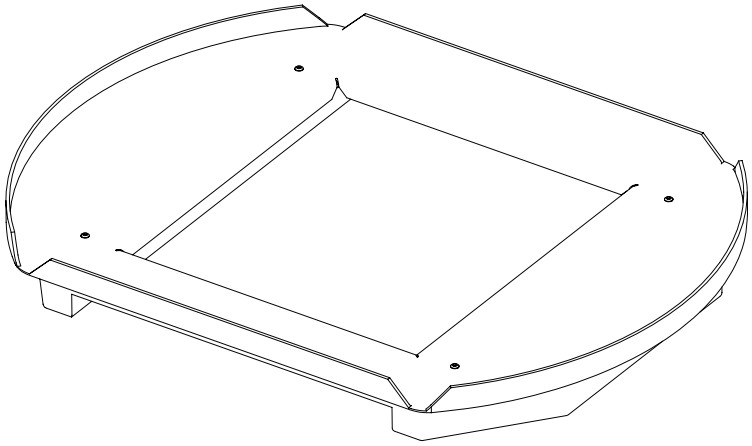
GE Healthcare

Giraffe® Infant Scale
Service Manual



Important

The information contained in this service manual pertains only to those models of products which are marketed by Ohmeda Medical as of the effective date of this manual or the latest revision thereof. This service manual was prepared for exclusive use by Ohmeda Medical service personnel in light of their training and experience as well as the availability to them of parts, proper tools and test equipment. Consequently, Ohmeda Medical 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 Ohmeda Medical does not imply in anyway that Ohmeda Medical 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.

This static control precaution symbol appears throughout this manual. When this symbol appears next to a procedure in this manual, static control precautions MUST be observed. Use the static control work station (Stock No. 0175-2311-000) to help ensure that static charges are safely conducted to ground and not through static sensitive devices.

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 Ohmeda 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.

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⚠ CAUTIONS

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

Always perform the checkout procedure after performing any type of repair and before placing the scale back in service.

WARNING:

This service manual is available in English only.

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

ПРЕДУПРЕЖДЕНИЕ

Това упътване за работа е налично само на английски език.

- 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。

- 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。

- 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、機械性或其他的危險。

警告

本維修手冊僅有英文版。

- 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.

- 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.
- Zanemarite 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.

- 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.

- 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.

- 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.

HOIATUS

See teenindusjuhend on saadaval ainult inglise keeles

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

VAROITUS

Tämä huolto-ohje on saatavilla vain englanniksi.

- 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.

- 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.

- 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.

- 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.

- Ha a vevő szolgáltatója angoltól eltérő nyelvre tart igényt, akkor a vevő felelőssége a fordítás elkészíttetése.
- Ne próbálja elkezdeni 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 fáanleg á ensku.

- Ef að þjónustuveitandi viðskiptamanns þarfnast annas tungumáls en ensku, er það skylda viðskiptamanns að skaffa tungumálaþjónustu.
- 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.

- 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。

- **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.

- 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.

- 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 trieciena, mehānisku vai citu faktoru izraisītu traumu risks apkopes sniedzējam, operatoram vai pacientam.

ĮSPĖJIMAS

Šis eksploatavimo vadovas yra tik anglų kalba.

- 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 eksploatavimo 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.

- 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.

- 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.

- 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.

- Se qualquer outro serviço de assistência técnica solicitar este manual noutro idioma, 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 eléctricos, mecânicos ou outros.

ATENȚIE

Acest manual de service este disponibil doar în limba engleză.

- 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 şi 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.

- 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.

- 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.

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

ATENCION

Este manual de servicio sólo existe en inglés.

- 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.

- 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.

DİKKAT

Bu servis kılavuzunun sadece ingilizcesi mevcuttur.

- 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.

1/Functional Description

(23G10RA instrument board)

1.0 General

The Ohmeda Medical Giraffe® Infant Scale utilizes the latest developments in transducer technology and integrated circuits to provide a highly reliable and accurate weighing scale. This section describes the technical aspects of the Giraffe accessory infant scale. A schematic diagram and parts list is included within this manual. Please refer to it when reading the following technical description.

