

GE Healthcare

# Giraffe<sup>®</sup> Incubator

Service Manual



To reorder this manual, order kit:

- 6600-0847-801 (USA)
- 6600-0847-802 (INTL)

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# About this Manual

## Scope and Intended Users

This service manual describes the service and maintenance of the Giraffe Incubator. The intended users for this service manual are authorized service personnel.

## Conventions

Various types of warnings, cautions, static control precautions, and information notes are used in this Service Manual to alert you to possible safety hazards and to provide you with additional information:



**WARNING:**

A WARNING statement is used when the possibility of injury to the patient or the operator exists.

---



**CAUTION:**

A CAUTION statement is used when the possibility of damage to the equipment exists.

---



**SENSITIVE TO ELECTROSTATIC DISCHARGE CAUTION**

An Electrostatic Discharge (ESD) Susceptibility symbol is displayed to alert service personnel that the part(s) are sensitive to electrostatic discharge and that static control procedures must be used to prevent damage to the equipment.

---

**NOTE:** A note provides additional information to clarify a point in the text.

**IMPORTANT:** An Important statement is similar to a note, but is used for greater emphasis.

## References

The following table lists the part numbers for the manual kit in each language containing the Giraffe Incubator Operation and Maintenance Manual and other documents pertaining to Giraffe Incubator:

Language	Manual Kit
Czech	M1141765
Danish	6600-0848-817
Dutch	6600-0848-810
English UK	6600-0848-812
English US	6600-0848-801
Estonian	M1141753
French	6600-0848-802
German	6600-0848-804
Italian	6600-0848-805

Language	Manual Kit
Korean	M1141804
Norwegian	6600-0848-818
Polish	M1141761
Romanian	M1141769
Russian	M1141767
Spanish	6600-0848-803
Swedish	6600-0848-806
Turkish	M1141751

## User Responsibility

This Product will perform in conformity with the description thereof contained in this operating manual and accompanying labels and/or inserts, when assembled, operated, maintained and repaired in accordance with the instructions provided. This Product must be checked periodically. A defective Product should not be used. Parts that are broken, missing, plainly worn, distorted or contaminated should be replaced immediately. Should such repair or replacement become necessary, GE Healthcare recommends that a telephone or written request for service advice be made to the nearest GE Healthcare Regional Service Center. This Product or any of its parts should not be repaired other than in accordance with written instructions provided by GE Healthcare and by GE Healthcare trained personnel. The Product must not be altered without GE Healthcare's prior written approval. The user of this Product shall have the sole responsibility for any malfunction that results from improper use, faulty maintenance, improper repair, damage or alteration by anyone other than GE Healthcare..

## Important

The information contained in this service manual pertains only to those models of products which are marketed by GE Healthcare as of the effective date of this manual or the latest revision thereof. This service manual was prepared for exclusive use by GE Healthcare service personnel in light of their training and experience as well as the availability to them of parts, proper tools and test equipment. Consequently, GE Healthcare provides this service manual to its customers purely as a business convenience and for the customer's general information only without warranty of the results with respect to any application of such information.

Furthermore, because of the wide variety of circumstances under which maintenance and repair activities may be performed and the unique nature of each individual's own experience, capacity, and qualifications, the fact that a customer has received such information from GE Healthcare does not imply in anyway that GE Healthcare deems said individual to be qualified to perform any such maintenance or repair service. Moreover, it should not be assumed that every acceptable test and safety procedure or method, precaution, tool, equipment or device is referred to within, or that abnormal or unusual circumstances, may not warrant or suggest different or additional procedures or requirements.

This manual is subject to periodic review, update and revision. Customers are cautioned to obtain and consult the latest revision before undertaking any service of the equipment.

**CAUTION:**

Servicing of this product in accordance with this service manual should never be undertaken in the absence of proper tools, test equipment and the most recent revision to this service manual which is clearly and thoroughly understood.

---

## Technical Competence

The procedures described in this service manual should be performed by trained and authorized personnel only. Maintenance should only be undertaken by competent individuals who have a general knowledge of and experience with devices of this nature. No repairs should ever be undertaken or attempted by anyone not having such qualifications. Genuine replacement parts manufactured or sold by GE Healthcare must be used for all repairs. Read completely through each step in every procedure before starting the procedure; any exceptions may result in a failure to properly and safely complete the attempted procedure.





# Important Safety Information

## Warnings



**WARNING:**

Before using the Giraffe Incubator, read through the entire operator's manual. As with all medical equipment, attempting to use this device without a thorough understanding of its operation may result in patient or user injury. This device should only be operated by personnel trained in its operation under the direction of qualified medical personnel familiar with the risks and benefits of this type of device. Additional precautions specific to certain procedures are found in the text of this manual.



**WARNING:**

Complete the "Pre-use Checkout" chapter of the Operator's manual before putting the unit into operation. If the incubator fails any portion of the checkout procedure it must be removed from use and repaired.



**WARNING:**

Do not use the incubator in the presence of flammable anesthetics; an explosion hazard exists under these conditions.



**WARNING:**

Always disconnect the power before performing service or maintenance procedures detailed in this manual. Apply power only if you are specifically instructed to do so as part of the procedure.



**WARNING:**

Thoroughly air dry the incubator after cleaning it with flammable agents. Small amounts of flammable agents, such as ether, alcohol or similar cleaning solvents left in the incubator can cause a fire.



**WARNING:**

The user or service staff should dispose all the waste properly as per federal, state, and local waste disposal regulations. Improper disposal could result in personal injury and environmental impact.

---

## Service Language Disclaimer

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### **ПРЕДУПРЕЖДЕНИЕ**

Това упътване за работа е налично само на английски език.

- (BG)
- Ако доставчикът на услугата на клиента изиска друг език, задължение на клиента е да осигури превод.
  - Не използвайте оборудването, преди да сте се консултирали и разбрали упътването за работа.
  - Неспазването на това предупреждение може да доведе до нараняване на доставчика на услугата, оператора или пациента в резултат на токов удар, механична или друга опасност.
- 



### **警告**

本维修手册仅提供英文版本。

- (ZH-CN)
- 如果客户的维修服务人员需要非英文版本，则客户需自行提供翻译服务。
  - 未详细阅读和完全理解本维修手册之前，不得进行维修。
  - 忽略本警告可能对维修服务人员、操作人员或患者造成电击、机械伤害或其他形式的伤害。
- 



### **警告**

本服務手冊僅提供英文版本。

- (ZH-HK)
- 倘若客戶的服務供應商需要英文以外之服務手冊，客戶有責任提供翻譯服務。
  - 除非已參閱本服務手冊及明白其內容，否則切勿嘗試維修設備。
  - 不遵從本警告或會令服務供應商、網絡供應商或病人受到觸電、機械性或其他危險。
- 



### **警告**

本維修手冊僅有英文版。

- (ZH-TW)
- 若客戶的維修廠商需要英文版以外的語言，應由客戶自行提供翻譯服務。
  - 請勿試圖維修本設備，除非您已查閱並瞭解本維修手冊。
  - 若未留意本警告，可能導致維修廠商、操作員或病患因觸電、機械或其他危險而受傷。
- 



### **UPOZORENJE**

Ovaj servisni priručnik dostupan je na engleskom jeziku.

- (HR)
- Ako davatelj usluge klijenta treba neki drugi jezik, klijent je dužan osigurati prijevod.
  - Ne pokušavajte servisirati opremu ako niste u potpunosti pročitali i razumjeli ovaj servisni priručnik.
  - Zanimarite li ovo upozorenje, može doći do ozljede davatelja usluge, operatera ili pacijenta uslijed strujnog udara, mehaničkih ili drugih rizika.
-

**VÝSTRAHA**

Tento provozní návod existuje pouze v anglickém jazyce.

- (CS)
- V případě, že externí služba zákazníkům potřebuje návod v jiném jazyce, je zajištění překladu do odpovídajícího jazyka úkolem zákazníka.
  - Nesnažte se o údržbu tohoto zařízení, aniž byste si přečetli tento provozní návod a pochopili jeho obsah.
  - V případě nedodržování této výstrahy může dojít k poranění pracovníka prodejního servisu, obslužného personálu nebo pacientů vlivem elektrického proudu, respektive vlivem mechanických či jiných rizik.

**ADVARSEL**

Denne servicemanual findes kun på engelsk.

- (DA)
- Hvis en kundes tekniker har brug for et andet sprog end engelsk, er det kundens ansvar at sørge for oversættelse.
  - Forsøg ikke at servicere udstyret uden at læse og forstå denne servicemanual.
  - Manglende overholdelse af denne advarsel kan medføre skade på grund af elektrisk stød, mekanisk eller anden fare for teknikeren, operatøren eller patienten.

**WAARSCHUWING**

Deze onderhoudshandleiding is enkel in het Engels verkrijgbaar.

- (NL)
- Als het onderhoudspersoneel een andere taal vereist, dan is de klant verantwoordelijk voor de vertaling ervan.
  - Probeer de apparatuur niet te onderhouden alvorens deze onderhoudshandleiding werd geraadpleegd en begrepen is.
  - Indien deze waarschuwing niet wordt opgevolgd, zou het onderhoudspersoneel, de operator of een patiënt gewond kunnen raken als gevolg van een elektrische schok, mechanische of andere gevaren.

**WARNING:**

This service manual is available in English only.

- (EN)
- 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 hazards, or other hazards.



### **HOIATUS**

See teenindusjuhend on saadaval ainult inglise keeles

- (ET)
- Kui klienditeeninduse osutaja nõuab juhendit inglise keelest erinevas keeles, vastutab klient tõlketeenuse osutamise eest.
  - Ärge üritage seadmeid teenindada enne eelnevalt käesoleva teenindusjuhendiga tutvumist ja sellest aru saamist.
  - Käesoleva hoiatuse eiramine võib põhjustada teenuseosutaja, operatori või patsiendi vigastamist elektrilöögi, mehaanilise või muu ohu tagajärjel.
- 



### **VAROITUS**

Tämä huolto-ohje on saatavilla vain englanniksi.

- (FI)
- Jos asiakkaan huoltohenkilöstö vaatii muuta kuin englanninkielistä materiaalia, tarvittavan käännöksen hankkiminen on asiakkaan vastuulla.
  - Älä yritä korjata laitteistoa ennen kuin olet varmasti lukenut ja ymmärtänyt tämän huolto-ohjeen.
  - Mikäli tätä varoitusta ei noudateta, seurauksena voi olla huoltohenkilöstön, laitteiston käyttäjän tai potilaan vahingoittuminen sähköiskun, mekaanisen vian tai muun vaaratilanteen vuoksi.
- 



### **ATTENTION**

Ce manuel d'installation et de maintenance est disponible uniquement en anglais.

- (FR)
- Si le technicien d'un client a besoin de ce manuel dans une langue autre que l'anglais, il incombe au client de le faire traduire.
  - Ne pas tenter d'intervenir sur les équipements tant que ce manuel d'installation et de maintenance n'a pas été consulté et compris.
  - Le non-respect de cet avertissement peut entraîner chez le technicien, l'opérateur ou le patient des blessures dues à des dangers électriques, mécaniques ou autres.
- 



### **WARNUNG**

Diese Serviceanleitung existiert nur in englischer Sprache.

- (DE)
- Falls ein fremder Kundendienst eine andere Sprache benötigt, ist es Aufgabe des Kunden für eine entsprechende Übersetzung zu sorgen.
  - Versuchen Sie nicht diese Anlage zu warten, ohne diese Serviceanleitung gelesen und verstanden zu haben.
  - Wird diese Warnung nicht beachtet, so kann es zu Verletzungen des Kundendiensttechnikers, des Bedieners oder des Patienten durch Stromschläge, mechanische oder sonstige Gefahren kommen.
-

**ΠΡΟΕΙΔΟΠΟΙΗΣΗ**

Το παρόν εγχειρίδιο σέρβις διατίθεται μόνο στα αγγλικά.

- (EL)
- Εάν ο τεχνικός σέρβις ενός πελάτη απαιτεί το παρόν εγχειρίδιο σε γλώσσα εκτός των αγγλικών, αποτελεί ευθύνη του πελάτη να παρέχει τις υπηρεσίες μετάφρασης.
  - Μην επιχειρήσετε την εκτέλεση εργασιών σέρβις στον εξοπλισμό αν δεν έχετε συμβουλευτεί και κατανοήσει το παρόν εγχειρίδιο σέρβις.
  - Αν δεν προσέξετε την προειδοποίηση αυτή, ενδέχεται να προκληθεί τραυματισμός στον τεχνικό σέρβις, στο χειριστή ή στον ασθενή από ηλεκτροπληξία, μηχανικούς ή άλλους κινδύνους.

**FIGYELMEZTETÉS**

Ezen karbantartási kézikönyv kizárólag angol nyelven érhető el.

- (HU)
- Ha a vevő szolgáltatója angoltól eltérő nyelvre tart igényt, akkor a vevő felelőssége a fordítás elkészítése.
  - Ne próbálja elkezdni használni a berendezést, amíg a karbantartási kézikönyvben leírtakat nem értelmezték.
  - Ezen figyelmeztetés figyelmen kívül hagyása a szolgáltató, működtető vagy a beteg áramütés, mechanikai vagy egyéb veszélyhelyzet miatti sérülését eredményezheti.

**AÐVÖRUN**

Þessi þjónustuhandbók er aðeins fánleg á ensku.

- (IS)
- Ef að þjónustuveitandi viðskiptamanns þarfnast annas tungumáls en ensku, er það skylda viðskiptamanns að skaffa tungumálþjónustu.
  - Reynið ekki að afgreiða tækið nema að þessi þjónustuhandbók hefur verið skoðuð og skilin.
  - Brot á sinna þessari aðvörun getur leitt til meiðsla á þjónustuveitanda, stjórnanda eða sjúklings frá raflosti, vélrænu eða öðrum áhættum.

**AVVERTENZA**

Il presente manuale di manutenzione è disponibile soltanto in lingua inglese.

- (IT)
- Se un addetto alla manutenzione richiede il manuale in una lingua diversa, il cliente è tenuto a provvedere direttamente alla traduzione.
  - Procedere alla manutenzione dell'apparecchiatura solo dopo aver consultato il presente manuale ed averne compreso il contenuto.
  - Il mancato rispetto della presente avvertenza potrebbe causare lesioni all'addetto alla manutenzione, all'operatore o ai pazienti provocate da scosse elettriche, urti meccanici o altri rischi.



**警告**

このサービスマニュアルには英語版しかありません。

- (JA)
- サービスを担当される業者が英語以外の言語を要求される場合、翻訳作業はその業者の責任で行うものとさせていただきます。
  - このサービスマニュアルを熟読し理解せずに、装置のサービスを行わないでください。
  - この警告に従わない場合、サービスを担当される方、操作員あるいは患者さんが、感電や機械的又はその他の危険により負傷する可能性があります。
- 



**경고**

본 서비스 매뉴얼은 영어로만 이용하실 수 있습니다.

- (KO)
- 고객의 서비스 제공자가 영어 이외의 언어를 요구할 경우, 번역 서비스를 제공하는 것은 고객의 책임입니다.
  - 본 서비스 매뉴얼을 참조하여 숙지하지 않은 이상 해당 장비를 수리하려고 시도하지 마십시오.
  - 본 경고 사항에 유의하지 않으면 전기 쇼크, 기계적 위험, 또는 기타 위험으로 인해 서비스 제공자, 사용자 또는 환자에게 부상을 입힐 수 있습니다.
- 



**BRĪDINĀJUMS**

Šī apkopes rokasgrāmata ir pieejama tikai angļu valodā.

- (LV)
- Ja klienta apkopes sniedzējam nepieciešama informācija citā valodā, klienta pienākums ir nodrošināt tulkojumu.
  - Neveiciet aprīkojuma apkopi bez apkopes rokasgrāmatas izlasīšanas un saprašanas.
  - Šī brīdinājuma neievērošanas rezultātā var rasties elektriskās strāvas triecienu, mehānisku vai citu faktoru izraisītu traumu risks apkopes sniedzējam, operatoram vai pacientam.
- 



**ISPĒJIMAS**

Šis ekspluatavimo vadovas yra tik anglų kalba.

- (LT)
- Jei kliento paslaugų tiekėjas reikalauja vadovo kita kalba – ne anglų, suteikti vertimo paslaugas privalo klientas.
  - Nemėginkite atlikti įrangos techninės priežiūros, jei neperskaitėte ar nesupratote šio ekspluatavimo vadovo.
  - Jei nepaisysite šio įspėjimo, galimi paslaugų tiekėjo, operatoriaus ar paciento sužalojimai dėl elektros šoko, mechaninių ar kitų pavojų.
- 



**ADVARSEL**

Denne servicehåndboken finnes bare på engelsk.

- (NO)
- Hvis kundens serviceleverandør har bruk for et annet språk, er det kundens ansvar å sørge for oversettelse.
  - Ikke forsøk å reparere utstyret uten at denne servicehåndboken er lest og forstått.
  - Manglende hensyn til denne advarselen kan føre til at serviceleverandøren, operatøren eller pasienten skades på grunn av elektrisk støt, mekaniske eller andre farer.
-

**OSTRZEŻENIE**

Niniejszy podręcznik serwisowy dostępny jest jedynie w języku angielskim.

- (PL)
- Jeśli serwisant klienta wymaga języka innego niż angielski, zapewnienie usługi tłumaczenia jest obowiązkiem klienta.
  - Nie próbować serwisować urządzenia bez zapoznania się z niniejszym podręcznikiem serwisowym i zrozumienia go.
  - Niezastosowanie się do tego ostrzeżenia może doprowadzić do obrażeń serwisanta, operatora lub pacjenta w wyniku porażenia prądem elektrycznym, zagrożenia mechanicznego bądź innego.

**AVISO**

Este manual de assistência técnica encontra-se disponível unicamente em inglês.

- (PT-BR)
- Se outro serviço de assistência técnica solicitar a tradução deste manual, caberá ao cliente fornecer os serviços de tradução.
  - Não tente reparar o equipamento sem ter consultado e compreendido este manual de assistência técnica.
  - A não observância deste aviso pode ocasionar ferimentos no técnico, operador ou paciente decorrentes de choques elétricos, mecânicos ou outros.

**ATENÇÃO**

Este manual de assistência técnica só se encontra disponível em inglês.

- (PT-PT)
- Se qualquer outro serviço de assistência técnica solicitar este manual noutra língua, é da responsabilidade do cliente fornecer os serviços de tradução.
  - Não tente reparar o equipamento sem ter consultado e compreendido este manual de assistência técnica.
  - O não cumprimento deste aviso pode colocar em perigo a segurança do técnico, do operador ou do paciente devido a choques elétricos, mecânicos ou outros.

**ATENȚIE**

Acest manual de service este disponibil doar în limba engleză.

- (RO)
- Dacă un furnizor de servicii pentru clienți necesită o altă limbă decât cea engleză, este de datoria clientului să furnizeze o traducere.
  - Nu încercați să reparați echipamentul decât ulterior consultării și înțelegerii acestui manual de service.
  - Ignorarea acestui avertisment ar putea duce la rănirea depanatorului, operatorului sau pacientului în urma pericolelor de electrocutare, mecanice sau de altă natură.



### **ОСТОРОЖНО!**

Данное руководство по техническому обслуживанию представлено только на английском языке.

- (RU)
- Если сервисному персоналу клиента необходимо руководство не на английском, а на каком-то другом языке, клиенту следует самостоятельно обеспечить перевод.
  - Перед техническим обслуживанием оборудования обязательно обратитесь к данному руководству и поймите изложенные в нем сведения.
  - Несоблюдение требований данного предупреждения может привести к тому, что специалист по техобслуживанию, оператор или пациент получит удар электрическим током, механическую травму или другое повреждение.
- 



### **UPOZORENJE**

Ovo servisno uputstvo je dostupno samo na engleskom jeziku.

- (SR)
- Ako klijentov serviser zahteva neki drugi jezik, klijent je dužan da obezbedi prevodilačke usluge.
  - Ne pokušavajte da opravite uređaj ako niste pročitali i razumeli ovo servisno uputstvo.
  - Zanemarivanje ovog upozorenja može dovesti do povređivanja servisera, rukovaoca ili pacijenta usled strujnog udara ili mehaničkih i drugih opasnosti.
- 



### **UPOZORNENIE**

Tento návod na obsluhu je k dispozícii len v angličtine.

- (SK)
- Ak zákazníkovi poskytovateľ služieb vyžaduje iný jazyk ako angličtinu, poskytnutie prekladateľských služieb je zodpovednosťou zákazníka.
  - Nepokúšajte sa o obsluhu zariadenia, kým si neprečítate návod na obsluhu a neporozumiete mu.
  - Zanedbanie tohto upozornenia môže spôsobiť zranenie poskytovateľa služieb, obsluhujúcej osoby alebo pacienta elektrickým prúdom, mechanické alebo iné ohrozenie.
- 



### **ATENCIÓN**

Este manual de servicio sólo existe en inglés.

- (ES)
- Si el encargado de mantenimiento de un cliente necesita un idioma que no sea el inglés, el cliente deberá encargarse de la traducción del manual.
  - No se deberá dar servicio técnico al equipo, sin haber consultado y comprendido este manual de servicio.
  - La no observancia del presente aviso puede dar lugar a que el proveedor de servicios, el operador o el paciente sufran lesiones provocadas por causas eléctricas, mecánicas o de otra naturaleza.
-



**VARNING**

Den här servicehandboken finns bara tillgänglig på engelska.

- (SV)
- Om en kunds servicetekniker har behov av ett annat språk än engelska, ansvarar kunden för att tillhandahålla översättningstjänster.
  - Försök inte utföra service på utrustningen om du inte har läst och förstår den här servicehandboken.
  - Om du inte tar hänsyn till den här varningen kan det resultera i skador på serviceteknikern, operatören eller patienten till följd av elektriska stötar, mekaniska faror eller andra faror.

**OPOZORILO**

Ta servisni priročnik je na voljo samo v angleškem jeziku.

- (SL)
- Če ponudnik storitve stranke potrebuje priročnik v drugem jeziku, mora stranka zagotoviti prevod.
  - Ne poskušajte servisirati opreme, če tega priročnika niste v celoti prebrali in razumeli.
  - Če tega opozorila ne upoštevate, se lahko zaradi električnega udara, mehanskih ali drugih nevarnosti poškoduje ponudnik storitev, operater ali bolnik.

**DİKKAT**

Bu servis kılavuzunun sadece ingilizcesi mevcuttur.

- (TR)
- Eğer müşteri teknisyeni bu kılavuzu ingilizce dışında bir başka lisandan talep ederse, bunu tercüme ettirmek müşteriye düşer.
  - Servis kılavuzunu okuyup anlamadan ekipmanlara müdahale etmeyiniz.
  - Bu uyarıya uyulmaması, elektrik, mekanik veya diğer tehlikelerden dolayı teknisyen, operatör veya hastanın yaralanmasına yol açabilir.

## Cautions

**CAUTION:**











Only competent individuals trained in the repair of this equipment should attempt to service it as detailed in this manual.






**CAUTION:**

Detailed information for more extensive repairs is included in the service manual solely for the convenience of users having proper knowledge, tools and test equipment, and for service representatives trained by GE Healthcare.

## Symbol Definitions

This section identifies the symbols that are displayed on the Giraffe Incubator:

Symbol	Description
	Consult accompanying documents.
	Lower the elevating base before mounting accessories.
>37°C	Temperature Alarm
	Airflow Curtain
	Fan
	Environmental Probe
	Scale
	Patient Oxygen
	Alarm Silence
	Patient
	Protective Ground
	Opening Giraffe Humidifier Reservoir

Symbol	Description
	Maximum Water Level for Humidifier
	Power Disconnect
	Maximum Weight
	Caution: Hot Surface
	Setup Screen



# Chapter 1: Functional Description

This functional description is divided into four sections representing each of the four boards. The reader should also reference the block diagram and wiring diagram when studying this section.

## 1.1 Control Board

The Intel 80C188EC microcontroller is an enhanced X86 processor with many on-board peripheral features, such as a interrupt controller, DMA controller, peripheral chip select driver, programmable timers, etc. The two programmable timers are used to control the bed heaters. The input to these timers is line frequency. This allows the control signal to be synchronized with the line frequency to better control the zerocrossing solid state relays. The on-board interrupt controller has several interrupts: analog-to-digital converter (ADC) conversion ready signal, overtemperature comparator output, watchdog output, power fail signal, and module interrupt signal from the system data bus. The microcontroller external bus is a multiplexed address and data bus.

The system memory consists of a programmable read-only memory (PROM) and static random access memory (SRAM). The EEPROM is used for calibration and biomedical configuration values. This memory holds the data even after power is turned off.

The RS-485 integrated circuit converts the RS-232 TTL signals from the microcontroller to RS-485 signals for the bus. This bus is the main communications bus from the control board to the display board, scale, and servo oxygen board.

There are two isolation transceivers used to isolate the circuits powered by +5V and the circuits powered by +5VSTBY (battery backup).

The board contains a 16 channel multiplexer. There are seven temperature measurement channels. These channels measure the two patient probes and the compartment probe (with two thermistors each), and the heat sink sensor used to measure the heat sink temperature. Additional channels include the humidity sensor (RHIN), LINE COMP & LINE COMP2, 5 Volts, Motor current, Vthref, VDAC, and 1.2Vind.

Attached to the compartment probe connection is the relative humidity signal conditioning circuitry. The 1V reference that is used for the analog circuitry is also the maximum input voltage and the offset voltage for the ADC. This yields a purely ratiometric system.

The overtemperature circuit compares the air temperature to a reference level, generates an interrupt, and turns off the heat if the air temperature is higher than the reference level. The overtemperature circuit requires varying its voltage levels to accommodate various thermistor measurements. This is because the calibration is digital (no potentiometer).

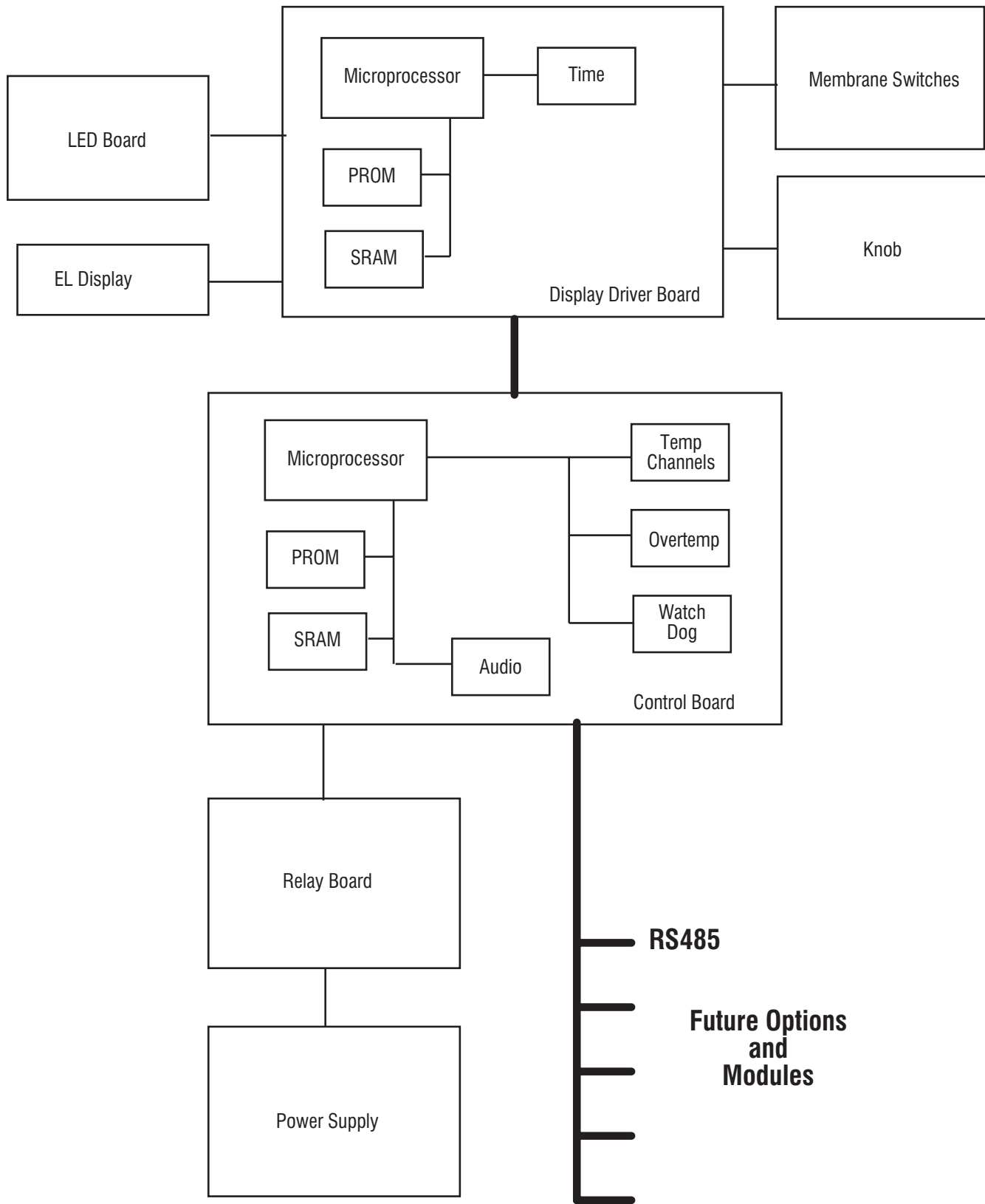


Figure 1-1 Block Diagram

The watchdog circuitry monitors the 80C188 microprocessor, and monitors the +5V and +5VSTBY voltages. It generates the interrupt signal and power failure signal to the 80C188 microprocessors. The audio circuit includes a 8752 microcontroller that reads a wavetable located in a PROM and sends the table to a digital audio circuit and amplifier. The high priority (HP) and other alarm signal lines select an output at the correct frequencies.

Three OR gates are combined to generate the error signal. The inputs to the circuit are overtemperature, power failure, and system failure. This circuit generates an error signal that turns off the heater and sounds the HP alarm. This circuit is independent of the microcontroller.

## 1.2 Relay Board

The Relay Board includes 2 safety relays, which close to supply mains power to the heater and motor circuits. Safety relay 1 is wired in series with the primary coil of the isolation transformer for the incubator heater. Safety relay 2 closes the mains supply to the humidifier isolation transformer and the transformer for the e-base motor. Control signals for the two relays originate on the Control Board.

The Relay Board interfaces the DC Control signal to the chassis mounted solid-state relay (SSR), which controls the incubator heater. The Control signals for the heater SSR originates on the Control Board.

The Relay Board includes a SSR for the humidifier. The SSR output is wired in series with the humidifier heater. The humidifier SSR control signal originates on the Control Board.

There is one current sense circuit for the incubator and an additional one for the humidifier heater. These circuits consist of a small signal transformer that produces a current proportional to the current through the heater circuits. The current is rectified and measured. The subsequent comparator then generates a digital level based on a specified current level. This results in a signal to the Control Board representing the state of the heater (on or off).

The line compensation circuit consists of a signal transformer connected to the mains voltage. The secondary of this transformer feeds a full wave rectifier and capacitor. The resulting DC voltage is proportional to mains voltage, and it is measured on the Control Board.

The line frequency circuit consists of a full wave rectifier and a comparator. This circuit generates a digital pulse with frequency twice that of the line frequency (50 or 60 Hz). The output signal is provide to the Control Board.

The Relay Board provides the +5v standby power supply to the entire Giraffe system. A +5V regulator generates the +5V standby from the diode OR combination of the system +12V power supply or the backup battery.

If there is no mains power, then +12v is not present, and the battery will generate the +5V standby. When +12V is present, the battery is biased out of the circuit with the diode and is merely being trickle charged though a resistor. The battery charges only when the unit is powered on.

The motor driver circuit turns the DC motor coils in the incubator airflow fan motor on and off based on feedback from the hall effect position sensors. This integrated circuit can also vary the speed and brake the motor based on input signals from the Control Board.

The airflow sensor consists of an optocoupler that outputs a clocking pulse proportional to the fan movement.

The signal is AC coupled to eliminate offset voltages and drifts. The resulting pulse is half wave rectified and stored in a capacitor to yield a DC voltage proportional to the fan speed. If the fan stops or there is no fan, this DC voltage becomes zero. The output signal is provide to the Control Board to indicate proper airflow motor operation.

The elevating base motor control circuits consist of a series of three relays. For the Giraffe Incubator, the speed relay and the E/H select relay are always switched to the same position. The speed relay connects the 15 volt secondaries of the toroidal transformer in a series (drive at 30 volts) for raising or lowering the elevating base. The direction relay reverses the polarity of the voltage output from the speed relay depending on the direction of travel. The E/H select relay switches the output voltage from the direction relay to the elevating base motor.

The Relay Board interfaces the user and system status input switch signals to the Control Board. Switch signals include, e-base activation, humidifier reservoir, and water level status.

## 1.3 Display Driver Board / EL Display

The Display Driver board contains the same Intel microcontroller as the Control board. The processor on the display board is used to control the EL display contents and monitor user inputs received from the membrane switch panel and rotary encoder knob.

There are two groups of digital inputs: membrane switch panel and rotary encoder knob. The membrane switches are pulled high; pressing the switch grounds the input. The encoder also has a switch, and two optically isolated lines that pulse out of phase with each other. The number of pulses represents the number of steps the knob rotates. The phase of the pulses represents the direction of the knob rotation.

The display board system memory consists of a programmable read-only memory (PROM) and static random access memory (SRAM).

The RS-485 integrated circuit converts the RS-232 TTL signals from the microcontroller to RS-485 signals for the bus.

The timekeeping RAM has a battery integrated into the chip so that the time and date run are kept current even with the power off. The battery has a minimum life of 10 years. Operator configuration values, patient information (trending), and the error log are stored in this RAM.

The graphics controller is an S-MOS VGA controller. The graphics controller interfaces the data from the video RAM to the EL display. The controller also synchronizes the display using a horizontal pulse (LP) and a vertical



pulse for the whole display frame (YD). The controller handshakes with the 80C188 using the READY line to eliminate any lost data during display refreshes.

## 1.4 LED Board

The LED Board contains five display banks and two display drivers. One of the display drivers controls the patient temperature and air temperature display banks. The other driver controls the patient set temperature, air set temperature, warmer bar graph, and the mode and override indicators.

This allows the two large displays (patient and air temperature) to be multiplexed at a slower rate than the other LEDs. This results in brighter large displays. Each driver has a brightness potentiometer that is preset at the factory and should not be adjusted in the field.

## 1.5 Power Supply

The universal input switching power supply converts the line voltage to +5V DC and +12V DC. This supply can source up to 75 watts. The 5 volts powers the electronics and the 12 volts is used by the EL display and for future boards. Acceptable voltage ranges are 4.75V - 5.25V and 10.8V - 13.2V.

## 1.6 Peripheral Components

For the heater isolation transformer with relay board revision 9 or lower, the heater isolation transformer isolates the incubator heaters from the mains voltage. The primaries mains input voltage comes from the relay board and is switched by safety relay 1 and is also routed through the heater current sense circuit. The dual primaries are connected in parallel for 115 volt operation and in series for 230 volt operation. The isolated secondary output voltage is always 115 volts and goes directly to the solid state relays and the incubator heaters

For the heater isolation transformer with relay board revision 10 or higher, the heater isolation transformer isolates the incubator heaters from the mains voltage. The primaries mains input voltage comes from the relay board and is switched by safety relay 1. The dual primaries are connected in parallel for 115 volt operation and in series for 230 volt operation. The isolated secondary output voltage is always 115 volts and is input to the relay board where it is used by the heater current sense circuit. It then outputs from the relay board to the solid state relays and the incubator heaters

The humidifier isolation transformer isolates the humidifier heater from the mains voltage. The primaries mains input comes from the relay board and is switched by safety relay 2. The dual primaries and secondaries are connected in parallel for 115 volt operation and in series for 230 volt operation. The isolated secondaries output voltage is equal to the mains input voltage..

The toroidal transformer is used to buck the mains voltage down to the range required for the elevating base motor. The primary mains input comes from the relay board and is switched by safety relay 2. The dual primaries are connected in parallel for 115 volt operation and in series for 230 volt operation. The output voltage from each secondary is about 15 volts for both 115 and 230 volt operation and is input to the relay board motor control circuits.

The solid state relay (SSR) is used to switch the isolated 115 volts to the incubator heaters. The SSR is mounted to the back wall of the electronics enclosure below the toroidal transformer.

The 8.4 NiMH battery is connected to the relay board. It is used to power the +5 STBY during power fail. The battery charges only when the unit is powered on.

## 1.7 DataLink Option

The DataLink option allows direct output of serial data to various remote monitoring systems, such as a computer or commercial RS-232 monitor. The DataLink option board contains the electronic circuitry necessary to provide a 2500 VRMS isolated serial interface to meet the logic levels specified by EIA RS-232D and CCITT V.28.

The MAX250 and MAX251 (U1 and U2), together with two 6N136 optocouplers and transformer TR1, form an isolated RS-232 transmitter and receiver. The MAX250 connects to the non-isolated or "logic" side of the interface, translating logic signals to and from the optocouplers, while the MAX251 resides on the isolated or "cable" side, translating data between the optocouplers and RS-232 line drivers and receivers. In addition to the optocoupler drivers and receivers, the MAX250 also contains isolation transformer drive circuitry which supplies power to the isolated side of the interface, and the MAX251.

The transmit signal is input to the MAX250 driver (U1 pin 4) whose output (U1 pin 3) drives optocoupler U4.

The optocoupler output (U4 pin 6) is then fed into the MAX251 driver (U2 pin 3). The output of the MAX251 driver (U2 pin 12) is at the logic levels conforming to EIA RS-232D and CCITT V.28. Conversely, the receive signal enters the MAX251 driver (U2 pin 10) and is stepped down to CMOS/TTL levels at U2 pin 5. This logic level drives optoisolator input (U3 pin 3) whose output is fed into U1 pin 10. The output (U1 pin 9) signal is then available to the control printed circuit board.

A slide switch SW1 is used as a "self test" for the RS-232 interface. In the closed position, the J30-1 transmit signal is sent through the MAX250/MAX251 transmitter and back into the receiver portions. The signal can be read at J30-2 and verified to be correct. Any external cable connection must be removed for this self test to function. CR1 and CR2 provide transient protection for MAX251. In normal operation SW1 should be in the open (OFF) position.

The nurse call signal is input at J30-5 as a TTL logic level. In the "no alarm" state, this signal is a logic high, which turns on Darlington Q1, energizing relay K1. This results in contact closure between J31-1 and J31-2. In the "alarm" state, J30-5 is a logic low, which turns off Q1, de-energizes K1 and results in contact closure between J31-2 and J31-3. K1 provides 2500 VRMS isolation between the relay coil inputs and contact outputs.

## 1.8 Servo Controlled Oxygen Option

The Giraffe Servo Control Oxygen System consists of an oxygen sensing circuit, Servo Oxygen circuit board, and an oxygen delivery system.

The sensing circuit is located beneath the bed and consists of a pair of fuel cell oxygen sensors, a three-way solenoid calibration valve, and a calibration fan. In normal operation the calibration valve is closed and allows the Giraffe fan to circulate gas from the infant compartment across the sensors.

The unit must be calibrated at least every 24 hours when servo oxygen is in use. After 24 hours have elapsed the system prompts the user to perform calibration. Once the operator initiates calibration, the calibration valve opens and the calibration fan is turned on. This draws ambient air across the sensors until a stable reading is obtained. This 21% oxygen reference value is then used to calibrate the measuring algorithm. After calibration 100% oxygen is briefly delivered to the system to ensure there are no occlusions. When calibration is complete the unit will resume controlling oxygen based on the last set point.

The system must have two sensors present to operate. One sensor is always used for control and the other is used for a redundant check and display. The sensors generate a voltage of about 40 millivolts at 21% oxygen concentration and about 200 millivolts at 100% oxygen concentration. The voltage is directly proportional to the concentration of oxygen. Humidity and temperature sensors located in the sensor plug are used for voltage compensation. A fan mounted to the sensor-housing door is activated when the temperature reaches 50 degrees C. This fan circulates air to keep the sensors below the maximum allowable operating temperature, about 55 degrees C.

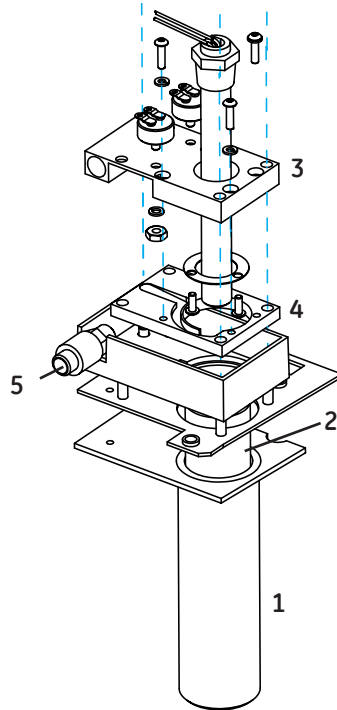
The Servo O2 board is located in the Giraffe controller. The microcontroller and integrated EPROM on the board perform the following:

- Convert sensor output from analog to digital
- Activates oxygen alarm conditions.
- Two-way communications via 485 bus with the Giraffe control board.
- Controls the calibration valve to select calibration mode.
- Controls the two supply valves to maintain the desired oxygen set point.
- Opens the safety relay, which removes power to the two-way valve and the supply valves in case of a system failure.

The oxygen delivery system consists of two solenoid supply valves, and a regulator assembly. The preset regulator regulates the oxygen supply to 50 psi (345 kPa). Two supply valves, controlled by the Servo Oxygen board, control flow to the infant compartment. Both valves are opened until the measured level gets close to the desired set point then one valve is closed. One valve is then cycled on and off as needed to maintain the desired oxygen levels in the infant compartment. The valve selected is alternated so both valves cycle about the same number of times. There are 2 fuses between the Servo O2 board and the supply valves that prevent high current from the board entering the valve housing should a short occur in the supply valves.

## 1.9 Humidifier

Refer to the following diagram. Water enters the insulating cylinder (1) through a small hole in bottom. Steam rises along the heater cartridge protective insert (2) and is channeled between the heater mount (3) and the ramp block (4) and out the steam port (5).



**Figure 1-2** Humidifier

# Chapter 2: Service Checkout



**WARNING:**

Do not perform the preoperative checkout procedure while the patient occupies the unit.



**WARNING:**

Complete the procedures in this chapter before putting the unit into operation. If the equipment fails any portion of the checkout procedure it must be removed from use and repaired.

---

## 2.1 Mechanical Checks

1. Disconnect the power cord for the mechanical portion of the preoperative checkout procedure.
2. Examine the power cord for any signs of damage. Replace the cord if damage is evident.
3. Check that both plug retaining brackets are in place.
4. Examine the unit overall for any damaged or missing parts. Examine the unit for any missing or damaged labels.
5. Check that all the casters are in firm contact with the floor and that the unit is stable. Lock the caster brakes and check that they hold the unit in place. Release the brakes and check that the unit moves smoothly.
6. Check the operation of the side doors. Open the doors and check that they swing all the way down and hang perpendicular to the bed. Check that the doors are securely attached to the unit and that the hinge pins are properly seated. Check that the inner walls are securely fastened to the doors. Close the doors and check that the latches hold the doors securely shut. The orange latch open indicators should not be visible when the latches are engaged. Check that the hood is in the locked position.
7. Check the tubing access door at the top of the ventilator slot in the back wall. It should flip up easily and smoothly, and stay in position anywhere on its travel path.
8. Check the portholes. Open the portholes by pressing on the latch. The cover should swing open. Close the porthole and check that the latch holds the cover securely shut and that the cover seals tightly against the porthole gasket. Check that all the porthole seals are in place and are in good condition.

9. If the unit is equipped with an iris porthole, check the iris is installed and in good condition. Check that the iris tightens when it is rotated.
10. Check that the tubing access covers in the four bed corners and the large slot grommet at the head of the bed are in place and are in good condition.
11. Check the operation of the bed. The bed should rotate easily without binding. If the bed is properly seated and locked in place, the mattress should be level. With the bed rotated back into the straight position, check to see that the bed platform extends and stops when it is pulled out on either side. Check the operation of the bed tilt mechanism. Squeeze the tilt control and push down on the foot of the bed. The head of the bed should raise easily, and should stay in position at any angle along its tilt path when the tilt control is released. Push down on the head of the bed. The foot of the bed should raise easily, and should stay in position at any angle along its tilt path when you the tilt control is released.
12. Check the operation of the hood lock. Release the lock and raise the hood. Make sure it locks in the open position. Release the lock and lower the hood. Make sure it locks in the closed position.

## 2.2 Controller Checks

---



**WARNING:**

Do not use the Incubator in the presence of flammable anesthetics: an explosion hazard exists under these conditions.

---

1. Connect the incubator power cord to a properly rated outlet.
2. Connect the patient probe to jack 1 on the probe panel.
3. Switch on the power at the mains switch on the back of the unit, and at the standby switch on the probe panel, while holding in the override button (>37) on the display during power up until the software revision screen appears. Release the button and the first service screen will appear.
4. Scroll to "Down" and select it to bring up the second service screen. Select Status to see Status screen. Check status of the software self tests. These include: heater on (INCHTRON), heater off (IHTROFF), humidifier heater on (RHHTR), remote monitoring data stream (RS232LOOP), incubator fan on (FANON), and incubator fan off (FANOFF). All test should say PASS except RS232 LOOP. If the RS232 option is not installed RS232LOOP will display N/A. To test the circuit if the option is installed, short pins 2 and 3 on the 9 pin connector on the back of the electrical enclosure.
5. Using the standby switch turn off the unit, then turn it back on. Verify the following:
  - All the displays and indicators light
  - The software revision appears
  - The prompt tone begins

**NOTE:** If the unit has been used in the last 2 hours, the patient history query appears.

6. Adjust the set temperature to silence the prompt tone.
7. Check the patient probe. If the probe is below 30 C, the display will show -L-. Warm it by placing it between your fingers, and verify that the baby temperature reading increases.
8. Unplug the patient probe and check that both visual and audio alarms trigger in the Baby control mode.
9. If so equipped, check the operation of the bed elevating system. Raise and lower the bed along its entire travel range, checking that the mechanism operates smoothly. Check that the pedals on both sides of the unit raise and lower the bed.
10. Check the power failure alarm and the battery backed up memory. Make note of the current control mode and temperature settings and wait one minute, then unplug the Incubator from the wall outlet. An alarm should sound and the power failure indicator should light. Wait one to two minutes and plug the Incubator back in. Verify that the alarm cancels and that the Incubator returns to the same control mode and temperature settings it displayed before the power interruption.

**NOTE:** A fully charged battery should supply the power failure alarm for 10 minutes minimum (IEC 60601-2-19 clause 101.3). If the alarm is tested for the full 10 minutes, the Incubator must be run at least two hours to recharge the battery before it is used with a patient. Total recharge time is 10 hours. The battery charges only when the unit is powered on.

11. Perform the Leakage Current and Ground Resistance checks in sections 3.8 and 3.9.

## 2.3 Humidity Check

Turn on the Giraffe unit and verify that the Servo Humidity icon is on the screen. Set the Humidity to 65%. Wait for 4 minutes. If no alarms are seen (except for a possible "Add Water" message) the humidifier is operational.

**NOTE:** It is not necessary to have water in the reservoir to perform this test.

## 2.4 Servo Controlled Oxygen Check

### 2.4.1 Leak Check

This test checks for leaks between the O2 sensors and the Heat sink vent fitting.

1. Remove translation deck, tilt platform, upper pan, and fan.
2. Cover the heat sink vent near the fan shaft with adhesive tape. Make sure the tape will not interfere with fan rotation. Reinstall the fan, upper pan, tilt platform, and translation deck.

**NOTE:** If the conical shaped rubber grommet was removed with the fan, when reinstalling fan be sure that rubber grommet clicks into groove on fan shaft.

3. Power up the unit, hold down the 'Air curtain' button and press the 'Down' button to force the Giraffe into low fan speed.
4. Set O2 set point to 21%; the display will show the actual concentration in the larger numerals next to the set point. Open the doors until the actual concentration reaches 21% (ambient).
5. Run the Servo O2 calibration routine and wait for the calibration complete message. In approximately 20 seconds, the "Check O2 Supply" alarm should sound. If there is no alarm, the tubing between the sensor housing and the heat sink vent fitting has a leak or is disconnected. Repair the leak and repeat steps 1 through 4 of this procedure.
6. After performing the test, power off the unit. Remove the translation deck, tilt platform, upper pan, and the fan, and remove the adhesive tape. Be sure to remove any residue on the heat sink left by the tape.
7. Reassemble the system and run the calibration routine one final time.

### 2.4.2 Pre-use Checkout

This test checks for leaks between the chassis vent fitting and the O2 sensors.

1. Connect an acceptable hose from an oxygen supply to the oxygen inlet fitting on the unit. Supply pressure should be between 310 kPa (45 PSI) and 586 kPa (85PSI).
2. Power up the unit.
3. Set the Air Control set point to the desired temperature.
4. Wait for the air temperature to stabilize. This could take about 45 minutes, depending on your circumstances.



5. Hold down the 'Boost Air Curtain' button and press the 'Decrease Temperature' button to force the unit into low fan speed (Whisper Quiet Mode).
6. Wait 10 minutes to ensure stability of the Whisper Quiet Mode.
7. Select wrench icon on display screen to bring up setup menu. Select Cal Oxygen on the setup menu to initiate calibration.
8. When calibration is completed, 100% oxygen is delivered for approximately 20 seconds to ensure there are no occlusions in the system. Do not turn off the unit or disconnect the oxygen supply during this brief period after the 'Calibration Complete' screen appears. Exit calibration screen.
9. Select O2 icon on display screen to bring up Servo Control Oxygen menu. Set O2 set point to 65%.
10. Start timer and verify that unit reaches 60% in less than 10 minutes.

**NOTE:** If rise time is longer than 10 minutes check all tubing between the O2 sensors and the chassis vent fitting. The chassis vent may be identified by its mushroom cap shaped cover.

**NOTE:** Unit should not be placed in service unless the calibration is successful and the rise time test passes.

**NOTE:** The Low O2 alarm may activate during the rise time test. Silence the alarm and let the test continue.

**NOTE:** The "O2 Cal Lost – No O2" alarm may appear after the unit is turned on or returned from power fail condition. If this alarm appears, calibrate the oxygen sensors (using the wrench icon and the Cal Oxygen option) and resume use. If this alarm appears during normal operation, calibrate and continue use, but call service.

### 2.4.3 Supply Valve Leak Test

1. Connect oxygen supply to Servo Oxygen fitting.
2. Disconnect the 10mm hose from the expansion chamber.
3. Power up unit in Service Mode.
4. Scroll to Servo Oxygen service screen, and open V1 & V2 and verify that gas flows audibly .
5. Close V1 & V2 and place the 10mm hose in a cup of water. Verify that no more than 10 bubbles appear over a one minute period. If unit fails, replace supply valves.

When test is completed, reattach 10 mm hose to expansion chamber.

## 2.5 Scale Check

The scale can be calibrated or checked using a Class F calibration weight between 1 kilogram and 8 kilograms (accuracy of 0.01%). (This class F Weight is available as part number 6600-0209-800.)

**NOTE:** For EU Member States:

- This scale has been designed and manufactured in accordance with the non-automatic weighing instruments (NAWI) directive, 90/384/EEC. In order to assure complete compliance to the Directive, have the unit calibrated by an accredited local test authority. If you are unable to identify a test authority, please contact your GE representative or distributor for assistance.
- Periodic re-verification (calibration) of the scale must be performed in accordance of the National Regulations Governing Legal Metrology. The required re-verification frequency will vary by country. Contact your local weights and measures authority for more information.

### 2.5.1 Mechanical Check

1. Examine the scale connector cord for damage.
2. Examine the LEMO connector to make sure it is tightly assembled.
3. Check for bent pins.
4. Examine the scale for obvious signs of damage.
5. If any of the parts are damaged replace them.

### 2.5.2 Weight Checks

**IMPORTANT:** If the scale fails the weight checks, calibrate it according to the procedure in section 3.7 and then perform the weight checks again.

#### 2.5.2.1 Center Weight Check

1. Enter the service screen by holding the override key (>37) while powering up. Set the scale resolution to 5 grams (if option is available).
2. Shut off the unit and power it back up to enter normal weighing mode.
3. Place a known weight in the center of the mattress and perform a weigh cycle. The displayed weight should be the known weight +/- 10 grams.

### 2.5.2.2 Off Center Weight Check

1. Enter the service screen by holding the override key (>37) while powering up. Set the scale resolution to 5 grams (if option is available).
2. Shut off the unit and power it back up to enter normal weighing mode.
3. Place a known test weight 10 cm (4") from the center of the mattress in 4 positions 90 degrees from each other (for example- toward each corner of the mattress) and check the reading at each position. Resulting weight readings should be within +/- 10 g of previously obtained center weight reading.

## 2.6 Other Accessory Checks

1. Check that all accessories are securely mounted and out of the path of the hood in the open position.
2. Check the operation of any accessories with reference to their appropriate operation manuals.
3. Setup any required suction or gas supply systems. Check them for leaks as described in their respective operation manuals.

