to the Ultrasound system user documentation whenever necessary.

### 10-6-2-1 System checks

Table 10-6: 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.	CF-Mode	Verify basic CF-Mode (Color Flow Mode) operation. Check the basic Ultrasound system controls that affect this mode of operation.
3.	Doppler Modes	Verify basic Doppler operation (PW and CW if available). Check the basic Ultrasound system controls that affect this mode of operation.
4.	M-Mode	Verify basic M-Mode operation. Check the basic Ultrasound system controls that affect this mode of operation.
5.	Probe Elements	Perform an Element Test on each probe to verify that all the probe elements and system channels are functional.
6.	Applicable Software Options	Verify the basic operation of all optional modes such as Contrast. Check the basic Ultrasound system controls that affect each options operation.
7.	Xmit/Recv Elements	Use the Visual Channel Utility on the loop connect to verify that all system xmit/recv channels are functional.
8.	Operator Panel test	Perform the Operator Panel Test Procedure.
9.	Keyboard	Do the interactive keyboard test.
10.	LCD	Verify basic LCD display functions. Refer to Chapter 3 of the User Manual.
11.	Software Menu check	Verify Software Menu display functions. Refer to Chapter 3 of the User Manual.
12.	Peripherals	See: <a href="#">4-3-32 'Peripheral checks' on page 4-35.</a>
13.	Measurements	In measurement mode, make distance measurement, get result in result window. Verify the distance by graduate rule. Distance Accuracy should be within $\pm 5\%$ . (Name result from result window Result A, result from graduate rule Result B; Distance Accuracy = (Result B-Result A)/Result A)

### 10-6-2-2 Peripheral/option checks

If any peripherals or options are not part of the system configuration, the check can be omitted.

Refer to the User Manual for a list of approved peripherals/options.

Table 10-7: GE 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.	DICOM	Verify that DICOM is functioning properly. Send an image to a DICOM device.
5.	ECG	Verify basic operation with customer
6.	Footswitch	Verify that the footswitch is functioning as programmed. Clean as necessary.
7.	DVD	Verify that the DVD is functioning properly. Clean heads and covers if necessary.

### 10-6-2-3 Mains cable inspection

Table 10-8: 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 kinds.
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.

### 10-6-2-4 Cleaning

Table 10-9: General Cleaning

Step	Item	Description
1.	Console	Remove the battery. Use a fluid detergent in warm water on a soft, damp cloth to carefully wipe the entire system. Be careful not to get the cloth too wet so that moisture does not enter the console.
2.	Probe Holder	Clean probe holders. (they may need to be soaked to remove excess gel).
3.	LCD	Use a soft, non-abrasive folder cloth. Gently wipe the LCD face. DO NOT use a glass cleaner that has a hydrocarbon base (such as Benzene, Methy Alcohol or Methy Ethyl Ketone) on LCD with the filter (anti-glare shield).

### 10-6-3 Physical inspection

**NOTE:** *These features may not be present on all Ultrasound systems.*

Table 10-10: Physical checks

Step	Item	Description
1.	Labeling	Verify that all Ultrasound system labeling is present and in readable condition.
2.	Scratches & Dents	Inspect the exterior for dents, scratches or cracks. .
3.	Input Power	Refer to: <a href="#">10-6-2-3 'Mains cable inspection' on page 10-14.</a>
4.	Cables & Connectors	Check all internal cable harnesses and connectors for wear and secure connector seating. Pay special attention to footswitch assembly and probe strain or bend reliefs.
5.	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 while scanning.
6.	Control Panel	Inspect keyboard and control panel. Note any damaged or missing items.
7.	Control Panel Lighting	Check for proper operation of all operator panel and Freeze Key light.
8.	LCD	Inspect the LCD Display for scratches and bad pixels. Verify proper operation of Contrast and Brightness controls. Where applicable, confirm that the LCD arm allows: <ul style="list-style-type: none"> <li>• swivelling the screen to the left and to the right</li> <li>• folding the screen to the locked position</li> <li>• release and adjustment backwards and forwards</li> <li>• can be adjusted in the up/down positions.</li> </ul> Note: LCD Arm movement may vary and is not applicable to all Ultrasound systems.
9.	External I/O	Check all connectors for damage.