1.1 Scale Assembly

Each scale assembly contains the following:

1. Load cell transducers (4).

2. Cable and connector.

3. Weighing & interface electronics.

1.2 Load Cell Transducer

The function of the load cell transducer is to convert the weight applied to the weighing platform into an electrical signal for further processing and subsequent transmission by the scale's electronics. Four (4) special load cell transducers are contained within the scale assembly. A separate "coplanar fold back beam" is mounted under each of the four corners of the scale, between the top and bottom surfaces. These load cells are very sensitive and precise devices which produce a voltage output in direct proportion to the weight applied. This change is linear to within $\pm$ 0.05%.

Two dual strain gauges are mounted on each simple beam to measure tension and compression of the beam as weight is applied. The four gauges of each simple beam are wired in a Wheatstone bridge configuration. This transducer arrangement is "excited" (powered) with a regulated +10 volts D.C. from the scale electronic's power supply. The "excitation" voltage is applied to the opposite corners of the bridge designated "+EXC" and "-EXC". The signal output ("+SIG" and "-SIG") is the total voltage that changes in proportion to the weight applied. This output is a very low level DC voltage (in the millivolt range at full scale capacity).

Each load cell has a small circuit which contains various resistors which are selected to insure matching of the four load cells. Correction of the load cell's output signal due to changes in temperature is also accomplished by compensating resistors on this circuit.

The four load cells are further interconnected in parallel, by the scales instrument board, in order to "sum" the total weight applied to the scale platform.

1.3 Cable and Connector

The scale is interconnected to the Giraffe by means of a seven-conductor (plus shield) cable and an eight circuit connector (one position not used). The cable shield is used to interconnect the load cell transducer beams and the shielding around the printed circuit assembly as an aid in protecting the scale from ESD (electrostatic discharge).

Color coding of the lead wires is as follows:

Red:	+12V Power supply
Brown:	/System failure
Green:	/Interrupt
Orange:	RS-485 communication line "A"

Yellow: RS-485 communication line “B”
Blue: Reset
Black: Common or circuit ground

1.4 Weighing and Interface Electronics

The electronic circuit board contained within the Giraffe accessory scale is used to process the signal from the load cell transducers of the weighing platform and provide an interface to the internal electronics bus of the Giraffe. Note that the scale shares the same data/power bus as do the various other modules of the system.

The scale electronics consists of the following:

1. Differential signal amplification.

2. Additional amplification and signal filtering.

3. Analog to Digital (A/D) converter & clock

4. DC power supplies.

5. Microcomputer and support circuitry.

6. Interface to Giraffe data bus.

1.41 Differential Signal Amplification

The weight dependent output signal produced by the load cell transducers in the scale platform is a “differential signal”, meaning it is the voltage difference between the “+ Signal” and “- Signal” leads. Integrated circuit U4, an instrumentation amplifier, is used to interface to this differential signal and amplify it.

The four individual load cell transducers are parallel connected at connectors J4A, J4B, J4C, & J4D. This summed weight output signal is applied to the protection network consisting of diodes CR4/CR5/CR6/CR7. These diodes prevent destructive overvoltages caused by static discharges from damaging U4. A “guard trace” is also provided on the printed circuit assembly to help prevent leakage to the signal pins of the load cells. The guard trace is biased by resistors R15 and R16. A high frequency filter, formed by L1/L2/C9/C10, couples the weight signal to the input of U4. In U4 the differential signal is amplified by a factor of 100, and converted to a “ground-referenced” voltage for further processing.

Capacitors C24/C16/C17 provide local bypassing of the power supplies used by instrumentation amplifier U4. Capacitor C18 furnishes compensation of U4 by reducing amplification at higher frequencies.

1.42 Additional Amplification and Signal Filtering

Operational amplifier U5 is included to provide additional gain and signal filtering. U5, together with capacitors C14/C15 and resistors R17/R18, forms an active low-pass filter. This helps to remove fluctuations in the weight signal caused by movement of the patient on the scale. U5, like U4, is “chopper-stabilized” to correct internal offset and drift errors.