## 2.7 Cable Connections and Mechanical Controls

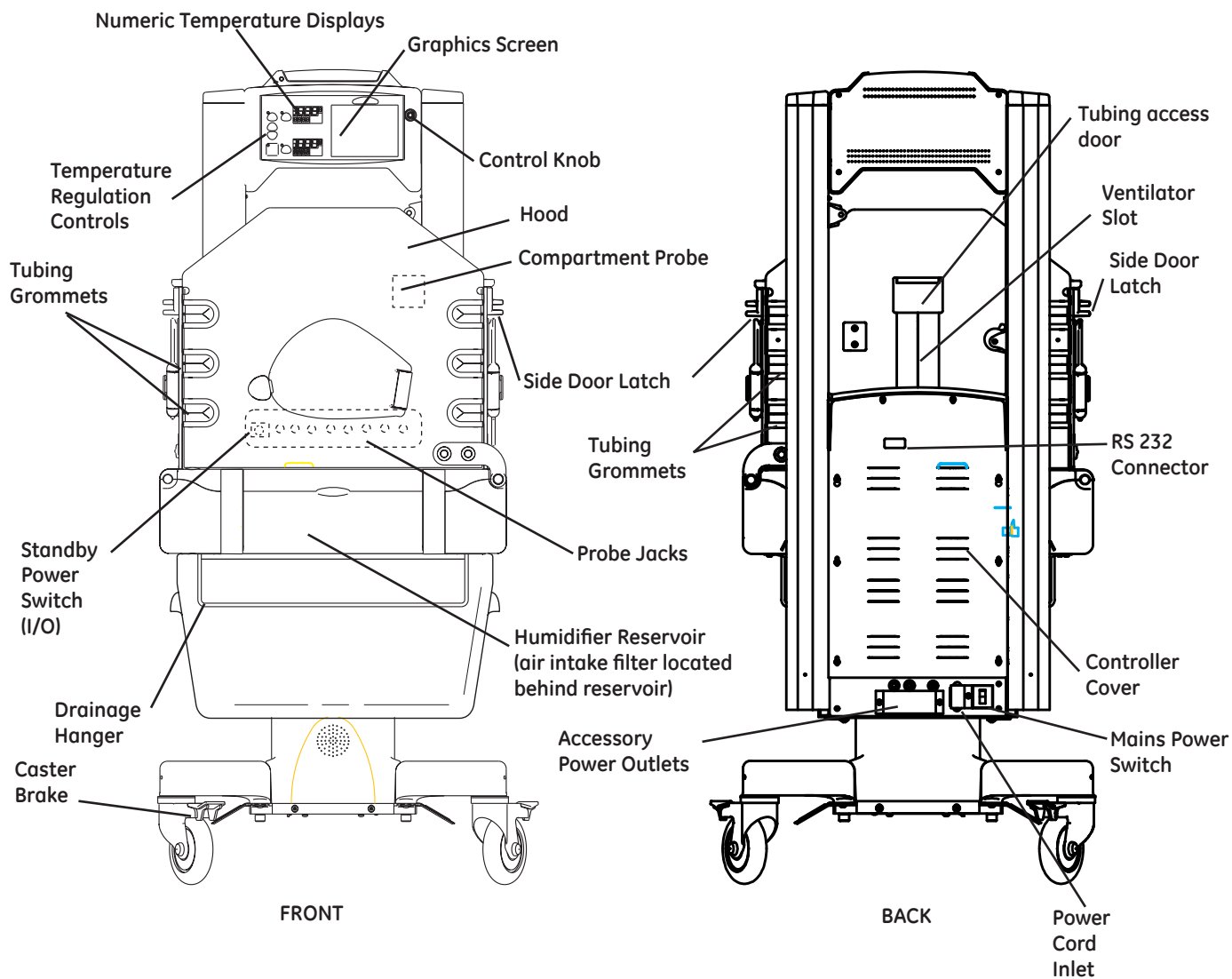
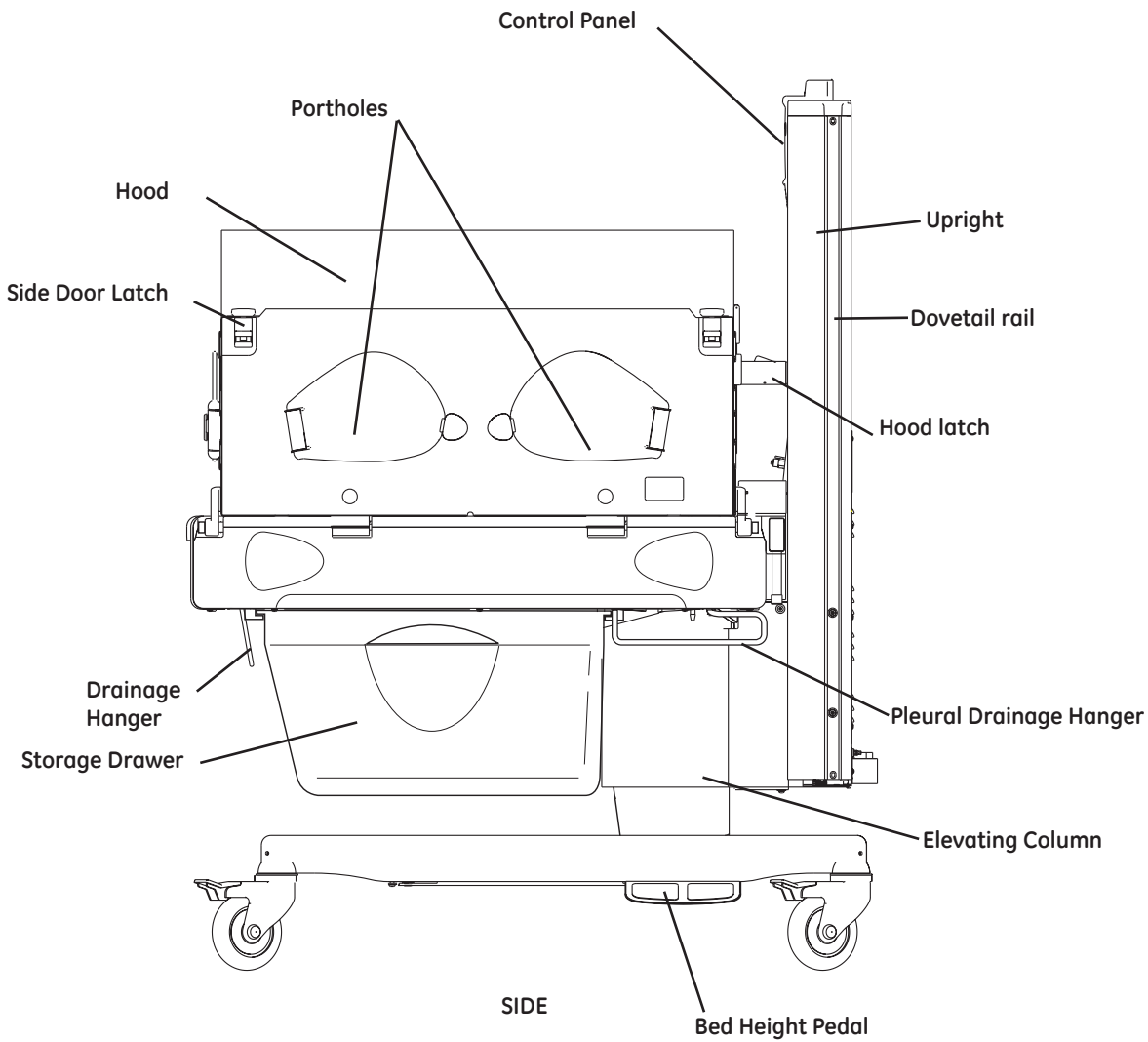


Figure 2-1 Connections and Controls





# Chapter 3: Calibration and Maintenance



## **SENSITIVE TO ELECTROSTATIC DISCHARGE CAUTION**

An Electrostatic Discharge (ESD) Susceptibility symbol is displayed to alert service personnel that the part(s) are sensitive to electrostatic discharge and that static control procedures must be used to prevent damage to the equipment.



## **WARNING:**

After performing any repair or calibration, always perform the Service Checkout Procedure before putting the unit back into service.

## 3.1 Service Maintenance Schedule

The unit should be maintained in accordance with the procedures detailed in this manual. Service maintenance must be performed by a technically competent individual.

This schedule lists the minimum frequencies. Always follow hospital and local regulations for required frequencies.

Frequency	Maintenance
Annually	<ul style="list-style-type: none"><li>Perform the electrical safety and calibration procedure as described later in this chapter.</li><li>Perform checkout procedures in Chapter 2. If the scales fail the weight check, perform the Scale Calibration procedure in section 3.7.</li></ul>
Every Two Years	<ul style="list-style-type: none"><li>Replace the battery.</li></ul> <p><b>NOTE:</b> The battery is used to sound the power failure alarm and to power memory circuits during a power failure. Run the unit for at least two hours to charge the new battery before using the unit. The battery charges only when the unit is powered on.</p>
Every Three Years	Calibrate the humidifier.

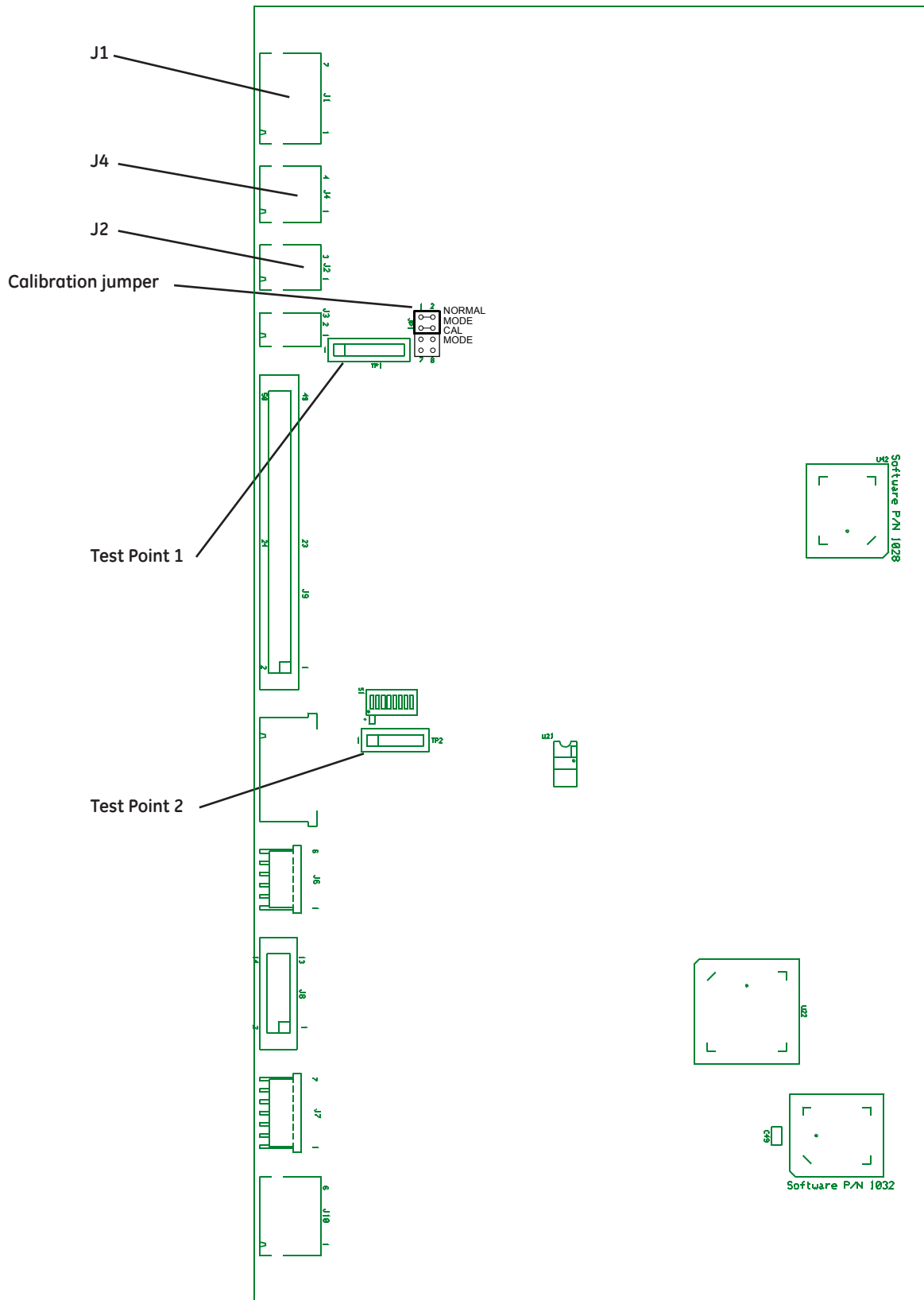


Figure 3-1 Control Board Test Points



## 3.2 Special Tools

The following tools (or their functional equivalents) are required to complete the recommended service procedures:

- Digital Multimeter, 4-1/2 digit
- PLCC Extractor for removing socketed chips
- Leakage Current Tester
- Static Control Work Station (recommended)
- Light gray touch-up paint (Munsell .16GY8.56-0.44 chroma)-18ml ..... 6600-0714-200
- Servo Humidity Calibration Kit ..... 6600-0048-850
- 5 kilogram (5000 gram) Class F test weight\* ..... 6600-0209-800

\*The scale can be calibrated using a Class F calibration weight between 1 kilogram and 8 kilograms (accuracy of 0.01%).

**NOTE:** Do not use simulator 6600-0876-700 for validation testing.

## 3.3 System Calibration

**NOTE:** If Only performing line voltage calibration, follow instructions in next section, 3.4.

**IMPORTANT:** Be sure to perform System Calibration after replacing a control board.

1. Turn power off.
2. Remove electrical enclosure back panel.
3. Unplug the temperature sensors from J1, J4 and J2 on the control board.
4. Move jumper JP1 to the CAL MODE position on the control board. (Refer to “Figure 3-1 Control Board Test Points” on page 20.) Be sure to orient the jumper correctly so pins 5-6 and 7-8 are shorted.
5. Turn power on. After running the power-up testing INITIALIZING will be displayed and dots will move across the top of the screen.
6. After about 90 seconds CALIBRATION MODE, Enter “VREF”, and Enter “Mains” will be displayed.
7. Using a 4 ½ digit DVM (capable of measuring to 0.1 millivolt) measure VREF at TP1, pins 1 and 6 (pin 6 is ground) on the control board. Measure to the nearest 0.1 millivolt. (Typical voltage reading will be 1.2350)
8. Dial in VREF using the control knob. Press the knob to enter the value.
9. Measure the Mains Voltage at the AC connectors at the bottom of the electronics enclosure cover.

10. Dial in the Mains voltage using the control knob. Press the knob to enter the value.
11. After a few seconds the dots will stop moving across the screen and DONE will appear on the top right of the display. Do not shut off the unit until the DONE message is displayed or the new calibration values will not be stored.

If the message "Mains voltage calibration failed. Please enter the mains voltage again" appears this indicates the dialed in line voltage is 20% different than the measured value (not the nominal value).

12. Power down the unit and move the calibrate jumper to the NORMAL MODE position. Be sure to orient the jumper correctly so pins 1-2 and 3-4 are shorted.

System and line voltage calibration are complete.

13. Proceed to humidifier calibration.

## 3.4 Line Voltage Calibration

**IMPORTANT:** Be sure to perform line voltage calibration after replacing a relay board.

1. Hold the override button (>37) while powering up the unit to enter the service screen.
2. On the second service screen select CAL LV.
3. Measure the line voltage at the AC connectors located at the bottom of the electrical enclosure.
4. On the CAL LV screen, dial in the mains voltage value that you measured and push the knob to enter it.
5. When calibration is completed screen will say Mains Voltage Calibration Complete.

If the message "Mains voltage calibration failed. Please enter the mains voltage again" appears this indicates the dialed in line voltage is 20% different than the measured value (not the nominal value).

## 3.5 Humidifier Calibration

**IMPORTANT:** Be sure to re-calibrate the humidifier whenever either the sensor or the control board is replaced.

**IMPORTANT:** In order for the water in the calibration bottle to be completely saturated, most of the salt should not be dissolved. There should be as little standing water above the salt line as possible to minimize the response time. The salt in the calibration bottle may only be used for a period of one year after its initial mix with water then the kit should be discarded.

1. Take the cap off the humidity calibration bottle and add one half cap full of sterile distilled water to the bottle. Shake the bottle to thoroughly mix the salt and water solution. Place the elbow on the bottle. The smaller end goes over the bottle.
2. Slide the elbow over the humidity sensor (mounted on the back wall) until it stops.
3. Hold the override key while powering up to enter the service screen.
4. On the second service screen, select Cal RH. The screen will prompt "Push knob when RH reading is stable." Wait for 20 minutes or until the RH display stabilizes (does not change by more than 1% in 5 minutes).
5. You have the option to select STABLE, SET TO DEFAULT or EXIT. STABLE initiates calibration. SET TO DEFAULT resets calibration values back to factory default settings. If you started calibration by mistake (without the calibration bottle in place, for example) you would select SET TO DEFAULT and then calibrate the unit. If you have entered the calibration routine by mistake, select EXIT to leave without initiating calibration
6. If "RH Sensor Calibration Completed" is displayed, the calibration is complete. Depress the knob to exit the Cal RH routine.
7. If "RH Sensor Calibration Failed Try Again" is displayed, verify your setup and press the knob to try the calibration again.

### 3.6 Servo Controlled Oxygen Calibration

1. Select Set Up icon (wrench) to bring up Set Up screen.
2. Scroll down and select Cal Oxygen to initiate calibration. Calibration is automatic and takes less than five minutes. A bar graph indicates progress toward completing calibration. If for any reason you wish to discontinue calibration before it is completed, turning the control knob in either direction will cause the word Cancel to appear on the calibration screen. Pushing in the control knob will discontinue calibration.

When calibration is completed, 100% oxygen is delivered for approximately 20 seconds to ensure there are no occlusions in the system. Do not turn off the unit or disconnect the oxygen supply during this brief period after the 'Calibration Complete' screen appears.

**NOTE:** The servo control oxygen system prompts for calibration every 24 hours, but the system may prompt for calibration if there is a large leak in the system (for example if a door is open) for half an hour.



**CAUTION:**

The servo-control system must be calibrated at the same atmospheric pressure in which it is to be used. Operation at atmospheric pressures other than that present during calibration may result in readings outside the stated accuracy for the unit.

---

## 3.7 Scale Calibration

**NOTE:** For EU Member States:

- This scale has been designed and manufactured in accordance with the non-automatic weighing instruments (NAWI) directive, 90/384/EEC. In order to assure complete compliance to the Directive, have the unit calibrated by an accredited local test authority. If you are unable to identify a test authority, please contact your GE representative or distributor for assistance.
- Periodic re-verification (calibration) of the scale must be performed in accordance of the National Regulations Governing Legal Metrology. The required re-verification frequency will vary by country. Contact your local weights and measures authority for more information.

**NOTE:** The scale is calibrated using a Class F calibration weight between 1 kilogram and 8 kilograms (accuracy of 0.01%).

1. Place the test weight on the center of the bed.
2. Hold the override key (>37) while powering up to enter the service screen.
3. On the second service screen, select Cal Scale.
4. Remove the weight and push the knob at the screen prompt "REMOVE THE WEIGHT AND PUSH KNOB". The screen will prompt "INITIALIZING" for a few seconds.
5. Replace the weight and push the knob at the screen prompt "PLACE TEST WEIGHT AND PUSH KNOB". The screen will prompt "MEASURING" for a few seconds.
6. When the screen prompts "ENTER TEST WEIGHT" Dial in the test weight to the nearest gram. Press the knob to enter. The screen will prompt "CALCULATING" for a few seconds.
7. When the screen prompts:

SAVE AND EXIT

EXIT ONLY

RESTORE DEFAULT

Select and enter "SAVE AND EXIT"

Turn off the power to exit the service mode.

### 3.8 Leakage Current

Use approved equipment and techniques to test the unit's leakage current and ground continuity. Follow the directions supplied by the test equipment manufacturer to verify the following:

1. Less than 300 microamperes measured at any exposed metal surface for equipment rated at 120 VAC, 50/60 Hz.
2. Less than 500 microamperes measured at any exposed metal surface for equipment rated at 220 VAC, 50/60 Hz or 240 VAC, 50/60 Hz.

### 3.9 Ground Resistance Check

Use a electrical safety analyzer to measure the resistance between the ground pin on the line cord plug and exposed metal of the electronic enclosure. The ground resistance must be less than 0.2 ohms.



# Chapter 4: Troubleshooting

## 4.1 Startup Sequence

By default, the Giraffe Incubator starts up in user mode. The next section describes how to start up the Incubator in service mode. The following table describes the Giraffe Incubator startup sequence for each mode:

User Mode	Service Mode
1. The alarm light turns on and remains on.	1. The alarm light turns on and remains on.
2. All LEDs and segments light up and the EL screen is yellow.	2. All LEDs and segments light up and the EL screen is yellow.
3. All LEDs turn off. The EL screen displays the Giraffe logo.	3. All LEDs turn off. The EL screen displays the Giraffe logo.
4. The alarm light turns off. Software revisions appear on the EL screen with OKs.	4. The alarm light turns off. Software revisions appear on the EL screen without OKs.
5. The user screen appears.	5. The service screen appears.

## 4.2 Service Screen

To access the service screen, hold in the override button (>37) during power up until the software revision screen appears. Release the button and the first service screen will appear.

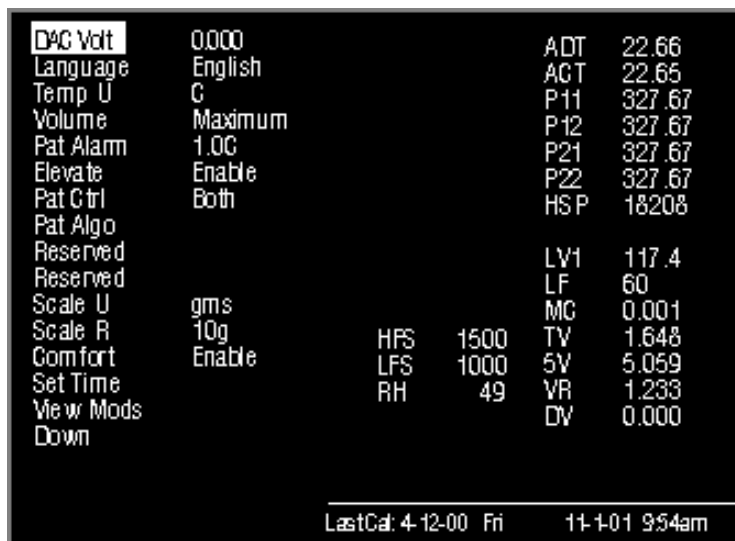


Figure 4-1 First Service Screen

Default options that may be selected from this screen appear along the left side of the screen.

Item	Description
DAC Volt	Digital/Analog Converter voltage. This is the over temperature voltage that is used by the system to verify the computer independent circuitry is working. To manually test this circuit enter voltages from 0 to .5 V. The DV value at the bottom right corner of the screen should match this value within 10mV.
Language	English is the default language that appears on the EL display, but you can select French, Spanish, etc., depending on what software is installed.
Temp U	Changes temperature displays to show "Fahrenheit", "Celsius" or "Celsius Only" so the Fahrenheit option is not present on the user Set-up screen (Celsius is factory set default).
Volume	Select one of four volume settings; 1 is minimum, 4 is maximum.
Pat Alarm	Set the default Hot Baby/Cold Baby alarm to activate when either 0.5°C or 1.0°C difference is read between a set temperature and the baby probe temperature.
Elevate	Disable or enable the bed up/down pedal switches.
Pat Ctrl	Allows you to disable patient control.
Pat Algo	To be used for future software options.
Scale U	Select from "Grams", "Pounds" or "Grams Only" so that the pounds option is not present on the user Scale screen (grams is the factory default).
Scale R	Select from 2 scale resolution settings; 10 grams or 5 grams (10 grams is the factory default).



Item	Description
Comfort	Allows you to remove the Comfort Screen feature.
Set Time	Set real time clock for time, day and date. Choose how date is displayed (North American or European). Choose a 12 hour (AM/PM) or 24 hour time display.
View Mods	Display the current software revision of the options installed on this specific unit (Humidifier, Scale, SPO2, etc.)
Down	Go to second service screen.

```

Up
Status          ACT  22.66
Switches        ACT  22.65
Errors          P11  327.67
Hours Run       P12  327.67
Cal LV          P21  327.67
Cal RH          P22  327.67
Cal Scale       HSP  18208
Man temp al.   Enable
                LV1  117.4
                LV2  117.8
                LF   60
                HFS  1500  MC  0.001
                LFS  1000  TV  1.648
                5V  5.059
                VR  1.233
                DV  -0.644
LastCal: 4-12-00 Fri  11-1-01 9:54am

```

**Figure 4-2** Second Service Screen

Up	Return to previous screen.
Status	<p>Check status of all self test the software runs continuously. These include: incubator heater on (INCHTRON), incubator heater off (I/HTROFF), humidifier heater on (RHHTR), remote monitoring data stream (RS232LOOP), incubator fan on (FANON), and incubator fan off (FANOFF).</p> <p>If the RS232 option is not installed, RS232LOOP will display fail. To test the circuit if the option is installed, short pins 2 and 3 on the 9 pin connector on the back of the electrical enclosure.</p>

```

Up
Status
Switches
Errors
Hours Run
Cal LV
Cal RH
Cal Scale
Man temp al.
                INCHTRON      PASS
                INCHTROFF    PASS
                RHHTR        FAIL
                RS232LOOP    N/A
                FANON        PASS
                FANOFF       PASS
                HFS  1500  MC  0.001
                LFS  1000  TV  1.648
                5V  5.059
                VR  1.233
                DV  -0.644
LastCal: 4-12-00 Fri  11-1-01 9:54am

```

**Figure 4-3** Status Menu

Item	Description
Switches	Select to bring up a diagnostic diagram of the unit that displays the status of all the switches. If the circle next to the switch is lit, the switch is closed; if it is not lit, the switch is open. Also, while the switch status screen is active, you can hold down the alarm silence button to light the alarm light, system failure light and all LED segments to test them.

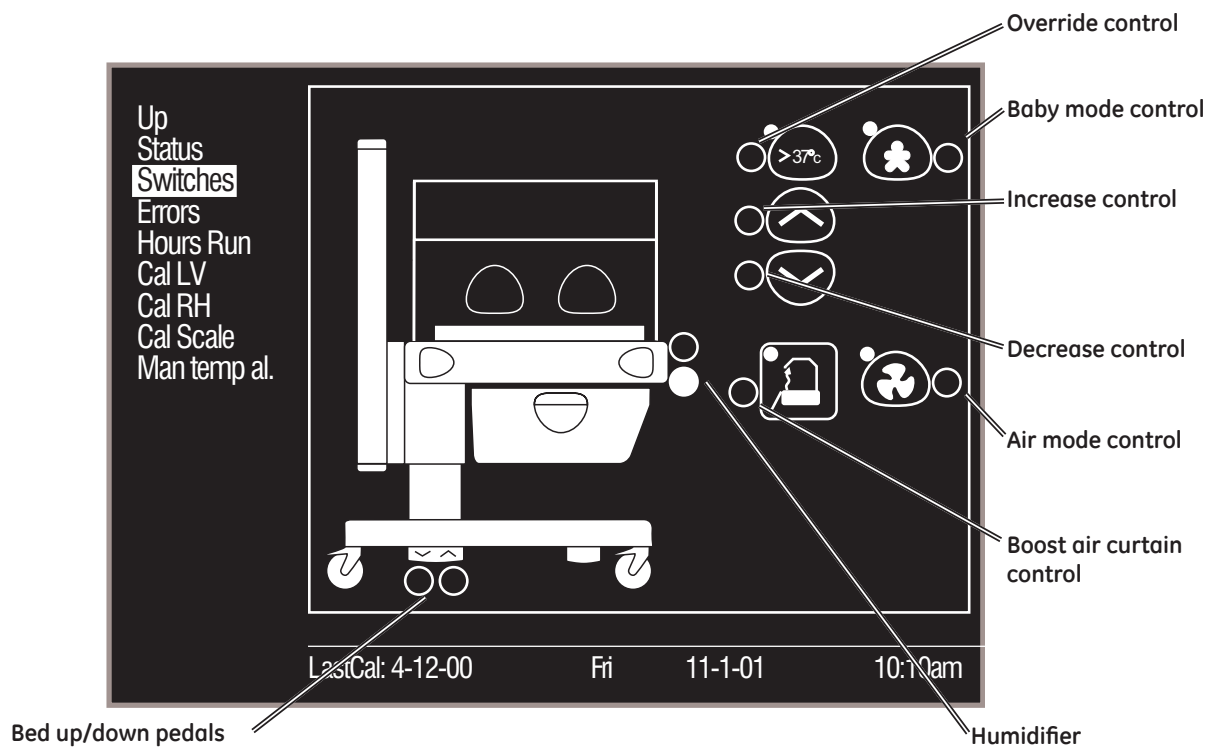


Figure 4-4 Switch Diagnostic Diagram

Item	Description
Errors	Lists a chronological log of the last 8 system errors that occurred. Shows error number and date. It is possible to clear the list.
Hours Run	Brings up a screen with 2 hour meters; one that is resetable and one that is not. To reset the resetable hour meter, highlight CLEAR and push the control knob.
Cal LV	Use to calibrate line voltage at the factory. To calibrate line voltage follow the procedure in section 3.4.
Man temp al.	Use to enable or disable the patient temperature alarms in the air mode.
Pedals	In the event of an bed up/down pedal failure, selecting pedals allows the bed to be raised or lowered (revision 1.5 software and higher).
BatLoad	Used for manufacturing only, not for service use.
Cal RH	Brings up humidifier calibration screen. Refer to "Chapter 3: Calibration and Maintenance" for information on how this screen is used.

Item	Description
Cal Scale	Brings up scale calibration screen. Refer to "Chapter 3: Calibration and Maintenance" for information on how this screen is used.

A number of diagnostic readings appear on the right side of the service screens.

DAG Volt	0000	ADT	22.66
Language	English	ACT	22.65
Temp U	C	P11	327.67
Volume	Maximum	P12	327.67
Pat Alarm	1.0C	P21	327.67
Elevate	Enable	P22	327.67
Pat Ctrl	Both	HSP	18208
Pat Algo			
Reserved		LV1	117.4
Reserved		LF	60
Scale U	gms	MC	0.001
Scale R	10g	TV	1.648
Comfort	Enable	HFS	1500
Set Time		LFS	1000
View Mods		RH	49
Down		VR	1.233
		DV	0.000

Last Cal: 4-12-00 Fri    11-1-01 9:54am

**Figure 4-5** First Service Screen: Diagnostics

Item	Description
HFS	High fan speed. Should be 1500 + 100 (measured at power up only)
LFS	Low fan speed. Should be 1000 + 100 (measured at power up only)
RH	Relative Humidity. % humidity read in the patient chamber
SR	Scale counts raw
SC	Scale counts corrected (1 count = 1 gram)
ADT	Air display temperature. Temperature read by the first thermistor in the compartment air probe. Should be + 0.3°C of ACT temperature.
ACT	Temperature read by second thermistor in the compartment air probe. Should be + 0.3°C of ADT temperature.
P11	Reading from the first thermistor in patient jack 1. Should be + 0.5°C of P12 temperature.
P12	Reading from the second thermistor in patient jack 1. Should be + 0.5°C of P11 temperature.
P21	Reading from the first thermistor in patient jack 2. Should be + 0.5°C of P22 temperature.
P22	Reading from the second thermistor in patient jack 2. Should be + 0.5°C of P21 temperature.
HSP	Heat sink sensor resistance. Should be approximately 20000 ohms @ 25°C. Refer to the Tips section 4.6.7 for resistance verses temperature values.
LV1	Line voltage in first mains circuit.
LF	60Hz or 50Hz
MC	Motor current. Shows current drawn by the e-base motor
TV	Thermistor voltage. Voltage of thermistor circuits located on the mother board.

Item	Description
5V	Power supply voltage. Should be + 0.25V of 5V
VR	Voltage reference. Independent voltage reference. Should be 1.235V + 1%
DV	DAC output voltage. It should match the DAC volt value within 10 mV.
BV	Used for manufacturing only, not for service use.

Across the bottom of the screen the date of last time the temperature and line voltage calibration was performed appears plus the current time settings of the unit.

## 4.3 Alarm Messages

This section describes the alarm messages that may appear for the Giraffe Incubator. The alarms have been organized in this section alphabetically.

### 4.3.1 "Air Probe Failure" Alarm

Cause or Circumstances	Failure	Action
The software detected a difference in the two air thermistors of > 0.5C	Defective compartment air probe or harness	Measure the resistance of the two sensors at the harness from control board J1, Pins 1-2, and 3-4. Under stable conditions, the resistances should be within about 100 ohms. If defective, disassemble the air probe assembly and disconnect the 5 pin connector inside. Measure resistance of the two thermistors at pins 1-2 and 3-4 to determine if the sensor or harness is defective. Refer to the Tips section 4.6.6 for resistance values.
Defective control board.		If the thermistors and harness measure OK, replace the control board.

### 4.3.2 "Air Temp >38C" or "Air Temp >40C" Alarm

Cause or Circumstances	Failure	Action
Air Temp >38C or Air Temp >40C alarm activated even though compartment temp is < alarm temp.  This alarm does not self reset after alarm condition is resolved.	None	Push the alarm silence button to clear the alarm.

### 4.3.3 “Baby Hot” or “Baby Cold” Alarm

Cause or Circumstances	Failure	Action
<p>Baby Hot or Baby Cold alarm activated while unit is in Air Mode.</p> <p>MANUAL TEMP alarm is set as active on the nurse setup screen or the service screen.</p>	None	On service screen or nurse setup screen, select OFF for the MAN TEMP ALARM setting.

### 4.3.4 “Baby Mode Disabled” Alarm

Cause or Circumstances	Failure	Action
Baby mode has been disabled in the service screen and baby mode button is pressed.	None	<p>Press alarm silence button to deactivate the alarm.</p> <p>If you wish to use the baby mode, re-enable it in service screen.</p>

### 4.3.5 “Baby Probe 1 (or 2) Failure” Alarm

Cause or Circumstances	Failure	Action
Probe thermistors show difference > 0.5C.	Defective patient probe	Replace patient skin probe.
	Defective patient probe jack wiring	Plug patient probe into probe jack 1. In service mode, note the difference between readings from P11 and P12. Plug the same probe into probe jack 2 and note the difference between readings from P21 and P22. If they are greater there is resistance in the probe jack harness. Replace the harness.

### 4.3.6 “Bad Membrane Switch” Alarm

Cause or Circumstances	Failure	Action
All	Defective membrane switch panel	Test switches in service mode. Replace membrane switch panel.

## 4.3.7 "Bed Heater Failure" Alarm

Cause or Circumstances	Failure	Action
The software has turned on the incubator heater but it is either not turning on or the current sense circuit is not detecting that it is on.	The bed safety thermostat is open (possibly because the unit was shut down when the heater was hot).	If the unit was shut off when the heater was hot, allow the fan to run for several minutes to cool to below 40 degrees C then power down and back up. If the failure still persists, continue .
	Defective incubator heater, thermostat, or wire harness.	Check the resistance of the incubator heater. Refer to the Tips section 4.6.2. If defective, remove the chassis cover and measure resistance at thermostat and heaters to determine if heater, thermostat, or wire harness is defective.
	Defective incubator solid state relay (SSR).	In service mode, check the voltage across the control line of the incubator heater SSR. This control signal varies between 0 VDC and about 12 VDC.  If voltage is present replace SSR. The two SSRs are identical and can be swapped for troubleshooting. If no voltage, continue.
	Defective 50 pin ribbon cable between the relay and control board.	Check for continuity on pins 36, 38, 39, and 40 (control signals). If defective, replace cable. If OK, continue.
	Defective relay board.	Replace the relay board.

## 4.3.8 "Bed Up/Down Pedal Failure" Alarm

Cause or Circumstances	Failure	Action
One of the bed up/down pedal switches is shorted.	Defective bed up/down pedal switch or harness.	<p>Check the switches on the service screen to determine which switch is shorted or open. Refer to the Tips section 4.6.8. To determine if a switch is defective or the wiring has a short:</p> <ul style="list-style-type: none"> <li>• If the shroud assembly is in two pieces, raise the lower shroud and check continuity at the switch connectors.</li> <li>• If the shroud assembly is in three pieces, take off the back cover, disconnect the lower shroud from the base plate, lean the shroud forward to access the switches, and check continuity at the switch connectors. Check connections before reassembling.</li> </ul>
Defective relay board.	Defective relay board.	If the alarm persists, replace the relay board.

### 4.3.9 “Bed Up/Down Pedal Switches Disabled” Alarm

Cause or Circumstances	Failure	Action
Bed up/down pedal switches have been disabled in nurse setup screen or service screen and pedal is pressed.	None	When pedal is released, the alarm deactivates.  <b>NOTE:</b> If the bed up/down pedal switches are disabled in the service screen and you wish to use them, you can reactivate them only in the service screen.

### 4.3.10 “Down Pedal Pressed” Alarm

Cause or Circumstances	Failure	Action
The bed down pedal switch was pressed and held on during power up.	None	When the bed down pedal switch is released, the alarm deactivates. If alarm silence button is pressed or the pedal remains on for 100 seconds the Bed Down Pedal Failure alarm activates and the bed down pedal switches are disabled. Shut down the unit and power up to clear failure.
Other	Bed down pedal switch has failed	Refer to section 4.3.8 for troubleshooting information.

### 4.3.11 “Fan Always in High Speed” Alarm

Cause or Circumstances	Failure	Action
Software cannot read temperature of the heat sink sensor in incubator heat sink.	Defective heat sink sensor or harness.	Check the heat sink temperature sensor resistance in service mode. You can also check heat sink sensor resistance by disconnecting the harness from J3 at the control board. Measure between pins 1 and 2. Refer to the Tips section 4.6.5.  If defective, remove the chassis cover and disconnect the harness from heat sink sensor. Measure sensor resistance at pins 1-2 on the sensor harness to determine if sensor or harness is defective.
	Defective control board.	If the heat sink sensor and harness measure OK, then replace the control board.

### 4.3.12 “Fan Failure” Alarm

Cause or Circumstances	Failure	Action
Fan rotation is not being detected.	Optical fan sensor not detecting the fan	<b>NOTE:</b> System failure 25 and FAN FAILURE are both triggered by the optical fan sensor not detecting the fan. If this occurs at power-up, a system failure 25 will activate. If it occurs after the power tests are completed, the FAN FAILURE alarm will activate.

Cause or Circumstances	Failure	Action
Fan is not turning.	Fan or fan hub not seated properly	Verify the fan hub is properly seated all the way down on the fan shaft. (It may be necessary to wet the part to get it to slide all the way down on to the shaft.) Verify the fan is seated in the groove at the top of the hub.
	Defective fan motor	Replace the fan motor.
	Defective relay board	Replace the relay board.
	Old design fan.	Replace with new design fan. The new fan can be identified by the grooves molded in the 2 black areas on the bottom of the fan (side facing the heat sink). The old fan has smooth surfaced black areas.
	Defective or obstructed optical sensor. Sensor holder or sensor gasket dirty or crazed.	Check that sensor, sensor holder, and gasket and free of dirt or other contaminants. Clean or replace.
	Defective 50 pin ribbon cable between the relay and control board.	Check for continuity on pin 9 (AIRFLOW). If defective, replace the cable. Refer to the Tips section 4.6.9.
	Defective relay board.	If the problem persists, replace the relay board.

### 4.3.13 "Humidifier Failure" Alarm



**NOTE:** The "Humidifier Failure" alarm can be caused by non-humidifier issues.

Cause or Circumstances	Failure	Action
The Motor Drive Failure alarm is on.	If this alarm activates, it opens safety relay 2 and disables the humidifier.	Refer to section 4.3.14 for troubleshooting.
The Elevating base does not function. If the elevating base does not function, then safety relay 2 is not being energized.	Defective 50 pin ribbon cable between the relay and control board.	Check for continuity on pin 34 (safety relay 2 control signal). If defective, replace the cable. If good, replace the relay board.
Elevating base functions	Humidifier safety thermostat is open.	Wait for the heater to cool. Cycle power to see if alarm resets.
	Defective humidifier heater or humidifier safety thermostat.	Check safety thermostat and humidifier heater resistance. Refer to the Tips section 4.6.5.



Cause or Circumstances	Failure	Action
Humidifier heater measures OK	Relay boards rev 10 or higher.	In service mode, verify mains voltage is present at the input to the humidifier isolation transformer. (J55 1-2)
	Relay boards rev 9 or lower. Humidifier Interface Board is mounted on relay board	In service mode, verify mains voltage is present at the input to the humidifier isolation transformer. (J55 1-2) J56 is on Humidifier Interface Board mounted on relay board.
No mains voltage at input to humidifier isolation transformer. (J55, 1-2)	Defective fuse. Relay boards rev 10 or higher	Check fuses F3 and F4 on the relay board. If OK, continue.
	Defective fuse. Relay boards rev 9 or lower. Humidifier Interface Board is mounted on relay board.	Check fuses on humidifier interface board.
	Defective relay board.	Replace the relay board.

#### 4.3.14 "Motor Drive Failure" Alarm

Cause or Circumstances	Failure	Action
The software has detected that the elevating base motor was running when not turned on.	Defective relay board.	Replace the relay board.  <b>NOTE:</b> Humidifier will not operate during this failure.

#### 4.3.15 Power Failure (LED Indicator)

Cause or Circumstances	Failure	Action
No AC power into unit	On/Off switch is not turned on.	Verify cord is plugged into a live wall outlet. Verify power switch/circuit breaker on back of unit is turned on.
Mains power is present but the 5V power supply is not present.	Defective fuse F1 or F2 on relay board.	Check the 5 volt supply. Refer to the Tips section 4.6.3. If no 5 volts, possible defective fuses on mains to the power supply. Check F1 and F2 on relay board.
	Defective power supply.	Check input to power supply for mains voltage. If present and no 5 volts at output, then power supply is defective.

#### 4.3.16 "Temperature out of Calibration" Alarm

Cause or Circumstances	Failure	Action
Calibration data is lost.	Defective calibration.	Perform system calibration
	Defective control board.	If problem persists replace the control board.

### 4.3.17 "Up Pedal Pressed" Alarm

Cause or Circumstances	Failure	Action
The bed up pedal switch was pressed and held on during power up.	None	When the bed up pedal switch is released, the alarm deactivates. If the alarm silence button is pressed or the pedal remains on for 100 seconds, the Bed Up Pedal Failure alarm activates and the Bed Up Pedal Switches are disabled. Shut down the unit and power up to clear failure.
Other	Bed up pedal switch has failed.	Refer to section 4.3.8 for troubleshooting information.

## 4.4 Error Codes

The following sections describe the meaning of each system failure code for Giraffe Incubator. Each table lists the possible causes and the corresponding recommended actions, in the order in which they should be tried.

For information on Giraffe Scale error codes, refer to the Giraffe Scale Service Manual, which can be ordered as part of a Giraffe Incubator service manual kit: (US) 6600-0847-801 or (INTL) 6600-0847-802.

### 4.4.1 System Failure 0

System failure 0 indicates: Communication error between the display driver board and the control board.

Cause(s)	Action(s)
Defective scale.	Disconnect the scale connector at probe panel. Power cycle the unit. If the error clears, replace the scale.
Defective scale harness.	Disconnect the scale harness from J7 on the control board. (The scale may be plugged in.) Power cycle the unit. If the error clears, replace the scale harness.
Defective Servo Oxygen board.	Disconnect the RS485 harness from J8 on the Servo Oxygen board. Power cycle the unit. If the error clears, replace the Servo Oxygen Board.
Defective Servo Oxygen cable.	Disconnect RS485 bus cable from J6 on the control board. Power cycle the unit. If the error clears, replace the RS485 cable going to the Servo Oxygen board.
Defective battery.	The battery is used only for power failure. Try powering up the unit with the battery disconnected. If the error clears, replace the battery.
Defective 14 pin ribbon cable between control board and display driver board.	Check that the 14 pin ribbon cable is properly seated at J6 on the control board and at J20 on the display driver board. (Have all three parts on hand and try them one at a time. Try routing the cable around the outside of unit first, then try the display board, and then try the control board. If the error is intermittent, replace all three.)
Defective display driver board.	Replace display driver board.

Cause(s)	Action(s)
Defective control board.	Replace control board.

#### 4.4.2 System Failure 1

System failure 1 indicates: No Timer2.

Cause(s)	Action(s)
The Timer2 circuit of the microprocessor on the control board is defective.	Replace the control board.

#### 4.4.3 System Failure 2

System failure 2 indicates: Timer2 too fast.

Cause(s)	Action(s)
Defective scale.	Disconnect scale connector at probe panel. Power cycle the unit. If the error clears, replace the scale.
Defective scale harness.	Disconnect scale harness from J7 on the control board. Power cycle the unit. If the error clears, replace the scale harness.
There is no line frequency signal to feed timer0 and timer1 of the microprocessor on the control board, or the timer2 of the microprocessor on the control board, is defective.	Power cycle the unit. If system failure 8 appears, follow the instructions for system failure 8 in section 4.4.8. If system failure 2 persists, replace the control board.

#### 4.4.4 System Failure 3

System failure 3 indicates: During ADC calibration, the software detected a channel out of range.

Cause(s)	Action(s)
During system calibration, J1, J2, and J4 were not unplugged, or calibration jumper JP1 is not installed properly.	Before calibrating, make sure J1, J2, and J4 on the control board are disconnected. Verify JP1 is correctly positioned. (Refer to section "3.3 System Calibration" on page 21.)
Defective circuit on control board.	Replace the control board.

#### 4.4.5 System Failure 5

System failure 5 indicates: The volt reference is out of the 1.171V - 1.259V range.

Cause(s)	Action(s)
System calibration required.	Perform system calibration.
Defective control board.	Replace the control board.

#### 4.4.6 System Failure 6

System failure 6 indicates: Defective overtemp DAC circuit on the control board.

Cause(s)	Action(s)
System calibration required.	Perform system calibration.
Defective control board.	Replace the control board.

#### 4.4.7 System Failure 7

System failure 7 indicates: 1.0 V Thermistor reference voltage is out of 0.951V - 1.049V range.

Cause(s)	Action(s)
System calibration required.	Perform system calibration.
Defective control board.	Replace the control board.

#### 4.4.8 System Failure 8

System failure 8 indicates: No Line Frequency. When troubleshooting this error code, have control board, 50 pin ribbon cable, and relay board on hand.

Cause(s)	Action(s)
Defective control board.	Measure the signal on the control board between J9 pin 43, and TP1-4 (Ground). It should be a 120 hertz signal. If the signal is OK, replace the control board.
Defective 50 pin ribbon cable between the relay board and control board.	If no signal, check continuity on the 50 pin cable, pin 43. If defective, replace the cable.
Defective relay board.	Replace the relay board.

#### 4.4.9 System Failure 11

System failure 11 indicates: The ADC on the control board is not operating to spec (too slow).

Cause(s)	Action(s)
Defective humidifier sensor or cable	Disconnect J1 on the control board. If it powers up OK, either the cable or the humidity sensor is defective. Reconnect J1 and disconnect the 4 pin humidity sensor connector in the compartment probe. If the unit now powers up OK, the humidity sensor is defective. If not, the cable is defective.
Defective control board.	If the error persists with the replaced sensor or cable, replace the control board.

#### 4.4.10 System Failure 12

System failure 12 indicates: Incorrect control board system software checksum.

Cause(s)	Action(s)
Defective system software PROM on control board.	Install new system software 6600-0234-850.
Defective control board.	If the error persists with new software, replace the control board

#### 4.4.11 System Failure 13

System failure 13 indicates: Defective SRAM.

Cause(s)	Action(s)
Defective SRAM circuit on control board.	Replace control board

#### 4.4.12 System Failure 14

System failure 14 indicates: Defective WDOG.

Cause(s)	Action(s)
Defective watch dog circuit on control board	Replace control board.

### 4.4.13 System Failure 15

System failure 15 indicates: Safety Relay 1 test failure. Unable to turn incubator heater on or off by switching safety relay 1. When troubleshooting this error code, have on hand at least the 50 pin ribbon cable.

Cause(s)	Action(s)
If this error occurs during system calibration, J1, J2, and J4 were not unplugged, or calibration jumper JP1 is not installed properly.	Before calibrating make sure J1, J2 and J4 on the control board are disconnected. Verify jumper JP1 is correctly positioned. (Refer to section "3.3 System Calibration" on page 21.)
Air temperature sensor is above 40C at power-up.	If the unit was shut off when the heater was hot, allow the fan to run for a few minutes to cool to below 40C, then power down and back up.
Defective sensor in compartment air probe.	Disconnect connector J1 from the control board. Power cycle the unit. If the error clears either the compartment air probe or the air probe cable is defective. Reconnect J1 and disconnect the compartment air probe connector at the compartment probe. If the unit now powers up OK the compartment air probe is defective.
Defective compartment air probe cable	If system failure 15 persists with connector J1 connected, and the compartment air probe disconnected, then the compartment air probe cable is defective.
No output from heater isolation transformer. Defective relay board.	<p>In service mode, check the output voltage of the heater isolation transformer at the one pin connectors on the black and white wires on the transformer secondary. This secondary voltage should always read 115 volts.</p> <ul style="list-style-type: none"> <li>• If 115 volts is present, then replace the relay board.</li> <li>• If 115 volts is not present, check that the mains voltage is input to the transformer primaries.</li> <li>• Be sure J49 on the relay board is properly connected.</li> <li>• Verify the configuration plug on the transformer primary is seated properly.</li> </ul> <p>To measure primary input voltage on 115 volt units:</p> <ul style="list-style-type: none"> <li>• Verify mains voltage is present at pins 2-5 (brown and orange wires) on the transformer primary configuration plug.</li> <li>• Verify mains voltage is present at pins 3-6 (yellow and blue wires) on the transformer primary configuration plug.</li> </ul> <p>To measure primary input voltage on 230 volt units:</p> <ul style="list-style-type: none"> <li>• Verify mains voltage is present at pins 2-6 (brown and blue wires) on the transformer primary configuration plug .</li> <li>• If voltages are not present, verify mains voltage is present at pins 1-4 (black and red wires) on the transformer primary configuration plug.</li> <li>• If not, replace the relay board.</li> </ul>

Cause(s)	Action(s)
Defective heater isolation transformer	If voltage is present at primaries but no voltage output at secondaries, replace the heater isolation transformer.
Defective DAC circuit on control board.	If failure persists, replace control board.
Defective solid state relay (SSR)	Power up the unit in service mode. Run status test on the second service screen and verify that the I/HTROFF (incubator heater off) test fails. If the status test fails, then it is an SSR problem. If the status test does not fail, then try the recommended action for a defective current sense circuit on relay board, below.
Defective incubator heater SSR	Disconnect the black wire (larger diameter) from the AC side of the incubator heater solid state relay. Run status test. If I/HTROFF test passes replace the incubator heater SSR. If it still fails reconnect the wire to the SSR.
Defective current sense circuit on relay board.	Replace relay board.
Defective 50-pin ribbon cable	If failure persists, replace 50 pin ribbon cable.

#### 4.4.14 System Failure 16

System failure 16 indicates: When the unit performed Power-on Self Test, the incubator heater could not be turned off.

Cause(s)	Action(s)
If this error occurs during System Calibration	Reconnect J1, J2 and J4 on the control board. Put JP1 in Normal position. (Refer to section "3.3 System Calibration" on page 21.) Power up unit in normal operating mode and follow instructions for the error that occurs.
Defective incubator heater SSR	Disconnect the black wire (larger diameter) from the AC side of the incubator heater solid state relay. Run status test. If I/HTROFF (incubator heater off) test passes replace the incubator heater SSR. If it still fails reconnect the wire to the SSR.
Defective current sense circuit on relay board.	If failure persists, replace relay board.

#### 4.4.15 System Failure 18

System failure 18 indicates: Defective Variables.

Cause(s)	Action(s)
Defective SRAM circuit on control board.	Replace the control board.

#### 4.4.16 System Failure 19

System failure 19 indicates: No Audio Frequency.

Cause(s)	Action(s)
Defective battery	Battery is only used for power fail. Try powering up the unit with the battery disconnected. If the error clears, replace the battery.
Defective scale.	Disconnect scale connector at probe panel. Power cycle the unit. If the error clears, replace the scale.
Defective scale harness.	Disconnect scale harness from J7 on the control board. Power cycle the unit. If the error clears, replace the scale harness.
Defective Servo Oxygen board.	Disconnect the RS485 harness from J8 on the Servo Oxygen board. Power cycle the unit. If the error clears, replace the Servo Oxygen Board.
Defective Servo Oxygen cable.	Disconnect RS485 bus cable from J6 on the control board. Power cycle the unit. If the error clears, replace the RS485 cable going to the Servo Oxygen board.
Defective audio circuit on control board.	Replace socketed IC U22 on control board. If failure persists, replace the control board.
Defective control board	Replace the control board.

#### 4.4.17 System Failure 20

System failure 20 indicates: Display WDOG Time Out.

Cause(s)	Action(s)
Display driver board software is not performing correctly.	Replace the display driver board.

#### 4.4.18 System Failure 22

System failure 21 indicates: During operation, the incubator heater will not turn ON.

Cause(s)	Action(s)
Refer to other errors.	Power down the unit. During the system tests after power-up the unit should detect system failure 15 or bed heater failure. Follow the instructions in this manual for those failures. Follow the instructions for system failure 15 in section 4.4.13 or for bed heater failure in section 4.3.7.
Error reading distorted line signal.	Check the revision of the relay board. The revision code is located in a triangle printed on the component side of the PCB. Refer to relay board Figure 6-34 (revision 10 or higher) and Figure 6-35 (revision 9 or lower). If the relay board is revision 10 or lower, replace with revision 13 or higher relay board.
	If you have replaced the relay board with revision 13 or higher and you still have an intermittent problem, follow the instructions for system failure 15 in section 4.4.13.



#### 4.4.19 System Failure 23

System failure 23 indicates: During operation the system was unable to turn the incubator heater OFF.