Table 10-10: Physical checks (Continued)

Step	Item	Description
10.	Power and System Status Indicators	Check for proper operation of all Power and System Status Indicators.
11.	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.

### 10-6-4 Optional Diagnostic Checks

Optionally you can access the diagnostic software as described in Chapter 5 or 7. View the error logs and run desired diagnostics.

#### 10-6-4-1 View the Log

1. Review the 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.
3. Check the Configuration Log; update if needed.

## 10-6-5 Probe maintenance

### 10-6-5-1 Probe related checks

Table 10-11: System preliminary checks

Step	Item	Description
1.	Probe Holder	Clean probe holders. (they may need to be soaked to remove excess gel).
2.	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.
3.	Probes	Verify that the Ultrasound system properly recognizes all probes.

### 10-6-5-2 Basic probe care

The Ultrasound system user manuals and various probe handling cards provide a complete description of probe care, maintenance, cleaning and disinfection. Ensure that you are completely familiar with the proper care of GE probes.

Ultrasound probes can be easily damaged by improper handling. See the User Manual and probe care cards 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.

The Interoperative probes often have special considerations and individual probe user manuals. For Interoperative probes also refer to their separate user manuals.

### 10-6-5-3 Basic probe cleaning

Refer to the User's Manual for details on probe cleaning.



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.



Failure to follow the prescribed cleaning or disinfection procedures will void the probe's warranty.

DO NOT soak or wipe the lens with any product not listed in the User Manual. Doing so could result in irreparable damage to the probe.

Follow care instructions that came with the probe.



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

# 10-7 Electrical safety tests

## 10-7-1 Safety test overview

The electrical safety tests in this section are based on and conform to IEC 60601-1 Medical Equipment Safety Standards. They are intended for the electrical safety evaluation of cord-connected, electrically operated, patient care equipment. If additional information is needed, refer to the IEC 60601-1 documents



*THE USER MUST ENSURE THAT THE SAFETY INSPECTIONS ARE PERFORMED AT LEAST EVERY 6 MONTHS ACCORDING TO THE REQUIREMENTS OF THE PATIENT SAFETY STANDARD IEC-EN 60601-1. ONLY TRAINED PERSONS ARE ALLOWED TO PERFORM THE SAFETY INSPECTIONS MENTIONED ABOVE.*



DANGER

TO MINIMIZE RISK OF ELECTRICAL SHOCK, ONLY TRAINED PERSONS ARE ALLOWED TO PERFORM THE ELECTRICAL SAFETY INSPECTIONS AND TESTS.



DANGER

TO AVOID ELECTRICAL SHOCK, THE ULTRASOUND SYSTEM UNDER TEST **MUST NOT** BE CONNECTED TO OTHER ELECTRICAL EQUIPMENT. REMOVE ALL INTERCONNECTING CABLES AND WIRES. THE ULTRASOUND SYSTEM UNDER TEST MUST NOT BE CONTACTED BY USERS OR PATIENTS WHILE PERFORMING THESE TESTS.



CAUTION

Possible risk of infection. Do not handle soiled or contaminated probes and other components that have been in patient contact. Follow appropriate cleaning and disinfecting procedures before handling the equipment.

### 10-7-1 Safety test overview(continued)

Prior to initiating any electrical test, the Ultrasound system must be visually inspected. Perform the following visual checks:

- Check for missing or loose enclosure covers that could allow access to internal live parts.
- Examine the mains cord, mains plug and appliance inlet for damaged insulation and adequacy of strain relief and cable clamps.
- Locate and examine all associated transducers. Inspect the cables and strain relief at each end. Inspect the transducer enclosure and lens for cracks, holes and similar defects.

Test the system, peripherals and probes for leakage current. Excessive leakage current can cause injury or death in sensitive patients. High leakage current can also indicate degradation of insulation and a potential for electrical failure. Do not use probes or equipment having excessive leakage current.

To minimize the risk that a probe may shock someone the customer should:

- Not use a probe that is cracked or damaged in any way.
- Check probe leakage current:
  - Based on your facilities QA program for surface probes.
  - Based on your facilities QA program for endocavitary probes.
  - whenever probe damage is suspected.