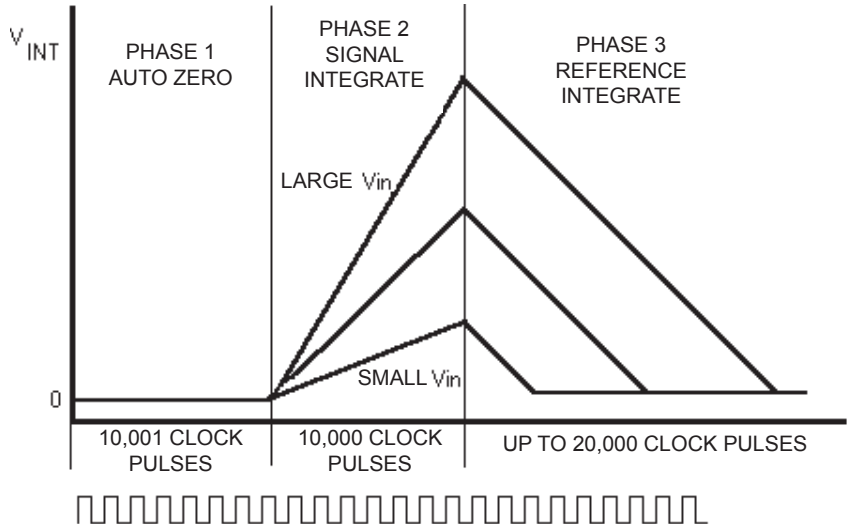
Resistor R24 is used to increase the gain of the amplifier stage in order to provide the required voltage output level. Resistor R22 biases the amplifier stage in a negative direction to increase dynamic range for scale operation; this helps remove any positive offset from the load cell transducers and also removes the weight of the scale’s top platform. The increased dynamic range allows more non-patient weight (“tare”, such as blankets and pillows) and patient weight to be applied to the scale before exceeding the input range of the A/D converter. An additional low-pass filter stage is furnished by resistor R34 and capacitor C23.

1.43 Analog and Digital Conversion

Integrated circuit U6 is the analog-to-digital converter. Included on this integrated circuit are auto-zero functions, auto-polarity, and the digital and analog functions necessary to perform dual slope integration conversion to 20,000 counts (4 1/2 digits). The weight signal voltage is applied to the analog input (pin 10) of U6.

A reference voltage for the conversion is applied to pin 2 of U6. The reference voltage, nominally 1 Volt, is derived from the load cell transducer excitation voltage (+10V), by the divider network consisting of resistors R29 & R30.

The system clock, applied at pin 22 of U6, is used to precisely time and control the phases of the dual slope conversion process. The system clock is generated by microcomputer U10 from its port P1.0, and consists of a square wave of approximately 160khz. The following diagram details the operation:



1.43.1 Phase 1, Auto Zero

During auto zero, the errors in the analog components (offset voltages of buffers, comparators, etc.) will be automatically nulled out. This is performed by internal logic that disconnects the input pins (9 & 10) from the applied analog signal, connects them to ground, then closes an internal feedback loop such that offset error information is stored in the “auto zero” capacitor, C21. Also during this phase, “reference capacitor” C22 is charged to the voltage present on “Vref” (pin 2 of U6).

1.43.2 Phase 2, Signal Intergrate

The input signal is reconnected and then integrated for exactly 10,000 clock pulses. On completion of the integration period, the voltage V-int is directly proportional to the input voltage, corresponding to the weight applied to the scale. Capacitor C20 is the integration capacitor, with resistor R32 setting the integration current. At the end of this phase the input signal polarity is determined.

1.43.3 Phase 3, Reference Integrate, Signal De-intergrate

The input to the integrator is switched from the input signal to reference capacitor C22. Internal switches connect capacitor C22 to the integrator input so that its polarity is opposite that of the previously applied input signal. This causes the integrator to discharge back towards zero. The number of clock pulses counted between the beginning of this cycle and the time when the integrator output passes through zero is a digital measure of the magnitude of the input signal. This count is stored in an internal latch on U6 for output to the microcomputer.

1.43.4 Zero Integrator Phase

One minor additional phase is included to insure that the integration capacitor C20 is fully discharged to zero volts. This typically lasts 100-200 counts.

1.44 DC Power Supplies

Four separate dc power supply voltages are provided on the circuit board for powering the various sections of the electronics. These include +10V ("+Exc") for load cell excitation, +5V (VAA) for analog circuits, +5V (VCC) for digital circuits, and -5V for analog circuits. Use of two separate +5V supplies prevents digital noise from entering the sensitive analog circuits.