Cause(s)	Action(s)
Other errors.	Power down the unit. During the system tests after power-up, the unit should detect system failure 16. Follow the instructions in this manual for this failure.
Defective relay board.	If system failure 23 persists without system failure 16, replace the relay board.

#### 4.4.20 System Failure 25

System failure 25 indicates: Fan rotation is not being detected.

**NOTE:** System failure 25 and FAN FAILURE are both triggered by the optical fan sensor not detecting the fan. If this occurs at power-up a system failure 25 will activate. If it occurs after the power tests are completed the FAN FAILURE alarm will activate.

Circumstance(s)	Cause(s)	Action(s)
Fan is not turning	Fan not connected.	Check jack.
	Fan or fan hub not seated properly.	Verify the fan hub is properly seated all the way down on the fan shaft and is seated in the groove at the top of the hub.
	Defective relay board.	Replace relay board.
	Defective fan motor.	Replace fan motor.
Fan is turning	Fan is turning too slow.	Check fan speed in service mode, should be about 1500 RPM in high fan speed. Note that this RPM measurement is only tested during the power up tests.
	Old design fan.	Replace with new design fan. The new fan can be identified by the grooves molded in the 2 black areas on the bottom of the fan (side facing the heat sink). The old fan has smooth surfaced black areas.
	Defective or obstructed optical sensor. Sensor holder or sensor gasket dirty or crazed.	Check that sensor, sensor holder, and gasket and free of dirt or other contaminants. Clean or replace.
	Defective 50 pin ribbon cable between the relay and control board.	Check for continuity on pin 9 (AIRFLOW). If defective replace cable.
	Defective relay board.	Replace relay board.

#### 4.4.21 System Failure 26

System failure 26 indicates: During the power up tests, the system was unable to turn off safety relay 1.

Cause(s)	Action(s)
Defective relay board.	Replace the relay board.

#### 4.4.22 System Failure 27

System failure 27 indicates: Defective non-volatile memory.

Cause(s)	Action(s)
Defective circuit on control board.	Replace the control board.

#### 4.4.23 System Failure 28

System failure 28 indicates: During operation, the display driver board lost communication with control board.

Cause(s)	Action(s)
Refer to system failure 0.	Power down the unit, during the self-test the unit should detect system failure 0. Follow the instructions for system failure 0 in section 4.4.1.
Defective flat ribbon cable between control board and display board.	If system failure 28 persists without system failure 0, replace the flat ribbon cable between control board and display board.

#### 4.4.24 System Failure 29

System failure 29 indicates: Defective signal on control board.

Cause(s)	Action(s)
Defective control board	Replace the control board.

#### 4.4.25 System Failure 30

System failure 30 indicates: Mains voltage reading LV1 is outside of the expected range.

Cause(s)	Action(s)
Mains Voltage Comp Circuit is not calibrated correctly.	Calibrate the line voltage.
High or low mains voltage. This failure is triggered if the mains voltage is outside the following ranges: <ul style="list-style-type: none"> <li>• 100V: 80-115V</li> <li>• 115V: 95-132V</li> <li>• 230V: 195-270V</li> </ul>	Connect to proper mains voltage source
Defective 50 pin ribbon cable between the relay and control board.	Check for continuity on pin 48 and 49 (LineComp1,2) If defective replace cable.
Defective relay board.	Measure the voltages at the relay board: <ul style="list-style-type: none"> <li>• J37 pin 48-45 and J37 pin 49-45.</li> <li>• If mains voltage 100/115 = 3-5 volts, difference within 0.4 volts.</li> <li>• If mains voltage 230 = 7-10 volts, difference within 0.8.</li> <li>• If not, replace the relay board.</li> </ul>
Defective control board.	If the voltages are OK, replace the control board.

#### 4.4.26 System Failure 33

System failure 33 indicates: Defective RH Solid State Relay.

Cause(s)	Action(s)
Defective RH Solid State Relay.	Replace relay board

#### 4.4.27 System Failure 34

System failure 34 indicates: Software revision level does not match.

Cause(s)	Action(s)
The software revision of the control board and the display board are not compatible	This error may occur after replacing the control/display board. Be sure to install the software provided in the control/display board. Replace the System Software.

**4.4.28 System Failure 35**

System failure 35 indicates: Wrong dipswitch set up.

Cause(s)	Action(s)
Switches set wrong	Check the 8 position dipswitch on the control board. Verify that Switch 1 is on and Switch 2 is off.
Defective control board.	Replace control board.

**4.4.29 System Failure 50**

System failure 50 indicates: Incorrect display driver board System Software checksum.

Cause(s)	Action(s)
Defective System Software PROM on display driver board.	Install new system software 6600-0234-850.
Defective display driver board.	If the system failure persists, replace display driver board.

**4.4.30 System Failure 51**

System failure 51 indicates: Display Defective SRAM.

Cause(s)	Action(s)
Defective SRAM circuit on the display driver board	Replace the display driver board.

**4.4.31 System Failure 52**

System failure 52 indicates: Display No Timer2.

Cause(s)	Action(s)
Defective display driver board.	Replace the display driver board.

**4.4.32 System Failure 53**

System failure 53 indicates: Display Timer2 Too Fast.

Cause(s)	Action(s)
Defective display driver board.	Replace the display driver board.

#### 4.4.33 System Failure 55

System failure 55 indicates: Display board On Line Self Test Failure.

Cause(s)	Action(s)
Defective display driver board.	Replace the display driver board.

#### 4.4.34 System Failure 98

System failure 98 indicates: Overflow.

Cause(s)	Action(s)
Software on the control board is not performing correctly.	Replace the control board.

#### 4.4.35 System Failure 99

System failure 99 indicates: Logic problem on the control board.

Cause(s)	Action(s)
Software on the control board is not performing correctly.	Replace the control board.

### 4.5 Troubleshooting Symptoms

Symptom	Possible Cause	Action
No audio alarm.	Defective speaker or harness.	Use an ohmmeter to verify the speaker resistance is about 8 ohms at relay board connector J40, pins 5-6. If defective, determine whether speaker or harness is defective as follows: <ul style="list-style-type: none"> <li>If the shroud assembly is in two pieces, raise the lower shroud to access the speaker connector, and measure the resistance.</li> <li>If the shroud assembly is in three pieces, take off the back cover, disconnect the lower shroud from the base plate, lean the shroud forward to access the speaker connector, and measure the resistance.</li> </ul>
	Audio driver circuitry on control board is defective.	Replace the control board.

Symptom	Possible Cause	Action
Unit equipped with servo-humidity but RH setpoint only shows 1-10.	Unit was powered on and the compartment probe was not plugged in at the probe panel (only on old style units with connector)	Cycle power after compartment probe is plugged in.
	Defective humidity sensor	Replace the humidity sensor.
	Defective control board.	If problem persists, replace control board.
ADD WATER message stays on even after water has been added.	Reservoir switch button is jammed (only on units with old style button).	Remove reservoir, but take care because surface may be hot! Check that the white reservoir switch button moves freely. If it is stuck in the closed position it should be replaced with the new style. (6600-1298-500)
	Defective reservoir switch.	Check resistance of reservoir switch at relay board harness J32, 2-3. Switch should be closed when reservoir is closed and open when reservoir is open.
	Defective 50 pin ribbon cable between the relay and control board.	Check for continuity on pin 6 (RHBOTTLE). If defective, replace cable.
	Defective relay board.	Replace relay board.
	Defective control board.	Replace control board.
Elevating base will not go up or down.	Pedal switches are disabled on nurse setup screen or service screen.	Check Setup screen (wrench symbol) or service screen to see if pedal switches are disabled.
	Defective toroidal transformer	Check the toroidal transformer. Refer to the Tips section 4.6.10. Replace transformer if defective.
	No mains input to the toroidal transformer.	Replace relay board.
	Output voltage from the toroidal transformer is OK. Defective fuse on relay board.	Check fuses F5, F6 on the relay board.
	Defective 50 pin ribbon cable between the relay and control board.	Check for continuity on pins 23, 24, 26, 27, 34 (motor control and safety relay 2 control signals). If defective, replace the cable.
	Output voltage from the toroidal transformer is OK. Fuses on relay board are OK. Defective elevating base motor.	Check the voltage to the elevating column motor. Refer to the Tips section 4.6.8. If OK, replace the elevating column assembly.
	Defective relay board.	Replace relay board.

Symptom	Possible Cause	Action
Unit will not switch to Baby Control Mode.	A patient probe is plugged into Jack 2 on the probe panel.	Disconnect probe from Jack 2 (unit will only allow Baby Control operation with a single probe in Jack 1).
	Baby Control is disabled on Service screen.	Select BOTH for Patient Control on service screen to activate Baby Control.
Unit will not power up, alarm sounds.	Defective scale.	Disconnect scale connector at probe panel. Power cycle the unit. If error clears replace the scale.
	Defective scale harness.	Disconnect scale harness from J7 on the control board. Power cycle the unit. If error clears replace the scale harness.
	Defective Servo Oxygen board.	Disconnect the RS485 harness from J8 on the Servo Oxygen board. Power cycle the unit. If the error clears, replace the Servo Oxygen Board.
	Defective Servo Oxygen cable.	Disconnect RS485 bus cable from J6 on the control board. Power cycle the unit. If the error clears, replace the RS485 cable going to the Servo Oxygen board.
	Defective battery.	Remove the electrical enclosure cover and disconnect the battery. Power down and power up again. If the unit powers up, replace the 9V battery (66001024600).
	Defective power supply.	Check power supply voltages. Refer to the Tips section 4.6.3.
	Defective power harness to display board.	Verify power supply voltages at J23 on display driver board. <ul style="list-style-type: none"> <li>• +5V 1-2</li> <li>• +12V 1-3</li> <li>• +5STBY 1-4</li> </ul>
	Defective display driver board	Disconnect ribbon cable from J6 on control board. Power up unit. Giraffe logo should appear on display. After about 70 seconds the audible alarm sounds. If the logo does not appear replace the display driver board.
	Defective control board.	Replace control board.
Baby Hot or Baby Cold alarms activated while unit is in Manual Mode.	MANUAL TEMP alarm is selected on the Setup screen	Select OFF for MANUAL TEMP alarm on Setup screen.
Air Temp >38C or Air Temp >40C alarm activated even though compartment temp is < alarm.	Alarm is not designed to automatically reset after alarm condition is resolved.	Push the alarm silence button to clear the alarm.

Symptom	Possible Cause	Action
Bed warms up very slowly, may not reach set temperature.	One of the bed heater cartridges is defective.	Feel the heat sink to see if one side is cooler than the other. Use care, since the heat sink can reach temperatures as great as 121C (250F). Replace the cartridge on the cool side.
Unit always powers up in service screen mode.	Defective dipswitch setting	Check position 8 on the control board dipswitch. Should be set to Off position.
	Override switch (>37C) on control panel shorted	Check switch on switch diagnostic screen.
Screen refreshes every few seconds while scale is attached.	Defective circuit on control board (Unbiased RS485 bus during idle state).	Replace control board with revision 17 or higher.
	Defective scale.	Disconnect scale connector at probe panel. Power cycle the unit. If error clears replace the scale.
	Defective scale harness.	Disconnect scale harness from J7 on the control board. Power cycle the unit. If error clears replace the scale harness.
Noise from speaker on power down.	Microprocessor does not hold reset during power off.	If noise is excessive, replace control board with revision 17 or higher.
Fan is running in high speed but no FAN ALWAYS IN HIGH SPEED message and the Boost Air Curtain Indicator is not lit.	This is normal condition for 90 minutes after power up, 45 min. after transition from open to closed bed mode, and during other conditions as determined by the heat control software.	To check HIGH and LOW fan speed, power up the unit. After the power up sequence is complete, hold down the Boost Air Curtain button and press the decrease temperature button to place the unit into low fan speed. The Boost Air Curtain button will now toggle the fan between high and low speeds.
Bed will not lock in tilt position.	Tilt ball not engaged in finger pocket latch.	Tilt the head of the bed platform all the way down while holding the latch open, then let the latch close to capture the tilt ball. (Refer to "Disassembling the Incubator for Complete Cleaning" in the Operation and Maintenance manual.)
	Tilt brake pad failure.	Replace the tilt brake.
Baby Cold or Baby Hot Alarm does not trigger at 0.5C or 1.0C in Air Control mode.	Manual Temp. Alarm is disabled on Service Screen.	Enable Manual Temp. alarm.
Humidifier reservoir is crazed (has hairline cracks).	Sterilization	Replace humidifier reservoir.



Symptom	Possible Cause	Action
Humidifier reservoir has scaling.	Use of tap water	Replace humidifier reservoir.

## 4.6 Additional Troubleshooting Tips

Following are tips on taking many of the measurements and diagnosing the failures that are referred to in the troubleshooting charts. For some tips, it may be necessary to determine the revision level of the relay board. The revision code is located in a triangle printed on the component side of the PCB. Refer to Figure 6-34 and Figure 6-35.

### 4.6.1 Raising and Lowering the Elevating Base

In the event of a system failure, it may be possible to raise or lower the elevating base in the service mode. Hold down the override button (>37) to bring up the service screen. The pedals are now activated and may assist in troubleshooting or transport.

If the switches still do not operate it may be possible to raise or lower the elevating base using the pedal function on page 2 of the service screen.

### 4.6.2 Incubator Heaters and Bed Safety Thermostat

There are two 115 volt incubator heaters rated at 225 watts at 104 volts and mounted at opposite ends of the incubator heat sink. They are always connected in parallel and are powered by isolated 115 volts from the heater isolation transformer. This voltage is switched by the incubator SSR.

The resistance of each heater is about 48 ohms and they are in parallel so you should measure about 24 ohms. Note that the bed safety thermostat is in series with the heaters so if the reading is open circuit you must take readings at the connectors under the bed to determine which is defective.

To measure the incubator heater resistance on units with revision 9 or lower relay boards, disconnect the black wire on the incubator SSR and the white wire on the output of the isolation transformer and measure between these 2 wires.

To measure the incubator heater resistance on units with revision 10 or higher relay boards, disconnect the black wire on the incubator SSR and the connector from J54 on the relay board. Measure between harness connector pin 4 and the black wire.

The incubator heater and bed safety thermostat resistance can also be measured by the removing the bottom cover and measuring directly at the components.

### 4.6.3 Power Supplies

The 5V and 12V supplies are generated on the power supply. +5STBY is generated on the relay board. These voltages are distributed to the control board, display driver board, servo oxygen board, and expansion slots through a harness with a series of 4 pin connectors. The easiest place to measure the power supplies is at one of the spare 4 pin connectors on this power bus.

Signal	Location	Wire Color	Value
+5V	J42 pins 1-2	Orange and blue	4.75 to 5.25
+5VSTBY	J42 pins 1-4	Orange and green	4.75 to 5.25
+12V	J42 pins 1-3	Orange and red	10.8 to 13.2

The 5VSTBY should also be present during power fail.

+5VAN and -5VAN are generated on the control board and are only used on the control board. They can be measured on the test points on the control board.

Signal	Location	Value
+5V	TP2 pins 1-4	4.75 to 5.25
+5VSTBY	TP2 pins 3-4	4.75 to 5.25
+5AN	TP1 pins 5-6	4.75 to 5.25
-5AN	TP1 pins 4-6	-4.0 to -5.5

### 4.6.4 Switches/Thermostat

Use switch status diagram on the second service screen to assist in troubleshooting the switches.

Humidity reservoir	Relay bd J32 pins 2-3	Closed when reservoir is closed
Add water thermostat	Relay bd J32 pins 1-3	Opens when reservoir needs water

Elevating base		
Left or right up	Relay bd J40 pins 2-4	Closed when either switch is pressed
Left or right down	Relay bd J40 pins 1-4	Closed when either switch is pressed

The following switches are membrane switches. When closed the resistance should be less than 200 ohms.

Display Touch Panel Switches		
Alarm Silence	Display Driver bd J21 pins1-2	Closed when switch is pressed
>37 degrees	Display Driver bd J21 pins1-3	Closed when switch is pressed
Servo Control	Display Driver bd J21 pins1-4	Closed when switch is pressed
Up	Display Driver bd J21 pins1-5	Closed when switch is pressed
Down	Display Driver bd J21 pins1-6	Closed when switch is pressed
Intervention	Display Driver bd J21 pins1-8	Closed when switch is pressed
Manual Mode Inc.	Display Driver bd J21 pins1-9	Closed when switch is pressed

#### 4.6.5 Humidifier Heater/Safety Thermostat

The humidifier has two separate heater elements rated at 225 watts at 104 volts. They are connected in parallel for 115 volt operation and in series for 230 volt operation. The humidifier safety thermostat is in series with the heater. It opens at 130 +/-5 C and closes at 90 +/-8 C. Measure the resistance at J53.1 to J53.3.

The resistance of each heater is about 144 ohms so it should measure about 72 ohms for 115 units, 288 ohms for 230 units.

#### 4.6.6 Compartment Air Probe and Patient Probes

Use the service screen to read the temperature of the compartment and patient probes. There are two thermistors in each probe. During stable temperature conditions the thermistors should read the same resistance within a few ohms.

Patient probe #1	Control bd J4 pins 1-3, 2-3
Patient probe #2	Control bd J2 pins 1-3, 2-3
Compartment probe	Control bd J1 pins 1-2, 3-4

Temperature (C)	Resistance (Ohms)
20	12527
25	10000
30	8037
35	6500

### 4.6.7 Incubator Heat Sink Sensor Thermistor

Use the service screen to read the resistance of the heat sink sensor.

Thermistor	Control bd J3 pins 1-2
------------	------------------------

Temperature (C)	Resistance (Ohms)
20	25000
25	20000
30	16102
35	13048
40	10636
80	2506
90	1827
100	1353
110	1017
120	775

### 4.6.8 Elevating Base Motor

If you must replace a footswitch when the bed is all the way down, use pedal screen on service screen to raise or lower the bed.

The e-base is driven at 24 volts DC (acceptable range 24-32). The following chart shows the control signal values and the output voltages for each of the motor conditions.

Switch	Control Signals, Relay Board				E-base	
	J37 pin 23	J37 pin 26	J37 pin 24	J37 pin 27	J45-1	J45-2
	24V SELECT	E/H ACTIVATE	NVERTPOLARITY	E/H SELECT		
Raise E-base	0	0	1	0	+24V	Gnd
Lower E-base	0	0	0	0	Gnd	+24V
None	NA	1	NA	NA	NA	NA

### 4.6.9 Troubleshooting the 50 Pin Ribbon Cable

All of the communication between the control and relay boards passes through the 50 pin ribbon cable. Many of the troubleshooting procedures in this manual recommend that you verify continuity for specific pins in the cable. Because it is difficult to remove and measure the cable without possibly changing the resistance, it is suggested that you keep a spare 50 pin ribbon cable to use as a troubleshooting tool.

#### 4.6.10 Troubleshooting the Toroidal Transformer

Perform the following tests in service mode. The referenced voltages should always be present when the unit is in service mode. In normal operating mode, the voltages are not present if safety relay 2 contacts are open.

1. Check the output voltage of the toroidal transformer at J44 pins 1-2 and at J44 pins 3-4. Voltages should be about 15 volts AC .
2. If the voltage is not present verify that mains voltage is present at the primary input to the toroidal transformer in service mode. This voltage can be measured at relay board connector J51 pins 1-2. It can also be measured at the configuration plug on the toroidal transformer pins 1-4.
3. If the primary voltage is present and there is no output voltage, the toroidal transformer is defective.
4. If the primary voltage is not present, then replace the relay board.

#### 4.6.11 Interpreting Serial Numbers

Datex-Ohmeda products have unit serial numbers with coded logic which indicates a product group code, the year of manufacture, and a sequential unit number for identification. The serial number is in the following format:

AAAX11111

The X represents an alpha character indicating the year the product was manufactured; H = 2004, J = 2005, etc. I and O are not used.

## 4.7 Servo Controlled Oxygen

### 4.7.1 Servo Controlled Oxygen Service Screen

To access the service screens, hold in the override button (>37) during power up until the software revision screen appears. Release the button and the first service screen will appear. Select DOWN on the first screen to go to the second service screen. Select Servo O2 to bring up the Servo Controlled Oxygen service screen.

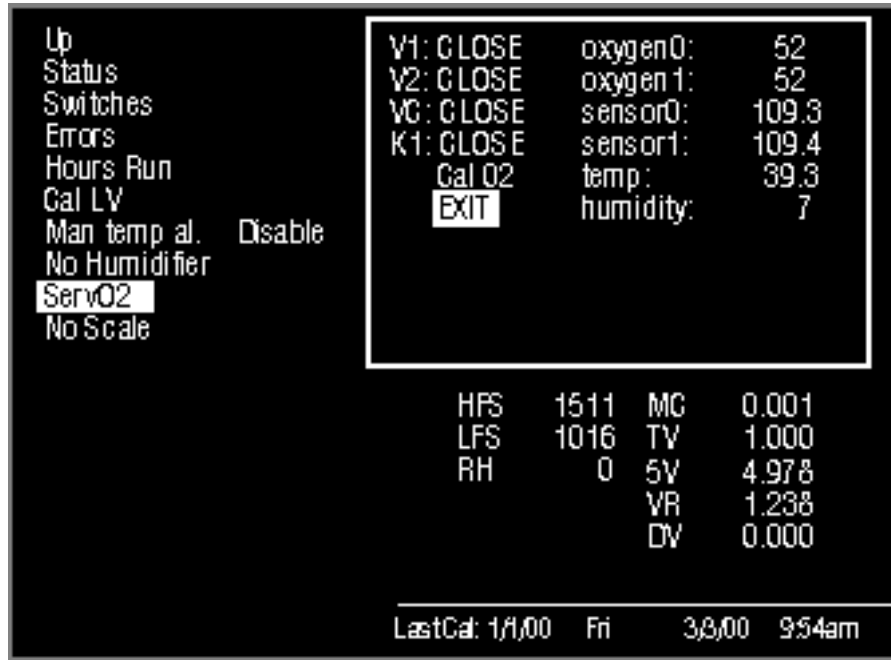


Figure 4-6 Servo Controlled Oxygen Service Screen

Item	Description
V1	Select to open or close supply valve one in the valve housing located beneath the electrical enclosure.
V2	Select to open or close supply valve two in the valve housing located beneath the electrical enclosure.
VC	Select to open or close calibration valve in the sensor housing located beneath the bed. Open is calibration position and closed is the normal operation position. The calibration fan is on and the cooling fan is off when VC is open.  <b>NOTE:</b> The cooling fan is on whenever the Servo Controlled Oxygen service screen is selected and VC is closed.
K1	Select to open or close the relay on Relay PCB that powers the valves.
Cal O2	Initiates calibration routine.
oxygen0	Oxygen reading in percent from first sensor cell:

Item	Description
oxygen1	Oxygen reading in percent from second sensor cell:
sensor0	Voltage output in millivolts from first sensor cell.
sensor1	Voltage output in millivolts from second sensor cell.  <b>NOTE:</b> The following information applies to the oxygen0, oxygen1, sensor0, and sensor1 values: <ul style="list-style-type: none"> <li>For software version 1.40 or previous versions, 23 mv - 280 mv = 21% - 100% O<sub>2</sub>.</li> <li>For software version 1.50 or later versions, 5 - 90 mv = 21 - 100% O<sub>2</sub>.</li> </ul>
temp	Temperature in degrees Celsius read from a sensor inside the sensor housing located beneath the bed. Refer to temperature to resistance curve in the Tips section 4.7.3.4.
humidity	Relative humidity in percent read from a sensor inside the sensor housing located beneath the bed.

#### 4.7.2 Servo Controlled Oxygen Alarm Messages

Alarm Message	Meaning	Cause	Action
Low Oxygen	Sensor1 reading is > 3% below the oxygen set point 7 minutes after a set point change.	Low O <sub>2</sub> supply pressure or flow.	Be sure supply is greater than 45psi (310 kPa) and flow rate is greater than 45 L/min. If flow rate is <45 check that the inlet screen in the regulator is not occluded.
		Inlet screen occluded.	Clean or replace screen.
		Air leaks into infant compartment.	Be sure all doors and portholes are closed
		Supply Valve not opening.	Check supply valves. Refer to the Tips section 4.7.3.1.
		End cap safety valve not opening.	Check valve and spring assembly. Refer to the Tips section 4.7.3.
		Calibration valve is not closing.	Check the calibration valve. Refer to the Tips section 4.7.3.2.
		Infant compartment vents occluded.	Check to be sure that the two vents in the infant compartment under the bed are not occluded.
High Oxygen	Sensor1 reading more than 3% above set point	Oxygen set point recently lowered.	Allow time for oxygen level to drop.
		Supply valve(s) not closing.	Check supply valves and kinked hoses. Refer to the Tips section 4.7.3.1.

Alarm Message	Meaning	Cause	Action
Oxygen Probe Failure	One of the sensors is reading out of range (23-280 millivolts) or the difference between the two O2 sensors is above 3%.	Defective Sensor(s)	In service mode sensor0 and sensor1 should be 23-280. If outside this range replace the sensors. If in range ensure oxygen0 and oxygen1 read within 3% of each other or replace the sensors.
		Leak or occlusion in sensor housing area.	Be sure sensor housing is seated properly and the retaining screws are tight. Be sure sensor gaskets are in place and the tubing is seated correctly in the connectors. Check to be sure that the two vents in the infant compartment under the bed are not occluded.
		Defective cable or connection.	Measure the voltage at J85.8-J85.7 (sensor0) and J85.6-J85.7 (sensor1) and compare them to displayed sensor0 and sensor1. If the measurement is the same as the displayed, check the cable and sensor contacts.
		Defective Servo O2 board.	If the measurement is not the same as the displayed, replace the Servo O2 board.
O2 Cal Lost-No O2	Servo oxygen unit has never been calibrated. Unit will not operate until initial calibration is performed.	Perform oxygen calibration.	Run calibration.
	Cell voltage less than 33 mV.	Earlier software versions did not store voltages this low.	Replace display software with 1.62 or higher.



Alarm Message	Meaning	Cause	Action
Oxygen System Failure 1	The sensor plug thermistor temperature reading is out of the range: 15C-55C.	Unit is cold: <15 degrees C.	Allow unit to warm up.
		Cooling fan is not running when the sensor housing temperature gets above 50 degrees.	Test the cooling fan. Refer to the Tips section 4.7.3.3.
		Defective sensor plug thermistor or cable.	Disconnect the cable and measure the resistance of the thermistor between J85.4 and J85.5. Refer to R/T chart in the Tips section 4.7.3.4. If sensor is shorted, open, or values don't agree with the R/T chart, replace the sensor plug assembly or the cable.
		Defective servo O2 board.	If resistance is in range replace the servo O2 board.
Oxygen System Failure 2	The RH reading is out of valid range: 1-99. When out of range it displays 0 in service mode.	Defective sensor plug.	Measure the humidity sensor voltage between J85.2 and J85.1. If the voltage is outside the range of 0.7V- 4.0V, replace the sensor plug assembly.
		Defective servo O2 board.	If it is in the correct range, replace the servo O2 Board.
Oxygen System Failure 3	The checksum test performed during power up testing failed.	Defective Microcontroller.	Replace microcontroller U6 on the Servo O2 board.
Oxygen System Failure 4	Analog to digital converter circuit self test failed. The reading of Vtest is out of the valid range: 1.216V-1.254V.	Defective Servo O2 board.	Replace servo O2 board.
Check O2 supply	After calibration, both supply valves are opened and after approximately 20 seconds, sensor1 reading is not greater than 23%.	O2 supply is not connected.	Verify O2 supply, minimum 45psi (310kPa) is connected to the inlet.

Alarm Message	Meaning	Cause	Action
Oxygen System Failure 5	Check O2 Supply alarm has been silenced twice and the sensor1 reading is still not greater than 23%.	O2 supply is not connected.	Verify O2 supply, minimum 45 psi (310 kPa) and 45 L/min is connected to the inlet.
		Calibration valve stuck in calibration position.	Check the calibration valve, Refer to the Tips section 4.7.3.2.
		Supply valves not opening.	Check supply valves. Refer to the Tips section 4.7.3.1.
		Leak or occlusion in sensor housing area.	Be sure sensor housing is seated properly and the retaining screws are tight. Be sure sensor gaskets are in place and the tubing is seated correctly in the connectors. Check to be sure that the two vents in the infant compartment under the bed are not occluded.
Oxygen System Failure 6	The Giraffe control board cannot communicate with Servo O2 board.	Defective Servo O2 board.	Replace servo O2 board.
		Defective Cable.	Check that the cable between the Giraffe control board and the Servo O2 board is seated properly.
Oxygen System Failure 7	Power up test detected a problem with the watchdog circuit.	Defective Servo O2 board.	Replace Servo O2 board.
Calibration failed	In calibration mode, after 5 minutes, both sensors are not reading between 23 and 55 millivolts so the unit cannot calibrate.	Calibration valve is not opening or the calibration fan is not turning on.	Check the calibration valve and fan. Refer to the Tips section 4.7.3.2.
		Defective sensors.	Replace the sensors.
FiO2>26%	Elevated O2 levels but Servo O2 is not turned on.	If other sources of oxygen are not in use, leak in Servo O2 system.	Check for valve leak. Refer to the Tips section 4.7.3.

**SENSITIVE TO ELECTROSTATIC DISCHARGE CAUTION**

An Electrostatic Discharge (ESD) Susceptibility symbol is displayed to alert service personnel that the part(s) are sensitive to electrostatic discharge and that static control procedures must be used to prevent damage to the equipment.

### 4.7.3 Servo Controlled Oxygen Troubleshooting Tips

#### 4.7.3.1 Check Supply Valves



Power up unit in service mode. Select Servo O2 on second page. Be sure O2 is connected. Open V1. You should hear gas flow. Close V1, open V2. You should hear gas flow. Close V2, gas flow should stop.

If both valves are not opening, test the fuses and supply valves. Disconnect J83 at the Servo O2 board. Measure the resistance on harness pin 1 to pin 2. It should be the supply valve resistance (50 to 100 ohms). If not, the fuse is opened or the supply valve is defective. Repeat for the second supply valve with pins 3 to 4. If the valves check OK, the Servo O2 board is defective.

**NOTE:** With one supply valve open the flow rate should be a minimum of 35 L/min. With both supply valves open, the minimum flow rate should be 40 L/min. If the flow rate is low, check that the regulator inlet screen is not occluded.

#### 4.7.3.2 Check Calibration Valve/Calibration Fan



The calibration valve is located beneath the chassis in the sensor housing. The calibration fan is mounted in the sensor housing next to the calibration valve. Power up unit in service mode. Select Servo O2 on second page. Open VC. This should open the calibrate valve and turn on the calibration fan. Verify the calibration fan is running. If the fan is running then the Servo O2 board is OK and the calibration valve may be defective. If the fan is not running check the control signal from the Servo O2 board to verify voltage is present when VC is opened to determine if the fan or board is defective.

#### 4.7.3.3 Check Cooling Fan



The cooling fan is mounted to the sensor housing door on the chassis cover. Power up unit in service mode. Select Servo O2 on second page. The cooling fan should be running.

If fan is not running verify 10.0 - 13.2 Volts at J86-1 to J86-2. If voltage is present the fan is defective. If voltage is not present the Servo O2 board is defective. Open VC, you should hear a click and the cooling fan should stop. If the fan does not stop the Servo O2 board is defective.

#### 4.7.3.4 Sensor Housing Temperature Sensor Temperature to Resistance Curve

Temperature	Resistance
15C	15.720 kohm
25C	10.000 kohm
30C	8.056 kohm
35C	6.530 kohm
40C	5.326 kohm
45C	4.369 kohm
50C	3.604 kohm
60C	2.491 kohm

# Chapter 5: Repair Procedures



## **SENSITIVE TO ELECTROSTATIC DISCHARGE CAUTION**

An Electrostatic Discharge (ESD) Susceptibility symbol is displayed to alert service personnel that the part(s) are sensitive to electrostatic discharge and that static control procedures must be used to prevent damage to the equipment.



## **WARNING:**

After performing any repair or calibration, always perform the Service Checkout Procedure before putting the unit back into service.

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## 5.1 Hood Removal for Replacement

Refer to "Figure 5-1 Hood" and "Figure 5-3 Compartment Probe".

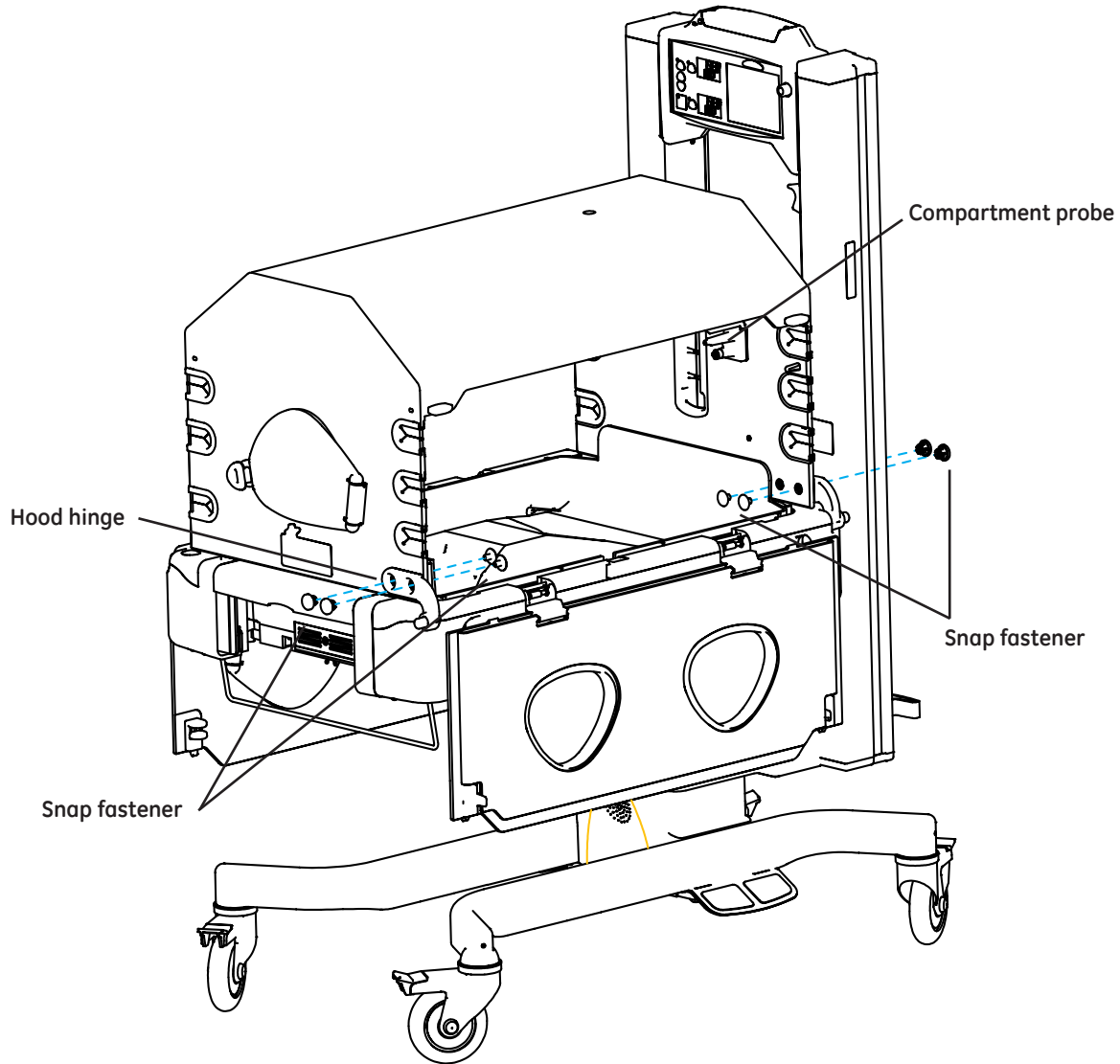


Figure 5-1 Hood

1. Open both side doors.
2. Using a small straight blade screwdriver, remove the 2 snap fasteners from the inside of the hood that secure the hood to each of its hinges. Each fastener has two halves that snap together and can be pried apart.
3. Remove the compartment probe and cable clip on the hood back wall as described in section 5.4.
4. Push the trigger on the hood latch post to disengage the latch and carefully lift the hood off the chassis.

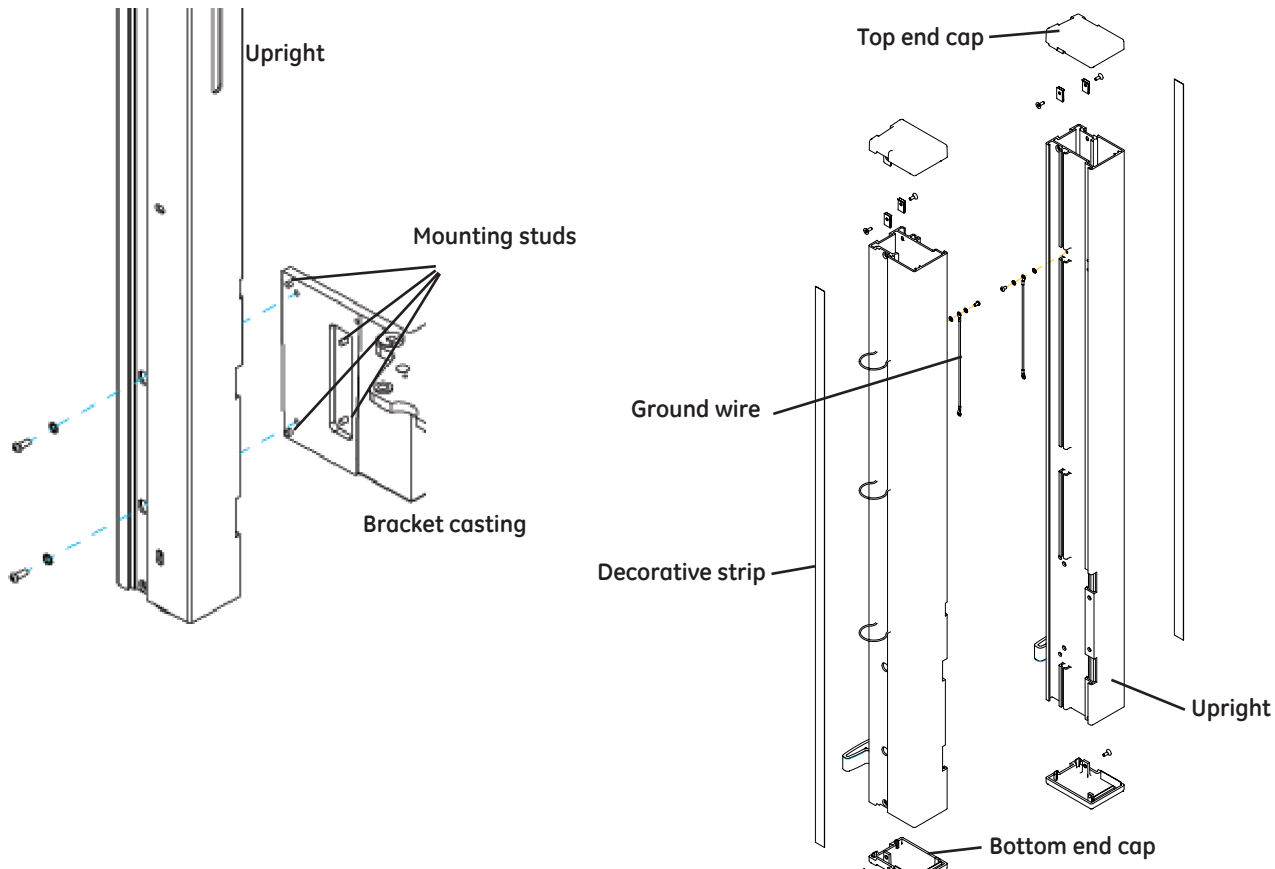
## 5.2 Porthole Door Replacement

Refer to "Figure 6-6 Side Door (East/West)".

1. Use a flat edge screwdriver to pry off the hinge cover.
2. Open the door to unload the springs.
3. Slide the hinge pin down, out the hole at the bottom of the hinge.
4. Remove the porthole door.
5. Now the door springs can be accessed along with screws that secure the inside half of the hinge cover.
6. To replace the porthole door, put the door back in place in the open position, install the springs, then slide the hinge pin back in place.
7. Close the door and snap the hinge cover back in place, keeping the thin side of cover closest to the porthole.

## 5.3 Uprights and End Caps

Refer to "Figure 5-2 Uprights and End Caps".



**Figure 5-2** Uprights and End Caps

1. Slide the decorative strip up about 1/2" in the groove on the outside of the upright to access hardware that secures the lower end cap. You may wish to use a piece of tape to grip the strip. Use a 2.5 mm hex key to remove the screw, then remove the bottom cap. Slide the decorative strip down to access the two screws that secure the upper end cap, then remove the top end cap.
2. Using a 2mm hex key, remove the 4 button head socket screws and split ring washers that secure the back cover to the display module and remove the cover.
3. Remove the 2 screws that secure the hood latch receptacle to the upright and remove the receptacle.
4. Using a 2mm hex key, remove the screw that secures the wire cover to the side of the upright.
5. To remove the wire cover, slide the wire cover up about 1/2", and then pull it straight back by grasping its back edge.



6. Using a 3mm hex key, remove the 2 screws that secure the display module to the nut bar and pull the nut bar up and out of the upright. Using a 3mm hex key, remove the screw that attaches the ground wire. Be careful not to drop the star washers down into the upright.
7. Hold on to the upright, and using a 4mm hex key, remove the 2 screws in the holes in the lower side of the upright. Remove the entire upright.

### **5.3.1 Re-installing the Upright**

1. To assist in reattaching the upright to the unit, there are four mounting studs on the bracket casting that mate with four holes in the upright. Place the upright on the studs. Be careful not to pinch any wires between the unit and the upright.
2. Secure the upright to the unit by reinstalling the 2 screws in the holes inside the upright. Apply Loctite™ 242 to the screws. Be careful not to drop the screws into the upright.
3. Attach ground wire to rail. Fasten the display module to the upright with the two screws and nut bar removed earlier.
4. Reinstall the wire cover. Take care to route the wires in the upright channels and not to pinch them with the cover when securing with the screw.
5. Reinstall the hood latch receptacle with the two screws removed earlier.
6. Attach ground wire to rail. Fasten the display module to the upright with the two screws and nut bar removed earlier.
7. Fasten the back panel to the display module with its 4 mounting screws.
8. Slide the decorative strip up and install the end caps.

## 5.4 Compartment Probe Repairs

Refer to "Figure 5-3 Compartment Probe".

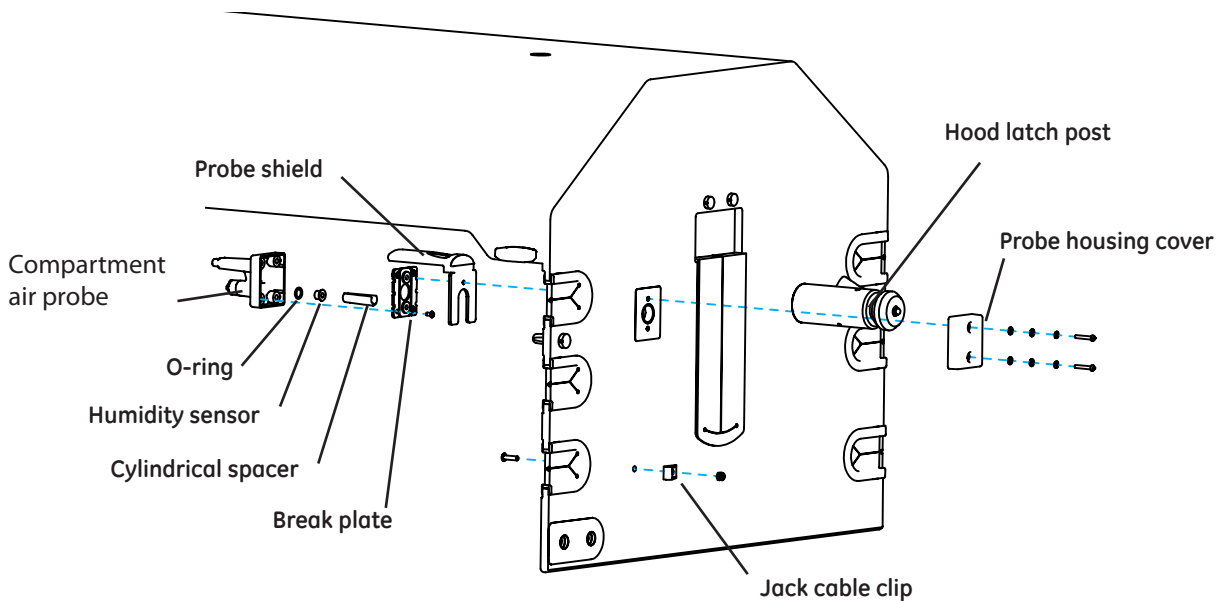


Figure 5-3 Compartment Probe

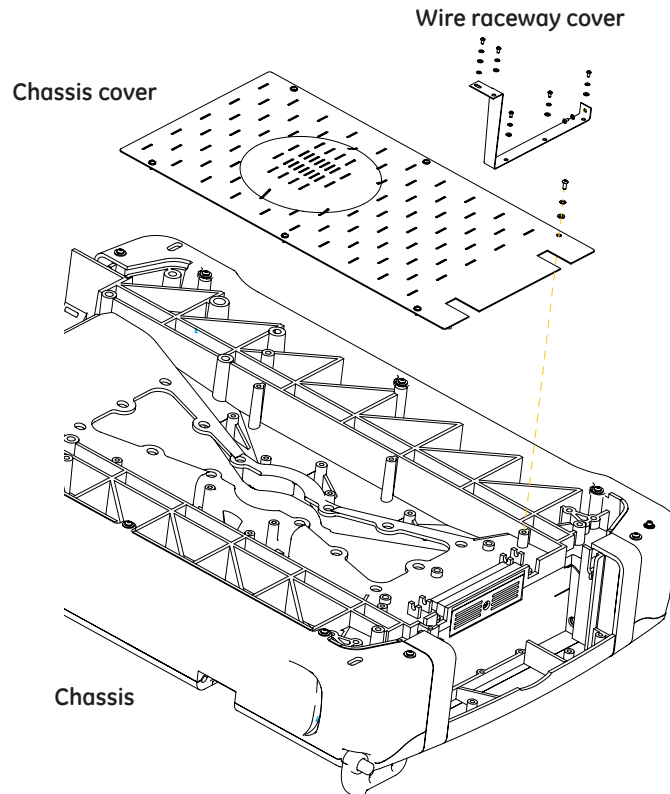
1. Using a 2.5 mm hex key, remove the screw that secures the jack cable clip to the hood back wall.
  2. Remove the 2 screws (2mm hex key) that secure the probe housing cover and remove it. The top screw secures the probe shield, so that it can now be removed from the inside front of the probe housing.
  3. Disconnect the electrical connectors for the temperature and humidity sensor (if installed) wires and remove the compartment air probe.
- NOTE:** Some early units have compartment air probes with jack connectors at the probe panel and should be disconnected there.
4. Remove the 4 screws in the break plate and remove the plate.
  5. To replace humidity sensor, pull it back out of the probe housing. Slide the wires out of the cylindrical spacer. Place the O-ring over the tip of the new sensor, and gently push it back into the housing using the cylindrical spacer until the O-ring seats. The sensor tip should be visible, but not up against its guard. Check to ensure that the O-ring did not roll over the sensor flange during insertion.
- NOTE:** Always perform Humidifier Calibration after replacing the humidifier sensor.
6. To replace the temperature sensor, you must replace the entire probe housing.

- When reassembling the probe housing make sure the groove in the break plate faces the probe housing cover. Also check that the temperature sensor is oriented so that it is on top.

## 5.5 Lower Unit Repairs

### 5.5.1 Removing the Chassis Cover with the Storage Drawer in Place

Refer to "Figure 5-4 Chassis Bottom Cover".



**Figure 5-4** Chassis Bottom Cover

- Slide the drawer all the way over in one direction, and use a 2.5 mm hex key to remove the 3 chassis cover screws on one side.
- Slide the drawer to the other side and remove the 3 remaining screws from the cover.
- Remove the humidifier reservoir.
- Remove the bottom 2 screws (2mm hex key) that secure the right end of the wire raceway cover.
- Flex the raceway cover and carefully slide the cover panel forward until it drops off the back drawer slide.

6. Rotate the cover slightly and push it out the right side of the unit.
7. Remove the ground wire.

### 5.5.2 Incubator Fan/Motor/Optical Sensor

Refer to "Figure 5-5 Fan Motor" and "Figure 5-6 Heat Sink and Fan".

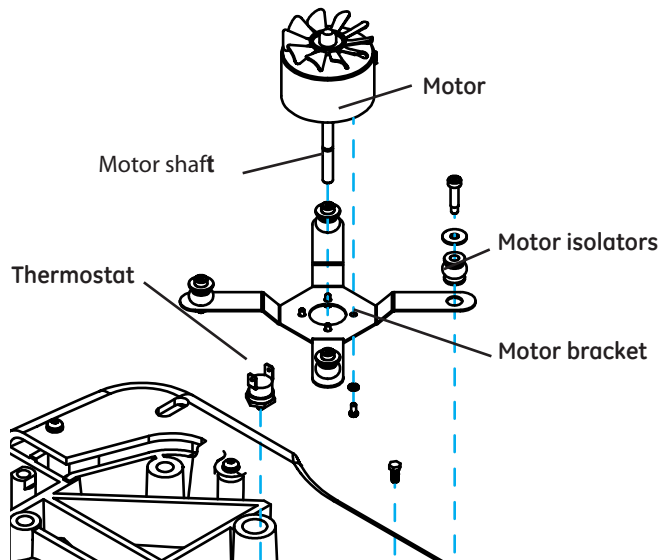


Figure 5-5 Fan Motor

1. Remove the rotating bed, translation deck, tilt platform and pan.
2. Remove the fan, fan hub, and fan seal from the top of the fan motor shaft.
3. Remove the chassis cover. (Refer to section 5.5.1.)
4. Disconnect the motor leads.
5. Remove the 4 screws in the motor bracket and remove the motor assembly.
6. The motor isolators pop out of the holes in the bracket.
7. To replace the optical sensor, disconnect its connector, remove the screw from the boss in the chassis that holds it in place, and remove the assembly.

### 5.5.3 Incubator Heater Replacement

Refer to “Figure 5-6 Heat Sink and Fan” and “Figure 6-10 Lower Chassis”.

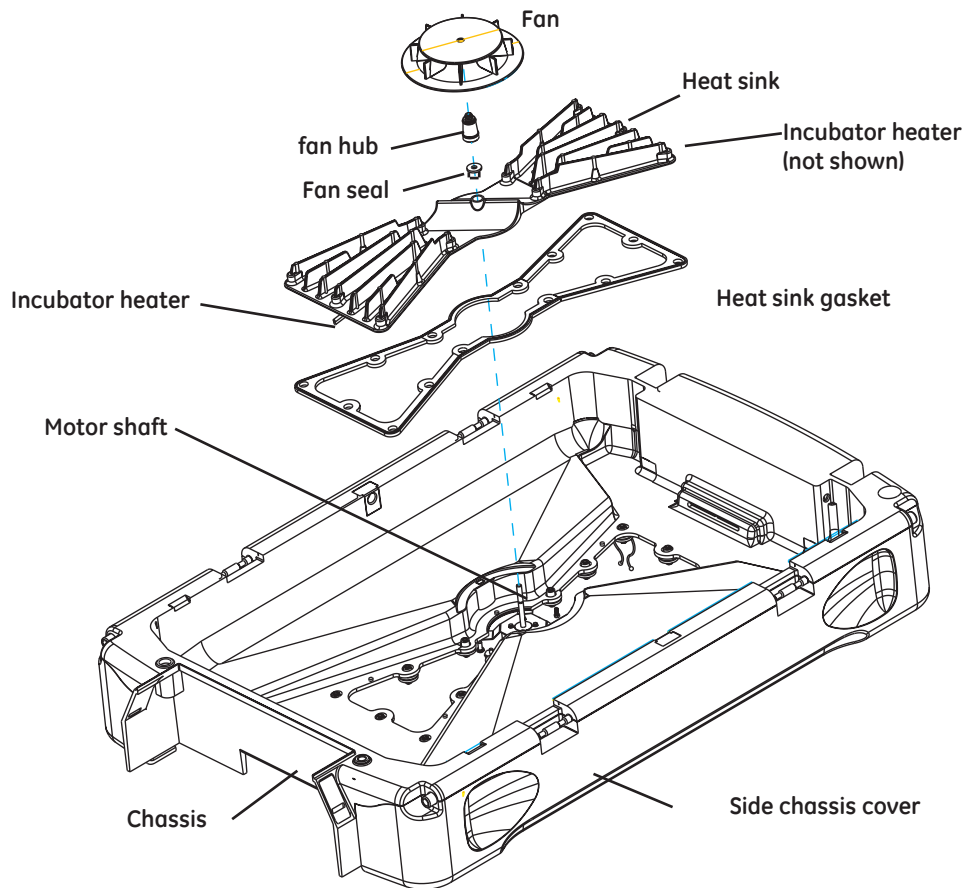


Figure 5-6 Heat Sink and Fan

#### 5.5.3.1 To Remove the Heater Closest to the Foot of the Bed

1. Remove the chassis cover. (Refer to section 5.5.1.)
2. Remove the screw (4 mm hex key) in the heatsink directly in front of the heater cartridge.
3. Disconnect the heater’s electrical connector.
4. Remove the retaining clip and slide the heater out of the heat sink.

**NOTE:** On early units, the incubator heater screwed into a threaded hole in the heat sink. For these units you must order kit 6600-0228-850 to replace both the heaters and heat sink.