## 10-7-2 Leakage current limits



Energy Control and Power Lockout for Vivid T9/Vivid T8.

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



1. Follow LOCK OUT/TAG OUT procedures.
2. Turn off the breaker.
3. Unplug the Ultrasound system.
4. Maintain control of the Ultrasound system power plug.
5. Wait for at least 30 seconds for capacitors to discharge as there are no test points to verify isolation.
6. Remove/disconnect the battery, if present.

Ultrasound System components may be energized.



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 for further analysis.

The following limits are summarized for IEC 60601-1 Medical Equipment Safety Standards. These limits are GEMS standards and in some cases are lower than the above standards listed.

Table 10-12: Chassis Leakage Current Limits - Accessible Metal Surface

Country	Normal Condition	Open Ground	Reverse Polarity	Open Neutral
All (Except USA & Canada)	0.1 mA	0.5 mA	0.5 mA	0.5 mA
USA & Canada	0.1 mA	0.3 mA	0.3 mA	0.3 mA

Table 10-13: Type BF Applied Part Leakage Current Limits - Probes Surface

Country	Normal Condition	Open Ground	Reverse Polarity	Open Neutral	*Mains Applied
All	0.1 mA	0.5 mA	0.5 mA	0.5 mA	5.0 mA

### 10-7-2 Leakage current limits(continued)

Table 10-14: Type CF Applied Part Leakage Current Limits - ECG Connections

Country	Normal Condition	Open Ground	Reverse Polarity	Open Neutral	*Mains Applied
All	0.1 mA	0.5 mA	0.5 mA	0.5 mA	5.0 mA

**NOTE:** *\*Mains Applied refers to the sink leakage test where mains (supply) voltage is applied to the part to determine the amount of current that will pass (or sink) to ground if a patient contacted mains voltage.*

The following tests are performed at the factory and should be performed at the site. These tests are: chassis leakage current, and probe leakage current. All measurements are made with an electrical safety analyzer which should be calibrated and compliant with AAMI/ESI 1993 or IEC 60601 or AS/NZS 3551.

Table 10-15: Equipment Type and Test Definitions

Applied Parts (AP)	Parts or accessories that contact the patient to perform their function. For ultrasound equipment, this includes transducers and ECG leads.	
Type BF	Body Floating or non-conductive ultrasound probes which are marked with the 'man in box' BF symbol. this includes all transducers.	
Type CF	Cardiac Floating or non-conductive intraoperative probes for direct cardiac contact and isolated ECG connections so marked with the 'heart in box' CF symbol.	
Sink Leakage	The current resulting from the application of mains voltage to the applied part. This test is required test for Type CF applied parts.	

### 10-7-3 Outlet test - wiring arrangement

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.

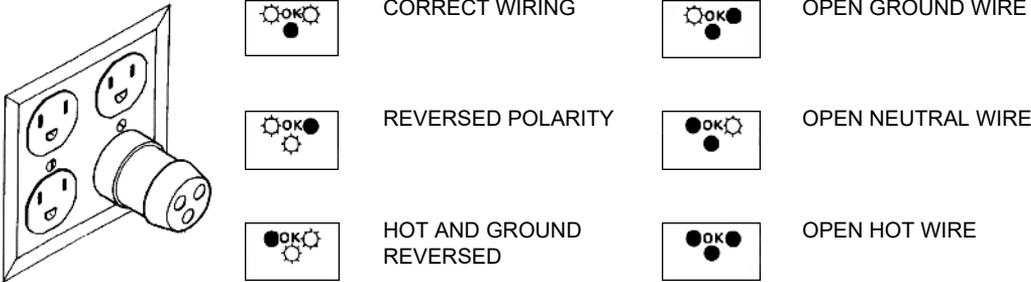


Figure 10-1. Typical alternate outlet tester

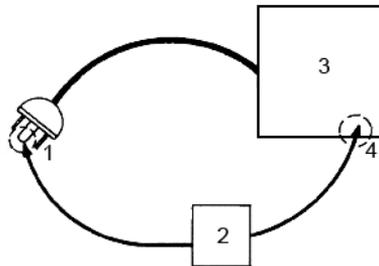
**NOTE:** No outlet tester can detect the condition where the Neutral (grounded supply) conductor and the Grounding (protective earth) conductor are reversed. If later tests indicate high leakage currents, this should be suspected as a possible cause and the outlet wiring should be visually inspected.