The two +5V power supplies and the +10V supply are obtained by reducing & regulating the +12V from the Giraffe's data/power bus. While +5V is available directly from the Giraffe's data/power bus, it is generated locally to simplify the connecting cable and interface.

An additional circuit consisting of Q1 and related components is included to provide a gradual turn-on to the scales power supply in order to eliminate problems with "hot-plugging". See section 1.46 for additional details

1.44.1 +5V Supplies

Voltage regulators VR2 and VR3 render regulated sources of +5 Volts D.C. for operation of the analog (VAA) and digital (VCC) circuits, respectively. As mentioned earlier use of two separate +5V regulators helps to prevent noisy digital signals from entering the sensitive analog circuits. VR2 and VR3 are three-terminal regulators that are very stable with load & temperature and provide internal current limiting.

Capacitors C3 and C8 are used to insure regulator stability. Capacitors C37 & C38 provide high-frequency bypassing of the respective power supply.

An indicator LED, marked "**+5V**", is provided for troubleshooting purposes and lights when the +5 volt supplies are operating. Current limiting for the LED is provided by resistors R67 and R68. Since the current is summed from the two +5 volt supplies to light the LED, the LED will be noticeably dimmer than the others if one of the two +5 volt supplies is not working.

1.44.2 +10V Supply

VR1 is an integrated circuit voltage regulator that provides a stable source of +10V ("+EXC") for load cell transducer excitation and amplifiers U4/U5. VR1 reduces the +12V input to +10V and maintains a steady output with load current and temperature fluctuations.

VR1 is actually a +5V fixed output regulator which has its common terminal connected to the VAA (+5V) power supply. This "stacks" the VR1 +5V regulator on top of the +5V VR2 regulator in order to provide a regulated source of +10V.

Additional components used include capacitor C27 to stabilize the regulator, capacitor C26 to contribute high frequency filtering, & schottky diode CR2 to insure the "stacked" regulator configuration initializes properly.

An indicator LED, marked "**+10**", is utilized for troubleshooting purposes and lights when the +10 volt supply is operating. Current limiting for the LED is provided by resistor R69.

1.44.3 -5V Supply

Integrated circuit U2 is used to convert +5 Volts D.C. to -5 Volts D.C. for use in the analog circuits. It contains an internal oscillator (operating at approximately 10 KHz) and a series of switches. During one half of the cycle capacitor C4 is connected between +5 Volts and ground. During the other half cycle capacitor C4 is reconnected between ground and pin 5, with its polarity such that the negative terminal of C4 is connected to pin 5 of U2. C4's charge is then transferred into capacitor C5, which filters the voltage, furnishing the -5 Volt D.C. output.

1.45 Microcomputer and Support Circuits

A microcomputer is employed to additionally process the data supplied by the A/D converter and execute the commands and responses from the Giraffe system. This microcomputer system consists of U10, a microcomputer; U9, a nonvolatile memory which remembers calibration and use data; and U11, a device to generate reset conditions for the microcomputer.

During operation of the scale the microcomputer continually receives the weight readings from the A/D converter. This data is received in a “multiplexed” format (one digit at a time) from the output of the A/D converter (microcomputer port lines P1.1 through P1.7). The microcomputer also continually monitors the Giraffe data bus and listens for commands relevant to the scale. After processing the A/D data the microcomputer assembles it for subsequent transfer to the Giraffe when requested.

U10 is a complete microcomputer, containing a software program stored in read-only memory, read/write memory for temporary storage of program variables, an arithmetic logic unit, input/output and other control lines, etc. U10 also contains an internal UART (universal asynchronous receiver transmitter), which allows serial communication between it and the Giraffe. Crystal XTAL1 and capacitors C29/C30 form the clock oscillator which controls the internal timing of the microcomputer.

1.45.1 Nonvolatile Memory

The internal memory of microcomputer U10 does not retain data when the power is switched off. Because lasting data retention is required for scale weight calibration integrated circuit U9 is included. This device, called an “electrically erasable programmable read only memory”, or “EEPROM” will store information for periods of up to 100 years.