### 5.5.3.2 To Remove the Heater Closest to the Head of the Bed

1. Remove the rotating bed, translation deck, tilt platform and pan.
2. Remove the fan, fan hub, and fan seal from the top of the fan motor shaft.
3. Remove the chassis cover. (Refer to section 5.5.1.)
4. Disconnect the heater's electrical connector, the thermostat connections and the heat sink sensor connector.
5. Remove the upper shroud.
6. Remove the 14 mounting screws that secure the heat sink. Remove the heatsink.
7. Remove the retaining clip and slide the cartridge out of the heat sink.

**NOTE:** On early units, the heater cartridge screwed into a threaded hole in the heat sink. For these units you must order kit 6600-0228-850 to replace both the heater cartridges and heat sink.

8. To reassemble, seat the fan seal in the center bore of the heatsink and use it to align the fan shaft before fully securing the heat sink with its mounting screws. It may be necessary to wet the motor shaft fan hub to allow it to slide all the way onto the fan shaft and seat properly.

### 5.5.4 Elevating Base

Refer to “Figure 5-7 Bed Disassembly”, “Figure 5-8 Elevating Base with Two-piece Shroud Assembly”, and “Figure 5-9 Elevating Base with Three-piece Shroud Assembly”.

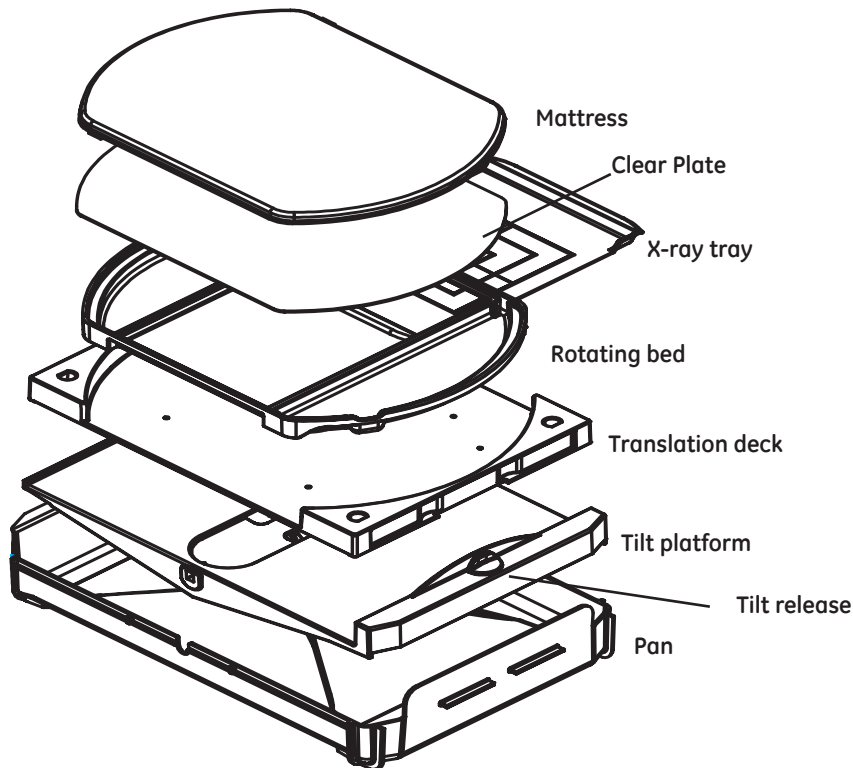


Figure 5-7 Bed Disassembly

1. Run the elevating base to its top travel limit then switch off and unplug the unit.
2. Remove the mattress, bed, translation deck, tilt platform, and pan.
3. Remove the chassis cover. (Refer to section 5.5.1.)
4. Disconnect the elevating base electrical connector at J-45 on the relay board, and tie a wire to it so you can fish it back through during reassembly.
5. Connect the replacement elevating base to the relay board, switch the unit back on and using the foot pedals fully extend the new base. Switch off and unplug the unit.

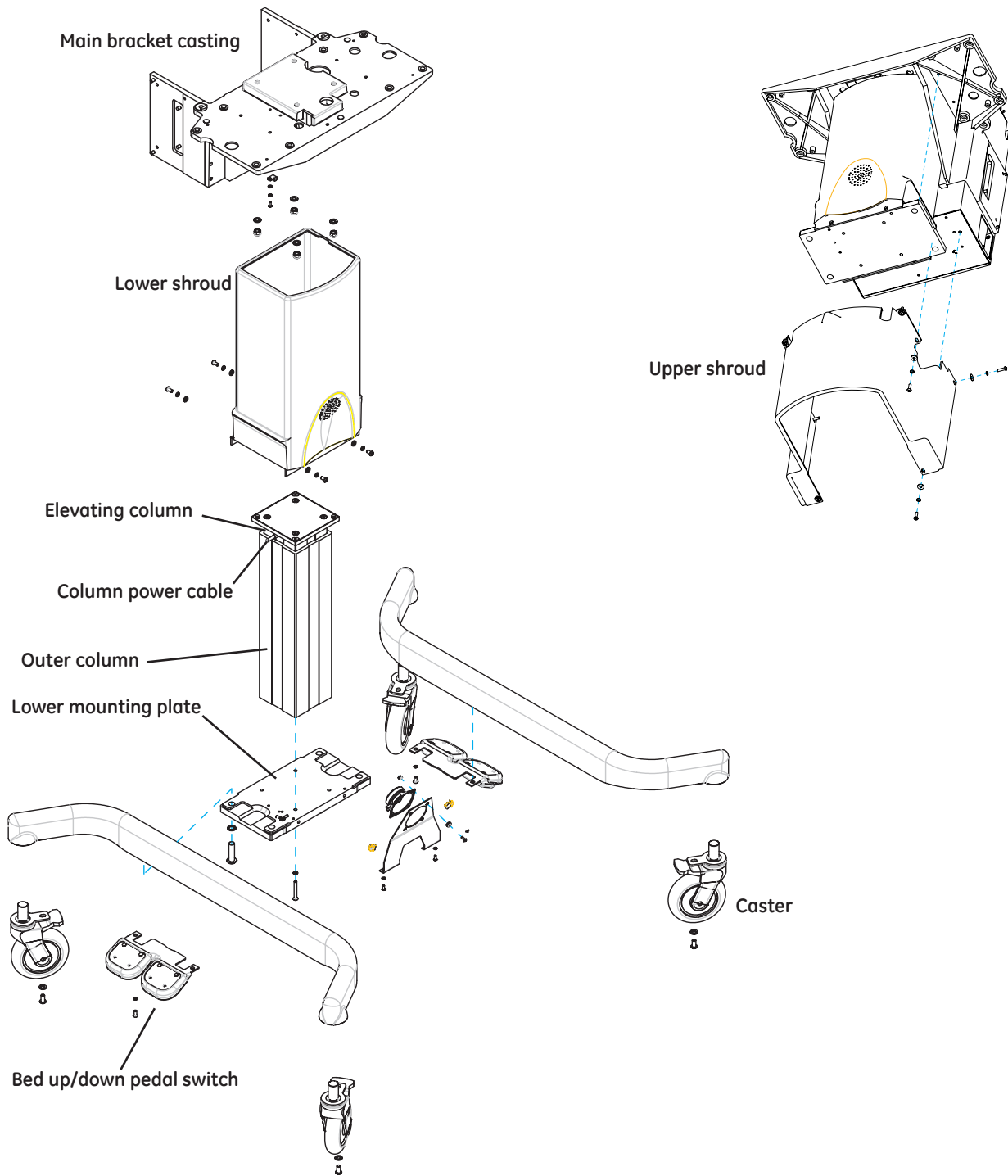


Figure 5-8 Elevating Base with Two-piece Shroud Assembly



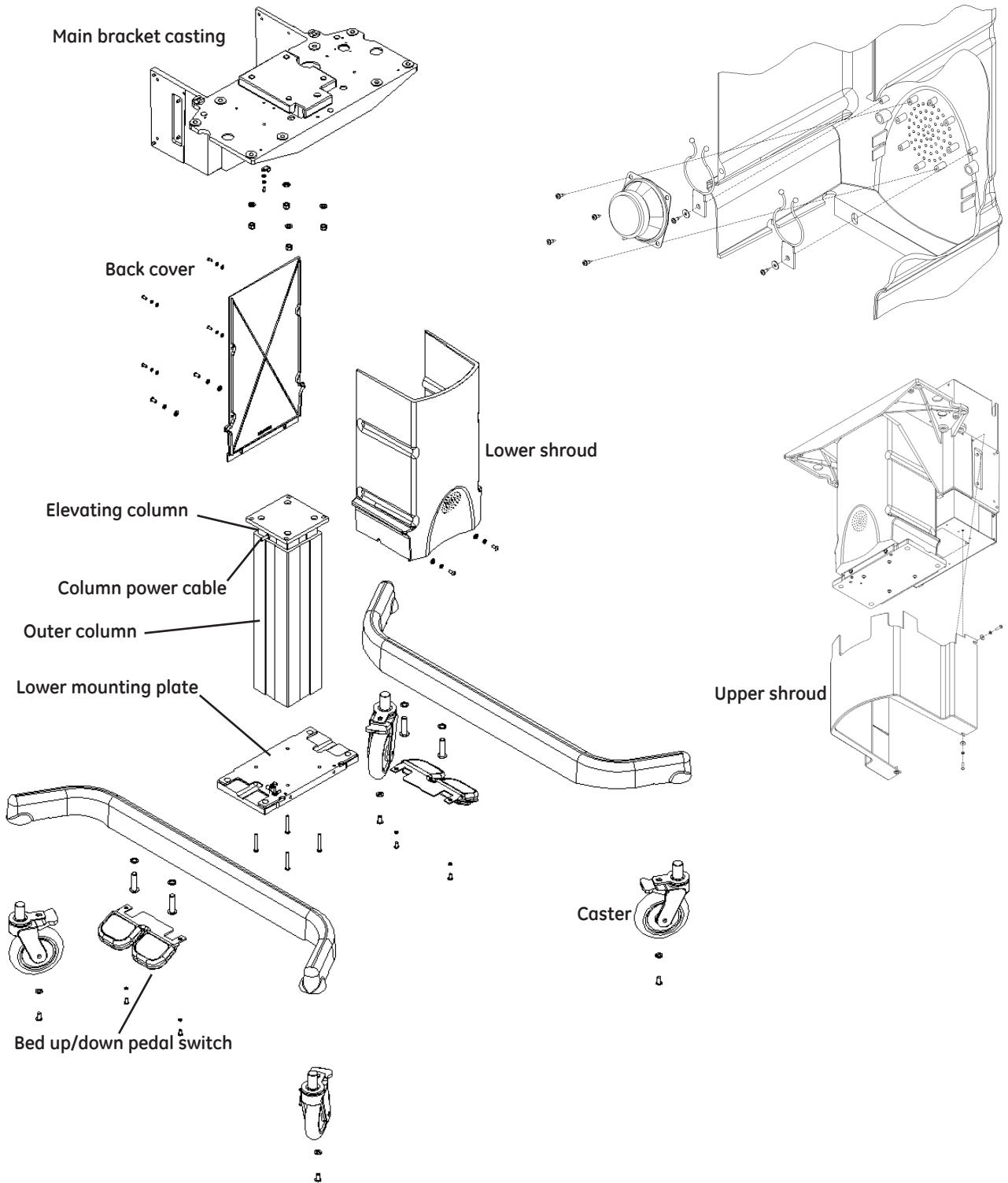


Figure 5-9 Elevating Base with Three-piece Shroud Assembly

6. This step depends on the type of shroud assembly:
  - If the shroud assembly is in two pieces: Using a 4 mm hex key, remove the four screws (at the bottom of the base - two in back and two in front) that secure the lower shroud and slide it up past the speaker.
  - If the shroud assembly is in three pieces:
    - a. Use a 2.5 mm hex wrench to remove four M4 flat washers, four M4 split lock washers, and four M4x10 button head socket cap screws, that attach the back cover shroud to the lower shroud.
    - b. Use a 4 mm hex wrench to remove two M6 flat washers , two M6 split lock washers, and two M6x12 button head screws, that attach the back cover shroud to the base plate.
    - c. Use a 4 mm hex wrench to remove two M6 flat washers, two M6 split lock washers, and two M6x12 button head screws, that attach the lower shroud to the base plate.
7. Using 3mm hex key remove the screws that secure the upper shroud. (For units with two-piece shroud assembly, remove eight screws. For units with three-piece shroud assembly, remove four screws.) Remove the upper shroud.
8. Pull the base wire harness out from the bracket casting.
9. Lock the back casters and lay the unit down on its back (controller on the floor). Place blocks under the uprights so the back casters are off the floor.
10. Using a 4mm hex key, remove the four socket head screws in the bottom of the elevating base that secure the lower mounting plate to the base, and remove the mounting plate/leg assembly.
11. Using a 13mm socket, remove the 4 nuts that secure the elevating base to the casting and remove the base.

**NOTE:** Should the elevating base fail in the completely retracted position, the outer column will prevent access to the 4 base mounting nuts. To remove the outer base, you must first remove the lower mounting plate and slide the outer column out. This requires a T-30 TORX key (service tool number 6600-1204-400).

12. To replace the elevating base, reverse the assembly steps above. Check that the casters are still locked before lifting the unit back into its upright position. If you are returning the old elevating base in its original packaging, attach it to the relay board and run it down to its fully retracted position. Release the shipping locks.

**NOTE:** With the unit on its back, be sure the base power cable is pointing up before you attach the base.

### 5.5.5 Chassis Replacement

Refer to “Figure 5-4 Chassis Bottom Cover”, “Figure 5-5 Fan Motor”, “Figure 5-6 Heat Sink and Fan”, “Figure 5-7 Bed Disassembly”, and “Figure 6-10 Lower Chassis”.

1. Remove the side doors, hood (refer to section 5.1), rotating bed, translation deck, tilt platform, and pan.
2. Remove the bottom chassis cover, (refer to section 5.5.1) and remove the two side chassis covers (3 mm hex key).
3. Disconnect the wiring harnesses.
4. Remove the two screws at the bottom corners that secure the probe panel to the enclosure. (Refer to section 5.8.2.)



**WARNING:**

Be sure the front of the chassis is supported before removing the screws from the bracket to prevent the chassis from falling.

---

5. While supporting the chassis, remove the 5 bolts on either side of the bracket casting that secure the chassis to the bracket and remove the chassis.
6. Remove all the components from the old chassis (bed tilt; fan and motor; heatsink; humidifier; front hinge covers, side panels, etc.) and install them on the new chassis.

### 5.5.6 Bed Up/Down Pedal Switch

Refer to “Figure 5-8 Elevating Base with Two-piece Shroud Assembly” and “Figure 5-9 Elevating Base with Three-piece Shroud Assembly”.

1. Run the bed up to the elevating base’s top travel limit. Unplug the unit.
2. This step depends on the type of shroud assembly:
  - If the shroud assembly is in two pieces: Using a 4 mm hex key, remove the four screws (at the bottom of the base - two in back and two in front) that secure the lower shroud and slide it up past the speaker.
  - If the shroud assembly is in three pieces:
    - a. Use a 2.5 mm hex wrench to remove four M4 flat washers, four M4 split lock washers, and four M4x10 button head socket cap screws, that attach the back cover shroud to the lower shroud.
    - b. Use a 4 mm hex wrench to remove two M6 flat washers, two M6 split lock washers, and two M6x12 button head screws, that attach the back cover shroud to the base plate.
    - c. Use a 4 mm hex wrench to remove two M6 flat washers, two M6 split lock washers, and two M6x12 button head screws, that attach the lower shroud to the base plate.
3. Make note of the switches’ electrical wire routing; the cable from the replacement switch must feed up through the same slot.

4. Using a 4 mm hex key, remove the button head socket screws on either side of the pedal switch.
5. Disconnect the switch electrical connector and pull the switch out. Discard old bed up/down pedal switch.
6. Install new bed up/down pedal switch. Make sure that you do not pinch the electrical wires.

### 5.5.7 Humidifier Assembly Repairs

A design change was made to the humidifier assembly to make it easier to remove the screws during disassembly. Units shipped since about March 2002 have this revised design. The earlier design can be identified by the button head cap screws used in the assembly. The later design uses Phillips head screws to make disassembly easier.

When working on the earlier design if you have difficulty with disassembly you may wish to replace the entire humidifier assembly with the later design 6600-0245-850 . When disassembling the older design, we recommend that you replace the old screws with the new screws listed below. You may also require the other parts listed below if they are damaged during disassembly. Refer to the Tips section 5.5.7.1.

The reservoir switch button was also redesigned to prevent it from jamming in the closed position. You should also replace this button when working on an old style humidifier.

Qty. per assy.	Description	Part Number
3	Screw, M3 X 8, Phillips head, Teflon coated	6600-1255-401
4	Screw, M3 X 10, Phillips head, Teflon coated	6600-1255-402
4	Screw, M3 X 12, Phillips head	6600-1255-403
2	Screw, M3 X 16, Phillips head	6600-1255-404
4	Spacer, .125 ID	6600-1779-500
1	Ramp block	6600-1777-500
1	Heater mount	6600-1291-500
1	Button, reservoir switch	6600-1298-500

#### 5.5.7.1 Tips for Repairing the Humidifier Assembly on an Old Style Unit

Some of the hex head screws may be difficult to remove. To minimize the chances of stripping the heads, be sure that the 1.5 mm Allen key you are using is not worn, and is not a ball head style. If you strip the heads, you may need to drill them out. If you drill out the heads, you may need to replace the ramp block and/or the heater mount if you have difficulty in removing the body of the screw.

### 5.5.7.2 Humidifier Disassembly

Refer to “Figure 5-4 Chassis Bottom Cover” and “Figure 5-10 Humidifier Parts”.

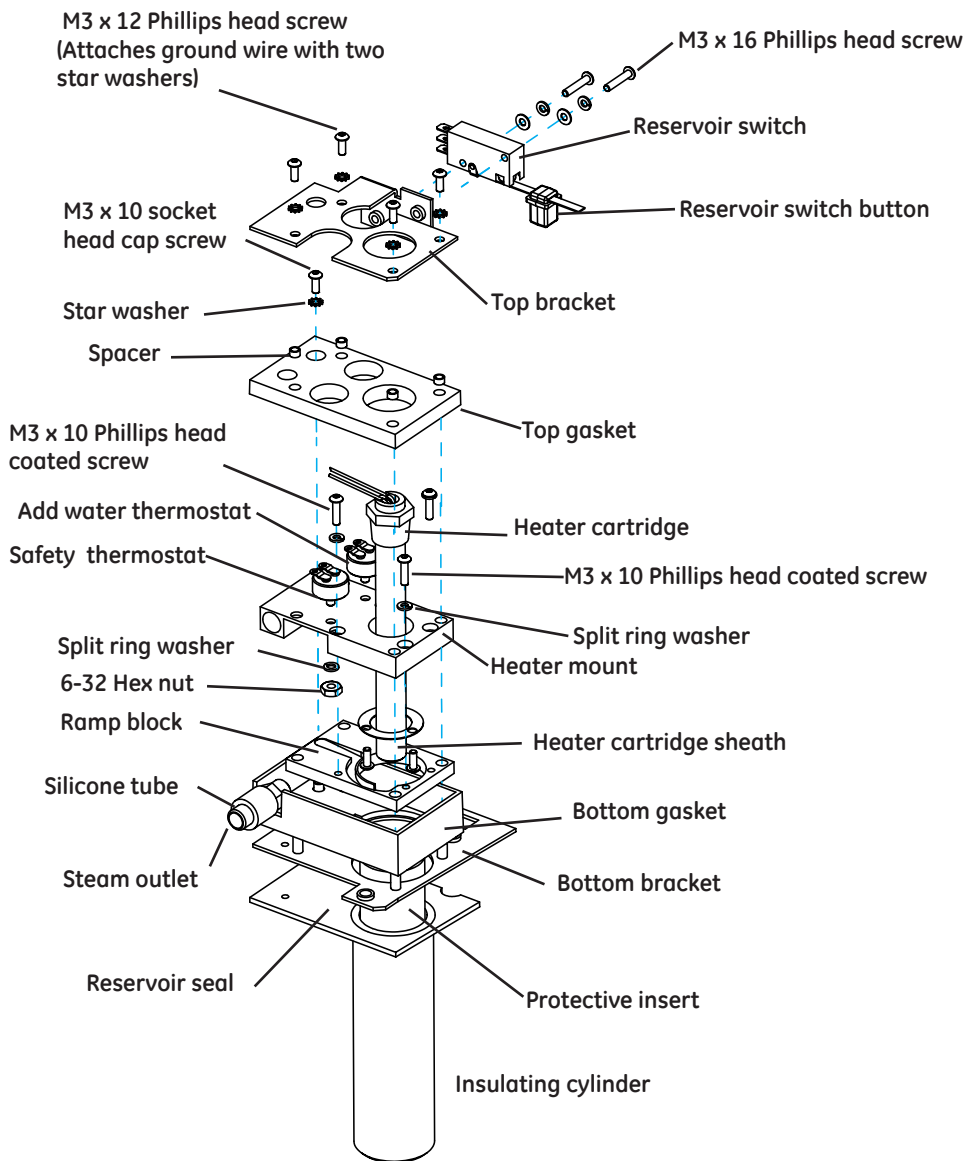


Figure 5-10 Humidifier Parts

1. Remove the humidifier reservoir.
2. Remove the 6 screws that secure the wire raceway cover and remove the cover.
3. Remove the chassis cover. (Refer to section 5.5.1.)
4. Disconnect the 3 electrical connectors.

5. Remove the 2 screws on either side of the heater assembly.
6. Remove the heater assembly.
7. Use a 2mm hex key to remove the 2 screws from the reservoir switch and remove the switch.
8. Remove the 4 screws that secure the top bracket. Back the bracket off, feeding the wire harnesses through as you remove it.
9. Remove the top gasket, feeding the wire harnesses through as you remove it. The thermostat wire harness can slide through the slots in the gasket.
10. Remove the 4 screws in the heater mount and remove the bottom bracket.
11. Remove the socket head cap screw next to the add water thermostat, then remove the bottom gasket, insulating cylinder, and protective insert.
12. Remove the 3 screws in the heater cartridge sheath.
13. To remove the heater cartridge, unscrew it from its threaded hole.
14. The thermostats can be replaced by removing the nuts securing them to the ramp block.
15. If either thermostat or the heater cartridge is being replaced, check all components (especially the plastic ones) for signs of heat damage or corrosion. We recommend replacing the sheath when replacing the heater cartridge.

### **5.5.7.3 Humidifier Reassembly**

1. Screw the steam outlet in the threaded hole on the heater mount.
2. Slide the silicone tube on the steam outlet flush to the hex.
3. Screw the heater cartridge assembly into the heater mount, then back it off so the harness exits between the two thermostat mounting holes.
4. Attach the heater sheath with the three M3 x 8 Phillips Teflon coated screws and split ring lock washers to the bottom of the heater mount.
5. Place two M3 x 10 Phillips Teflon coated screws and split ring lock washers into the heater mount counter bore holes next to the thermostat mounting holes.
6. Attach the two thermostats to the mounting block with the 6-32 hex nuts and split ring lock washers, being careful not to position the thermostat wires over the mounting holes in the heater mount. The add water thermostat has the micro-switch attached to the harness.

7. Attach the ramp block to the heater mount with the two screws placed in the counter bore holes above, and with two additional M3 x 10 Phillips Teflon coated screws and split ring lock washers.
8. Place the protective insert inside the insulating cylinder. Slide the bottom gasket over the insulating cylinder then over the ramp block.
9. Align and slide the posts of the bottom bracket through the bottom gasket, then through the ramp block.
10. Install an M3 x 10 socket head cap screw and star washer through the hole in the heater mount next to the add water thermostat. This screw grounds the bottom bracket so do not use a Teflon coated screw.
11. Route the heater and thermostat wire harnesses through the top gasket.
12. Install the top gasket and place the 4 0.125ID x 0.107L spacers into the gasket holes.
13. Route the heater and thermostat wire harnesses through the holes in the top bracket.
14. Install the reservoir switch button up through the bottom bracket and slide the switch actuator lever through the button slot.

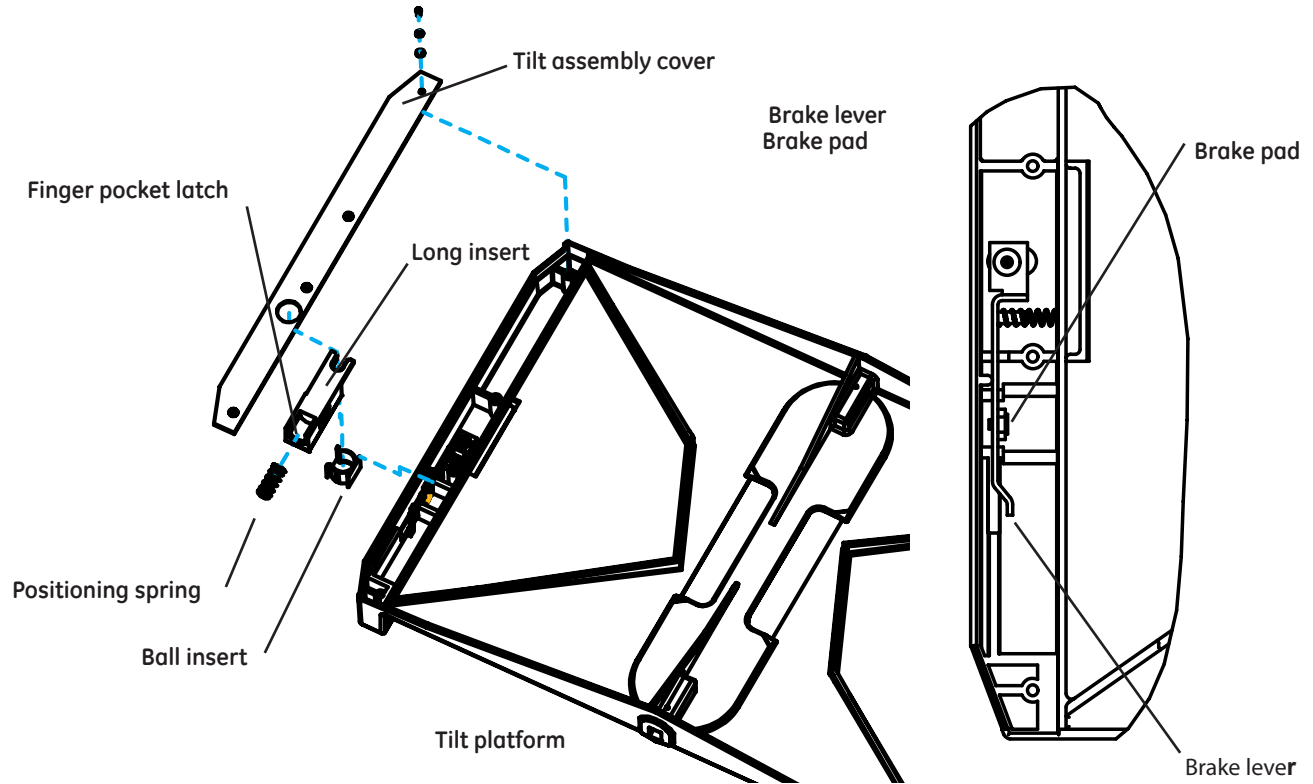
**NOTE:** Old style button installs down through the bracket.

15. Attach the reservoir switch to the top bracket using the two M3 x 16 Phillips screws, flat washers, and split ring lock washers.
16. Align the top bracket with the mounting holes and install the four M3 x 12 Phillips screws and star washers through the 4 holes in the top bracket. Attach the ground wire to the screw closest to the switch, using two star washers.
17. Dress the wire harnesses and install a cable tie.
18. Slide the reservoir seal into place.
19. When installing the humidifier, rotate the cylinder so the max line is visible.



## 5.6 Bed Tilt Brake Pad Replacement

Refer to “Figure 5-7 Bed Disassembly” and “Figure 5-11 Replacing the Tilt Brake”.



**Figure 5-11** Replacing the Tilt Brake

1. Remove the mattress, clear plate, rotating bed and translation deck.
2. To release the tilt screw ball, squeeze the tilt release and slide open the finger pocket latch until you hear the ball drop.
3. Release the tilt platform from the chassis by pushing the pivot pin tabs in on both sides, then lifting the tilt platform out of the chassis.
4. Turn the tilt platform over and remove the 4 screws (2.5 mm hex key) that secure the tilt assembly cover.
5. Remove the two plastic inserts. The long insert holds a positioning spring and the smaller ball insert holds the screw ball in position.

6. Press back the brake lever to provide access to the brake pad, then use pliers or a thin 14mm open end wrench to remove the nut to which the brake pad is fastened. Replace the brake pad assembly.

## 5.7 Caster Replacement

Refer to “Figure 5-8 Elevating Base with Two-piece Shroud Assembly”, and “Figure 5-9 Elevating Base with Three-piece Shroud Assembly”.

The casters may be replaced with the unit upright or carefully placed on its back.

1. Lock all the other casters.
2. Lift the caster off the floor and use blocks to support the leg near the caster you are replacing.
3. Remove the screw on the side of the leg that holds the caster in its mounting hole. Remove the caster.

On older casters with a set screw on the side of the leg casting, remove the screw on the side of the leg that holds the caster in its mounting hole. Remove the caster.

**NOTE:** The new style caster with a mounting plate has a different shaft diameter than the older caster and will not fit on the older set screw style leg casting.

4. Line up the hole in the caster stem with the set screw hole in the leg and insert the caster. As you tighten the screw the caster should be drawn into the leg.

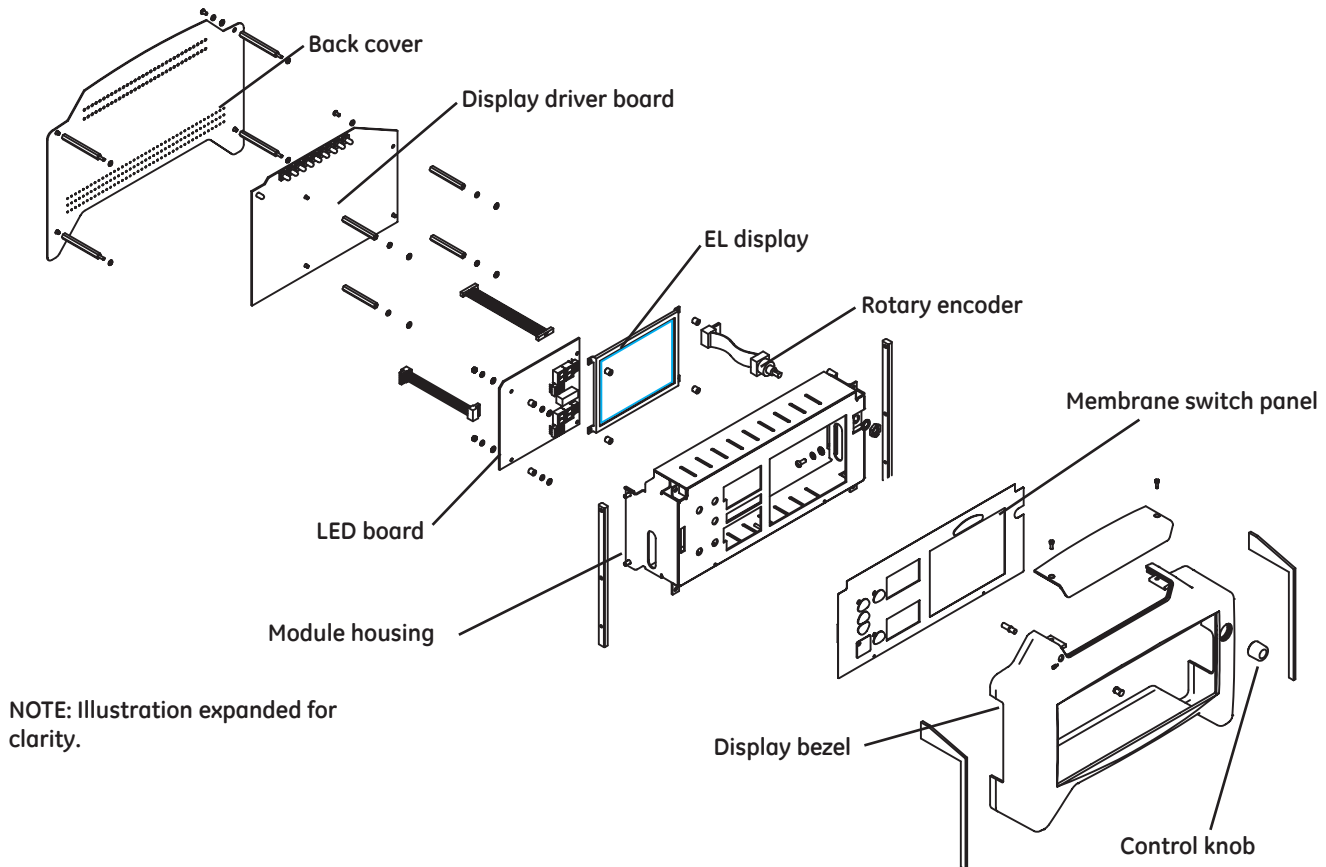
On older casters, line up the hole in the caster stem with the set screw hole in the leg and insert the caster. Apply Loctite #242 to the screw. As you tighten the screw, the caster should be drawn into the leg.

**NOTE:** If you are replacing a caster hub cover, you must use a 1/8” drill to remove the old cover stem before snapping the new hub cover in place.

## 5.8 Controller and Display Module Procedures

### 5.8.1 Display Module

Refer to "Figure 5-12 Display Module".



NOTE: Illustration expanded for clarity.

Figure 5-12 Display Module



1. Using a 2mm hex key, remove the 4 button head socket screws and lock washers that secure the back cover to the display module and remove the panel.
2. To remove the display driver board, first remove the 4 screws that hold the board to the standoffs, then disconnect the electrical connectors.
3. To replace the rotary encoder for the EL display, pull the control knob off the shaft, disconnect the electrical connector, remove the nut that secures the encoder, and remove the encoder.



4. To remove the LED board, disconnect the electrical connectors, then remove the 2 standoffs (6mm wrench) that hold the board in place, and then the 2 nuts with hardware.

5. To remove the EL display, disconnect the electrical connectors, then remove the 2 nuts that hold the display in place. Be careful not to get finger prints on the display and be sure it is clean before replacing it.
6. The standoffs that hold the back cover also secure the bezel to the front of the module housing. Remove the standoffs (6mm wrench) and remove the bezel. To replace the membrane switch panel, first disconnect its electrical connector and then peel it off the display module housing. Be careful to remove all residue adhesive from the module before installing a new membrane panel. The membrane panel cannot be repositioned once it has been applied without damaging it.

### 5.8.2 Probe Panel

Refer to "Figure 5-13 Probe Panel" and "Figure 6-1 Probe Panel Assembly".

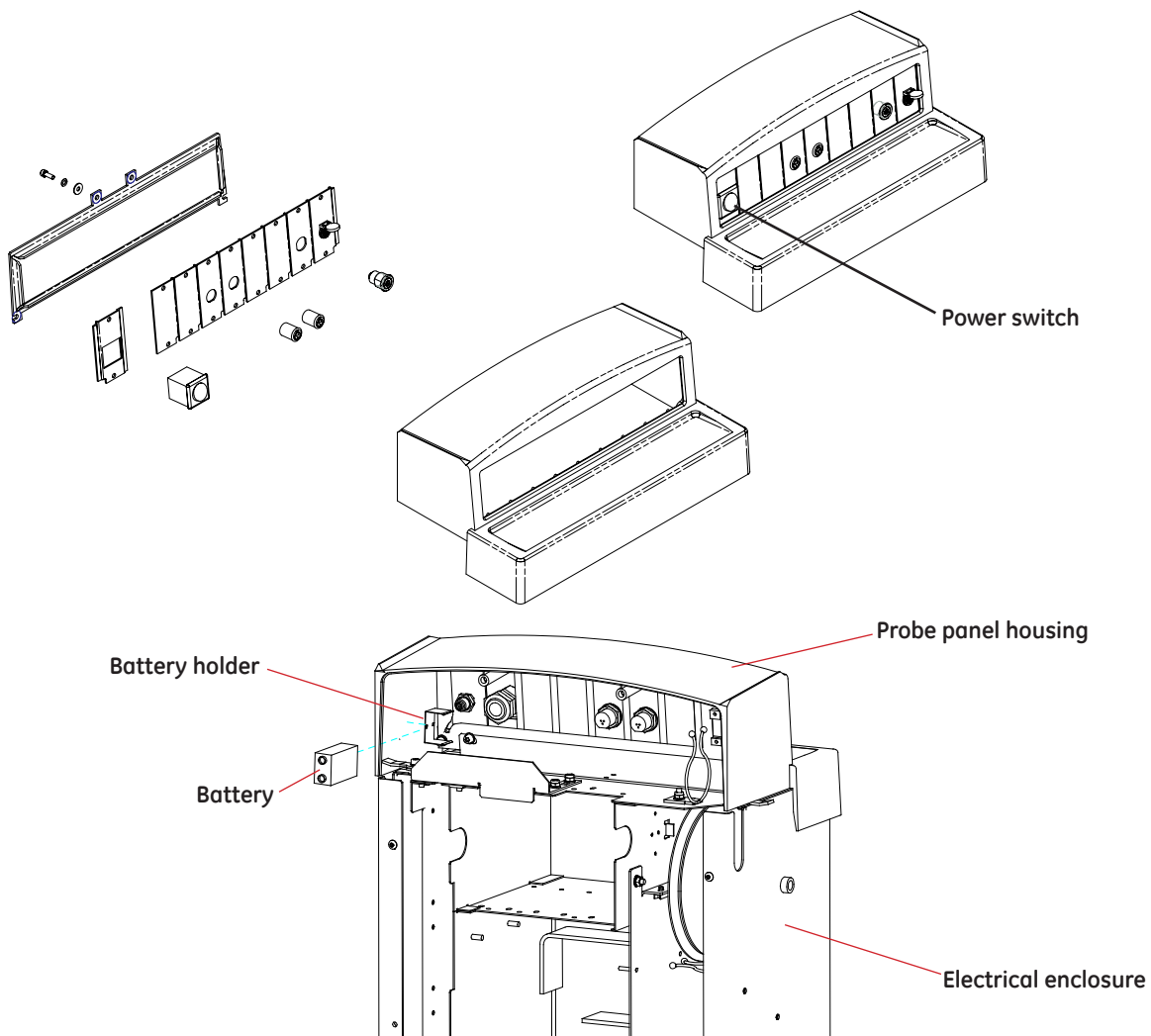


Figure 5-13 Probe Panel

1. Using a 2.5 mm hex key, loosen the 2 screws in the keyhole slots and remove the 6 remaining screws that secure the controller cover, then remove the cover. Disconnect the wire harnesses coming from the probe panel.
2. Remove the 2 screws at the bottom corners that hold the probe panel to the enclosure.
3. Remove the probe panel assembly.
4. While tilting the panel enclosure forward, use a 3mm hex key to remove the 4 screws that hold the panel frame in place. Add new jacks through the panel frame as appropriate.

**NOTE:** The power switch panel must be on the far left. The position of the remaining panels is not critical.

### 5.8.2.1 Battery

The battery snaps into a holder on the side of the probe panel housing. It has two snap connectors at its top. When replacing the battery, its easier to first connect the terminals then push the battery into its holder.

**NOTE:** Run the unit for at least two hours to charge the new battery before using the unit. The battery charges only when the unit is powered on.

**NOTE:** If your battery is in the electrical enclosure above the relay board, order relocation kit M1045981. This kit includes parts and instructions to relocate the battery to the probe panel to reduce battery ambient temperature and prolong battery life.

### 5.8.3 Controller Components

Refer to "Figure 5-14 Electronics Enclosure".

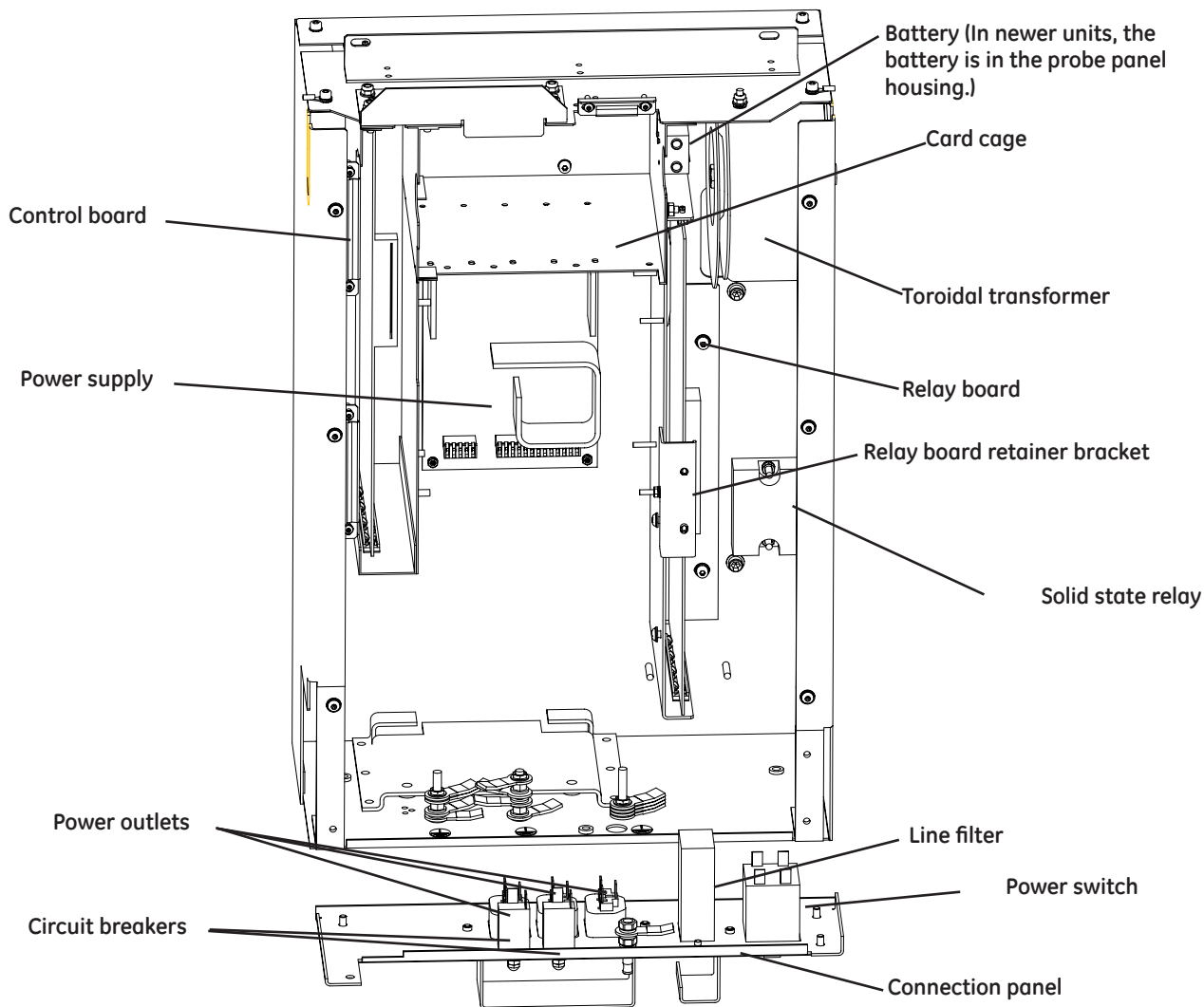


Figure 5-14 Electronics Enclosure

Using a 2.5 mm hex key, loosen the 2 screws in the keyhole slots and remove the 6 remaining screws that secure the controller cover, then remove the cover. Now you can access the electrical components listed below.

### 5.8.3.1 Control Board

Slide the control board out about an inch and disconnect all the electrical connectors along its outside edge, then remove the board.

Dipswitch configuration on replacement control boards:

- Switch 1 must be ON.
- Switch 2 must be OFF (if board is used in an incubator).
- Switch 3 must be ON if servo humidifier is installed.
- Switches 4,5, 6 and 7 are unused and should be OFF.
- Switch 8 must be OFF. (If switch 8 is on, unit will power up in service mode.)

**NOTE:** Always perform System Calibration and Humidifier calibration after replacing the control board.

### 5.8.3.2 Relay Board

Remove the two M3 hex nuts that secure the relay board retainer bracket with a 5.5 mm socket, then pull the board out a little and disconnect the electrical connectors on the outer edge. Then pull it out a little more and disconnect the connectors at the bottom end of the board. Now the board can be pulled out the rest of the way so the back connectors can be disconnected. You can now access the 4 fuses on the board.

**NOTE:** Always perform Line Voltage Calibration after replacing the relay board.

### 5.8.3.3 Solid State Relay

To replace the solid state relay, disconnect the electrical connections, and using a 7mm wrench remove the 2 nuts that secure it to the enclosure.

### 5.8.3.4 Power Supply

To access the power supply, disconnect the 50 pin ribbon cable that crosses in front of it. To remove the power supply, use a 5.5 mm nut driver to remove the nuts that secure it.

**NOTE:** The fuses on the power supply cannot be replaced. If the fuses are open, there will be component damage that necessitates replacing the entire power supply.

After installing the replacement power supply, perform the following tests:

To verify the power supply outputs are correct, measure the following voltages on one of the unused connectors that feed power to the option boards. The voltages are not adjustable. If they are out of specification the power supply must be replaced.

Signal	Measure at	Acceptable Range
5 Volts	Pins 2 to 1	4.75 volts to 5.25 volts
12 volts	Pins 3 to 1	10.80 volts to 13.20 volt

### 5.8.3.5 Toroidal Transformer

To replace the elevating base toroidal transformer:

1. Disconnect the wire harnesses connected to the relay board and remove the board.
2. Using an 1/2" open end wrench loosen transformer retaining bolt.
3. Remove both the toroidal transformer and the retaining bolt. Save the bolt for installing the replacement transformer.
4. Disconnect the old transformer from its wire harness.
5. The replacement toroidal transformer comes with two 4" diameter rubber insulating washers that are installed on both sides of the transformer like a sandwich, and a 4" diameter metal mounting washer that is installed on the same side of the transformer as the head of the retaining bolt. To make aligning these parts easier during installation, you may wish to use electrical tape to attach the 3 large washers to the transformer.
6. Install the new transformer by passing the retaining bolt through the washers and transformer and into the threaded hole in the side of the electrical enclosure. Turn the transformer so you can see the label on the side transformer to orient the wire harness so it exits toward you, then finish tightening the retaining bolt.
7. Connect the transformer wire harness.
8. Reinstall the relay board and reconnect its wire harnesses.

### 5.8.3.6 Circuit Breakers, Power Switches, and Power Outlets

The circuit breakers, power switches and power outlets can all be more easily accessed by removing the connection panel at the bottom of the enclosure by removing the 3 screws that secure it with a 2.5 mm hex key.



## 5.9 Servo Controlled Oxygen Service Procedures

### 5.9.1 Installing Oxygen Sensors

Refer to "Figure 5-15 Installing Sensors".

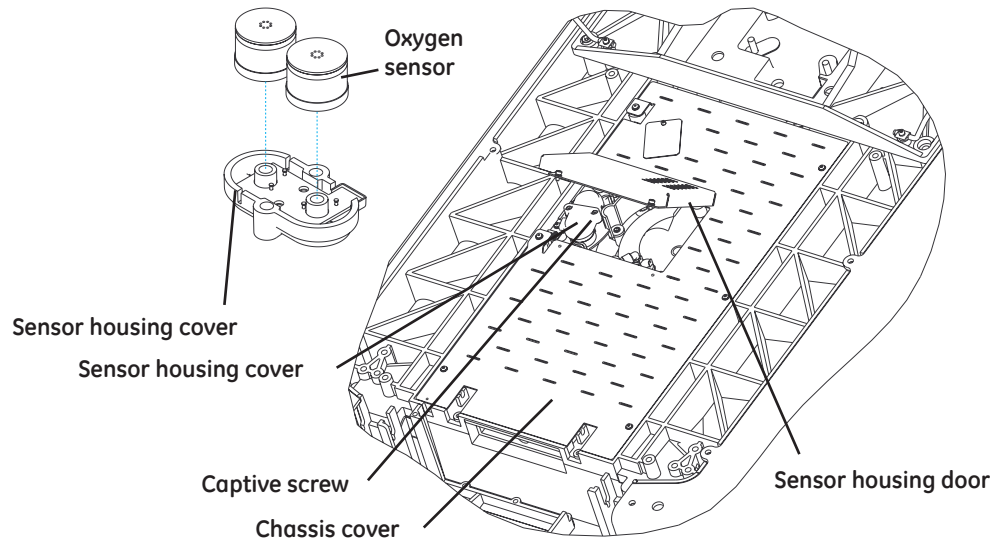


Figure 5-15 Installing Sensors

1. Slide the drawer to one side and using a 3mm hex key, loosen the captive screws in the chassis cover sensor housing door and swing the door down to access the sensor housing.
2. Using a 3mm hex key, loosen the two M4 socket head screws that secure the sensor housing cover, and remove the cover.
3. Remove the old oxygen sensors. Replace with two new sensors (6600-0120-850).

**NOTE:** the date on the sensor is a discard date; the sensor should be removed from service on this date. All sensors are shipped from Ohmeda at least 12 months prior to this date; sensors should be installed immediately to ensure maximum operating life.

4. Reinstall the sensor housing cover and close and secure the door in the chassis cover.
5. Perform the Pre-use Checkout.

## 5.9.2 Replacing the Vent Screen

1. Remove rotating mattress tray, tilt platform and upper pan.
2. Remove the vent cover by turning it counter clockwise.
3. Remove and discard the ring shaped vent filter screen from the chassis vent.
4. Install a new vent screen and reinstall the vent cover.
5. Perform the Pre-use Checkout.

## 5.9.3 Sensor Housing Repairs

Refer to "Figure 5-16 Sensor Housing".

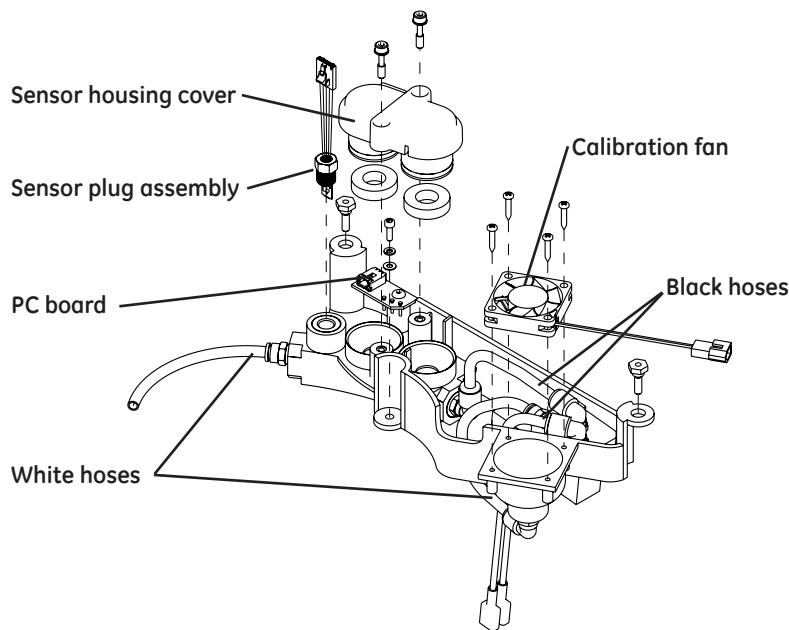


Figure 5-16 Sensor Housing

### 5.9.3.1 Sensor Housing Boards, Calibration Fan Assembly, and Sensor Plug Assembly

1. Slide the drawer to one side and using a 3mm hex key, loosen the captive screws in the chassis cover sensor housing door and swing the door down to access the sensor housing.
2. Using a 3mm hex key, loosen the two M4 socket head screws that secure the sensor housing cover, and remove the cover.
3. To replace the half of the PC board inside the sensor housing cover, use 2.5 mm hex key to remove the 2 M4 button head screws that secure it to the cover.

4. To replace the half of the PC board inside the sensor housing, disconnect from the wire harness and remove the single M4 button head screw that holds it to the housing. Perform the Pre-use Checkout.
5. To replace the calibration fan, disconnect its electrical connector and remove the 4 self tapping screws that secure it to the sensor housing. Install replacement fan so flow arrow on side points up into chassis. Perform the Pre-use Checkout.



6. To replace sensor housing plug assembly, disconnect it from the sensor cable, and use a 7/16" open wrench to unscrew it from the housing, then disconnect its other electrical connector. In addition to taking static sensitive precautions, take care not to touch the sensor portion of the assembly with your fingers to avoid contaminating it. After you replace the plug assembly, perform the Pre-use Checkout.

### 5.9.3.2 Calibration Valve

1. Slide drawer to one side and remove three M4 screws that secure bottom cover to chassis.
2. Remove the humidifier reservoir by pulling forward from bottom. A sheet metal ground strap is located behind the reservoir. Remove the M3 screw that secures the strap to the bottom cover. Slide drawer to other side and remove remaining three M4 screws that secure bottom cover to chassis. Remove the cover by sliding out toward the right side of the unit.
3. Disconnect the ground cable from bottom cover. The ground cable is secured to a 4mm stud in the bottom cover with a nut and two internal tooth lock washers.
4. Disconnect the cooling fan cable.
5. Use a 2.5 mm hex key to remove the M3 screw that secures the center of the sensor housing to the chassis. Refer to "Figure 5-16 Sensor Housing".
6. Use a 10mm nut driver to remove the two stand-off fasteners that secure the sensor housing to the chassis.
7. Disconnect tubing from chassis and heat-sink vent fittings.
8. Disconnect all harnesses from sensor housing, and remove sensor housing from unit.
9. Remove the two M4 flat head screws that secure the calibration valve to the sensor housing, and remove calibration valve assembly.
10. Install new calibration valve assembly. Connect the black wire to the - terminal and the red to the + terminal.
11. Perform the Pre-use Checkout and Leak Check.