### 10-7-4 Grounding continuity



**DANGER** ELECTRIC SHOCK HAZARD. THE PATIENT MUST NOT BE CONTACTED TO THE EQUIPMENT DURING THIS TEST.

Measure the resistance from the third pin of the attachment plug to the exposed metal parts of the case. The ground wire resistance should be less than **0.2** ohms. Reference the procedure in the IEC60601-1.



1. GROUND PIN
2. OHMMETER
3. Vivid T9/Vivid T8
4. ACCESSIBLE METAL PART:
  - MONITOR HOUSING
  - PEAR PANEL CONNECTOR
  - ANY CASTER/WHEEL SUPPORT

Figure 10-2. Ground continuity test

## 10-7-5 Chassis leakage current test



**DANGER** ELECTRIC SHOCK HAZARD. WHEN THE METER'S GROUND SWITCH IS OPEN, DON'T TOUCH THE ULTRASOUND SYSTEM!.



**CAUTION**

Equipment damage possibility. Never switch the Polarity and the status of Neutral when the Ultrasound system is powered ON. Be sure to turn the Ultrasound system power OFF before switching them using the POLARITY switch and/or the NEUTRAL switch. Otherwise, the Ultrasound system may be damaged.

### 10-7-5-1 Generic procedure

The test verifies the isolation of the power line from the chassis. The testing meter is connected from accessible metal parts of the case to ground. Measurements should be made with the unit ON and OFF, with the power line polarity Normal and Reversed. Record the highest reading of current.

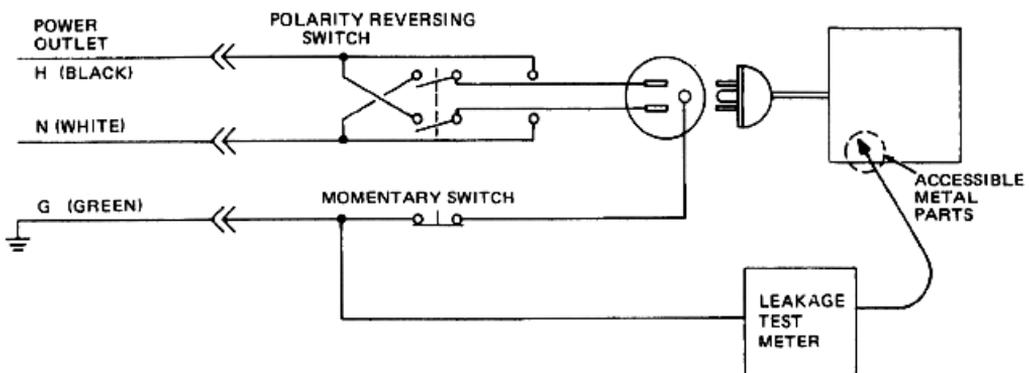


Figure 10-3. Set Up for Chassis Source Leakage Current, IEC 601-1 Clause 19 - Continuous Leakage Currents and Patient, Auxiliary Currents

When using the Microguard or a similar 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 chassis source leakage is shown in [Table 10-12 on page 10-21](#).

**10-7-5-2 Data Sheet for enclosure Source Leakage Current**

The test passes when all readings measure less than the value shown in [Table 10-12 on page 10-21](#). Record all data on the PM Inspection Certificate.

Table 10-16: Typical Data Sheet for enclosure Source Leakage Current

Unit Power	Tester Polarity Switch	Tester Neutral or Ground Switch	Test 1 Speaker Cover	Test 2 Real Panel Metal Parts	Optional Test 3	Optional Test 4
Enter Name of tested peripheral here:						
ON	NORM	OPEN				
ON	NORM	CLOSED				
ON	REV	OPEN				
ON	REV	CLOSED				
OFF	NORM	OPEN				
OFF	NORM	CLOSED				
OFF	REV	OPEN				
OFF	REV	CLOSED				

## 10-7-6 Probe leakage current test



DO NOT USE THE PROBE IF THE INSULATING MATERIAL HAS BEEN PUNCTURED OR OTHERWISE COMPROMISED. INTEGRITY OF THE INSULATION MATERIAL AND PATIENT SAFETY CAN BE VERIFIED BY SAFETY TESTING ACCORDING TO IEC60601-1.