Information needed to be stored to or retrieved from U9 is sent in serial form using the lines SCL (serial clock) and SDA (serial data). These are controlled by microcomputer U10. A data bit (a high or low level) is sent and received on SDA when the SCL line provides a pulse.

Resistors R54/R55 are provided as pull-ups on the SCL/SDA lines to insure the data and clock pulses are properly shaped.

1.45.2 Reset Generation

In order for microcomputer U10 to properly execute its software instructions it must be initialized to the start of the program when power is first turned on. “Reset” pin 9 of U10 will accomplish this when it is set “high”. U11 is a “watchdog timer” included to provide the reset when needed.

The +5V VCC supply is monitored by the device and the reset line of U10 is set when VCC is insufficient to guarantee operation of the microcomputer. Once the proper minimum level of VCC is attained (approximately 4.75 V) the reset line is set low and the microcomputer is allowed to run its software program.

Additionally an on-board timer of U11 must be reset periodically by pulsing its input pin, “WDI”; this is done by microcomputer U10 using port pin P3.6. Failure of the microcomputer to reset this timer, caused by an error in its operation, will cause U11’s watchdog timer to time out. This sets line “/WDO” (watchdog output) low, and subsequently pulls the “/MR” (master reset) line low through small signal schottky diode CR20. This initializes a reset pulse and restarts microcomputer U10. Diode CR22 is included to couple an external reset pulse from the Giraffe’s data bus (see section 1.46.5).

An additional “data line time delay” is fabricated using the remaining part of U11. See section 1.46.1 for additional details.

1.46 Interface to Giraffe Data Bus

Since the scale plugs into the existing Giraffe electronics data bus, it must conform to the specifications of that data bus. Circuitry is also included on each line to provide “hot-plug” capability, which allows the scale to be plugged or unplugged from the Giraffe while the power is on and the Giraffe is operating. Signals to and from the scale include the following:

Common ground: The common return for all the circuitry.

+12V DC Power: Power source used by the scale for all its circuitry. This voltage is the source for the scale’s own internal voltage regulators and converters.

/System failure: This is an output to the scale and other modules from the Giraffe indicating that the system has encountered a failure and that each module should take appropriate action. The */System failure* line, which normally idles at “high” (+5V), is pulled “low” by the Giraffe to indicate a problem.

/Interrupt: An input to the Giraffe signaling that a module(s) is requesting attention. Normally idling at “high” (+5V), it is pulled “low” (towards “0V”) by the module making the request. Upon receiving the */Interrupt* signal the Giraffe will poll each module to determine if it was the one that required attention. Once the interrupting module is queried, it will release the */Interrupt* line.

Reset: A signal to the scale and any other modules to return to their initial “start-up” state. A reset pulse is provided on power-up of the Giraffe.

RS-485A, RS-485B: A pair of lines used to provide communication between the Giraffe and all modules. Serial data is transferred over these lines. The use of a differential pair of lines provides high noise immunity and therefore excellent signal integrity.

1.46.1 Data Line Time Delay

A time delay is provided in the scale’s electronics which prevents any of the scale’s three output lines, /INT, RS-485A, RS-485B, from activating during “hot-plugging” and corrupting the operation of the Giraffe. The term “hot-plugging” refers to plugging and unplugging the scale from the Giraffe while it is powered on and functioning.

These output lines are kept disconnected from the Giraffe by the normally open contacts of relays RLY1 and RLY2. The parallel connected coils of the relays are energized by mosfet transistor Q22. Zener diode CR21 is provided to protect transistor Q22 from inductive transients caused by the two relays switching off. Resistor R71 reduces the power dissipation of the relay coils.

A time delay is furnished by the network consisting of resistors R60, R61, R70, and capacitor C61. This time delay is on the order of several seconds, and is connected to the “PFI” line of U11. When the voltage on the C61 line reaches approximately +1.25 volts, watchdog timer U11 will set the /PFO line high, energizing Q22, and therefore switching the relays.

Transistor Q20 is used to discharge the capacitor C61 when a reset occurs and therefore restart the time constant. Also upon reset, microcomputer U10 sets its port lines “high”. Transistor Q21, which is connected to port pin P3.7, will keep C61 discharged until U10’s software sets port P3.7 “low”. This allows U10 to further delay the data line connection until it is ready.

An extra set of contacts on relay RLY1 is used to tell U10 through port P2.3 that the relays have closed.