## 5.9.4 Valve Housing Repairs

Refer to "Figure 5-17 Valve Housing".

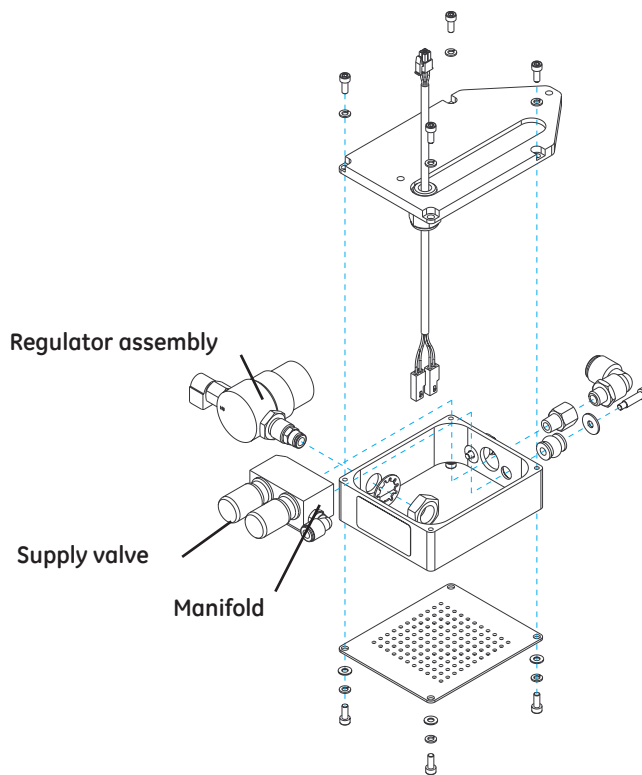


Figure 5-17 Valve Housing

### 5.9.4.1 Regulator Assembly

1. Using a 3mm hex key, remove the 4 screws that secure the valve housing bottom cover and remove the cover.
2. Disconnect the tubing from the straight push-in fitting on the regulator assembly.
3. Using two adjustable wrenches, turn the 14mm hex nut on the inside of the housing while holding the hex on the regulator on the outside of the housing to loosen the assembly. Remove the regulator assembly.
4. To replace the regulator inlet filter, use a wrench to remove the elbow fitting, then turn the filter fitting off the regulator. Before installing a new filter, make sure all old PTFE tape remnants are removed and new tape is applied.
5. When installing the new regulator assembly, be sure to replace the M14 lock washer under the 14mm hex nut. Hold the regulator so that when it is installed the oxygen supply fitting points straight down at the floor. Perform the Pre-use Checkout.

### 5.9.4.2 Supply Valves

1. Remove the regulator assembly as described in steps 1 through 3 above.
2. Disconnect the supply valves electrical connector.
3. Use a pair of pliers to turn the valve out of the manifold block.
4. When installing a new valve, finger tighten it into the manifold. Perform the Pre-use Checkout Supply Valve Leak Test.

### 5.9.5 Servo Oxygen Board Repairs

1. Use a 2.5 mm hex key to loosen the 2 screws in the keyhole slots and remove the 6 remaining screws that secure the electrical enclosure cover, then remove the cover.
2. The Servo O2 Board is located in the second slot of the option card cage. The 485 data cable, sensor housing cable, calibration cable and cooling fan cable are attached to it. The board can be slid part way out of its guide to access its connectors or to replace the U6 EPROM. Perform Pre-use Checkout.



# Chapter 6: Illustrated Parts

This chapter provides illustrated parts of the Giraffe Incubator.

For illustrated parts of the Giraffe Scale, refer to the Giraffe Scale Service Manual, which can be ordered as part of a Giraffe Incubator service manual kit: (US) 6600-0847-801 or (INTL) 6600-0847-802.

## 6.1 Exploded Views

The exploded views begin on the next page.

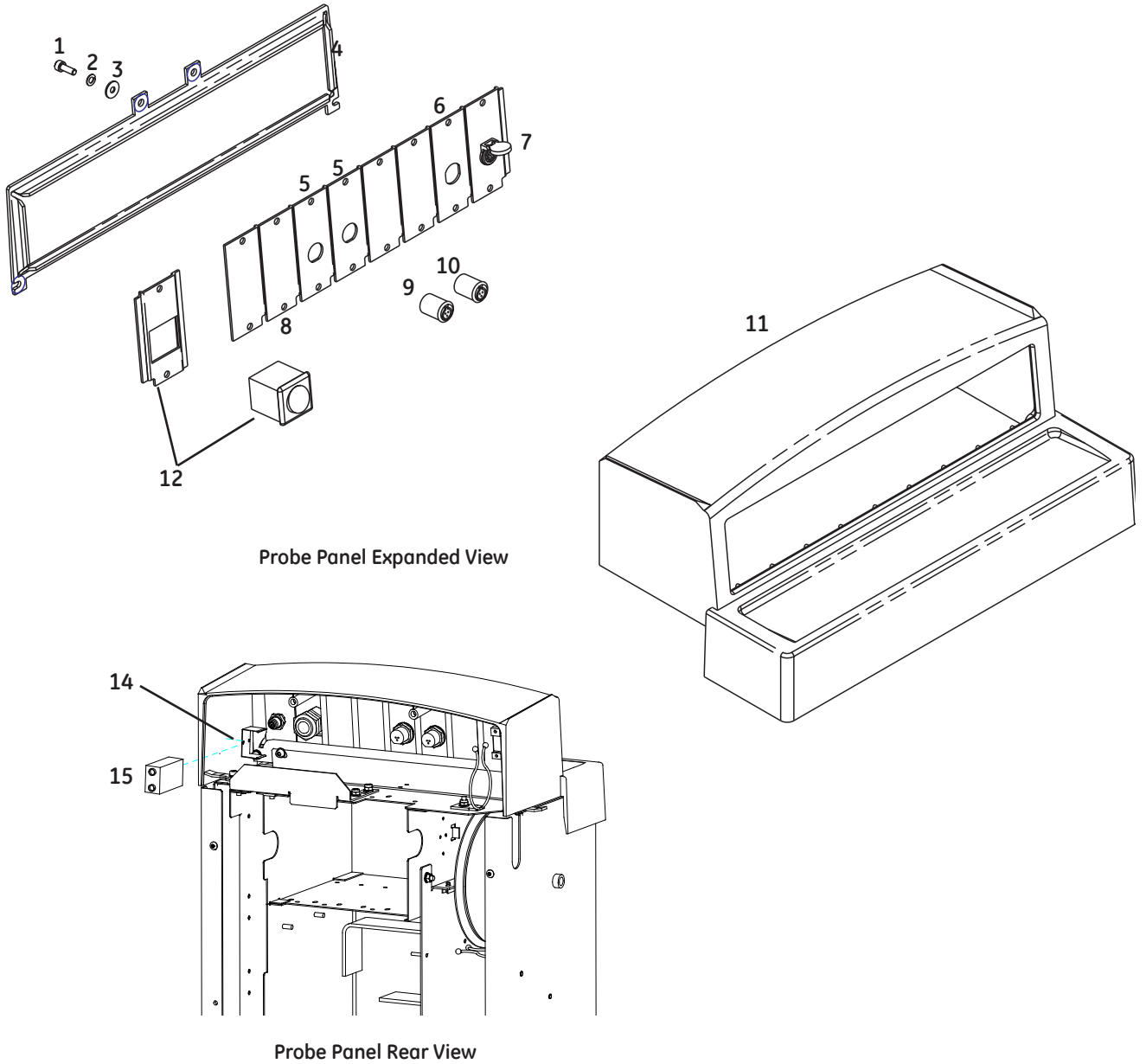
### 6.1.1 Probe Housing, Display Module, and Electrical Enclosure

1. Screw, M4 x 8 Socket Head.....	6600-0707-408
2. Washer, M4 Split Ring.....	6600-0713-403
3. Washer, M4 Flat.....	6600-0712-403
4. Retaining Frame.....	6600-1288-500
5. Patient Probe Connector Plate.....	6600-1287-502
Patient Probe Label*.....	6600-2325-102
6. Compartment Air Probe Connector Plate.....	6600-1287-506
Compartment Air Probe Label*.....	6600-2325-109
Strain relief nut.....	6600-0884-400
7. Scale Wire Harness.....	6600-0728-700
Scale connector plate.....	6600-1287-504
Scale label.....	6600-2325-104
Dust cover.....	6600-1195-600
8. Blank Connector Plate.....	6600-1287-501
Blank Label.....	6600-2325-101
9. Patient Probe 1 Panel Harness.....	6600-0716-701
10. Patient Probe 2 Panel Harness.....	6600-0716-702
11. Probe Panel Housing.....	6600-1290-500
12. Rocker Switch Assembly.....	6600-0227-850
Power Switch and Battery Wire Harness.....	6600-0707-700
Switch Mounting Plate.....	6600-1844-500
Switch Plate Label*.....	6600-2325-108
14. Battery holder with adhesive.....	M1049264
15. Battery*.....	6600-1024-600

\*Refer to section "6.3 Labels".

\*Battery is a 7 cell, 8.4v nickel-metal hydride battery.





Probe Panel Expanded View

Probe Panel Rear View

Figure 6-1 Probe Panel Assembly

1. Rear Cover .....	6600-1134-500
2. Screw, M3 x 8 Button Head.....	6600-0706-405
3. Washer, M3 Split Ring.....	6600-0713-402
4. Washer, M3 Flat.....	6600-0712-402
5. Standoff, M3 x 2.25" .....	6600-1070-400
6. PCA Display Driver .....	6600-0213-850
7. Standoff, M3 x 2.0" .....	6600-1068-400
8. EL Display Harness.....	6600-0725-700
9. Display Cage.....	6600-0222-850
10. Round Spacer.....	6600-1191-400
11. Rotary Encoder Switch (includes cable, lockwasher, and nut).....	6600-1026-600
12. ESD Cage* .....	6600-1133-500
13. Nut Plate.....	6600-1276-500
14. No longer available.	
15. Touch Panel Assembly.....	6600-1254-600
16. Screw, M2.5 x 8 Socket Head.....	6600-0715-403
17. Alarm Lens.....	6600-1132-500
18. Right (east) Seal.....	6600-1736-501
19. Control knob.....	6600-1480-500
20. Power Fail Lens.....	6600-1065-400
21. Display Bezel.....	6600-1131-500
22. Left (west) Seal.....	6600-1736-502
23. Light Pipe.....	6600-1066-400
24. Washer, M4 Flat.....	6600-0712-403
25. Washer, M4 Split ring.....	6600-0713-403
26. Screw, M4 x 10 Socket Head.....	6600-0707-409
27. Nut, M3.....	6600-0711-403
28. PCA LED.....	6600-0215-850
29. LED Display Harness.....	6600-0739-700
30. Washer, M3 Internal lock .....	6600-0713-431

\*When replacing, must also order touch panel (6600-1254-600).

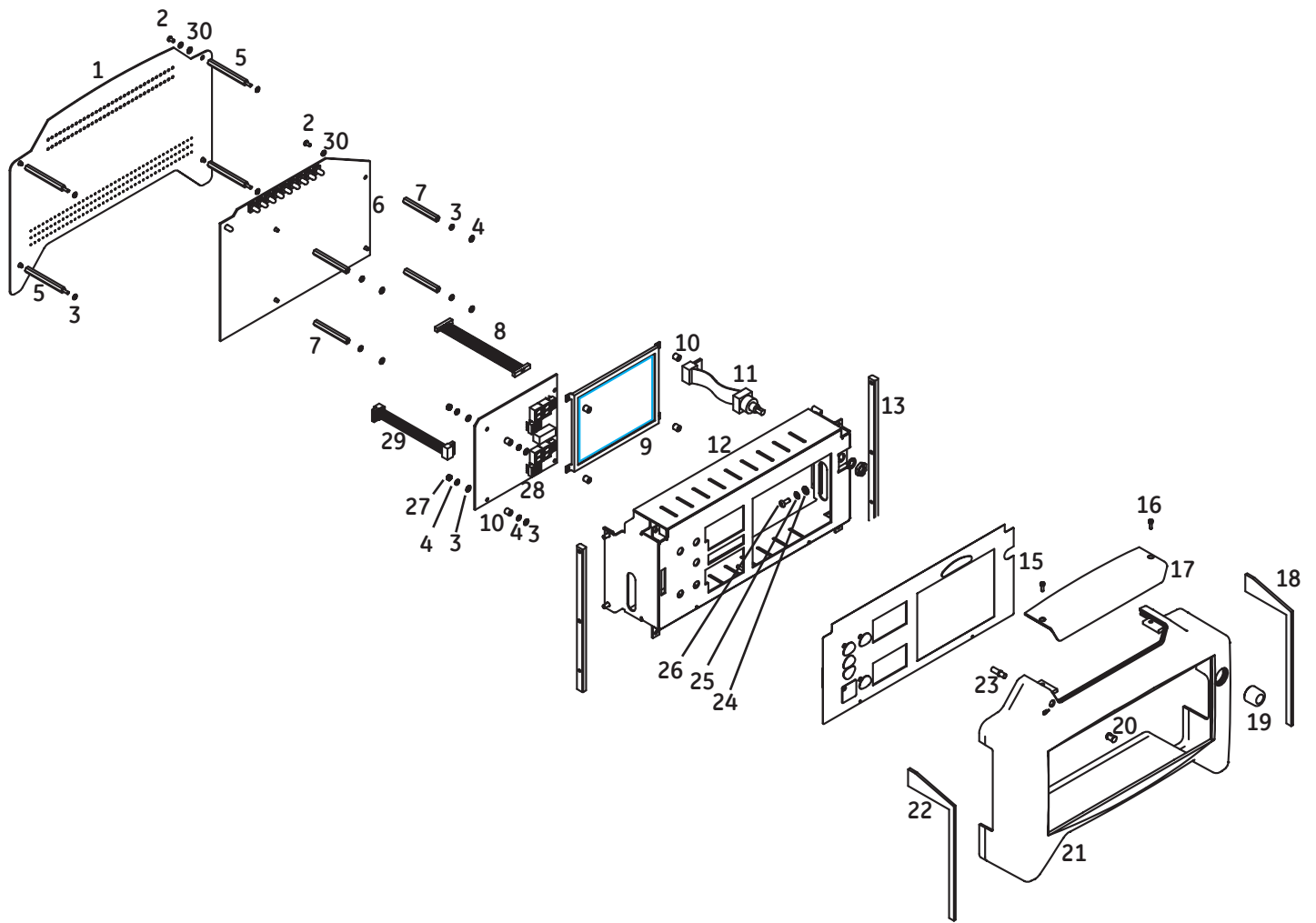
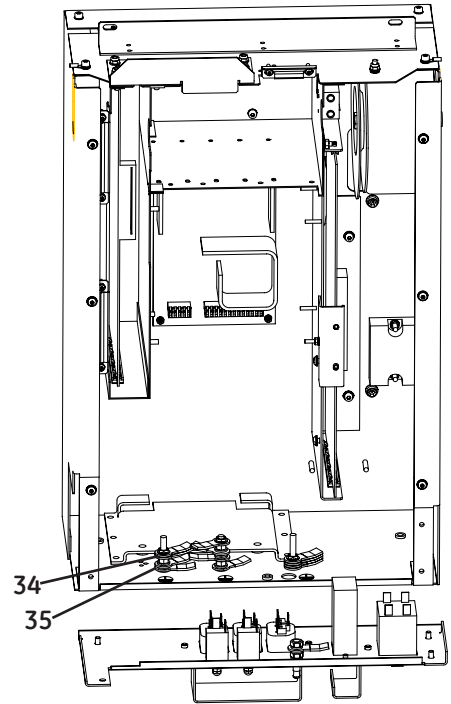


Figure 6-2 Display Module

1.	RS232 blank plate .....	6600-1752-500
2.	Cable twist lock .....	6600-1197-600
3.	Card cage.....	6600-1347-500
4.	In older units:	
	Battery* .....	6600-1024-600
	Battery adapter harness@.....	6600-0617-700
5.	Relay board bracket.....	6600-1166-500
6.	Relay board.....	6600-0214-850
	120 V 2 amp fuse (relay brd. 10 or higher).....	6600-0877-600
	230 V 1 amp fuse (relay brd. 10 or higher).....	6600-0882-600
	3.5 amp fuse (relay brd. 10 or higher).....	6600-0878-600
	Interface board@ (relay brd. 9 or lower).....	No longer needed.
	120V 2 amp fuse@ .....	6600-1324-602
	230V 1 amp fuse@ .....	6600-1324-601
7.	E-base toroidal transformer.....	6600-0746-700
8.	Screw, 5/16-18 x 2 ½.....	6600-1111-400
9.	Incubator heater solid state relay .....	6600-1003-600
10.	Screw, M6 x 16.....	6600-0707-421
11.	Star washer, M6 internal tooth.....	6600-0713-434
12.	Flat washer, M6.....	6600-0712-405
13.	Star washer, M6 external tooth.....	6600-0713-445
14.	Wire shield@.....	6600-1798-500
15.	Bed heater isolation transformer@ .....	6600-0815-700
16.	Power switch (115V).....	6600-1014-602
	Power switch (230V).....	6600-1014-601
17.	Line filter.....	6600-1006-600
18.	Single plug guard	
	U.S., U.K., Italian, Swiss, Australian (short).....	6600-1701-500
	C.E. cord (long).....	6600-1857-500
	Bumper kit for power cord (40 bumpers).....	M1135907
19.	Accessories plug guard.....	6600-1711-500
20.	Flat washer, M4.....	6600-0712-403
21.	Lock washer, M4 internal tooth.....	6600-0713-432
22.	Screw, M4 x 8.....	6600-0706-408
23.	Washer, color code.....	6600-0338-400
24.	Plug ground.....	6600-0337-400
25.	Power outlet.....	6600-0583-600
26.	Connection panel.....	6600-1746-500
27.	Circuit breaker.....	6600-0562-603
28.	Nut, M6.....	6600-0340-400
29.	Lock washer.....	6600-0339-400
30.	Electrical enclosure .....	6600-1346-500
31.	Card tension rack (bottom) .....	6600-1064-400
32.	Control board .....	6600-0212-850
33.	Card guide (top).....	6600-1183-400
34.	Hex nut, M5.....	6600-0711-408
35.	Lock washer, M5.....	6600-0713-444
36.	Card guide (rear) .....	6600-1105-400
37.	Board retaining bracket .....	6600-1822-500
38.	Nut for bracket .....	6600-0711-403
39.	Door hardware-	
	Screw, SEMS M4 x 10 btn hd skt.....	6600-0908-401



Parts not shown

Enclosure door.....6600-1349-500  
 Also refer to power cords in section "6.2 Accessories".

\*Battery is a 7 cell, 8.4v Nickel Metal Hydride battery.

@Not present on all units.

**NOTE:** If your battery is in the electrical enclosure above the relay board, order relocation kit M1045981. This kit includes parts and instructions to relocate the battery to the probe panel to reduce battery ambient temperature and prolong battery life.

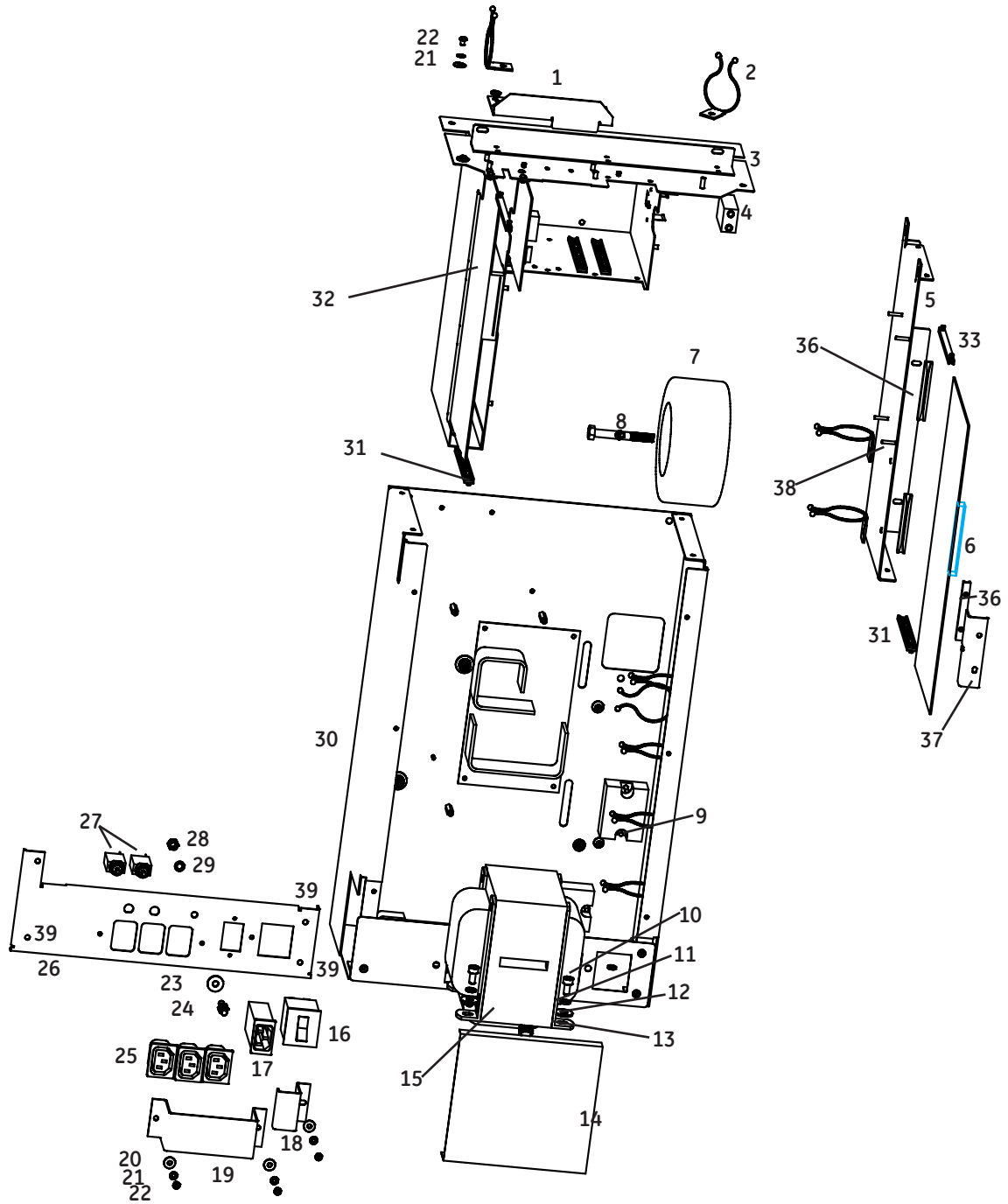


Figure 6-3 Electrical Enclosure

1. Power supply* .....	6600-0221-850
Mounting hardware-	
Spacer, M3 x 8 .....	6600-1192-400
Star washer, M3 .....	6600-0713-442
Nut, M3 .....	6600-0711-403
2. Nut, M3 .....	6600-0711-403
3. Star washer, M3 .....	6600-0713-442
4. Nut, M4 .....	6600-0711-407
5. Split ring washer, M4 .....	6600-0713-403
6. Washer, M4 .....	6600-0712-403
7. Humidifier isolation transformer .....	6600-1328-600
8. Spacer, M3 x 18 .....	6600-1192-400
9. Screw, M6 skt. hd. ....	6600-0707-420
10. Lockwasher, M6 int. tooth .....	6600-0713-434
11. Mounting bracket .....	6600-1587-500
12. Washer, M4 .....	0402-1133-300
13. Nylon lock nut, M4 .....	6600-0714-402
14. Lockwasher, M3 ext. tooth .....	6600-0713-442
15. Nylon lock nut, M3 .....	6600-0714-401
16. Wire harness, ISO transformer .....	6600-1526-700
17. Screw, M4 x 6 .....	6600-0706-407
18. Lockwasher, M4 int. tooth .....	6600-0713-432
19. Cable twist lock .....	6600-1197-600
20. RS232 chassis .....	6600-1479-500
21. Screw lock, female .....	6600-0673-400
22. Retaining clip .....	6600-0672-400
23. Wire harness (with 9 pin D connector) .....	6600-1531-700
24. RS232 ThermaLink PC board .....	M1059915
RS232 upgrade kit .....	6600-0257-850
25. Wire harness (connects to Control PCB) .....	6600-1530-700

\*The fuses on the power supply cannot be replaced. If the fuses are open there will be component damage that necessitates replacing the entire power supply.

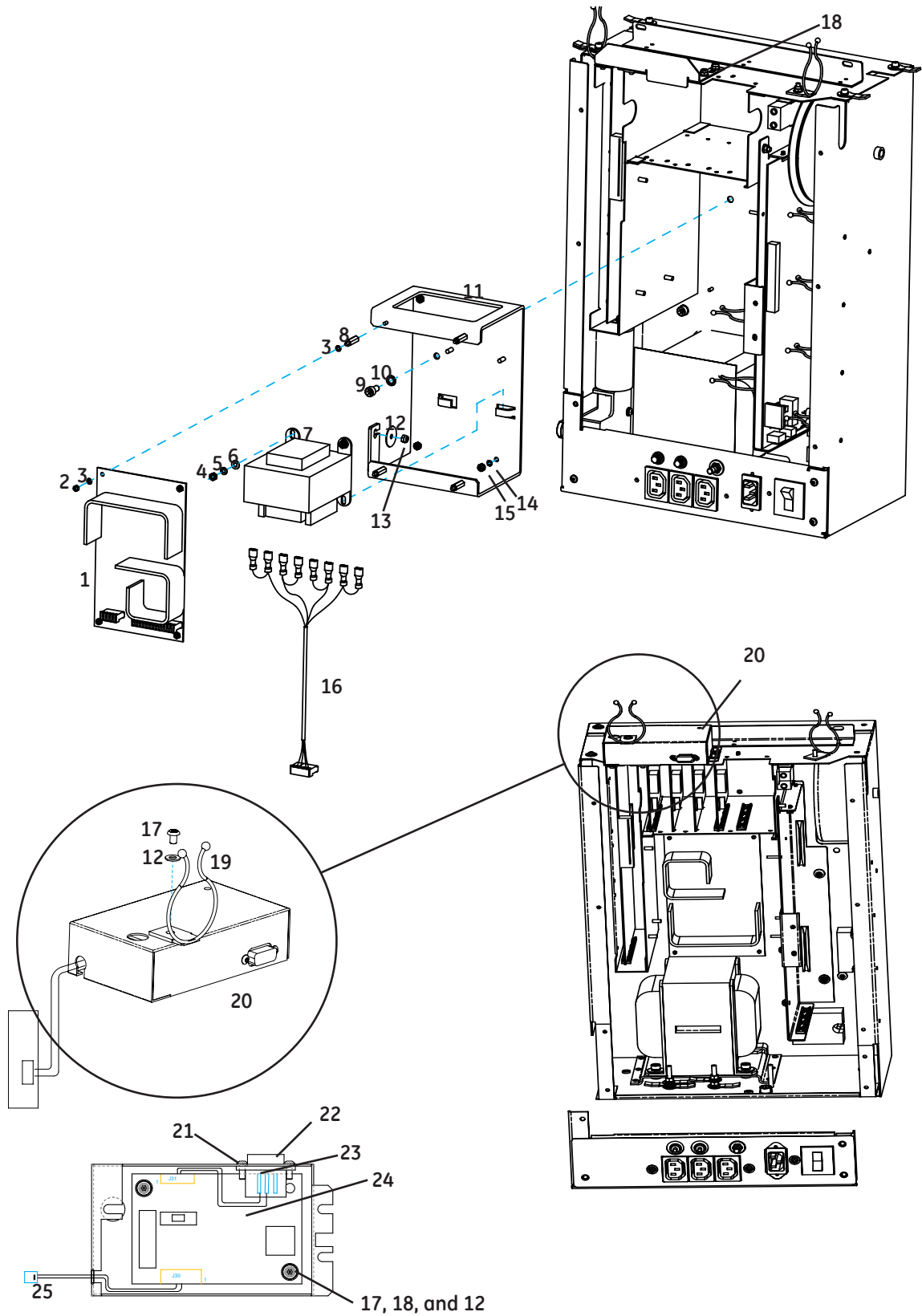


Figure 6-4 Humidifier Transformer and RS232 Option

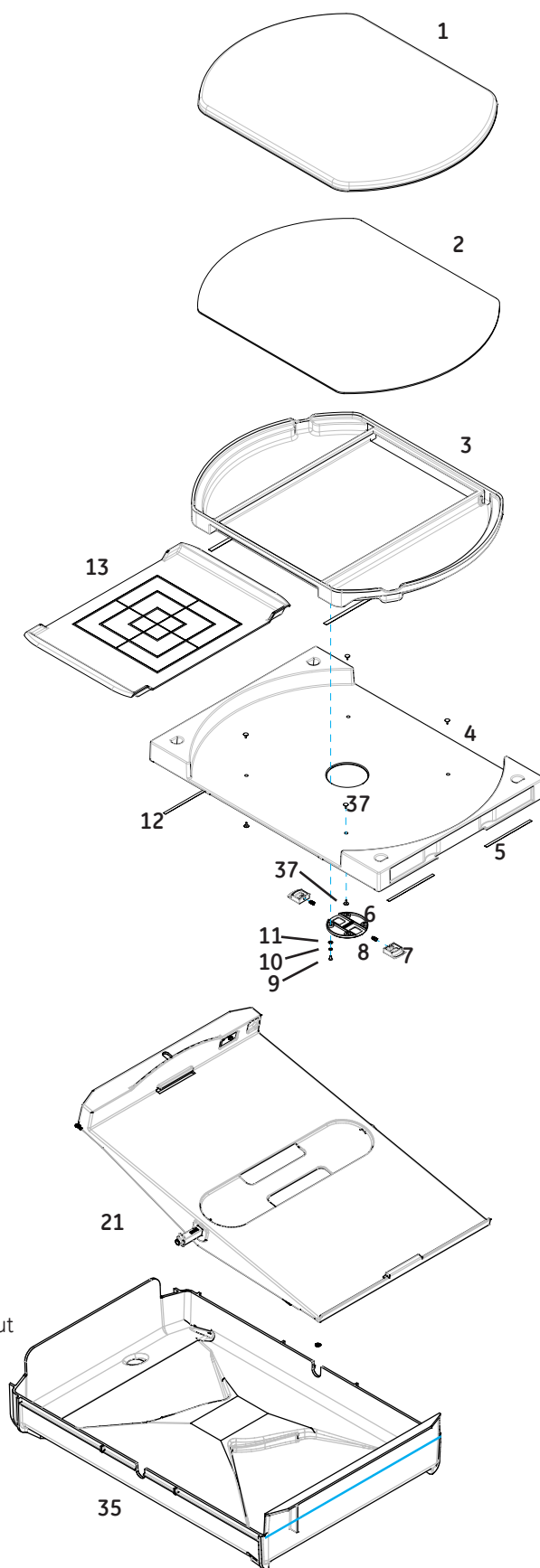
### 6.1.2 Bed and Side Doors

- 1. Giraffe pressure-diffusing mattress (blue) .....6600-0689-800
- Mattress (white).....6600-1116-500
- 2. Plate.....6600-1365-500
- 3. Mattress Tray Support .....6600-1353-500
- 4. Translation Deck.....6600-1352-500
- 5. Tape (5.4 in.) .....6600-1758-502
- 6. Latch Cover.....6600-1364-500
- 7. Locking Latch.....6600-1363-500
- 8. Spring.....6600-1079-400
- 9. Screw M4\*.....6600-0706-409
- 10. Washer, M4 split ring\* .....6600-0713-403
- 11. Washer, M4 flat\*.....6600-0712-403
- 12. Tape (19.3 in.).....6600-1758-501
- 13. X-ray Tray .....6600-1334-500
- 14. Tilt Ball and Screw Assembly .....6600-0814-700
- 15. Cover .....6600-1329-500
- 16. Top Plate.....6600-1328-500
- 17. Nut.....6600-1330-500
- 18. Plate.....6600-1457-500
- 19. Stop.....6600-1366-500
- 20. O-ring.....6600-1080-400
- 21. Tilt platform\*.....6600-1313-500
- 22. Washer\*.....0202-4520-340
- 23. Spring\*.....6600-1009-400
- 24. Brake bracket\*.....6600-1225-500
- 25. Brake pad assembly\* .....6600-0853-700
- 26. Knob\* .....6600-1158-500
- 27. Cover\* .....6600-1327-500
- 28. Slide\* .....6600-1227-500
- 29. Spring\*.....6600-1083-400
- 30. Ball bearing\* .....6600-1228-500
- 31. Pin\*@.....6600-2023-500
- 32. Pin retaining clip\*@ .....6600-0240-400
- 33. Plunger\* .....6600-1325-500
- 34. Spring\*.....6600-1043-400
- 35. Pan .....6600-0801-700
- 36. Screw, M4 .....6600-0706-407
- 37. Rivet, small .....6600-1078-400
- 38. Rivet, large.....6600-1203-400
- 39. Washer, brake\* .....6600-1335-500

Parts not shown

Tilt platform assembly (includes all items with \*) .....6600-0771-700

@New pin and retaining clip replaces earlier roll pin and fits platform without modifying the hole.





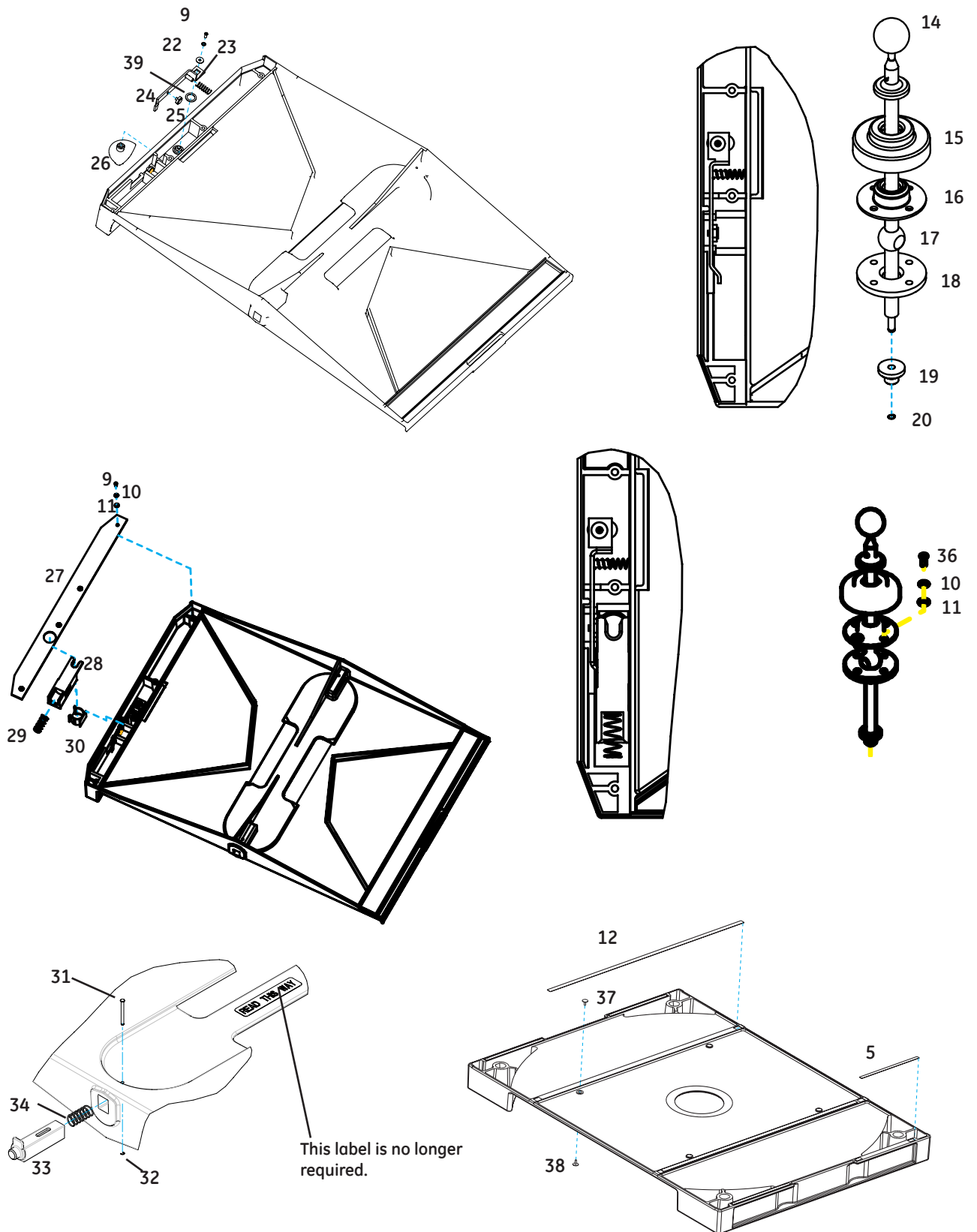


Figure 6-5 Bed

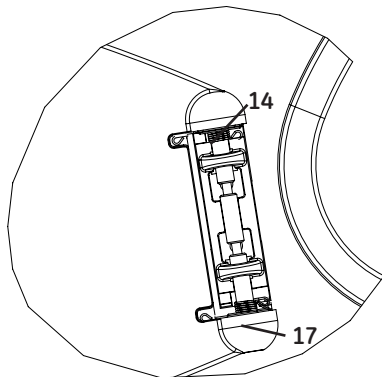
1. Door with porthole cutouts@ .....	6600-1807-500
2. Inner wall.....	6600-1792-500
3. Porthole seal.....	6600-1249-500
4. Wall hinge snap .....	6600-1436-500
5. Side wall hinge.....	6600-1149-500
6. Side wall hinge mask label.....	6600-2321-100
7. Side wall inside latch cover.....	6600-1826-500
8. Porthole hinge bottom.....	6600-1239-500
9. Side wall latch.....	6600-1403-500
10. Screw, M2.9 x 9.5 .....	6600-0709-409
11. Side wall latch spring.....	6600-1405-500
12. Side wall latch cover .....	6600-1404-500
13. Wall hinge snap post.....	6600-1429-500
14. Porthole hinge right (East) spring*.....	6600-1026-400
15. Porthole middle hinge.....	6600-1240-500
16. Hinge pin .....	6600-1041-400
17. Porthole hinge left (west) spring*.....	6600-1040-400
18. Flat washer.....	6600-0712-403
19. Split ring lock washer, M4 .....	6600-0713-403
20. Screw, M4 x 16.....	6600-0706-411
21. Porthole hinge cover.....	6600-1242-500
22. Porthole door.....	6600-1238-500
23. Porthole latch cover*.....	6600-1246-500
24. Porthole latch spring.....	6600-1245-500
25. O-ring.....	6600-1049-400
26. Porthole latch base* .....	6600-1244-500
27. Plastic washer .....	6600-1050-400
28. Screw, M2.9 .....	6600-0709-407
29. Porthole latch spacer .....	6600-1257-500
30. Screw, M4 x 12.....	6600-0706-410
31. Porthole Latch Assembly (Includes 23-28) .....	6600-0738-700
32. Ohmeda logo label@ (refer to section 6.3) .....	6600-2384-101
33. Giraffe logo label@ (refer to section 6.3).....	6600-2382-101
34. Iris service kit.....	6600-0037-850
35. (This item is no longer available.)	
36. Iris gasket.....	6600-0699-500

Parts not shown:

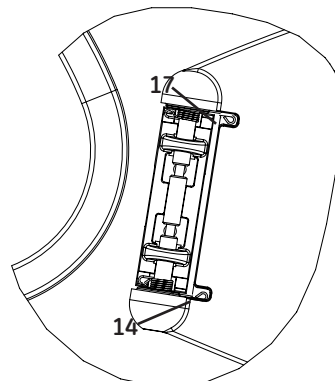
Oscillator (High Freq. Vent) port cover.....6600-0838-800

\* Use Vac Kote (6700-0092-200) sparingly on the porthole door springs (items 14 and 16) and on the surfaces where the door latch pieces (items 23 and 26) slide together.

@ Order items 32 and 33 when ordering item 1.



LEFT DOOR



RIGHT DOOR

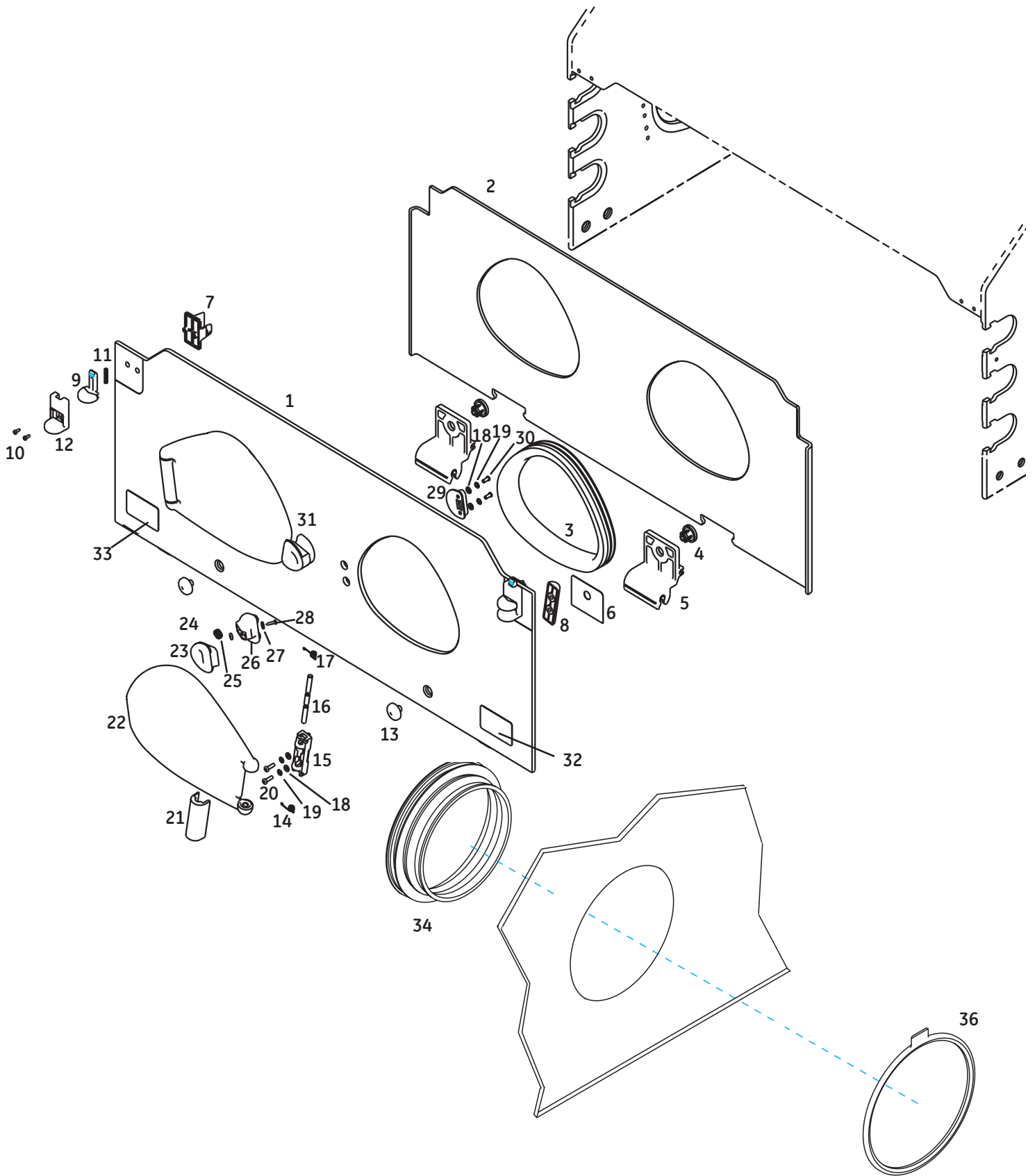


Figure 6-6 Side Door (East/West)

1. Ventilator slot grommet .....	6600-1231-500
2. Corner grommet .....	6600-1248-500
3. Screw, M4 x 16 Bt. Hd.....	6600-0706-411
4. Hinged screw cover, small.....	6600-1206-402
5. Door latch receiver .....	6600-1819-500
6. Door latch label.....	6600-2423-100
7. Corner bracket.....	6600-1939-500
8. Flip Door kit (includes items 3,4 and 9).....	6600-0119-850
9. Flip door bumper .....	6600-1580-500
10. Mask label.....	6600-2424-100
11. Inner wall bumper.....	6600-1485-500
12. Screw, M4.2 x 19 Pn. Hd.....	6600-0709-404
13. Corner bracket nut.....	6600-1940-500
14. Hinged screw cover, medium.....	6600-1206-401
15. Hinged screw cover, large.....	6600-1206-403

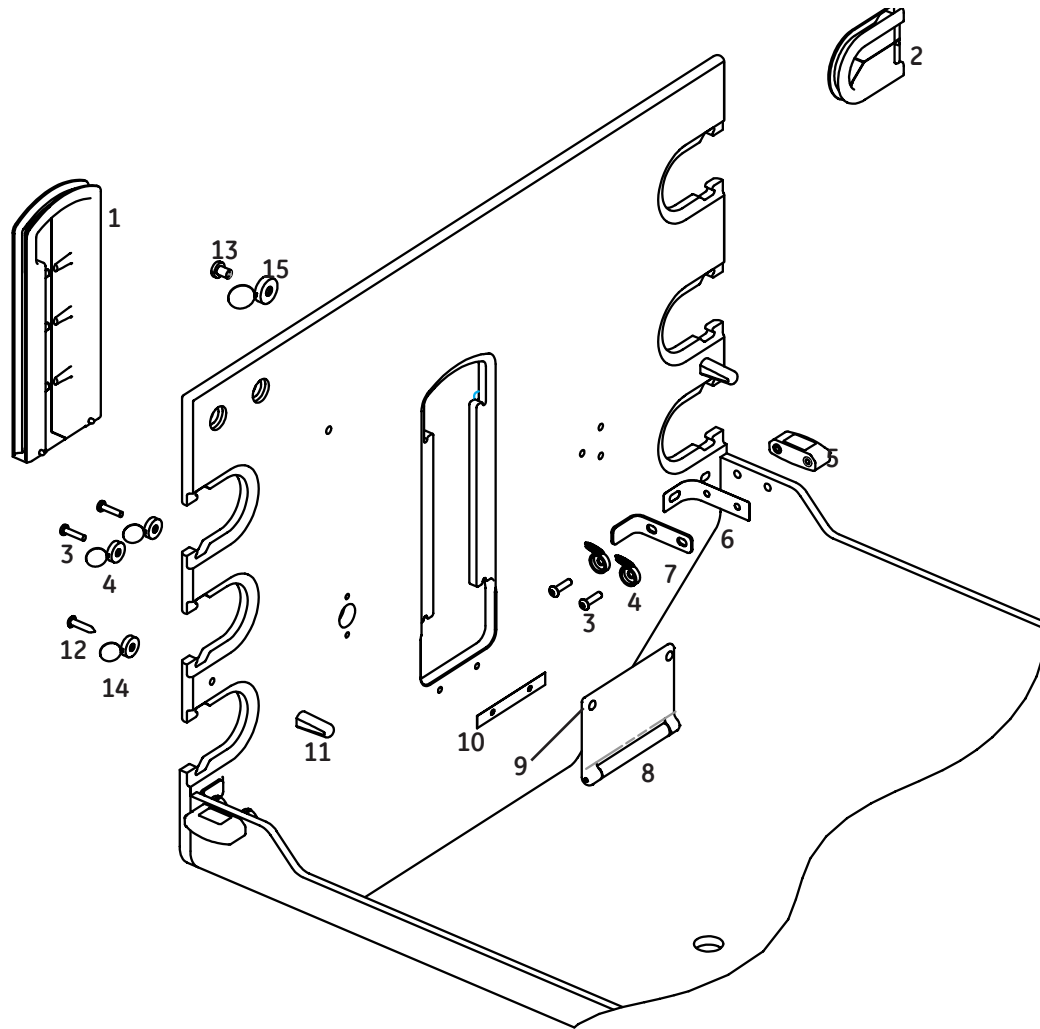


Figure 6-7 Flip Door, Corner Brackets, and Grommets

### 6.1.3 Hood and Compartment Air Probe

1. Compartment air probe@ .....	6600-1512-700
Probe harness cable@ .....	6600-1513-700
2. O-ring .....	6600-0540-400
3. Humidity sensor assembly* .....	6600-0784-700
Plug (no humidity sensor installed) .....	6600-1476-500
4. Retainer .....	6600-1475-500
5. Break plate .....	6600-1473-500
6. Screw, M3 x 6 button hd .....	6600-0706-406
7. Probe shield .....	6600-1864-500
8. Back plate .....	6600-1474-500
9. Flat washer, M3 .....	6600-0712-402
10. Split ring lock washer .....	6600-0713-402
11. Screw, M3 x 25 button hd .....	6600-0706-450
12. Screw, M4 x 16 button hd .....	6600-0706-411
13. Cable clamp .....	6600-0144-400
14. Lock nut, M4 .....	6600-0714-402
15. Hinge snap .....	6600-1436-500
16. Hinge post .....	6600-1848-500
17. Hood latch kit .....	6600-0231-850
Parts not shown	
Humidifier Calibration Kit* .....	6600-0048-850
Hood replacement kit (includes hood, 4 each of items 15 and 16, 10 each of item 14, 2 each of item 4 and 4 each of item 15 shown on previous page, and labels)	
Ventilator slot and porthole .....	6600-0232-850
Ventilator slot and iris porthole .....	6600-0270-850
Ventilator slot and ventilator slot .....	6600-0269-850
Oscillator (High Freq. Vent) port cover .....	6600-0838-800

\* Unit must be recalibrated using Humidifier Calibration Kit whenever sensor is replaced.

@ For earlier units with a compartment air probe cable that disconnected at the probe panel, order service kit 6600-0241-850.