Equipment damage possibility. Never switch the Polarity and the status of Neutral when the Ultrasound system is powered ON. Be sure to turn the Ultrasound system power OFF before switching them using the POLARITY switch and/or the NEUTRAL switch. Otherwise, the Ultrasound system may be damaged.

### 10-7-6-1 Definition

This test measures the current that would flow to ground from any of the probes through a patient who is being scanned and becomes grounded by touching some other grounded surface.

*NOTE: 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.*

### 10-7-6-2 Tools

For needed tools, see: [10-5 'Tools required' on page 10-8.](#)

### 10-7-6-3 Generic procedure on probe leakage current

Measurements should be made with the ground open and closed, with power line polarity normal and reversed, and with the unit Off and On. For each combination, the probe must be active to find the worst case condition.

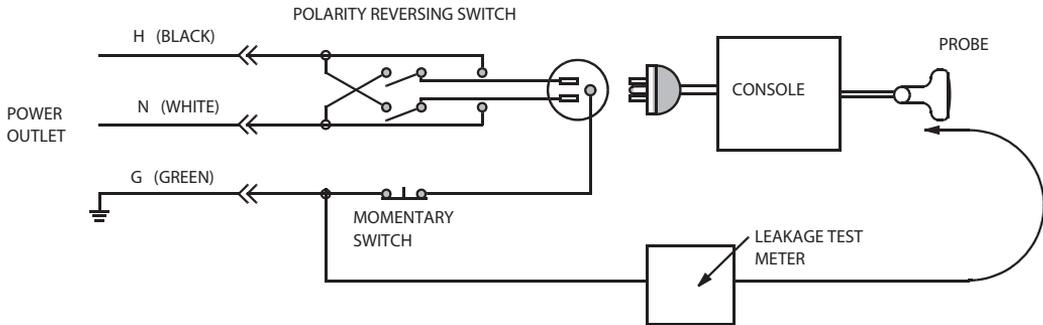


Figure 10-4. Set up for probe leakage current

**NOTE:** *Each probe will have some amount of leakage current, dependent on its design. Small variations in probe leakage currents are normal from probe to probe. Other variations will result from differences in line voltage and test lead placement.*



**DANGER** TO AVOID PROBE DAMAGE AND POSSIBLE ELECTRIC SHOCK, DO NOT IMMERSE PROBES INTO ANY LIQUID BEYOND THE LEVEL INDICATED IN THE PROBE USERS MANUAL. **DO NOT TOUCH THE PROBE, CONDUCTIVE LIQUID OR ANY PART OF THE UNIT UNDER TEST WHILE DOING THE TEST.**

### 10-7-6-4 Meter Procedure Using Probe Adapter

Follow the Safety Analyzer tool instruction to test each transducer for leakage current.

The electrical Safety Analyzer tool should be calibrated and compliant with AAMI/ESI 1993 or IEC 60601 or AS/NZS 3551.

### 10-7-6-5 No Meter Procedure Using Probe Adapter

Follow the Safety Analyzer tool instruction to test each transducer for leakage current.

The electrical Safety Analyzer tool should be calibrated and compliant with AAMI/ESI 1993 or IEC 60601 or AS/NZS 3551.

**10-7-6-6 Data Sheet for Transducer Source Leakage Current**

The test passes when all readings measure less than the values shown in [Table 10-13 on page 10-21](#). Record all data on the PM Inspection Certificate.

Table 10-17: Typical Data Sheet For Transducer Source Leakage Current

<b>Transducer Tested:</b>			
<b>Unit Power</b>	<b>Tester Power Polarity Switch</b>	<b>Tester GROUND or NUETRAL Switch</b>	<b>Measurement</b>
ON	NORM	OPEN	
ON	NORM	CLOSED	
ON	REV	OPEN	
ON	REV	CLOSED	
OFF	NORM	OPEN	
OFF	NORM	CLOSED	
OFF	REV	OPEN	
OFF	REV	CLOSED	

# 10-8 When there's too much leakage current ...

## 10-8-1 AC/DC Fails

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

## 10-8-2 Chassis Fails

Check the ground on the power cord and plug for continuity. Ensure the ground is not broken, frayed, or intermittent. Replace any defective part.