1.46.2 +12 Volt Power Interface

Power is applied to the VR1 / VR2 / VR3 voltage regulator array by use of mosfet transistor Q1. Q1, a P-channel

device, is included to provided a gradual “soft-start” of the scale’s power supply. This is done to insure that hot-plugging the scale will not cause a surge on the power supply of the Giraffe and upset its operation.

Capacitor C1 is connected across the gate and source of Q1. A time delay circuit is formed from C1 and resistor R2. Upon connection of the scale to the Giraffe, Q1 is initially kept off by a discharged C1. As C1 charges through R2 it gradually forward biases the gate of Q1, turning it on slowly and allowing current to gently flow into the remainder of the scale’s electronics.

Diode CR1 and resistor R1 provide a rapid discharge of C1 so that momentary unplugging of the scale resets the soft-start time delay. Transient suppressor diode TS1 is included to protect the scale power supply from “ESD” (electrostatic discharge), momentary overvoltage, or reversed polarity connection.

1.46.3 /System Failure Interface

A “low” signal on the /SYSTEM FAILURE (“/sysfail”) line tells the scale to shutdown. The scale’s /sysfail line is normally biased low by resistor R63; the Giraffe pulls this line up towards +5 volts under normal conditions. If the line becomes disconnected, or the Giraffe senses a serious problem, the line will go “low” and cause the scale’s software to shutdown.

The “/sysfail” signal is connected to the network of resistor R62 and capacitor C6 to provide current limiting, ESD protection, and noise filtering. Integrated circuit U21 provides a pair of inverters that shape and buffer the signal before applying it port pin P3.2 of microcomputer U10.

An indicator LED (light-emitting diode), marked “**/SFL**”, is also attached to the buffered line to help in troubleshooting, and lights when a system failure is occurring. Current limiting for the LED is provided by one resistor of network RN1.

1.46.4 /Interrupt Interface

An “interrupt” line is used by all the modules to signal the Giraffe that they need attention. This line is normally biased “high” by the Giraffe. It is pulled “low” by one or more of the modules.

The scale’s interrupt line, “/INT”, is isolated upon hot-plugging or power-up through relay RLY1 (see section 1.46.1). When microcomputer U10 requests attention from the Giraffe, it sets output port P2.5 “low”. Port P2.5 is buffered by two inverters from U21 then applied through schottky diode CR25 and relay RLY1 to connect to the Giraffe’s “/INT” line. Resistor R64 is included for current limiting.

An indicator LED, marked “**/INT**”, is utilized for troubleshooting purposes and lights when the “/INT” line is low, indicating the scale is requesting attention. Current limiting for the LED is provided by one resistor of network RN1.

1.46.5 Reset Interface

While the scale contains its own circuitry for resetting on power-up or other conditions, the Giraffe also provides a line labeled “**RESET**” to force an initialization of all modules. The “RESET” signal is connected to the network consisting of resistor R65 and capacitor C7 to provide current limiting, ESD protection, and noise filtering. A “pull-down” resistor, R66, is included to bias the reset signal so it is normally “low”. Integrated circuit U21 provides an inverter to shape and buffer the signal before applying it to watchdog timer/reset generator U11 through small signal schottky diode CR22 (see section 1.45.2).

An indicator LED, marked “**RST**”, is utilized for troubleshooting purposes and lights when the “RESET” line is high, indicating the scale and other modules are being forced to reset by the Giraffe. Current limiting for the LED is provided by one resistor of network RN1.

1.46.6 RS-485 Communications Interface

Communication between the scale and the Giraffe uses a format known as “RS-485”. This technique utilizes a differential voltage between two lines, labeled “A” and “B”. The data is transmitted as a serial string of “0’s” and

"1's", and is represented as a voltage on the A and B lines with A > B or B < A. Use of this differential voltage approach provides high noise immunity and signal integrity, since common mode interference is greatly rejected.

Use of the RS-485 format allows multiple modules and the Giraffe to share the same pair of communication lines by taking turns, much like a telephone "party line". Each module has a unique address used to identify it, and the Giraffe controls all communication by acting as the "master". The data transfer between the Giraffe and any module also includes encoding for the number of digital bytes and a checksum, so that errors in communication can be readily identified.