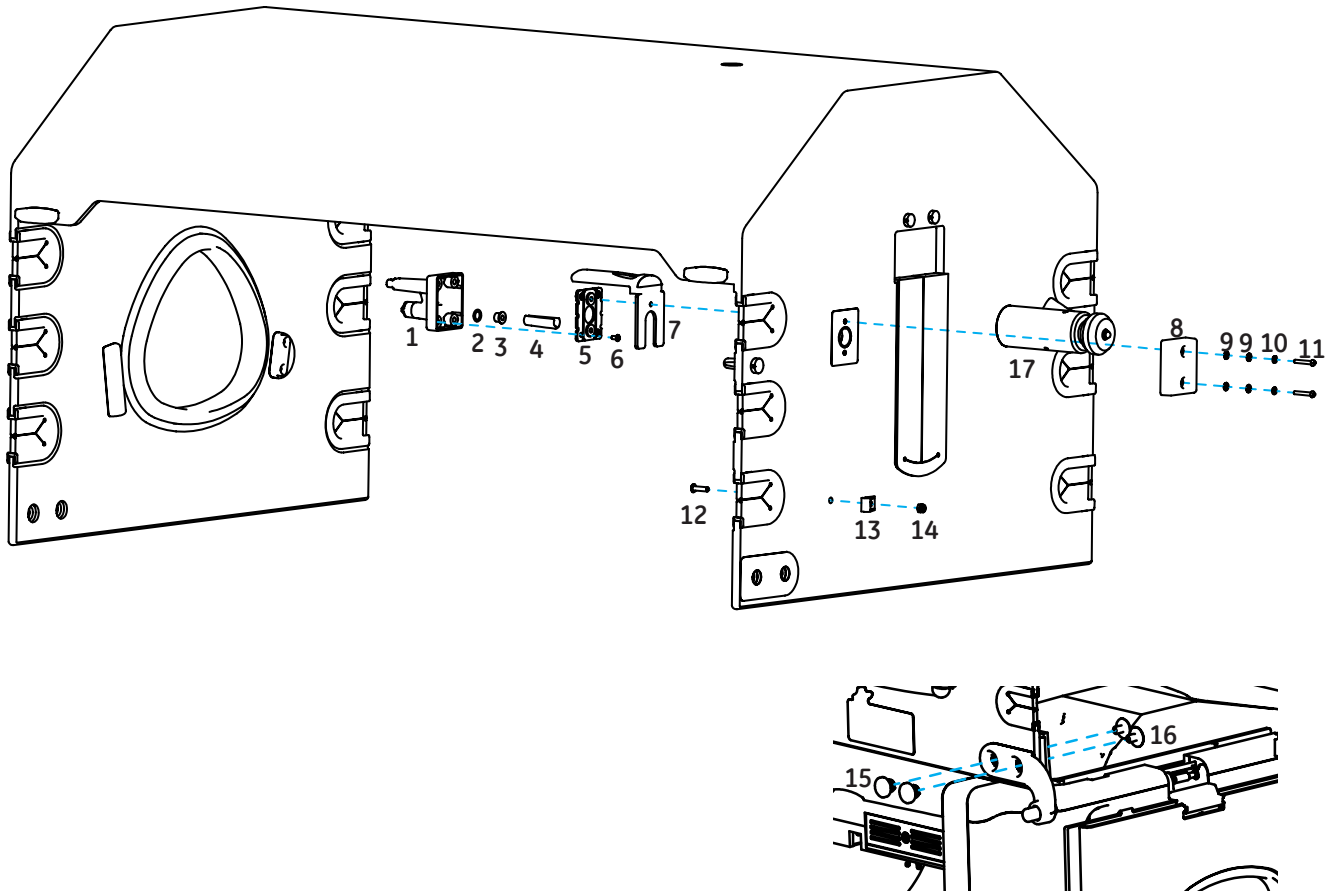


Figure 6-8 Compartment Air Probe

### 6.1.4 Chassis

1. Fan.....	6600-1738-500
2. Fan hub.....	6600-1440-500
3. Fan seal.....	6600-1557-500
4. No longer available.	
5. Hinge cover.....	6600-1802-500
6. Tab washer.....	6600-1801-500
7. Lock washer, split ring M5.....	6600-0713-404
8. Screw, M5 x 20, Skt. Hd.....	6600-0707-417
9. Washer, M4.....	6600-0712-403
10. Lock washer, Split ring, M4.....	6600-0713-403
11. Screw, M4 x 25 Btn. Hd.....	6600-0706-413
12. Blank label.....	6600-2410-100
13. Screw, M8 x 16 Skt. Hd.....	6600-0707-427
14. Lock washer, split ring M8.....	6600-0713-406
15. Tie down cylinder.....	6600-1795-500
16. Screw, 8 - 32 x 7/8, Phillips.....	0140-6527-114
17. Washer, .193ID x .687 OD x .032.....	0402-0739-300
18. Well nut, neoprene.....	6600-1218-400
19. Screw, M5 x 25.....	6600-0707-418
20. Split ring lock washer, M5.....	6600-0713-404
21. Flat washer, M5.....	6600-0712-409
22. Bushing.....	6600-1434-500
23. Silicon washer.....	6600-1778-500
24. Screw, M4 x 8.....	6600-0707-408
25. Split ring lock washer, M4.....	6600-0713-403
26. Flat washer, M4.....	6600-0712-403
27. Wire routing clip.....	6600-1197-600
28. Socket plug.....	6600-1214-400
29. Jam nut.....	6600-1216-400
30. Incubator heater and harness assembly.....	6600-1041-700
31. Retaining clip.....	6600-1211-500
32. Heat sink gasket.....	6600-0300-300
33. Heat sink.....	6600-1858-500
34. Heat sink sensor.....	6600-0226-850
35. Thermostat.....	6600-1019-600
36. Screw, M5 Bt, Hd.....	6600-0706-418
37. Star washer, M5.....	6600-0713-433
38. Seal washer.....	6600-1872-500
39. Chassis (order 2pcs. item 12).....	6600-0278-850



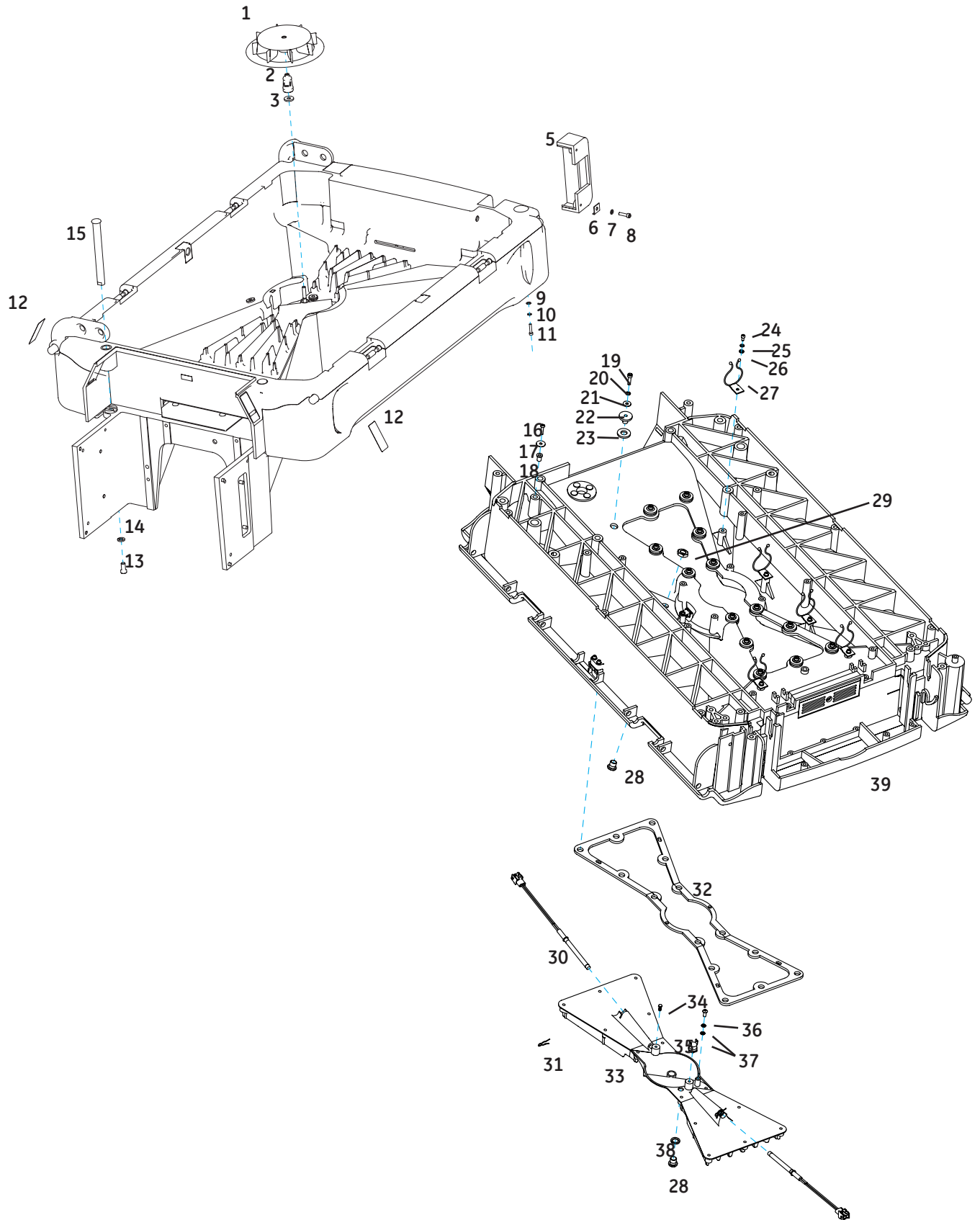


Figure 6-9 Upper Chassis and Heat Sink

1. Screw, M4 x 10.....	6600-0706-409
Screw, M4 x6 (for Servo O2 cutout).....	6600-0707-407
2. Split ring lock washer .....	6600-0713-403
3. Washer, M4.....	6600-0712-403
4. Chassis cover .....	6600-1888-500
5. Fan motor .....	6600-1057-600
6. Fan motor bracket.....	6600-1162-500
7.. Screw, M4 shoulder .....	6600-1051-400
8. Flat washer, M5.....	6600-0712-409
9. Motor mount.....	6600-1000-400
10. Star washer, M3, Int.....	6600-0713-431
11. Screw, M3 x 6.....	6600-0707-401
12. Left door hinge button.....	6600-1285-500
13. Left hinge pin.....	6600-1284-500
14. Chassis side panel.....	6600-1280-500
15. Screw, shoulder .....	6600-1033-400
16. Flat washer, M5.....	6600-0712-404
17. Spring.....	6600-1299-500
18. Spring clip.....	6600-1300-500
19. Humidifier sound damper .....	6600-1494-500
20. Wire raceway cover .....	6600-1303-500
21. Filter (10 pcs, behind the humidifier reservoir).....	6600-0207-850
22. Filter cover assy. (includes knob and washer).....	6600-1533-700
23. Knob .....	6600-0894-400
Push washer .....	6600-0895-400
24. Screw, M3 x 6 button head .....	6600-0706-406
25. Flat washer, M3.....	6600-0712-402
26. Humidifier spacer.....	6600-1814-500
27. Right door hinge button .....	6600-1853-500
28. Hood hinge, front (south).....	6600-1817-500
Hinge snap .....	6600-1436-500
Hinge post.....	6600-1429-500
Hinge mask label.....	6600-2670-100
29. Washer.....	6600-0860-400
30. Right hinge pin.....	6600-1803-500
31. Bed pivot block.....	6600-1326-500
32. Screw, M4 x 20.....	6600-0707-412
33. Optical fan sensor (includes wire harness).....	6600-0820-700
34. Sensor holder .....	6600-1435-500
35. Sensor gasket.....	6600-1437-500
36. Screw, M2.9 x 6.5 .....	6600-0709-405
37. Split ring lock washer, M3 .....	6600-0713-402
38. Screw, M3 x 6.....	6600-0707-401
39. E-clip.....	6600-1045-400
40. Washer.....	6600-1100-400
41. Door spring.....	6600-1044-400
42. Pin stop.....	6600-1730-500
43. Screw, M5 x 12.....	6600-0706-418
44. Lock washer, split ring M5 .....	6600-0713-403
45. Hood hinge, rear (north).....	6600-1816-500

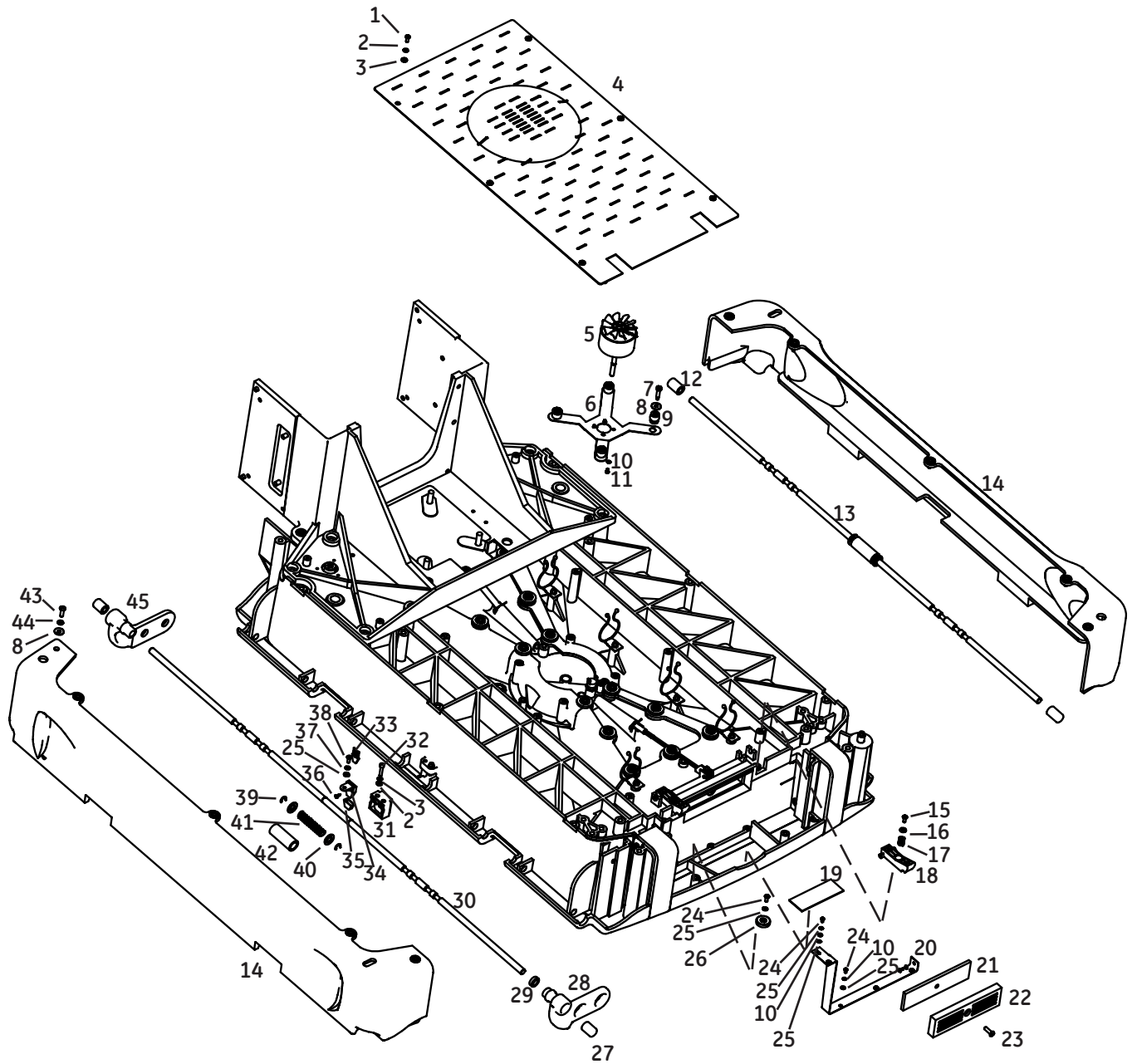


Figure 6-10 Lower Chassis

### 6.1.5 Humidifier

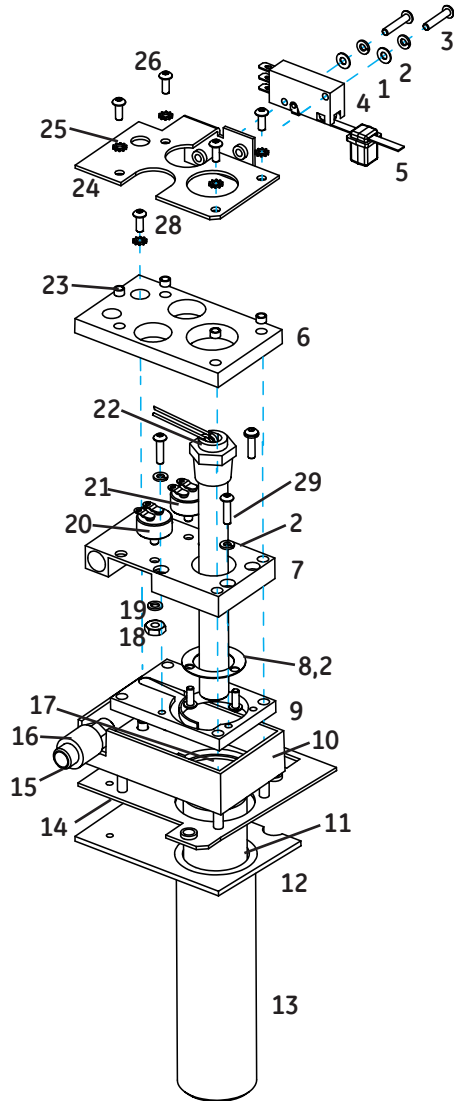
1. Flat washer, M3 x 3.2, ID .5.....	6600-0712-402
2. Split ring lock washer, M3 x 3.1, ID .8.....	6600-0713-402
3. Screw, M3 x 16 Cheese head Phillips.....	6600-1255-404
4. Reservoir switch (included in item 21)	
5. Button, reservoir switch .....	6600-1298-500
6. Top humidifier gasket.....	6600-1293-500
7. Heater mount.....	6600-1291-500
8. Screw, M3 x 8 Cheese head Phillips, Teflon coated.....	6600-1255-401
9. Ramp block .....	6600-1777-500
10. Humidifier gasket bottom .....	6600-1294-500
11. Protective insert.....	6600-1714-500
12. Reservoir seal.....	6600-1495-500
13. Insulating cylinder.....	6600-1182-500
14. Bottom bracket .....	6600-1181-500
15. Steam outlet .....	6600-1296-500
16. Silicone tube .....	6600-1780-500
17. Heater sheath* .....	6600-1292-500
18. Nut, hex 6 -32 .....	0144-3324-113
19. Split ring lock washer, #6.....	6600-0345-400
20. Safety thermostat assembly.....	6600-0225-850
21. Add water thermostat assembly (includes item 4).....	6600-0803-700
22. Humidifier heater* .....	6600-0224-850
23. Spacer, .125 ID.....	6600-1779-500
24. Humidifier top bracket.....	6600-1295-500
25. Star washer, M3 x 3.2 ID.....	6600-0713-442
26. Screw, M3 x 12 Cheese head Phillips.....	6600-1255-403
27. Humidifier reservoir.....	6600-0216-850
Reservoir bottom.....	6600-1493-500
Reservoir lid.....	6600-1492-500
28. Screw, M3 x 10 skt. hd.....	6600-0707-403
29. Screw, M3 x 10 Cheese hd. Phillips Teflon coated.....	6600-1255-402

Parts not shown

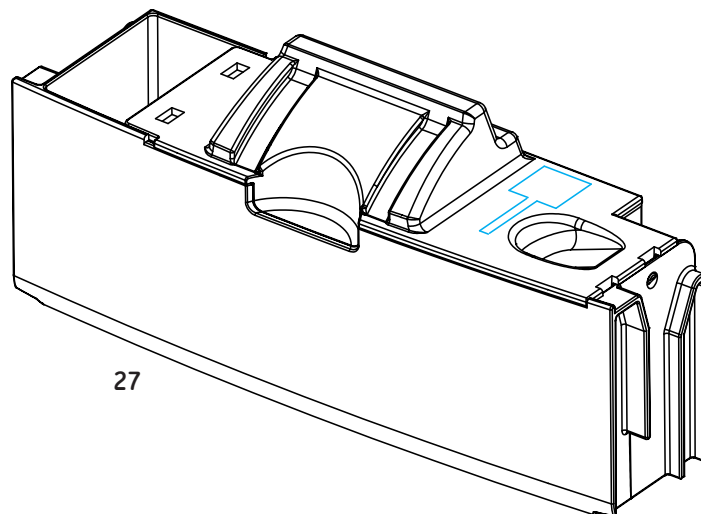
Humidifier heater kit

(includes all parts above except reservoir).....6600-0245-850

\* Always replace item 17 when replacing item 22.



**NOTE:** Due to design changes, refer to "5.5.7 Humidifier Assembly Repairs" on page 81 before ordering parts.



**Figure 6-11** Humidifier Assembly

### 6.1.6 Elevating Base, Old Designs

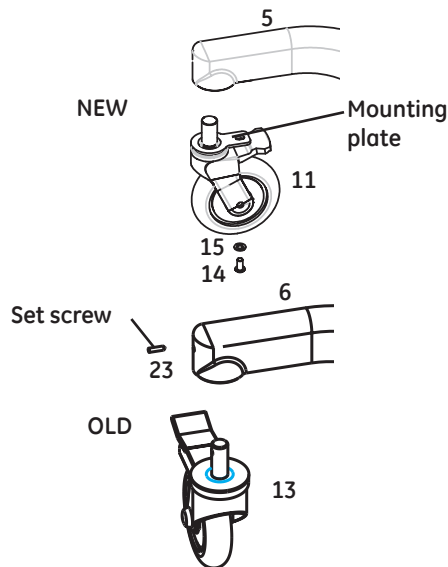
- 1. Main bracket.....6600-1183-500
- 2. Flat washer.....6600-0712-406
- 3. Lock nut, M8 x 1.25.....6600-0714-405
- 4. Inner shroud .....6600-1489-500
- 5. Leg (new) .....6600-1599-500
- 6. Leg (old).....6600-1323-500
- 7. Bed up/down pedal (gray).....M1108745  
Bed up/down pedals, set of two (gray).....M1108748  
Bed up/down pedal assembly (teal) obsolete, use gray (M1108748)
- 9. Lock nut, M4 x .7.....6600-0714-402
- 10. Speaker .....6600-1168-600
- 11. Caster, all (new).....6600-0890-400
- 12. Caster, front (old).....6600-1039-401
- 13. Caster with shield, rear (old).....6600-1039-402
- 14. Screw, M8 x 16 Btn. Hd. skt. (new) .....6600-0706-435
- 15. Lockwasher, M8 (new) .....6600-0712-406
- 16. Speaker bracket.....6600-1462-500
- 17. Screw, M12 socket head.....6600-0706-449
- 18. Lock washer M12 .....6600-0713-408
- 19. Screw, M6 .....6600-1117-402
- 20. Split ring lock washer, M6 .....6600-0713-405
- 21. Star washer.....6600-0713-445
- 22. Screw, M6 x 12 button head.....6600-0706-427
- 23. Cone point set screw, M6 (old)@.....6600-0715-405
- 24. Mounting plate .....6600-1186-500
- 25. Elevating column .....6600-0753-701
- 26. Washer.....6600-0712-405
- 27. Screw, M6 .....6600-0706-427
- 28. External star washer.....6600-0713-443
- 29. Flat washer.....6600-0712-403
- 30. Clamp, 5/16.....0208-0335-300
- 31. Outer shroud.....6600-1324-500
- 32. Screw, M5 .....6600-0706-420
- 33. Split ring lock washer .....6600-0713-404
- 34. Flat washer.....6600-0712-409
- 35. Screw, M4 socket head .....6600-0706-409
- 36. Caster cap.....6600-1600-500
- 37. Wire routing clip.....6600-0866-600

Parts not shown

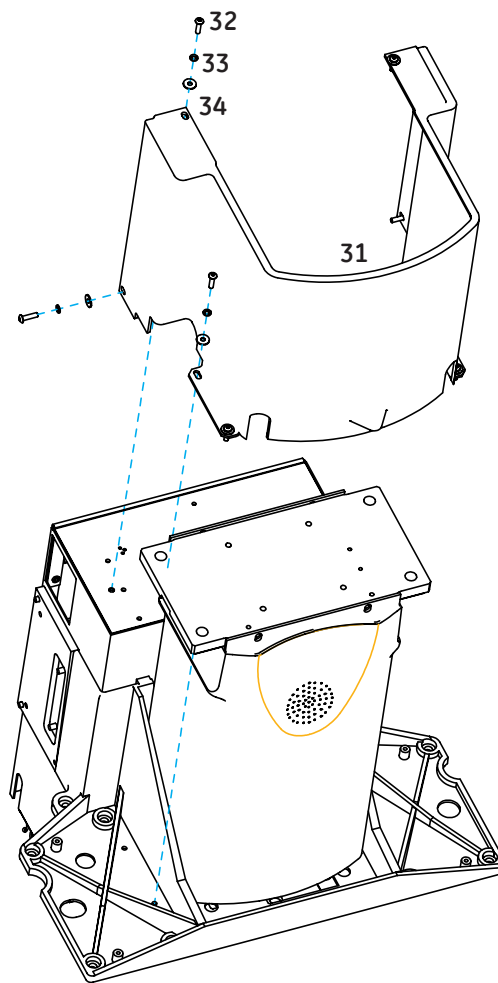
Blue plastic connector clip for footswitch .....6600-1163-600

\* If you unit is still equipped with these parts, contact customer service for new style footswitch kit.

@Apply Loctite #242



**NOTE:** Due to design changes, refer to “5.7 Caster Replacement” on page 86 before ordering parts.



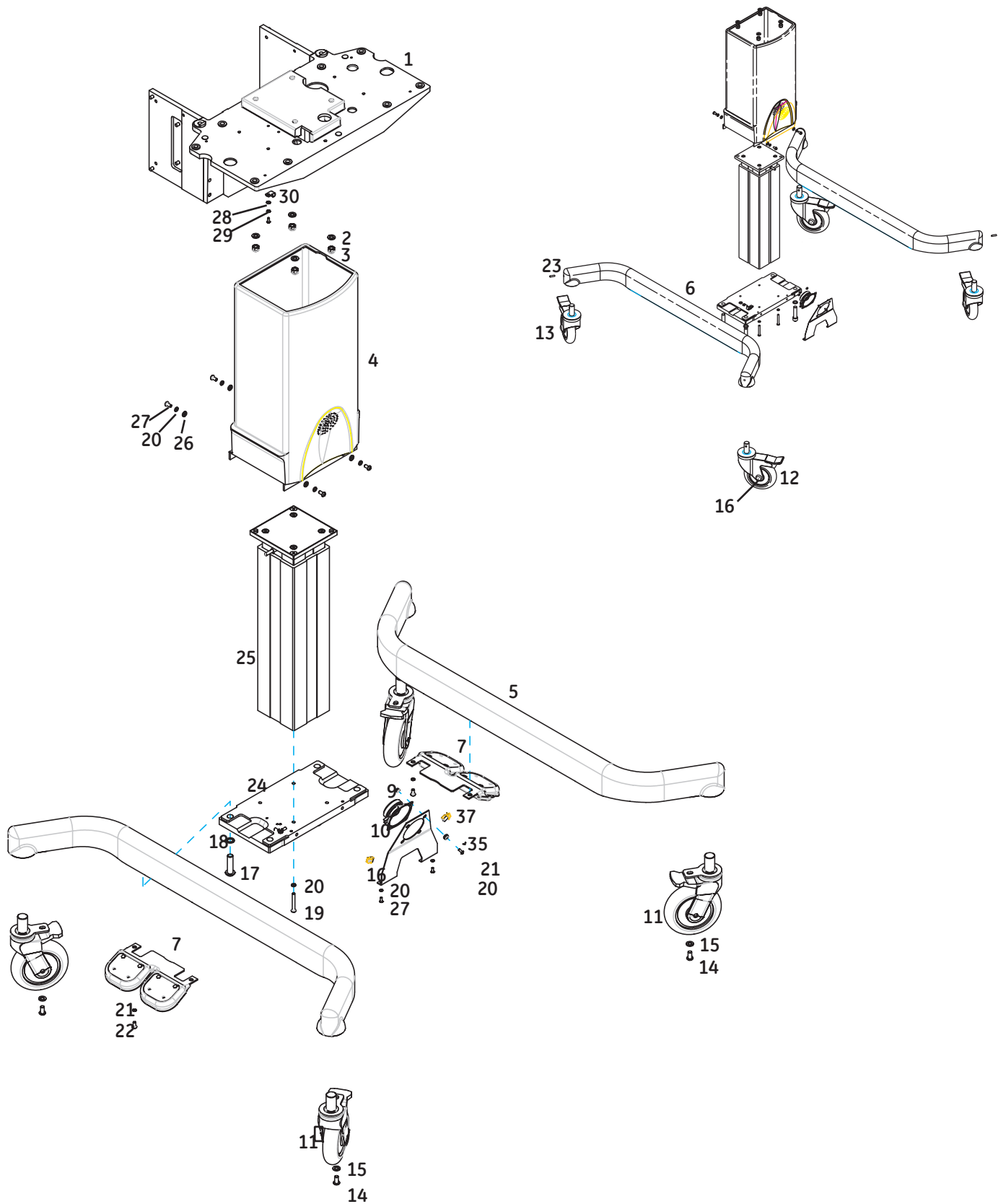
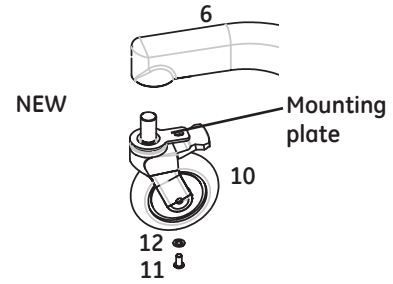


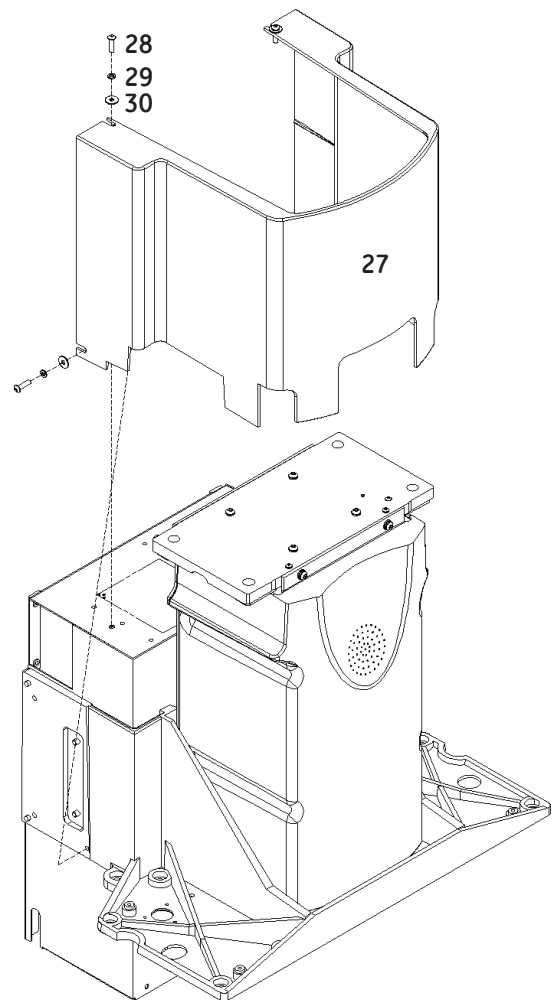
Figure 6-12 Base and Elevating Column with Two-piece Shroud Assembly

6.1.7 Elevating Base, Current Design

- 1. Main bracket.....6600-1183-500
  - 2. Flat washer.....6600-0712-406
  - 3. Lock nut, M8 x 1.25.....6600-0714-405
  - 4. Inner shroud .....M1078152
  - 5. Inner shroud back cover .....M1078156
  - 6. Leg (new) .....6600-1599-500
  - 7. Bed up/down pedal (gray).....M1108745  
Bed up/down pedals, set of two (gray).....M1108748
  - 8. M2.9x9.5 pan head screw .....6600-0709-409  
Split ring lock washer .....6600-0713-403  
M4x10 button head screw .....6600-0706-409
  - 9. Speaker .....6600-1168-600
  - 10. Caster, all (new).....6600-0890-400
  - 11. Screw, M8 x 16 Btn. Hd. skt. (new) .....6600-0706-435
  - 12. Lockwasher, M8 (new) .....6600-0712-406
  - 13. Wire harness tie .....M1084707
  - 14. Screw, M12 socket head.....6600-0706-449
  - 15. Lock washer M12 .....6600-0713-408
  - 16. Screw, M6 .....6600-1117-402
  - 17. Split ring lock washer, M6 .....6600-0713-405
  - 18. Star washer.....6600-0713-445
  - 19. Screw, M6 x 12 button head.....6600-0706-427
  - 20. Mounting plate .....6600-1186-500
  - 21. Elevating column .....6600-0753-701
  - 22. Washer.....6600-0712-405
  - 23. Screw, M6 .....6600-0706-427
  - 24. External star washer.....6600-0713-443
  - 25. Flat washer.....6600-0712-403
  - 26. Clamp, 5/16.....0208-0335-300
  - 27. Outer shroud.....M1078154
  - 28. Screw, M5 .....6600-0706-417
  - 29. Split ring lock washer .....6600-0713-404
  - 30. Flat washer.....6600-0712-409
  - 31. Screw, M4 socket head .....6600-0706-409
  - 32. Caster cap.....6600-1600-500
- Parts not shown
- Blue plastic connector clip for footswitch .....6600-1163-600



**NOTE:** Due to design changes, refer to the "5.7 Caster Replacement" on page 86 before ordering parts.





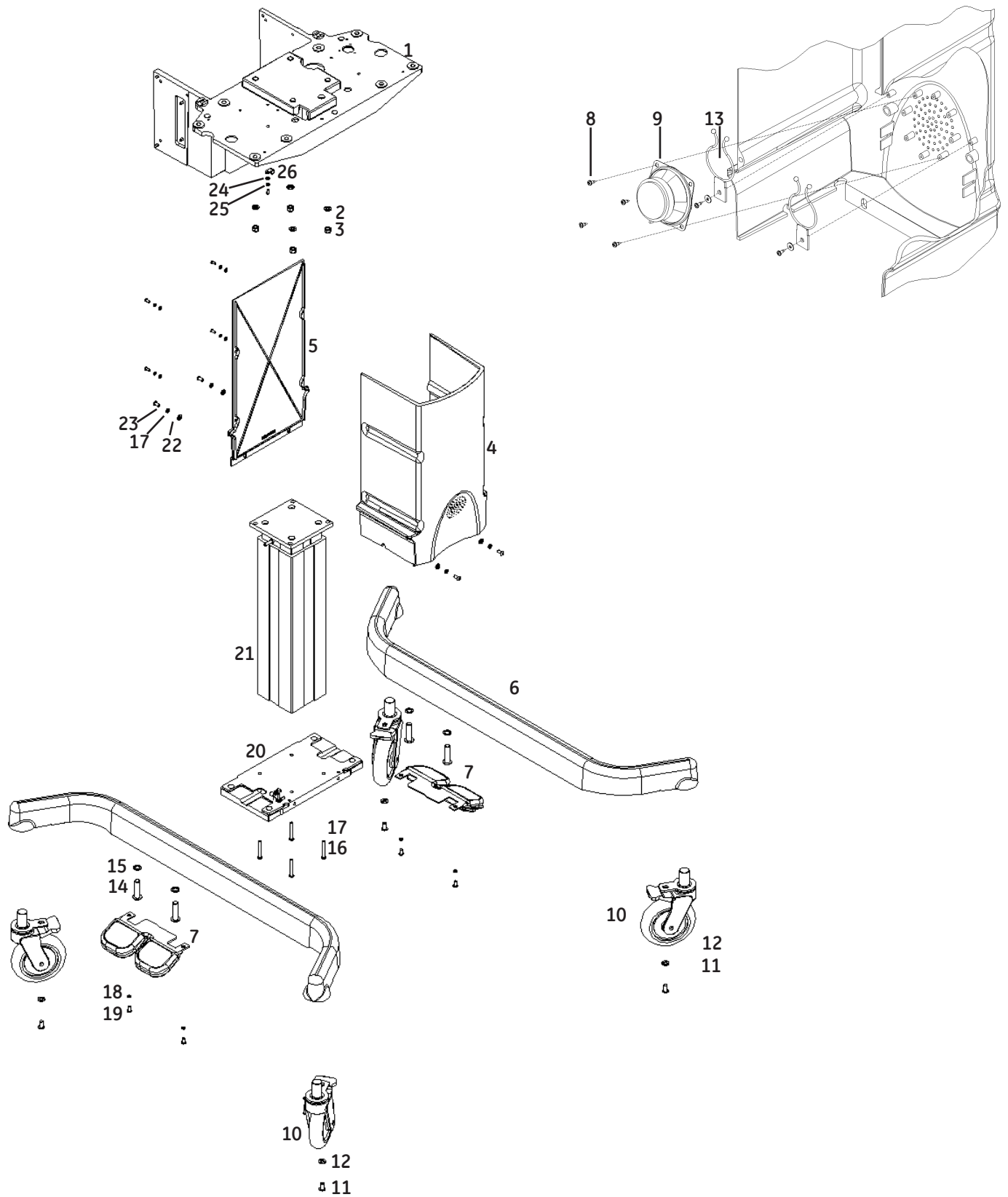


Figure 6-13 Base and Elevating Column with Three-piece Shroud Assembly

### 6.1.8 Hood Latch, Wire Covers, and Uprights

1. Hood latch kit.....6600-0231-850
2. Hood latch receptacle.....6600-1825-500
3. Screw, M4 x 16L, Fl. Hd. Skt.....6600-0715-413
4. Right (east) wire cover.....6600-0918-700
5. Left (west) wire cover.....6600-0919-700
6. Screw, M3 x 10L, Bt. Hd. ....6600-0706-401
7. Star washer.....6600-0713-431

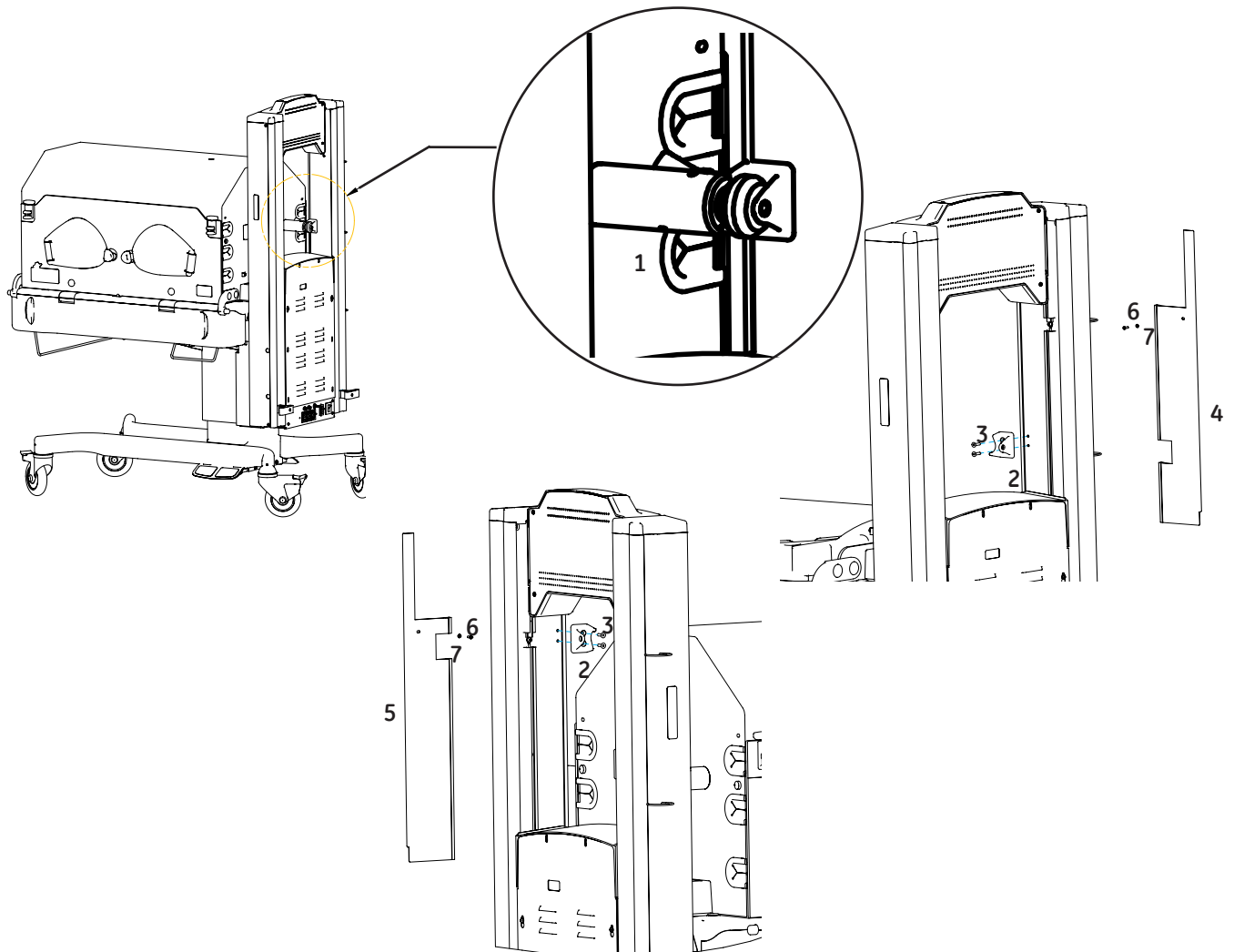


Figure 6-14 Hood Latch and Wire Covers

1. End cap, top left (West) .....	6600-1799-500
2. End cap, top right (East).....	6600-1800-500
3. Speed nut.....	0402-2003-300
4. Screw, M4 .....	6600-0708-409
5. Decorative strip (teal).....	6600-1456-501
6. End cap, bottom right (East).....	6600-1463-500
7. End cap, bottom left (West).....	6600-1341-500
8. Cord wrap .....	6600-1482-500
Dog point set screw .....	6600-1124-400
9. Routing clips (6) .....	6600-0055-851
10. Screw, M4 .....	6600-0707-408
11. Star washer .....	6600-0713-432
12. Ground wire .....	6600-0883-700
13. Upright, left (West) .....	6600-0280-850
14. Upright, right (East).....	6600-0280-851

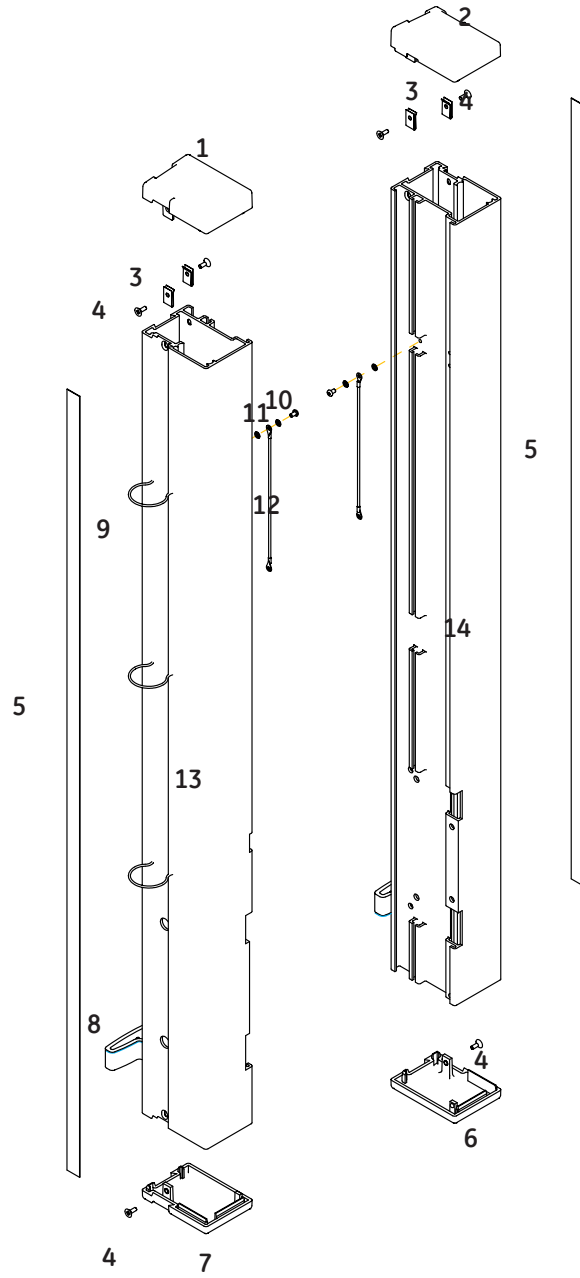


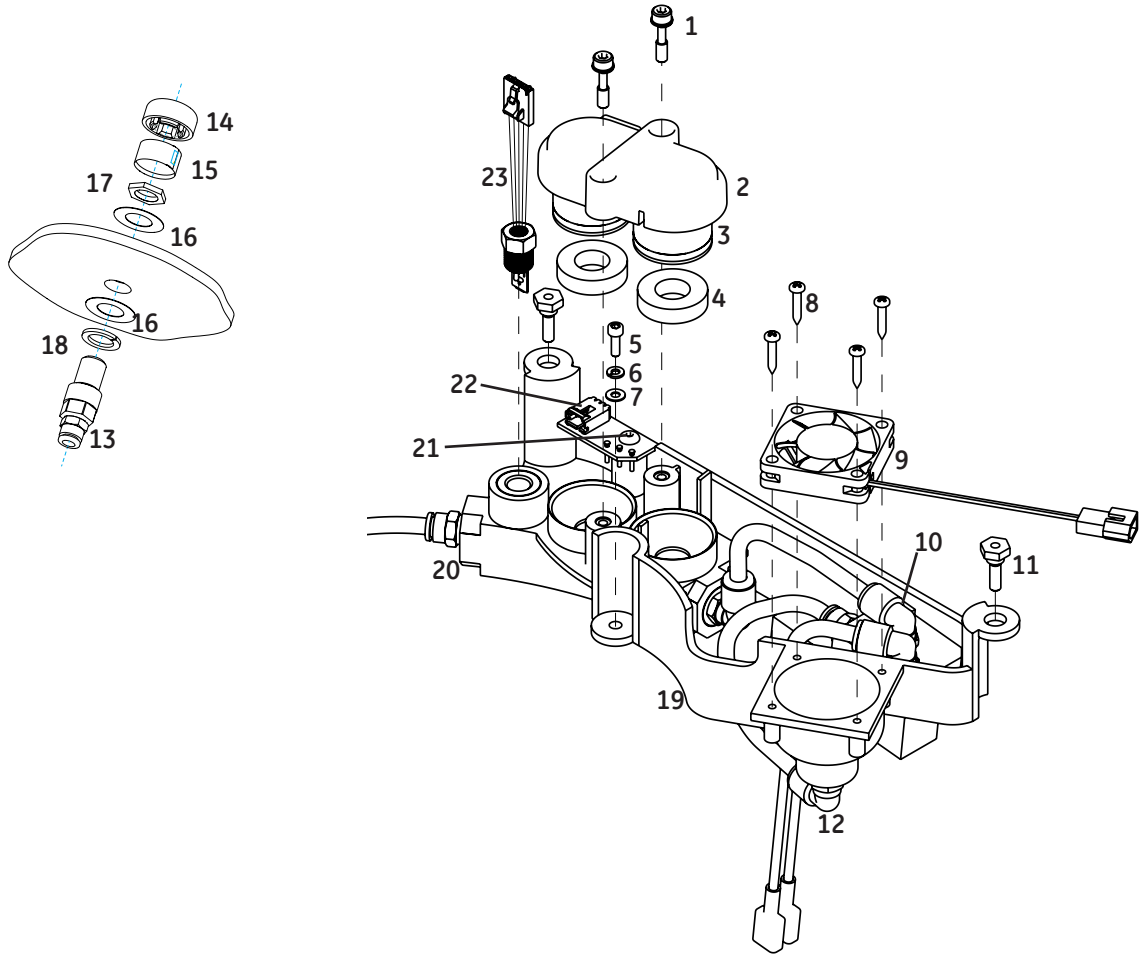
Figure 6-15 Uprights and End Caps

### 6.1.9 Servo Control Oxygen

1. Screw, M4 Skt Hd .....	6600-0868-402
2. Sensor housing cover .....	6600-1876-500
3. Oxygen sensor kit (2 pcs.) <sup>@</sup> .....	6600-0120-850
4. Sensor gasket .....	6600-1887-500
5. Screw, M3x10L Skt Hd .....	6600-0707-403
6. Split ring washer, M3 .....	6600-0713-402
7. Flat washer, M3 .....	6600-0712-402
8. Screw, M2.9x16L, self tap .....	6600-0709-411
9. Calibration fan with harness* .....	6600-1510-700
10. Calibration valve assembly (includes gasket) .....	6600-1539-700
Calibration valve mounting screws (2)- M4x12L Fl Hd Skt .....	6600-0708-409
11. Male/female shoulder screw .....	6600-0862-400
12. Push fitting, 90 degree elbow .....	6600-0865-400
13. Chassis Vent .....	6600-2017-500
14. Vent cover .....	6600-2018-500
15. Vent screen .....	6600-2020-500
Vent screens (5) .....	6600-0271-850
16. Washer (thin) .....	6600-1236-400
17. Panel hex nut .....	6600-1275-400
18. M12 Split ring washer .....	6600-0713-408
19. Sensor housing .....	6600-1875-500
20. Push fitting, straight .....	6600-0877-400
21. Screw, M4x6L Button Hd .....	6600-0706-407
22. Sensor housing board (also includes the board inside the sensor housing cover) .....	6600-1511-700
23. Sensor plug assembly .....	6600-0604-700
Sensor housing assembly (includes all parts above except item 3) .....	6600-1506-700
Tubing (order by inch)	
6mm black .....	6600-0129-300
from sensors to manifold, 3.9"	
from chassis vent to manifold, 3.9"	
6mm white .....	6600-0866-400
from cal fan to manifold, 4.7"	
from manifold to heatsink vent, 4.7"	

\* Install fan so flow arrow on side points up into chassis.

@ The date on the sensor is a discard date; the sensor should be removed from service on that date.



**Figure 6-16** Servo Control Oxygen Sensor Housing Assembly

Servo Control Oxygen service kits:

Incubator DISS.....	6600-0849-800
Incubator NIST.....	6600-0849-801
Incubator DIN.....	6600-0849-802
Incubator Air Liquide.....	6600-0849-803

1. Screw, M4x12L Skt Hd.....	6600-0707-410
2. Split ring washer, M4.....	6600-0713-403
3. Valve housing top cover.....	6600-1838-500
4. Valve housing wire harness.....	6600-1069-700
5. Adapter 1/8NPTFx1/8NPTM.....	6700-0616-800
6. Elbow fitting 10 OD x1/8NPT.....	6600-0873-400
7. Screw, M4 Skt Hd.....	6600-1051-400
8. Flat washer, M5.....	6600-0712-409
9. Damper manifold mount.....	6600-1248-400
10. Valve housing.....	6600-1836-500
11. Valve housing bottom cover.....	6600-1837-500
12. Jam nut, M14.....	6600-0711-450
13. Label Max kPa.....	6600-2448-101
Label Max PSI.....	6600-2448-102
14. Lock washer, M14 Int tooth.....	6600-0713-438
15. Push-in fitting, 90° Elbow.....	6600-0865-400
16. Supply valve.....	6600-0602-700
17. Manifold.....	6600-1839-500
plug.....	0413-3510-335
gasket.....	6600-1950-500
18. Regulator assembly.....	6600-0254-850
In-line screen fitting.....	6600-1249-400
19. O2 adapter, Air Liquide.....	6600-0725-400
20. O2 adapter, DIN.....	6700-0050-700
21. O2 adapter, NIST.....	6600-0100-400
22. O2 adapter, DISS.....	6700-0522-800
23. Washer, M4.....	6600-0712-403
Parts not shown	
Oxygen inlet label (green).....	6600-2611-101
Oxygen inlet label (white).....	6600-2611-102
Valve housing assembly (includes all parts above except items 11, 13 and mounting hardware).....	6600-1507-700
6mm Tubing (order by inch).....	6600-0866-400
From regulator to manifold, 3.9" Tubing/sleeve assembly.....	6600-0262-850
10mm tube from valve housing to expansion chamber, 27"	



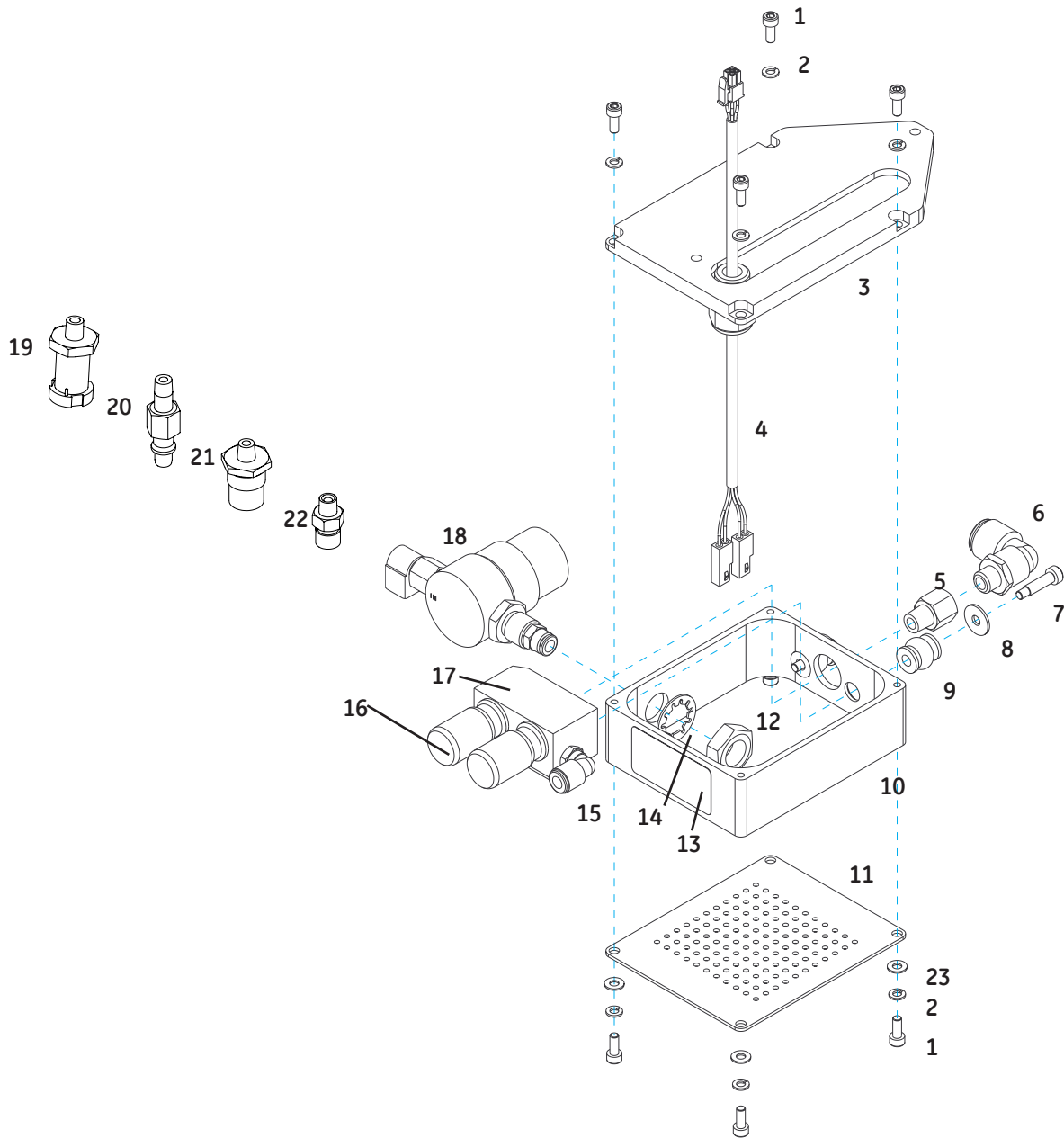
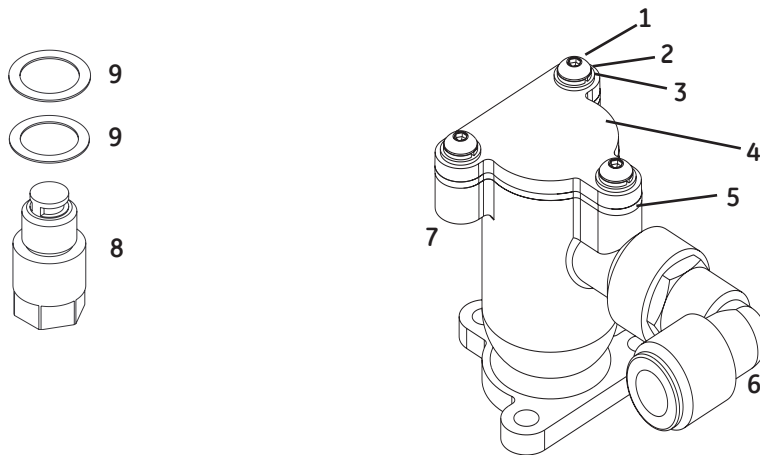


Figure 6-17 Servo Control Oxygen Valve Housing

1. Screw, M4 Skt Hd .....	6600-0706-409
2. Split ring washer, M4.....	6600-0713-403
3. Flat washer, M4.....	6600-0712-403
4. Expansion chamber cover .....	6600-1878-500
5. Cover gasket.....	6600-1883-500
6. Elbow fitting.....	6600-0873-400
7. Expansion chamber assembly (includes items 1-6).....	6600-0256-850
8. Vent.....	6600-1881-500
9. Washer (thick).....	6600-1219-400
Parts not shown	
P-clamp (under Pleur-evac holder).....	0690-1240-331
Washer, M6 (under Pleur-evac holder).....	6600-0712-405
Expansion chamber inlet gasket.....	6600-1884-500



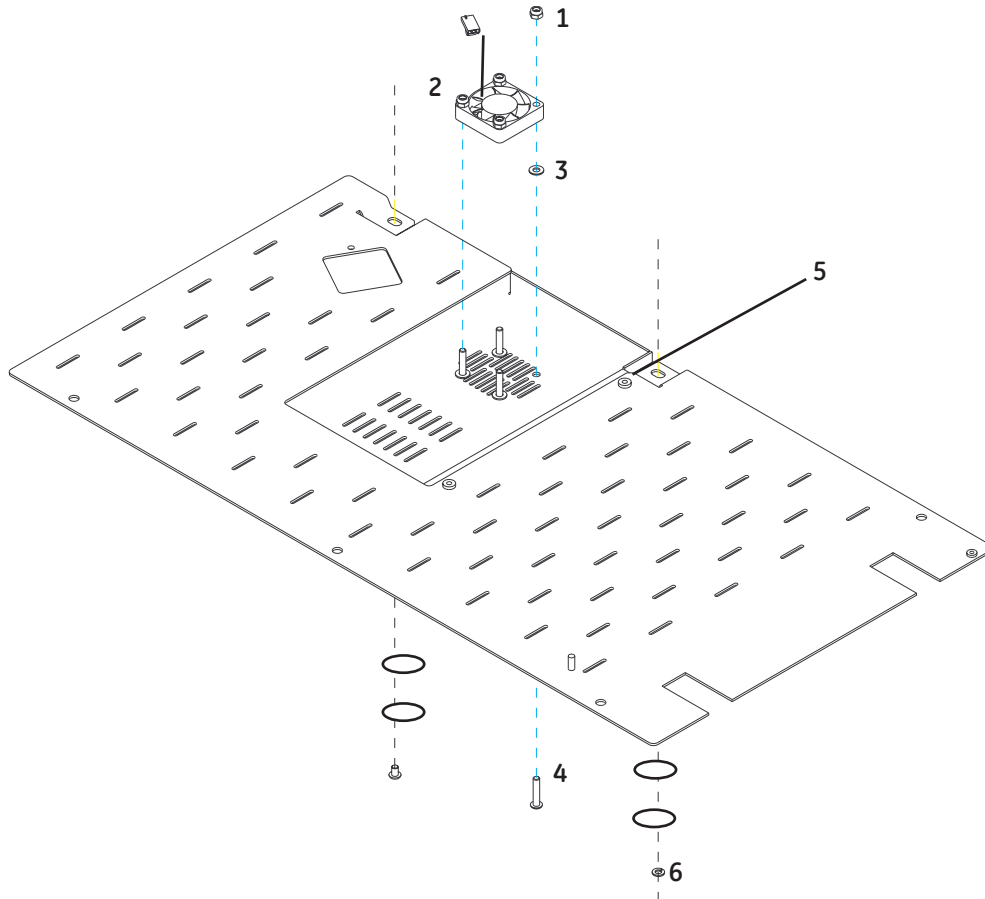
**Figure 6-18** Expansion Chamber/Heatsink Vent

- 1. Nyloc nut, M4 .....6600-0714-402
- 2. Cooling fan assembly\* .....6600-1523-700
- 3. Flat washer, M4.....6600-0712-403
- 4. Screw, M4x20L Button Hd .....6600-0706-412
- 5. Screw, captive 8mm long .....6600-0868-401
- 6. Screw, SEMS M4 x 6 Button Hd .....6600-0908-402

Parts not shown

- Cable tie .....6600-0384-400

\* Install fan so flow arrow on side points down, away from chassis.