Where applicable, tighten all grounds. Ensure star washers are under all ground studs.

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

Test the wall outlet; verify it is grounded and is free of other wiring abnormalities. Notify the user or owner to correct any deviations. As a work around, check the other outlets to see if they could be used instead.

**NOTE:** *No outlet tester can detect the condition where the white neutral wire and the green grounding wire are reversed. If later tests indicate high leakage currents, this should be suspected as a possible cause and the outlet wiring should be visually inspected.*

### **10-8-3 Probe Fails**

Test the probe in another connector to isolate if the fault lies with the probe or the Ultrasound system. Or Change another probe to confirm if the fail is caused by console.

*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.*

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.

### **10-8-4 Peripheral Fails**

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

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

### **10-8-5 Still Fails**

If all else fails, begin isolation by removing the probes, external peripherals, then the on board ones, one at a time while monitoring the leakage current measurement.

### **10-8-6 New Unit**

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

### **10-8-7 ECG Fails**

Inspect cables for damage or poor connections.

# 10-9 Inspection Paperwork

## 10-9-1 Ultrasound Inspection Forms

### ULTRASOUND INSPECTION CERTIFICATE

Customer Name:		System ID:	Dispatch Number / Date Performed:	Warranty/Contract/HBS
System Type		Model Number:	Serial Number:	Manufacture Date:
Probe 1:	Frequency:	Scan Format*:	Model Number:	Serial Number:
Probe 2:	Frequency:	Scan Format*:	Model Number:	Serial Number:
Probe 3:	Frequency:	Scan Format*:	Model Number:	Serial Number:
Probe 4:	Frequency:	Scan Format*:	Model Number:	Serial Number:
Probe 5:	Frequency:	Scan Format*:	Model Number:	Serial Number:

\* Scan Format: Phased Array, Linear Array, Curved Array, Mechanical Array or Other

Figure 10-5. Ultrasound Inspection Certificate

\* Scan Format: Phased Array, Linear Array, Curved Array, Mechanical Array or Other

### 10-9-1 Ultrasound Inspection Forms(continued)

**FUNCTIONAL CHECKS**

Functional Check (if applicable)	OK? or N/A
B-Mode Function	
Doppler Modes Function	
CF-Mode Function	
M-Mode Function	
Applicable Software Options	
Applicable Hardware Options	
Control Panel	
LCD	
Measurement Accuracy	
GE Approved Peripherals	

**PHYSICAL INSPECTION AND CLEANING**

Physical Inspection and Cleaning (if applicable)	Inspect	Clean
Console		
LCD		
External I/O		
Cables and Connectors		
GE Approved Peripherals (DVD-RW, Printer)		
Labeling (see User Manual for Labeling)		

**COMMENTS:**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Figure 10-6. Functional Checks

**ELECTRICAL SAFETY**

Electrical Test Performed	Max Value Allowed	Value Measured	OK?	Comments
Outlet (correct ground & wiring config.)				
Type BF Applied Part Leakage Current Limits- Probe				
enclosure Source Leakage Current - Chassis Leakage Current Limits				
Peripheral 1 Leakage Current				
Peripheral 2 Leakage Current				

**PROBES**

Probe Number (from previous page)	Max Value Allowed	Max Value Measured	OK?	Comments
Probe 1:				
Probe 2:				
Probe 3:				

Final Check. All system covers are in place. System scans with all probes as expected.

Accepted by: \_\_\_\_\_

Figure 10-7. Electrical Safety

# 10-10 Electrical Safety Tests Log

Table 10-18: Electrical safety tests log

Electrical test performed	Max value allowed	Value measured	OK?	Comments
Outlet (correct ground and wiring config.)				
System ground continuity				
Chassis source leakage current - probe				
Chassis source leakage current - wheel				
Chassis source leakage current - monitor				
Patient lead source leakage (lead to ground)				
Patient lead source leakage (lead to lead)				
Patient lead source leakage (isolation)				
Peripheral 1 leakage current				
Peripheral 1 ground continuity				
Peripheral 2 leakage current				





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**GE**

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