**Figure 6-19** Servo Control Oxygen Cooling Fan

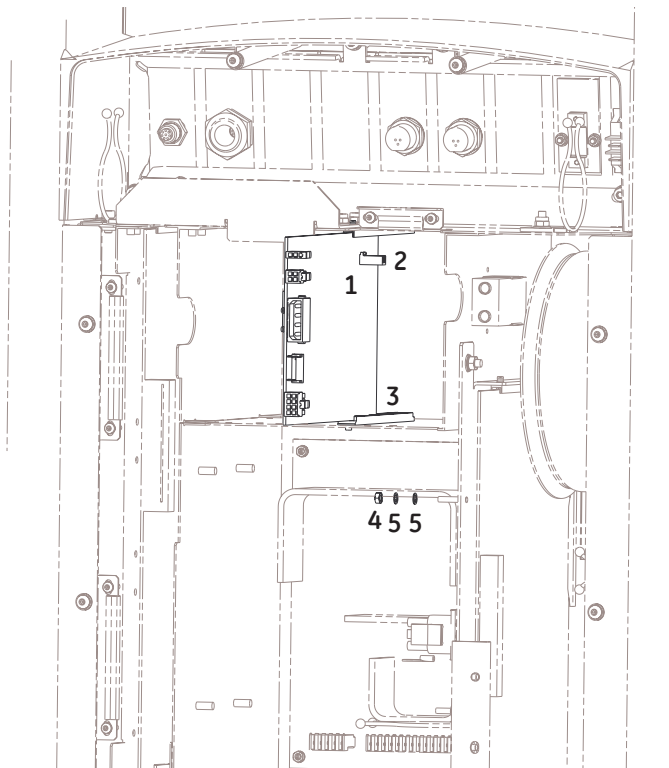
- 1. Servo Oxygen PCB .....6600-0233-850
- 2. Card guide, black.....6600-1064-400
- 3. Card guide, white.....6600-1183-400
- 4. Nut, M3.....6600-0711-403
- 5. Lock washer, int. tooth.....6600-0713-431

Parts not shown

EPROM (U3).....6600-0255-850

In-line fuse cable\* .....6600-0618-700

\* Fuse is not replaceable; you must order cable to replace fuse.



**Figure 6-20** Servo Control Oxygen PC Board

### 6.1.10 Accessory Hangers

- |   |               |
|---|---------------|
| 1. Front Pleur-evac hanger (south)..... | 6600-1202-500 |
| 2. Side Pleur-evac hanger (E/W).....    | 6600-1703-500 |
| 3. Screw, M4 x 10.....                  | 6600-0707-409 |
| 4. Split ring lock washer, M4.....      | 6600-0713-403 |
| 5. DIN rail bracket.....                | 6600-1820-500 |
| 6. DIN rail.....                        | 6600-1854-500 |
| 7. Screw, M4 x 16L, Skt. Hd.....        | 6600-0707-411 |
| 8. Washer, M4.....                      | 6600-0712-403 |
| 9. Screw, M5 x 16L, Btn. Hd.....        | 6600-0706-419 |
| 10. Split ring lock washer, M5.....     | 6600-0713-404 |
| 11. Label weight limit.....             | 6600-2426-100 |
| 12. Screw, M6 x 12, Btn. Hd.....        | 6600-0706-427 |
| 13. Star Washer.....                    | 6600-0713-445 |

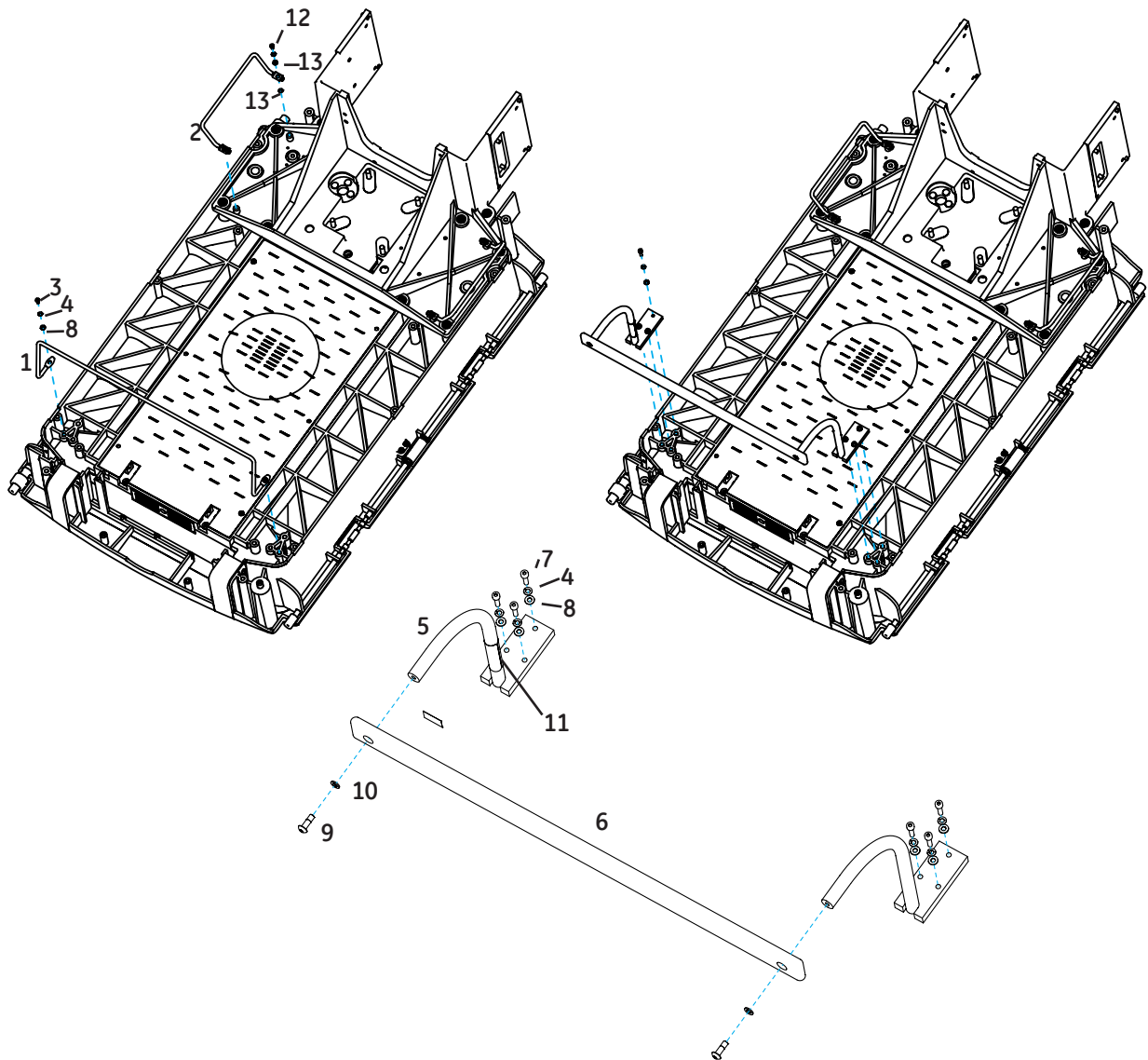


Figure 6-21 Drainage Hangers and DIN Rail

### 6.1.11 Storage Drawer

1. Drawer slide.....6600-1717-500
2. Drawer mounting bracket\*, front (south).....6600-1781-500
3. Screw, M4 x 12 Button HD.....6600-0706-410
4. Screw, M4 x 8 Button HD.....6600-0706-408
5. Split ring lock washer, M4.....6600-0713-403
6. Flat washer, M4.....6600-0712-446
7. Storage drawer.....6600-1279-500
8. Screw, M5 x 12 Button HD Nyloc.....6600-0715-410
9. Star washer, M5 internal tooth.....6600-0713-433
10. Drawer mounting bracket\*, rear (north)  
On units with two-piece shroud assembly.....6600-1716-500  
On units with three-piece shroud assembly.....M1172111
11. Tray.....6600-1718-500
12. SEMS button head screw M4 x 8.....6600-0908-403

\*In order to remove the drawer, you must disassemble the drawer from the drawer slides.

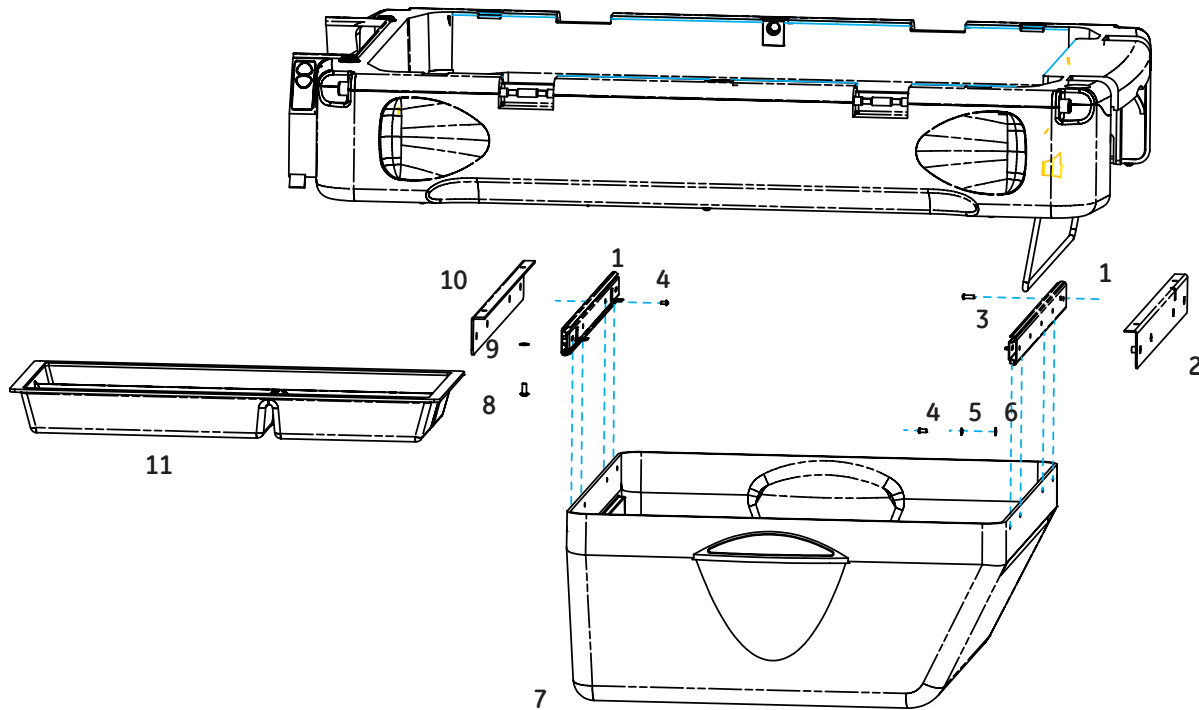
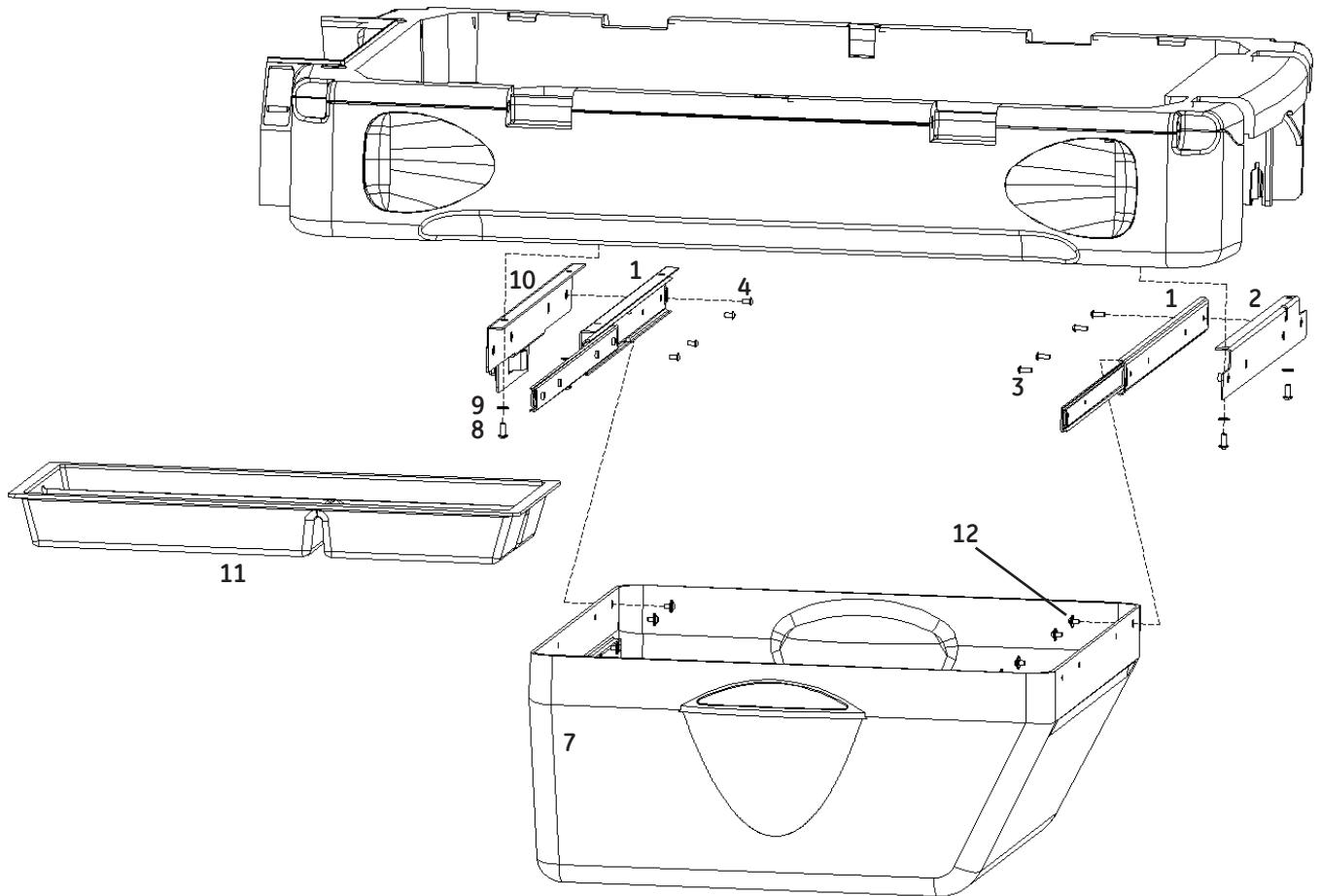
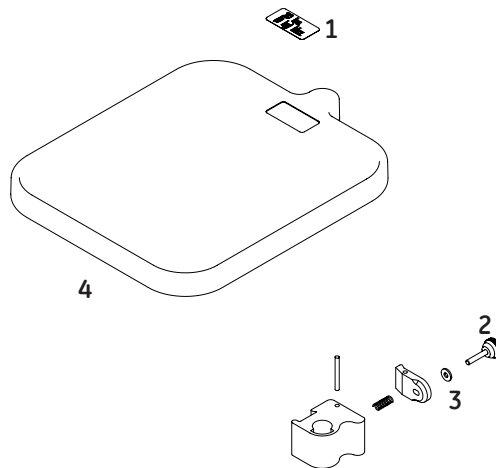


Figure 6-22 Storage Drawer (on Units with Two-piece Shroud Assembly)



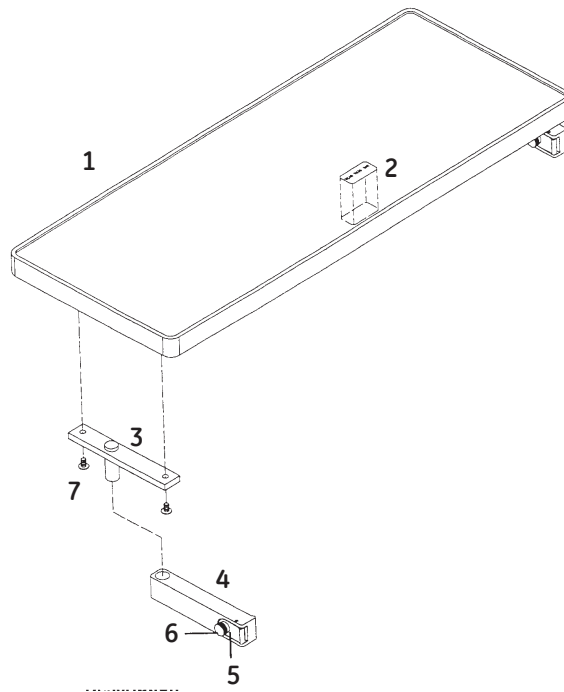
**Figure 6-23** Storage Drawer (on Units with Three-piece Shroud Assembly)

- 1. Weight limit label.....6600-1839-101
- 2. Knob .....0217-5335-300
- 3. Washer .....0202-0095-300
- 4. Shelf (order item 1 when replacing shelf).....6600-1733-500



**Figure 6-24** Instrument Shelf (6600-0865-700)

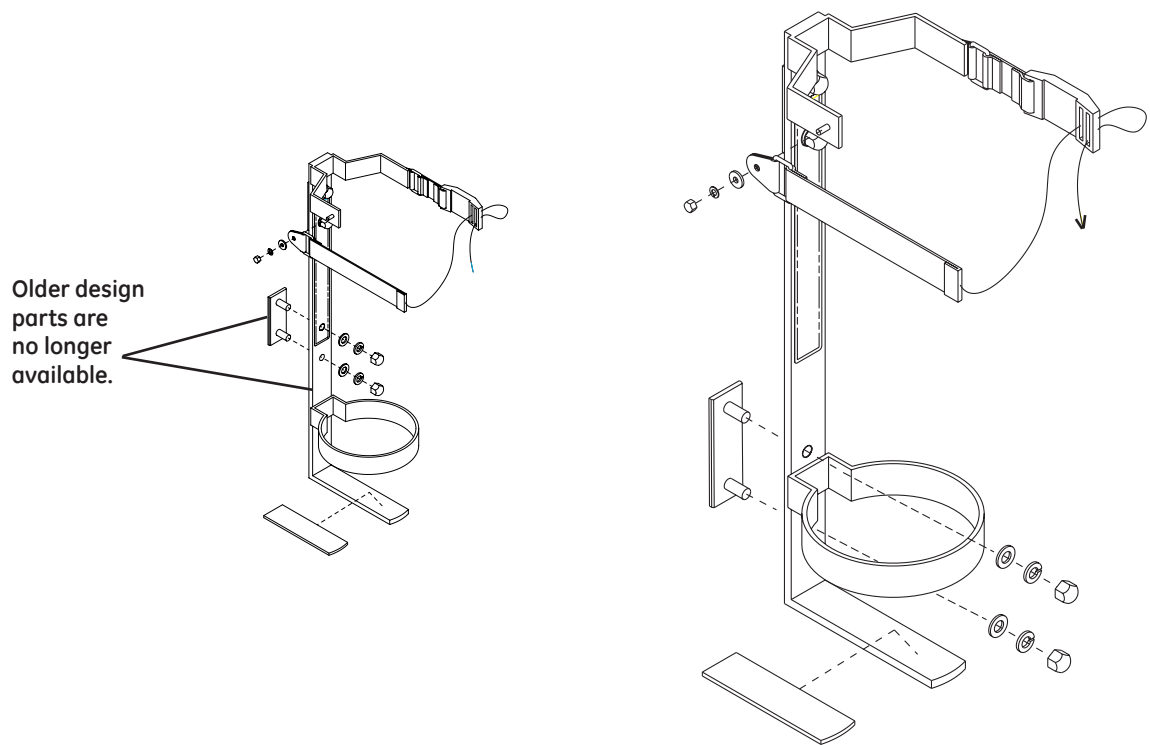
1. Shelf (order item 2 when replacing shelf).....6600-0481-501
2. Weight limit label.....6600-1941-101
3. Shelf support .....6600-0811-501
4. Mounting block assembly.....6600-0290-800
5. Washer.....0202-0095-300
6. Knob .....0217-5335-300
7. Screw, 1/4 - 20 x 5/8.....6600-0394-400



**Figure 6-25** Monitor Shelf (6600-0824-800)

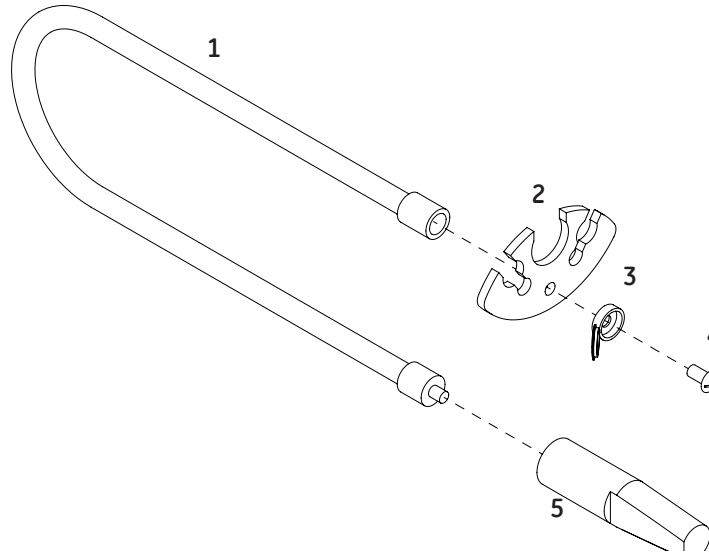


Cylinder Holder Assembly.....M1151570  
 Cylinder Holder Assembly, XL.....M1151571



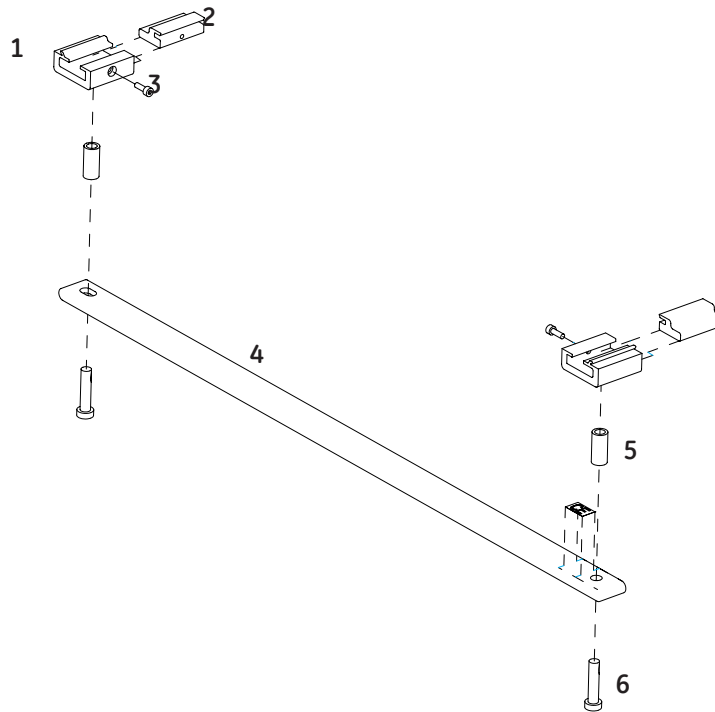
**Figure 6-26** E-Cylinder Holder (6600-0836-800)

- 1. Goose neck.....6600-1866-500
- 2. Tubing plate.....6600-1862-500
- 3. Screw cover.....6600-1206-403
- 4. Screw, pan hd.....6600-1213-400
- 5. Mount.....6600-1845-500

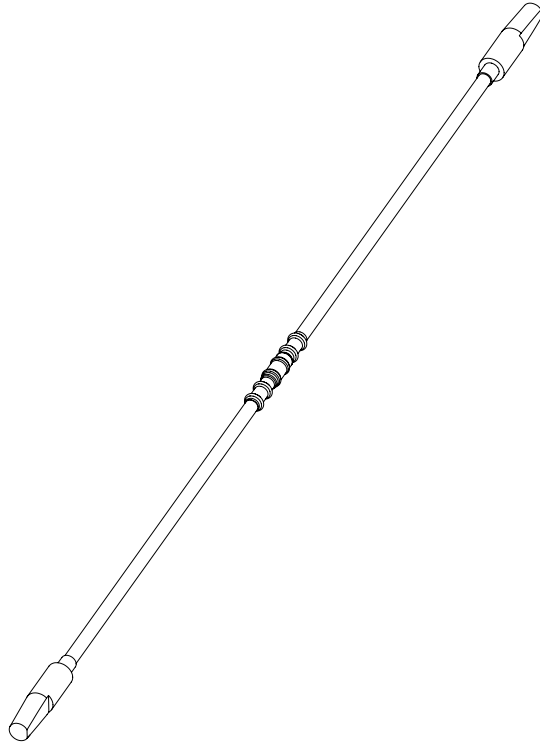


**Figure 6-27** Tubing Management Arm (6600-0837-800)

1. Mounting bracket housing.....6600-1541-500
2. Mounting bracket lock.....6600-1542-500
3. Screw, M4 x12 .....6600-0853-400
4. DIN rail.....6600-1540-501
5. Spacer .....6600-1538-500
6. Screw, M8 x 35 Skt Hd.....6600-0852-400



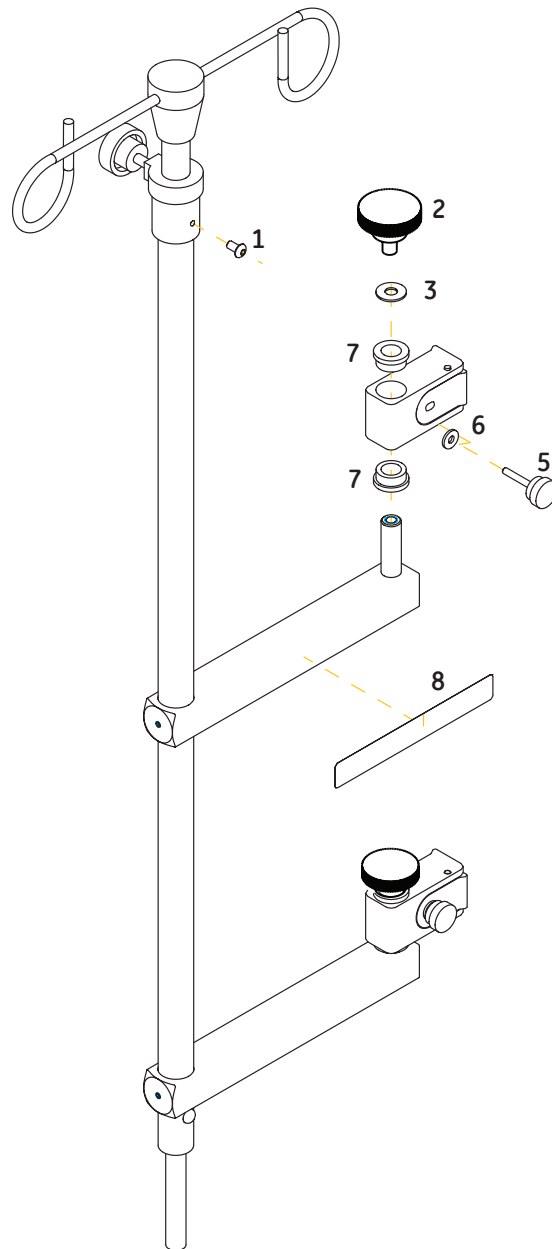
**Figure 6-28** Dovetail Mount DIN Rail (6600-0659-803)



**Figure 6-29** Silo Support Assembly (6600-0853-800)

- |                                 |               |
|---------------------------------|---------------|
| 1. Screw, 10-32 Button Hd. .... | 6600-1258-400 |
| 2. Knob .....                   | M1081553      |
| 3. Teflon washer.....           | 6600-1238-400 |
| 4. (No longer available.)       |               |
| 5. Knob, block.....             | 0217-5335-300 |
| 6. Washer.....                  | 0202-0095-300 |
| 7. Bushing.....                 | 6700-0030-400 |
| 8. Label.....                   | 6600-2497-101 |

**NOTE:** If you need to replace the upper or lower swing arms, order the entire I.V. pole assembly.



**Figure 6-30** Rotating I.V. Pole Assembly (6600-0851-800)

1. Dovetail rail.....	6600-1946-500
2. Bottom end cap.....	6600-0366-500
3. Screw, 4-40 x 1/2, Skt. Hd.....	0144-2117-208
4. Top end cap.....	6600-1239-400
5. Swing arm assembly.....	6600-1516-700
6. Knob.....	M1081553
7. Teflon washer.....	6600-1238-400
8. Knob, block.....	0217-5335-300
9. Washer.....	0202-0095-300
10. Bushing.....	6700-0030-400
11. Lock washer, int. tooth.....	0202-3418-300
12. Screw, 5/16 - 18 Skt. Hd.....	6600-0787-400
13. Label.....	6600-2497-102

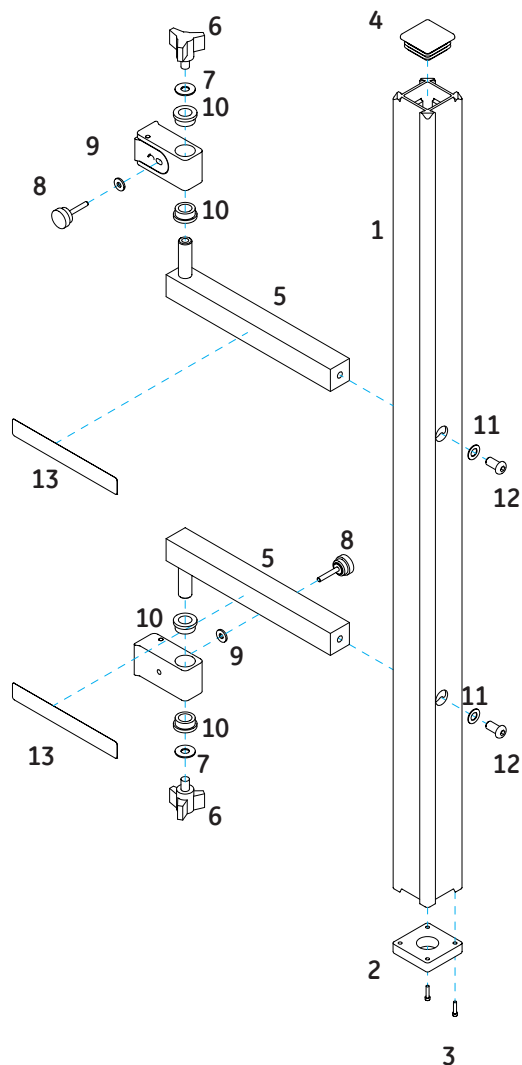
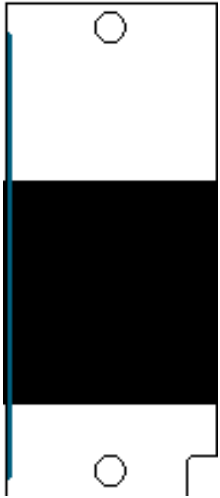


Figure 6-31 Dovetail Extension (6600-0852-800)

## 6.2 Accessories

Power cord, Europe .....	6600-0574-612
Power cord, Switzerland.....	6600-0574-621
Power cord, North America .....	6600-0775-603
Power cord, China.....	M1052154
Power cord, Denmark.....	M1133443
Power cord, India.....	M1153026
Power cord, South Africa .....	M1161227
Power cord, Israel.....	M1164736
Touch-up paint, light gray (Munsell .16GY8.56-0.44 chroma) .....	6600-0714-200
Patient probe, disposable (10 pcs.).....	6600-0873-700
Patient probe, disposable (50 pcs.).....	6600-0874-700
Patient probe, reusable .....	6600-0875-700
Porthole wristlets (8 pcs.).....	6600-0211-850
Air intake filter (10 pcs.).....	6600-0207-850
Fabric hood cover .....	6600-0846-800
Internal shelf- front right (SE) and rear left (NW) .....	6600-1793-500
rear left (NE) and front right (SW) .....	6600-1794-500
Scale .....	Call your GE sales representative or distributor.
Oscillator port cover.....	6600-0838-800

### 6.3 Labels



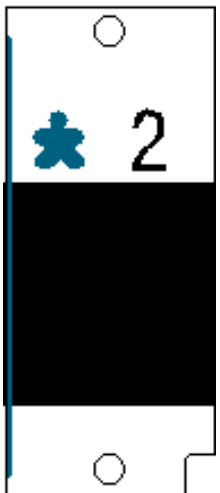
6600-2325-101



6600-2325-102



6600-2325-103



6600-2325-107




6600-2325-104



6600-2325-108



**⚠ WARNING:** When performing **ECMO** (Extracorporeal Membrane Oxygenation) or **HFOV** (High Frequency Oscillatory Ventilation), disable Elevating Base in set up screen by selecting wrench icon. 

English, German, French, Italian, Spanish, and Dutch.....6600-2546-101  
 Russian, Danish, Swedish, and Norwegian .....6600-2546-102  
 Portuguese, Estonian, Turkish, Romanian, Czech, and Polish .....M1093119  
 Korean, Serbian, Slovak, Greek .....M1125076  
 Lithuanian, Croatian, Bulgarian.....M1144131



6600-2343-101



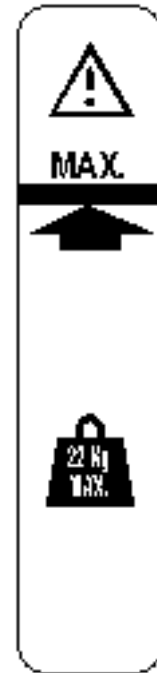
6600-2426-100



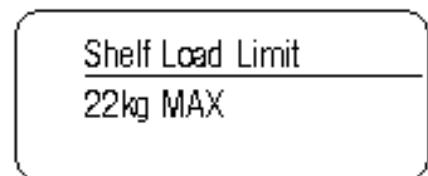
6600-1839-101



6600-2384-101



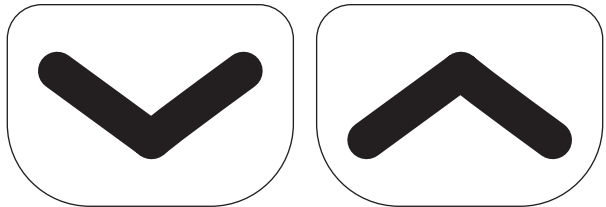
6600-2347-101



6600-1941-101



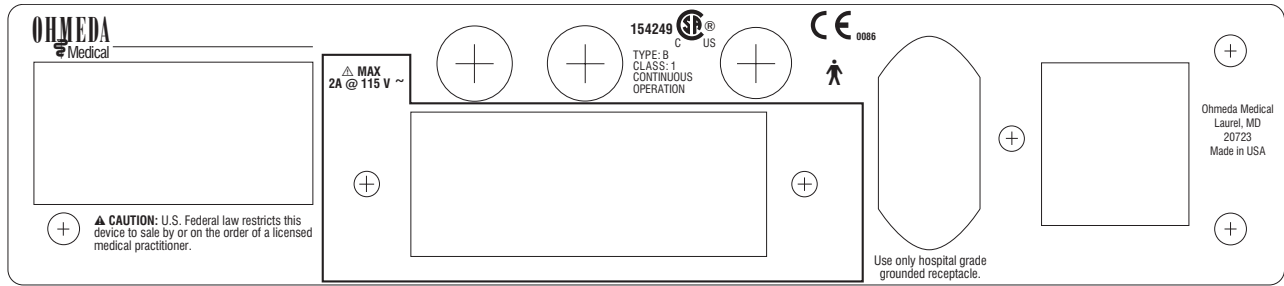
Clear.....6600-2382-102  
Opaque.....6600-2402-102



Bed up/down pedal switch label.....6600-2552-101

**⚠ WARNING:**  
**Oxygen concentrations may vary with fan speed. Use ONLY a servo control oxygen delivery system.**

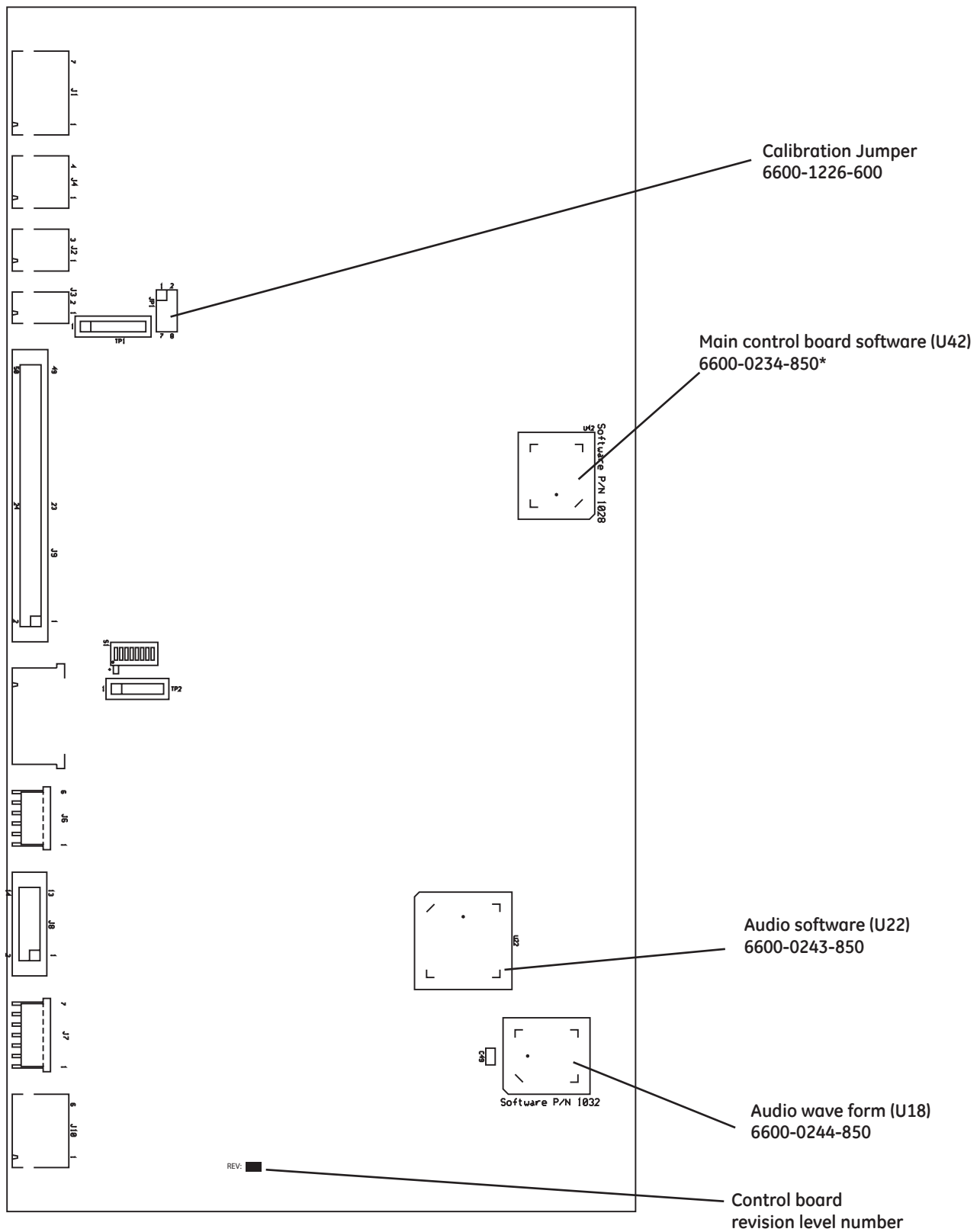
English .....6600-2341-101  
 French.....6600-2341-102  
 Spanish.....6600-2341-103  
 German .....6600-2341-104  
 Italian .....6600-2341-105  
 Dutch.....6600-2341-110



6600-2345-101

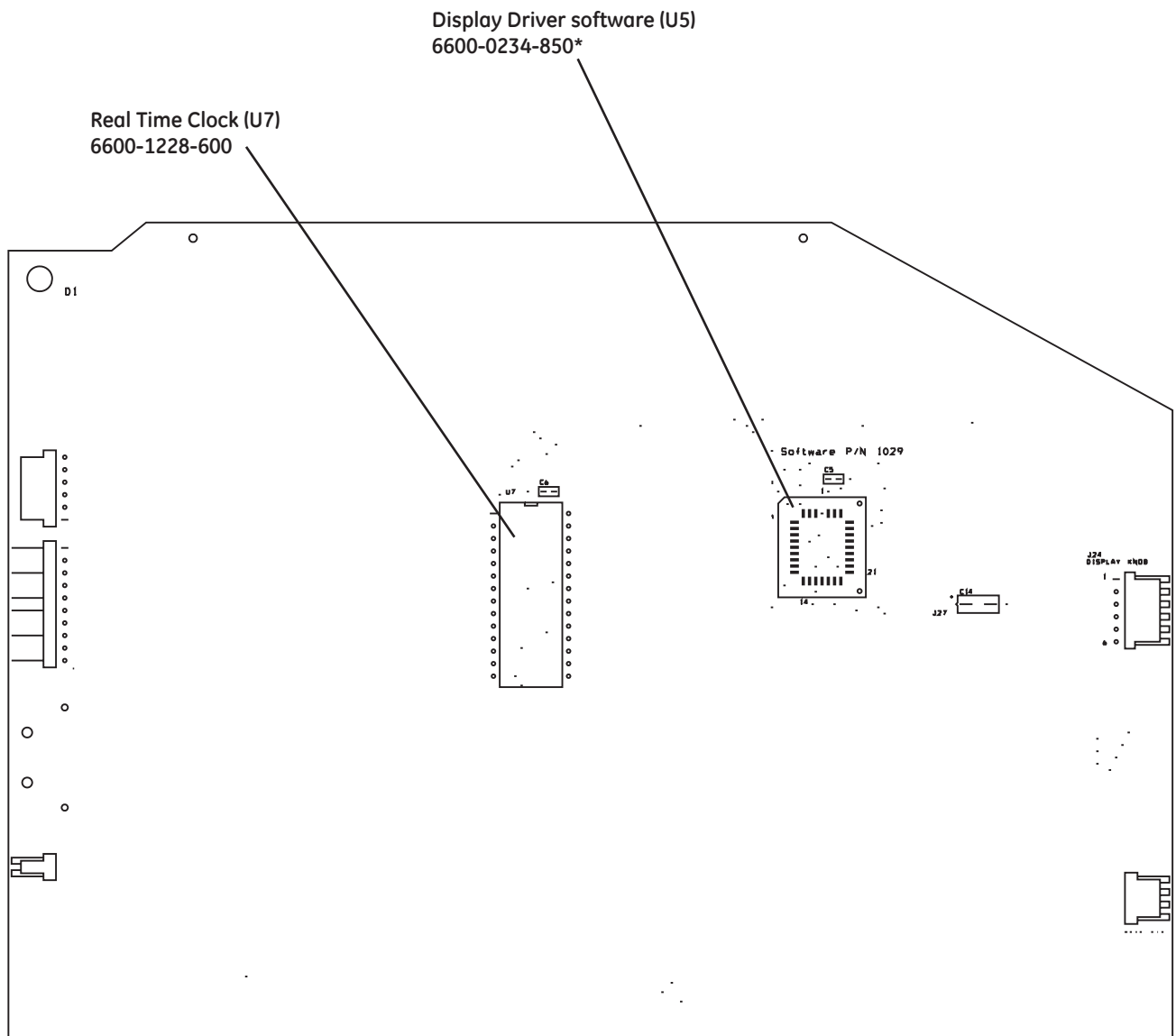
Rating label 115V.....6600-2345-101  
 Rating label 220V.....6600-2345-102  
 Rating label 100V.....6600-2345-103

## 6.4 PCB Layouts



\*Kit includes display driver software.

**Figure 6-32** Control Board (6600-0212-850)



\*Kit includes main control board software.

**Figure 6-33** Display Driver Board (6600-0215-850)

Board assembly revision number

Fuse 3.15 amp  
6600-0878-600

Fuse 120V 2 amp  
6600-0877-600  
Fuse 230V 1 amp  
6600-0882-600

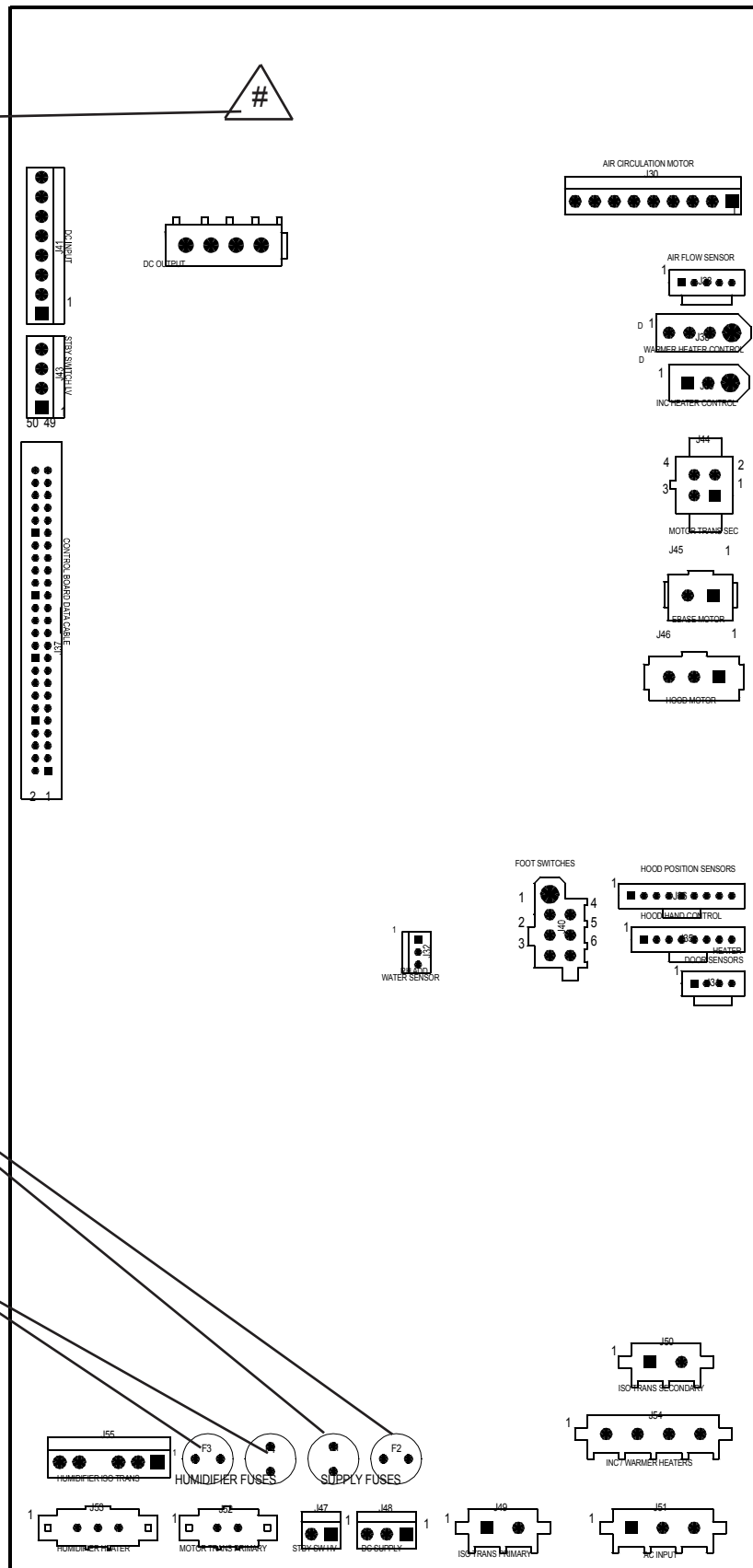


Figure 6-34 Relay Board (6600-0214-850) Revision Level 10 or Higher

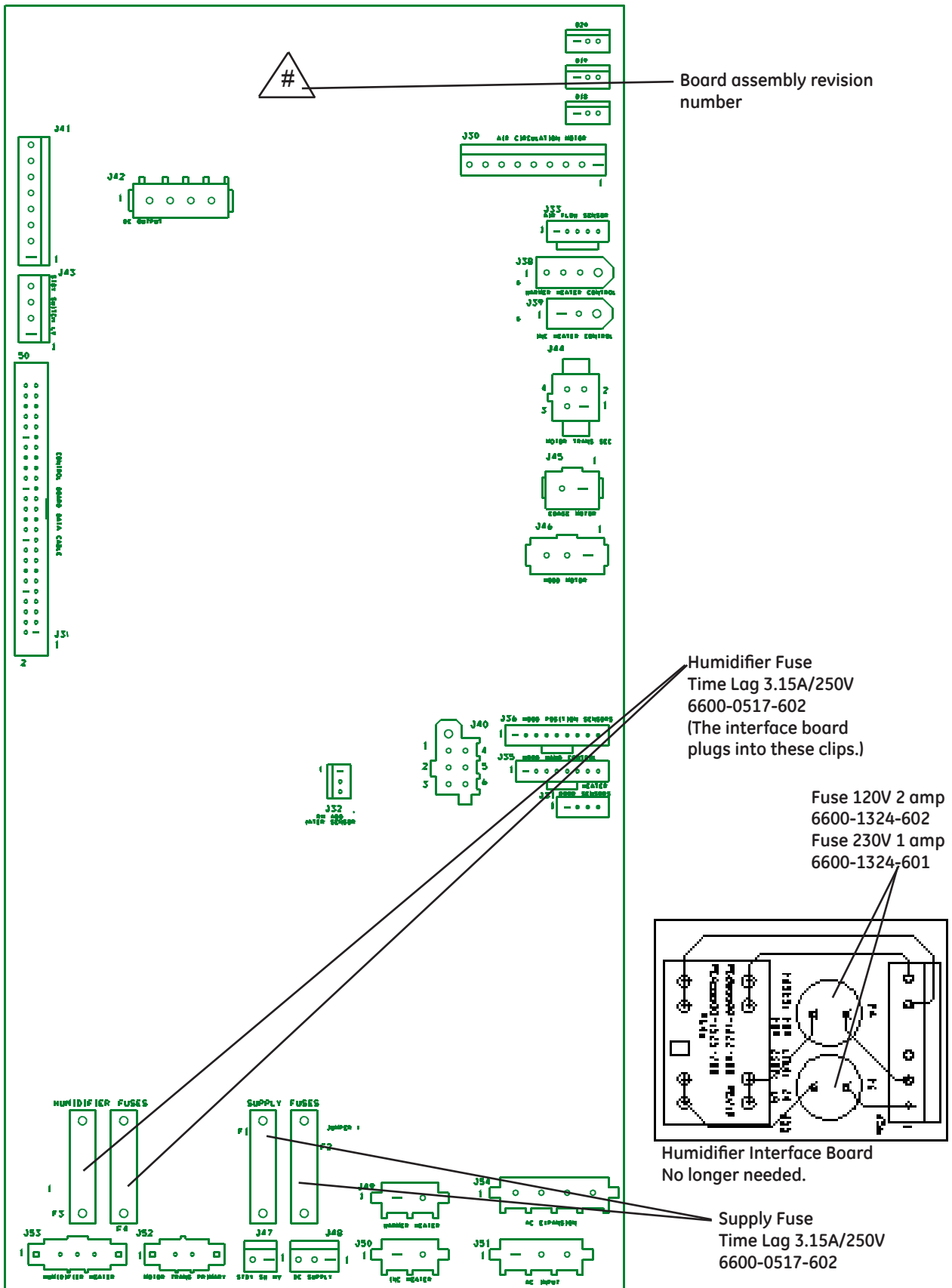


Figure 6-35 Relay Board (6600-0214-850) Revision Level 9 or Lower

# 6.5 Wiring Diagrams

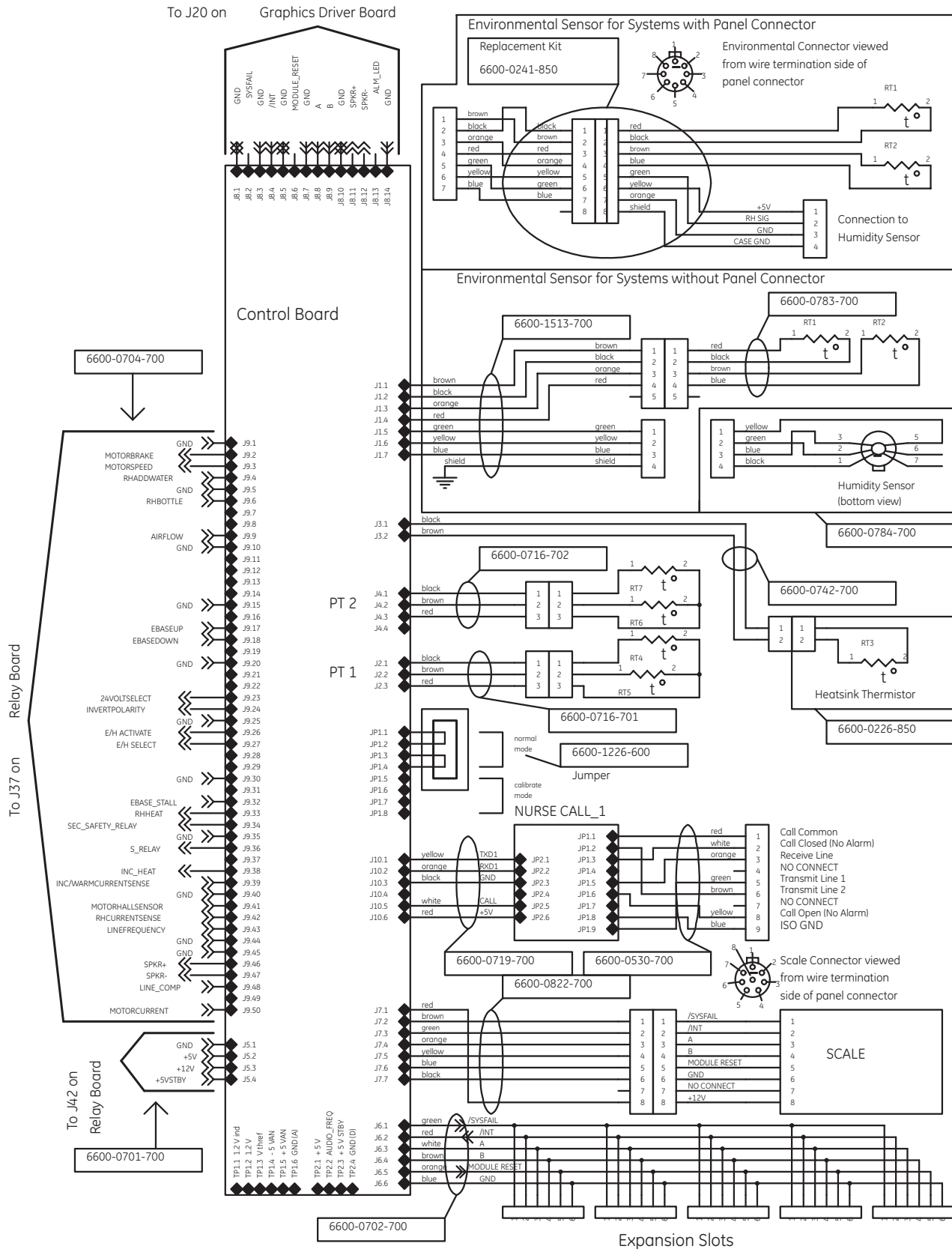
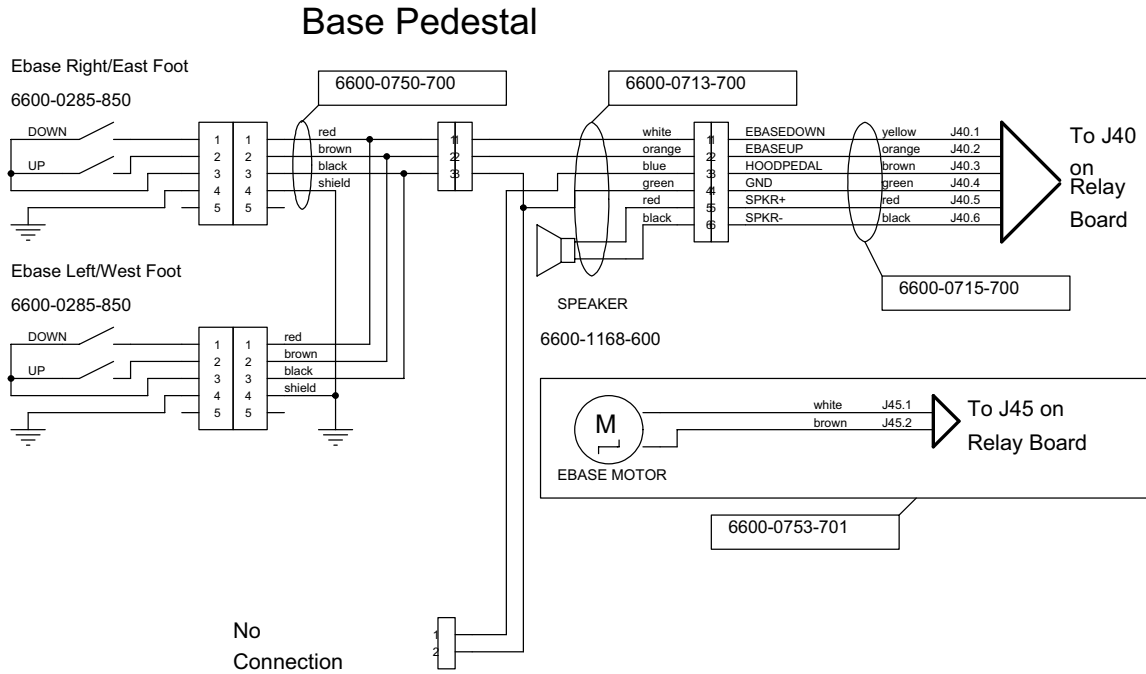
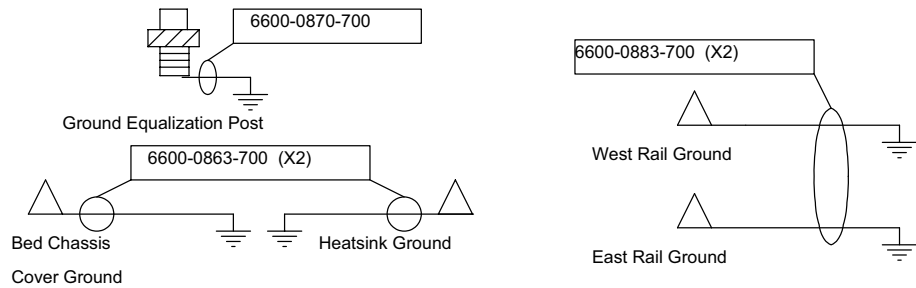


Figure 6-36 Wiring Diagram: Control Board

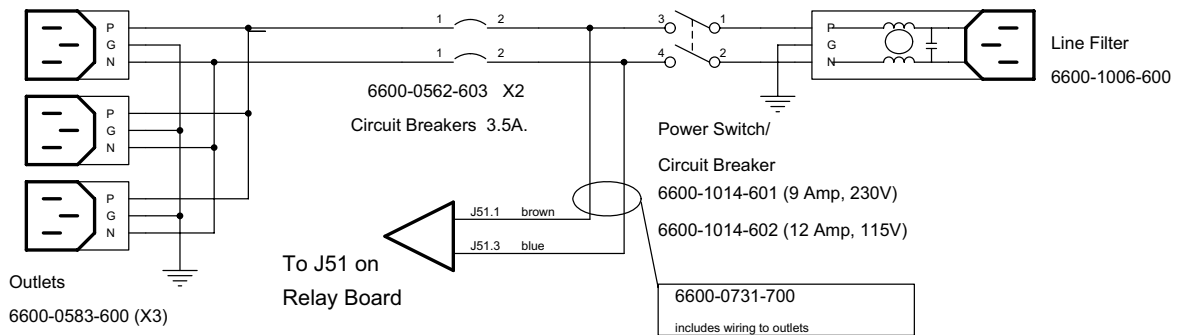




### Ground Wires



### Mains Outlets



**Figure 6-37** Wiring Diagram: Elevating Base

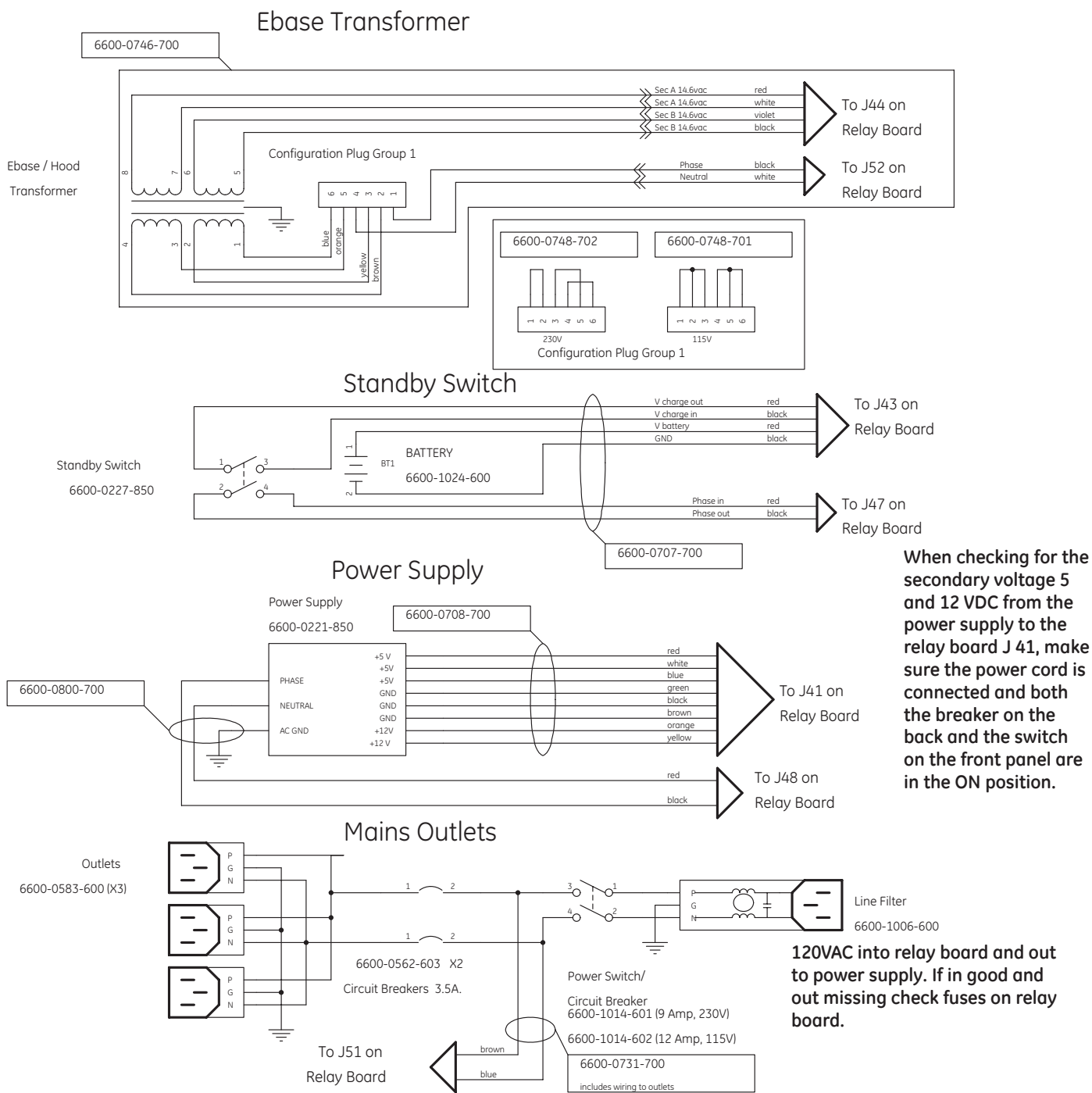


Figure 6-38 Wiring Diagram: Electrical Enclosure

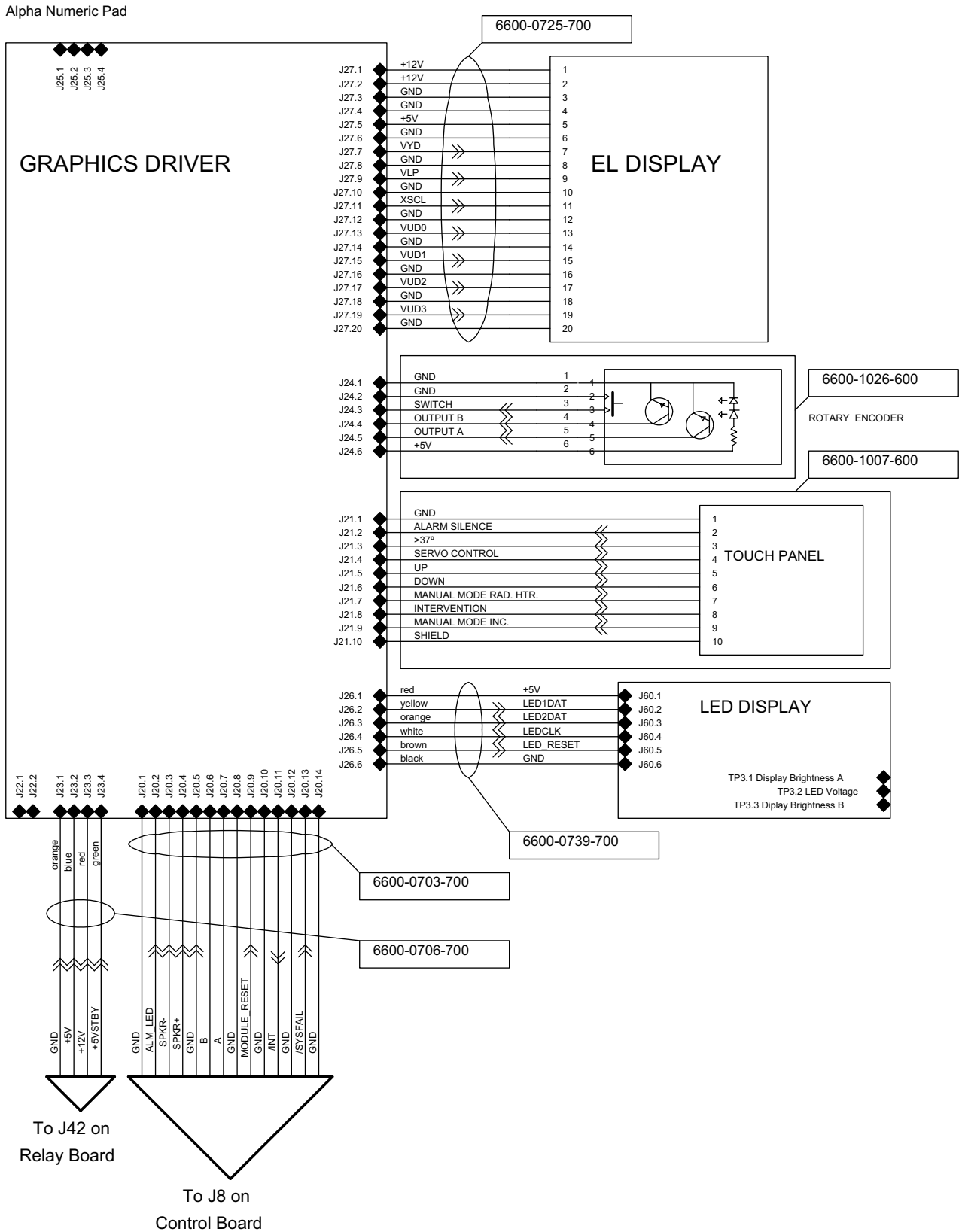


Figure 6-39 Wiring Diagram: Graphics Display

# Incubator Heater With Isolation Transformer

## Revision 10 and above Relay Boards

Existing Isolation Transformer design unchanged from existing Giraffe Incubator.

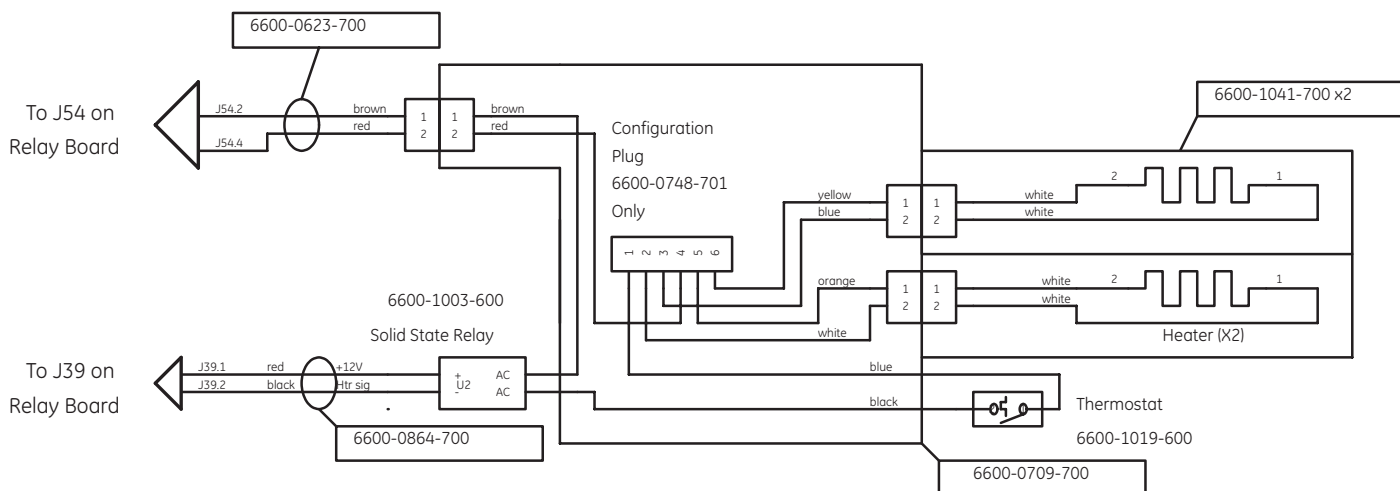
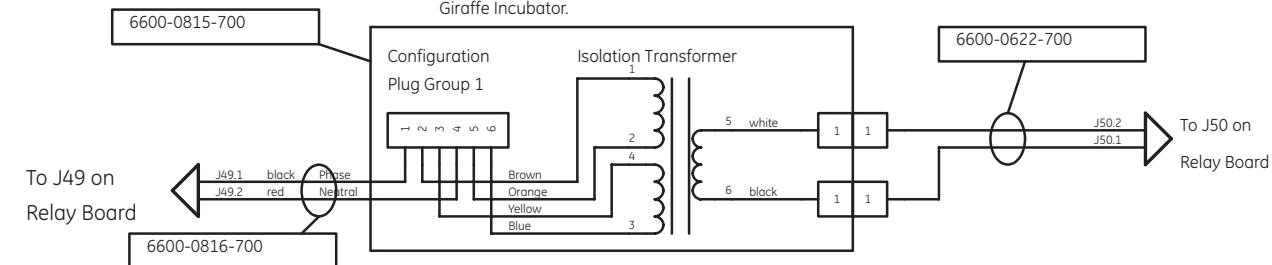
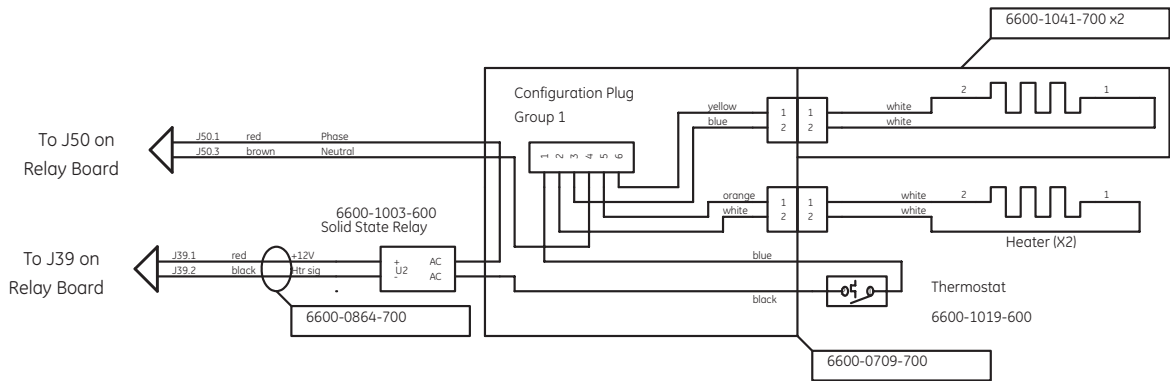


Figure 6-40 Wiring Diagram: Incubator Heater, Relay Board Rev. Level 10 or Higher

Original Configuration of Incubator Heater



Incubator Heater with Isolation Transformer

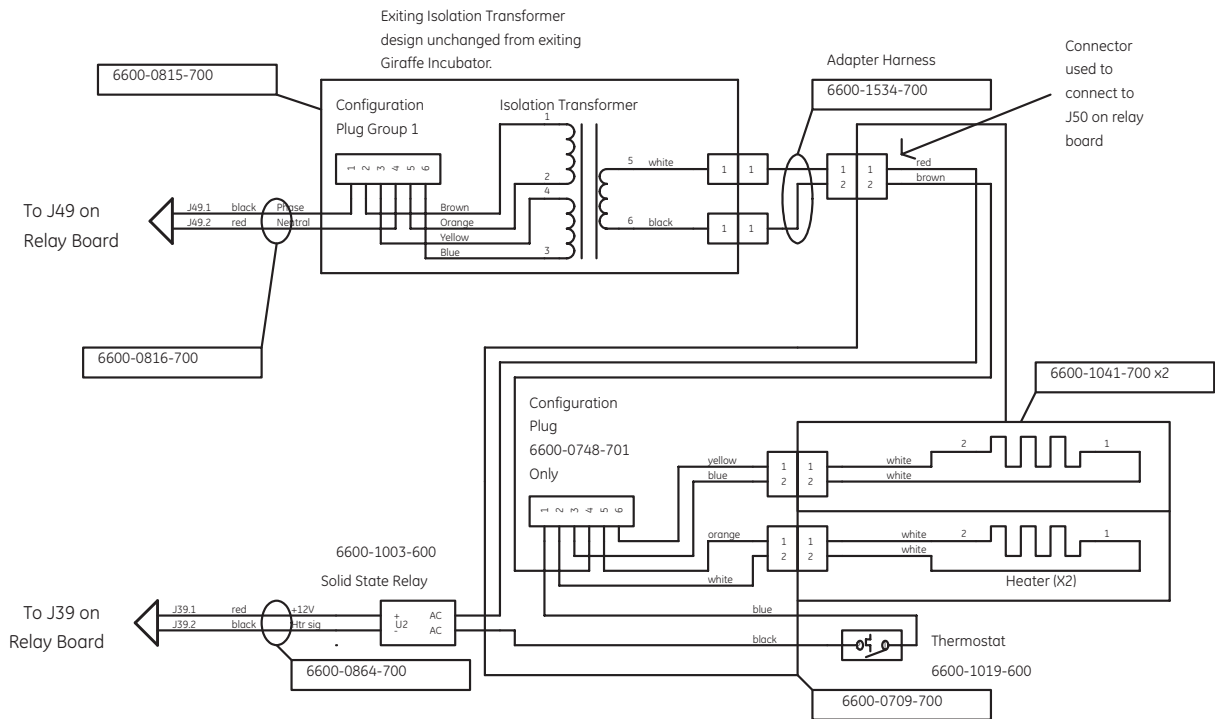


Figure 6-41 Wiring Diagram: Incubator Heater, Relay Board Rev. Level 9 or Lower

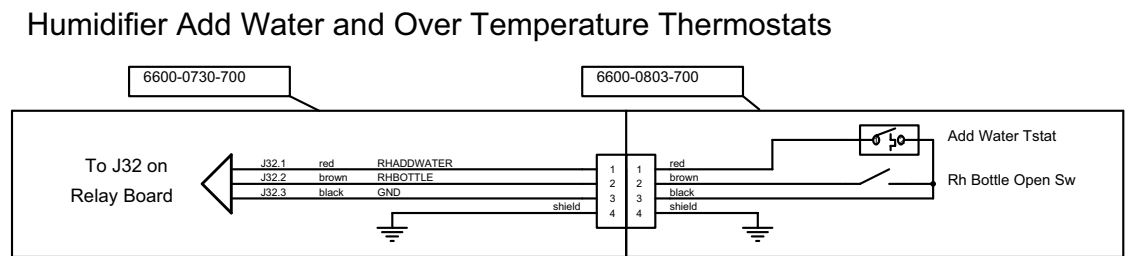
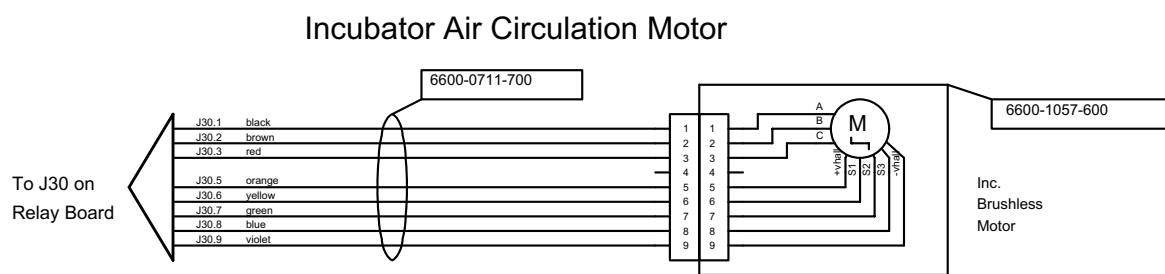
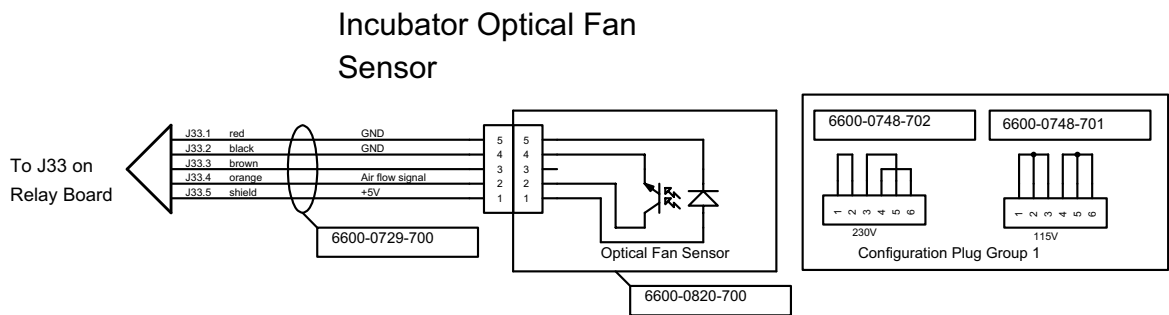


Figure 6-42 Wiring Diagram: Incubator Fan and Sensor

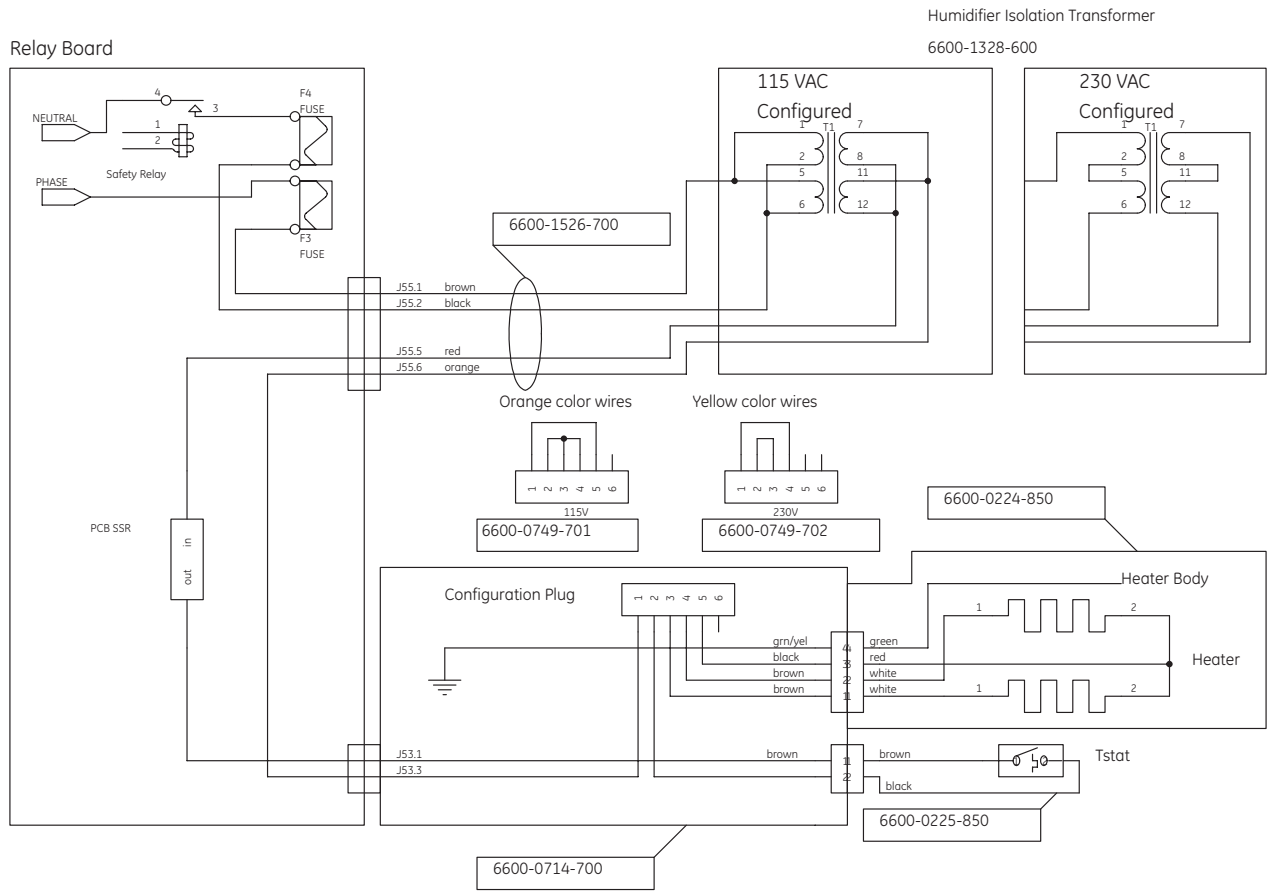


Figure 6-43 Wiring Diagram: Servo Humidifier, Relay Board Rev. Level 10 or Higher

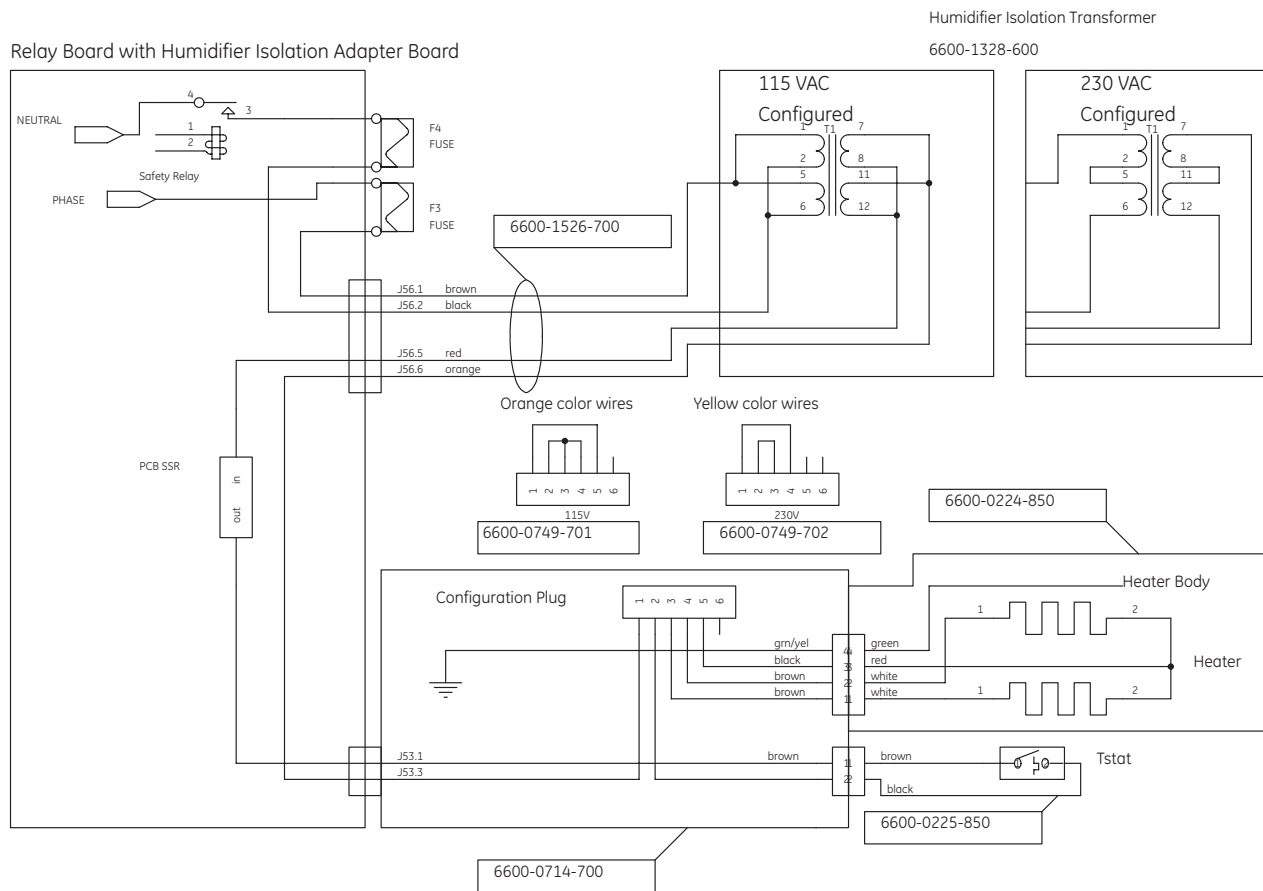


Figure 6-44 Wiring Diagram: Servo Humidifier, Relay Board Rev. Level 9 or Lower



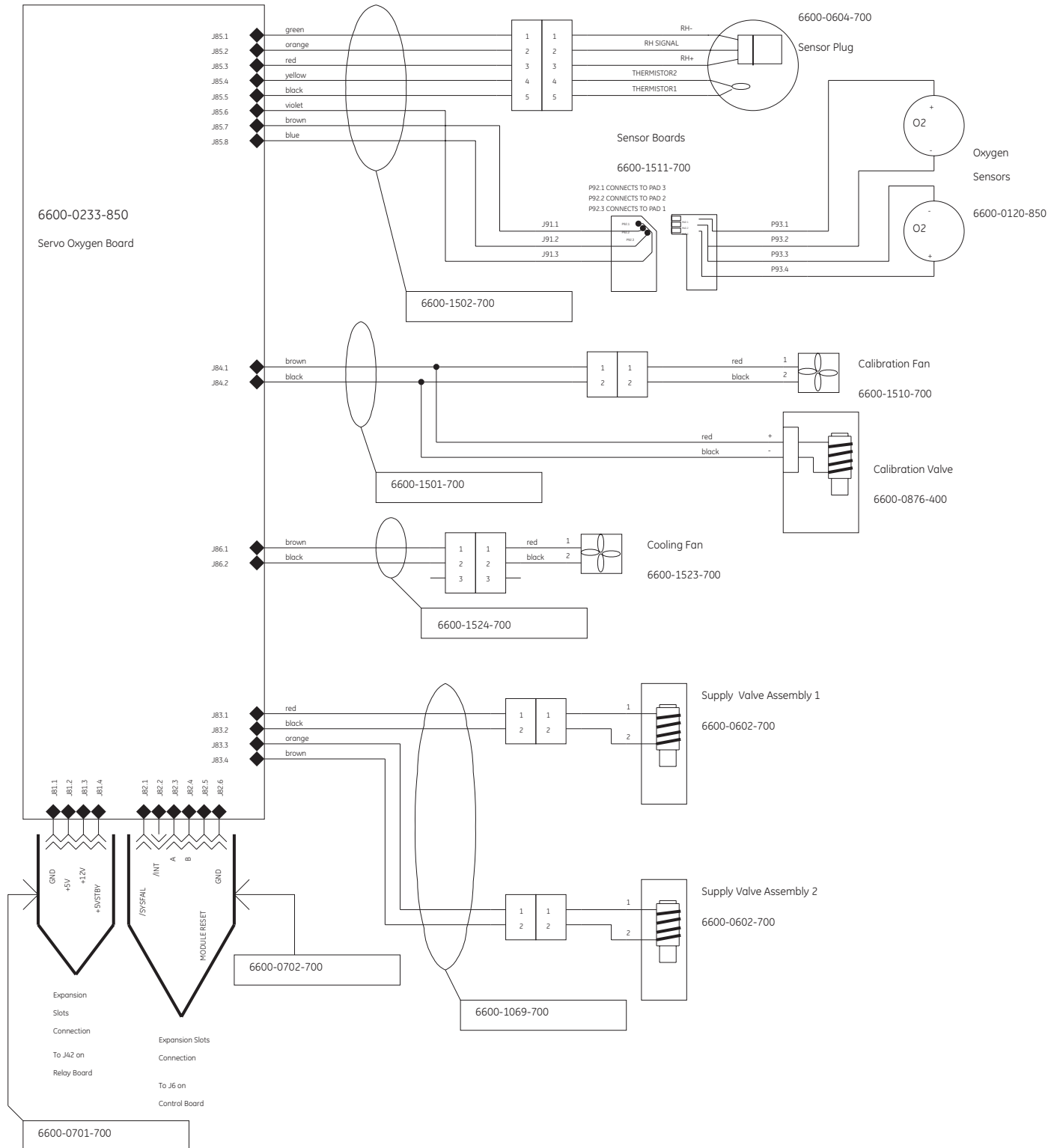


Figure 6-45 Wiring Diagram: Servo Control Oxygen



# Appendix A: Compartment and Skin Probe Characteristics

Temp °C	Res. Ohms
29.9	8071.2
30.0	8036.5
30.1	8002.0
30.2	7967.6
30.3	7933.4
30.4	7899.4
30.5	7865.6
30.6	7831.9
30.7	7798.3
30.8	7765.0
30.9	7731.7
31.0	7698.7
31.1	7665.8
31.2	7633.1
31.3	7600.5
31.4	7568.1
31.5	7535.9
31.6	7503.8
31.7	7471.8
31.8	7440.0
31.9	7408.4
32.0	7376.9
32.1	7345.6
32.2	7314.4
32.3	7283.4
32.4	7252.5
32.5	7221.8
32.6	7191.2
32.7	7160.8
32.8	7130.5
32.9	7100.4
33.0	7070.4
33.1	7040.5
33.2	7010.8
33.3	6981.3
33.4	6951.8
33.5	6922.6
33.6	6893.4
33.7	6864.4

Temp °C	Res. Ohms
33.8	6835.5
33.9	6806.8
34.0	6778.2
34.1	6749.8
34.2	6721.5
34.3	6693.3
34.4	6665.3
34.5	6637.3
34.6	6609.6
34.7	6581.9
34.8	6554.4
34.9	6527.0
35.0	6499.8
35.1	6472.6
35.2	6445.7
35.3	6418.8
35.4	6392.1
35.5	6365.4
35.6	6339.0
35.7	6312.6
35.8	6286.4
35.9	6260.3
36.0	6234.3
36.1	6208.4
36.2	6182.7
36.3	6157.0
36.4	6131.5
36.5	6106.2
36.6	6080.9
36.7	6055.8
36.8	6030.7
36.9	6005.8
37.0	5981.1
37.1	5956.4
37.2	5931.8
37.3	5907.4
37.4	5883.1
37.5	5858.9
37.6	5834.8

Temp °C	Res. Ohms
37.7	5810.8
37.8	5786.9
37.9	5763.1
38.0	5739.5
38.1	5716.0
38.2	5692.5
38.3	5669.2
38.4	5646.0
38.5	5622.9
38.6	5599.9
38.7	5577.0
38.8	5554.3
38.9	5531.6
39.0	5509.0
39.1	5486.6
39.2	5464.2
39.3	5441.9
39.4	5419.8
39.5	5397.7
39.6	5375.8
39.7	5354.0
39.8	5332.2
39.9	5310.6
40.0	5289.0
40.1	5267.6
40.2	5246.2
40.3	5225.0
40.4	5203.9
40.5	5182.8
40.6	5161.9
40.7	5141.0
40.8	5120.2
40.9	5099.6
41.0	5079.0
41.1	5058.5
41.2	5038.2
41.3	5017.9
41.4	4997.7
41.5	4977.6

Temp °C	Res. Ohms
41.6	4957.6
41.7	4937.7
41.8	4917.9
41.9	4898.1
42.0	4878.5
42.1	4858.9
42.2	4839.5
42.3	4820.1
42.4	4800.8
42.5	4781.6
42.6	4762.5
42.7	4743.5
42.8	4724.5
42.9	4705.7
43.0	4686.9
43.1	4668.3
43.2	4649.7
43.3	4631.2
43.4	4612.7
43.5	4594.4
43.6	4576.1
43.7	4558.0
43.8	4539.9
43.9	4521.9
44.0	4503.9
44.1	4486.1
44.2	4468.3
44.3	4450.6
44.4	4433.0
44.5	4415.5
44.6	4398.1
44.7	4380.7
44.8	4363.4
44.9	4346.2
45.0	4329.1



# Appendix B: Specifications

## B.1 Power Requirements

- 10.5 A @100v ~, 50/60 Hz
- 9 A @115v ~, 50/60 Hz
- 4.5 A @ 220v ~, 50/60 Hz
- 4.5 A @ 230v ~, 50/60 Hz
- 4.5 A @ 240v ~, 50/60 Hz

Inrush for 1/2 cycle current < 80 A

## B.2 Accessory Outlets

- 2 A @100v ~, 50/60 Hz
- 2 A @115v ~, 50/60 Hz
- 1 A @ 220v ~, 50/60 Hz
- 1 A @ 230v ~, 50/60 Hz
- 1 A @ 240v ~, 50/60 Hz

## B.3 Standards

Designed to meet requirements of

- IEC 60601-2-19 1990 with amendment 1 1996
- IEC 60601-1 1998 with amendment 1 1991 and amendment 2 1995
- IEC 60601-1-2 2007
- 21 CFR CH-1, Section 1020.30 (N)
- UL 60601-1 2003
- CAN/CSA-C22.2 No. 601.1-M90 1990 with supplement 1 1994 and amendment 2 1998
- ISO 19054 2005 with an exception claim to clause 5.2.7.2. Slight deformation of rail occurs after application of 500N to wide surface of DIN rail.

## B.4 Operating Environment

Temperature	20 to 30°C
Humidity	10 to 95% Non-condensing relative humidity
Pressure	50 to 106 kPa

## B.5 Storage Conditions

Temperature	-25 to 60°C
Humidity	5 to 95% Non-condensing relative humidity
Pressure	50 to 106 kPa

## B.6 User Control Settings

Patient control temperature	35-37.5°C in 0.1°C increments
Air control temperature	20-39°C in 0.1 increments
Humidity: Servo- % relative humidity	30-95% in 5% increments

## B.7 Alarms

High Air Temp	1.5°C over AST (air set temperature)
Low Air Temp	3.0°C under AST
Baby Hot	1.0°C* over BST (baby set temperature)
Baby Cold	1.0°C* under BST
Fan Failure	Failure of blower system
Air Temp >38°C	>38°C for AST <37°C
Air Temp >40°C	>40°C air temperature for AST >37°C
Air Probe Failure	Compartment air probe failure
Air Probe Disconnect	Disconnection of compartment air probe
Power failure	Power switch on but no power
System failure	Non-recoverable system failure
Add Water	Humidifier water level low
Scale: Weight Exceeds Maximum	Greater than 8kg load (visual only)
Scale: Scale Failure	Detectable system failure (visual only)

\* Can be re-set on the Service screen to 0.5°C

## B.8 Performance

### B.8.1 System

Control accuracy	+/- 1.0°C	Control Temp vs. Avg. Incubator Temp with level bed in manual mode.
Variability	+/- 0.5°C	Incubator Temp vs. Avg. Incubator Temp
Warm-up time	< 50 min.	Time to reach 38.5°C control temp from cold start in 25°C 50% RH room ambient
Patient measurement	+/- 0.3°C @ 30°C to 42°C accuracy	Accuracy of patient temperature measurement system within range of temperature measurement
Air Velocity	< 10 cm/sec	In Whisper Quiet™ mode, velocity measured 10 cm above the center of the mattress, closed bed
CO2 level	0.3%	Maximum CO2 level measured per IEC 60601-2-19, clause 105.1
Sound level	< 50 dBA	In Whisper Quiet™ mode, sound level measured 10 cm above the center of the mattress

### B.8.2 Humidity

Servo control accuracy	+/- 10 % of full range for settings up to 85%; minimum 75% for settings >85%	Humidity control setting vs. average humidity at 10 cm above center of bed
Ramp-up time	<50 minutes	Time to reach 75% RH with a 39°C control temp from cold start in 25°C 50% RH room ambient
Operating time without refill	>12 hours	Operational time at 65% RH control setting with one filling of reservoir in 25°C 50% RH room ambient

### B.8.3 Servo Control Oxygen

Control range	21 to 65% in 1% increments
Resolution	1 %
Accuracy	5%*
Rise time	10 minutes from 21% to 5% below set point
Recovery from opening porthole	5 minutes from closing porthole to 5% below set point

\*Over the life of the sensor

## B.9 Weight Scale

Functional range	300 g to 8 kg
Accuracy	± 10 g
Resolution	10 g (factory setting) or 5 g (for some scales only)

**NOTE:** For the European Union (EU) and the European Free Trade Association (EFTA) member states in Europe, check with your local regulations with respect to the Non-Automated Weighing Instrument (NAWI) directive as to the process and frequency for scale calibration. The resolution of scales distributed in this EU region vary depending on the scale revision:

- Scales with revision 2.72 only have a resolution option of 10 g.
- Scales with revision 2.86 have a resolution of 5 g up to 5000 g and 10 g up to 8000 g.

## B.10 Mechanical Specifications

	Bed Lowered	Bed Raised
Maximum Height	147 cm	178 cm

Maximum Width:	66 cm
Maximum Depth (front to back):	114 cm
Maximum Weight:	174 kg

### B.10.1 Accessories

	Maximum load
Storage drawer	7 kg
Monitor shelf	23 kg
Instrument shelf	9 kg
Total each accessory rail	23 kg
DIN rail	15 kg



# Appendix C: RS-232 Serial Data



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**WARNING:**

The computer or RS-232 monitor's user program must continuously check the data link. The program should constantly verify connection to the incubator controller and check for updated data.

---

**NOTE:** In the event of a power failure, all serial communication will cease until power is restored.

## C.1 RS-232 Connector

The Nurse Call and the serial data output share the same female, nine pin, d-type connector.

- Pin 2: Receive Data (incubator input)
- Pin 3: Transmit Data (incubator output)
- Pin 5: Gnd (Signal Ground)

Cable requirements

The user interface cable must have capacitance less than 1500 pF. It should be a shielded cable such as Belden 9611 with AMP shielding kit 748046-1 and ferrule 747579-8.

## C.2 Data Stream

The data stream from the Giraffe products is repeated every two seconds. The RS-232 parameters are 19200bps baud rate, no parity, 8 data bits, and one stop bit. The data is in ASCII format; the string is described below.

HYB\_1.40,36.1,OPEN,28.3,33.0,36.5,100,N,N,C,00,063,D,L,02043,0000,00,43,000,000,03,00

Item	Description
HYB	This is the product code. A "HYB" represents an OmniBed; a "INC" represents an incubator.
1.40	This is the control board software revision (thermoregulation in the startup screen).
36.1	Temperature from Patient Probe #1.
OPEN	Temperature from Patient Probe #2. "OPEN" represents no probe connected.

Item	Description
28.3	Air display temperature from the compartment probe.
33.0	Desired Environmental Temperature (DET). In air mode, this is also the air control temperature.
36.5	Patient control temperature.
100	Heater power.
N	Patient mode. This is either a "P" or "N."
N	Open bed mode. This is either an "O" or "N."
C	Closed bed mode. This is either an "C" or "N."
00	Set point for humidity. The "00" means the humidifier is not on.
063	Relative humidity in the infant compartment as measured by the compartment probe.
D	Boost air curtain button LED status. This is either a "D", "A" or "L". ( "D" means the air curtain button LED is off. "A" means the LED is on. "L" means the fan speed is forced to low speed by the user using the air curtain button and the down arrow. )
L	Fan speed. This is either an "L" or "H."
02043	Heat sink sensor resistance. The resistance-temperature curve is located in the Tips section 4.6.7.
0000	Last scale weight in grams. The zeros mean that no weight was taken in this patient session.
00	Oxygen set point. If the software revision is lower than 1.42, this parameter is not shown.
43	Oxygen measurement. If the software revision is lower than 1.42, this parameter is not shown. If both "Oxygen set point" and "oxygen measurement" are 0, the GSOCS module is not installed.
000	SpO2 measurement. If the software revision is lower than 1.42, this parameter is not shown.
000	Pulse rate measurement. If the software revision is lower than 1.42, this parameter is not shown.
03	Alarms. This is the alarm code 03. If there are multiple alarms, then all of the codes will be listed here.
00	The string ends with "00".

## C.3 Nurse Call

### Contact ratings

- Maximum resistive load: 4 VA
- Maximum DC switching voltage: 100 VDC
- Maximum switching current: 0.25 A
- Maximum carrying current: 0.50 A.

## Connector

The Nurse Call contacts and the serial data output share the same female, nine pin, d-type connector.

Pin	Description
Pin 6:	Closed contact under normal conditions, i.e. power on, no alarm (recommended configuration)
Pin 1:	Common contact
Pin 9:	Open contact under normal conditions, power on, no alarm These contacts are not powered. They only provide closure.

## Nurse Call signals

Incubator Status	Nurse Call Signal	
	Pins 1 and 6	Pins 1 and 9
Normal	Closed	Open
Alarm	Open	Closed
Pwr switch off or pwr fails	Open	Closed
Nurse Call cable disconnected	Open	Open



# Appendix D: Additional Safety Information

## Statements



**WARNING:**

The user or service staff should dispose all the waste properly as per federal, state, and local waste disposal regulations. Improper disposal could result in personal injury and environmental impact.

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## Symbols

The following symbols appear on the unit:

Symbol	Description
	Consult accompanying documents.
	Lower the elevating base before mounting accessories.

## Checkout Procedures

The following additional checkout step is recommended to support the new service life statement:

Examine the unit for any missing or damaged labels.



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Giraffe Incubator  
Service Manual  
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To reorder this manual, order kit:

- 6600-0847-801 (USA)
- 6600-0847-802 (INTL)

6600-0356-000  
Revision 103  
Language: English

Printing instructions:  
Black on white  
8.5" x 11" paper size  
Two (2) sides print  
Three (3) hole punch  
Stapled or shrink-wrapped