Communication takes place in "half-duplex" mode, which means receiving and transmitting must occur alternately. Communication occurs at a rate of 19,200 baud, producing a "0" or "1" pulse duration of 52 microseconds.

U20 is an integrated circuit specifically designed to act as an RS-485 interface. It contains the necessary transmit and receive drivers to couple the scale's microcomputer internal UART to the Giraffe's RS-485 communication bus. Microcomputer U10 port pin P2.4 controls the transmit/receive function of the U20 interface through one of U21's inverters. Data from the Giraffe is routed to microcomputer U10's receive line, port P3.0, also known as "RXD". Data to the Giraffe initiates from microcomputer U10's transmit line, port P3.1, also known as "TXD".

Note that both the "A" and "B" lines are linked to the U20 interface circuit by relay "RLY2". This relay disconnects these lines from the Giraffe during "hot-plugging" (see section 1.46.1) so as to prevent disruption of data communication between the Giraffe and various other modules.

A pair of indicator LED lamps, marked "**XMT**" and "**RCV**", are supplied for troubleshooting purposes and light when communication is taking place between the scale and the Giraffe. Correct operation will consist of a short blink from the "**RCV**" lamp, indicating the scale has received a query from the Giraffe, followed by a short blink from the "**XMT**" lamp, verifying the scale's response. Note that because of the complex addressing involved on the RS-485 data bus, the indicator lamps provide a simulated transmit and receive indication of the scale's data bus activity. The lamps are actually driven by microcomputer U10 as opposed to directly monitoring the data bus.

Current limiting for the LED lamps is provided by two resistors of network RN1.

1.5 SR and SC display

Two displays of internal scale operation are provided in the service menu. These are labeled "SR" and "SC". Both pertain to values from the scale's A/D (analog to digital) converter, which are in turn related to the weight applied to the top deck of the scale. Note that the scale must be connected to the OmniBed before entering the service menu to obtain the SC and SR displays.

SR: Scale counts Raw. This is the actual digital, converted weight number received from scale's A/D converter without any further processing. It can be thought of as the "hardware" value representing the weight applied to the scale. Each count of this value represents approximately 100 uVolts (0.0001V) DC applied to the input of the scale's A/D converter. The range of displayed value is from -20,000 to +20000, corresponding to a voltage input applied to the A/D converter of -2.0000 Vdc to +2.0000 Vdc.

In terms of weight applied to the scale, each count typically represents approximately 1.1 grams. Note that this value will vary with tolerances of the transducers and electronics, and could range from 0.85 gram to 1.20 gram per count. Calibration of the scale converts this count to an exact weight representation.

The value of SR displayed without a weight, insert, and mattress will vary greatly, again due to the tolerance of the transducers and electronics. Values may range from –5000 to +3000 under this condition. Provided the scale's top deck is stable, the value displayed should not momentarily fluctuate more than five counts total.

SC: Scale counts Calibrated. This is the weight value after processing from the scale's internal microcomputer. It can be thought of as the "software" value representing the weight applied to the scale. On a properly calibrated scale, each count of this value represents exactly 1 gram of weight . The range of possible displayed values is from 0 to 40000; offsets and correction factors will limit this to a smaller range.

To observe scale operation using the “SC” display, note the displayed value without weight. Add a test weight to the platform. The new value should closely equal the previous number plus 1 count for every gram of weight applied. As an example, if the no weight SC value is 20000, adding a 5000 gram (5 kilogram) test weight should produce an SC value of approximately “25000”.

The value of SC displayed without a weight, insert, and mattress will vary greatly, due to the tolerance of the transducers and electronics. Values may range from 16000 to 23000 under this condition. Provided the scale’s top deck is stable, the value displayed should not momentarily fluctuate more than four counts total.

1.6 Specifications

Functional range	300 gm to 8 kg
Accuracy	+/- 10 gm
Resolution	10 gm (factory setting) or 5 gm

Notes

2/Checkout Procedures

The scale can be calibrated using a Class F calibration weight between 1 kilogram and 8 kilograms (accuracy of 0.01%). It is recommended to perform weight testing of the scale with a 5 kilogram (5000 gram) certified test weight. This weight is available as Ohmeda part number 6600-0209-800.

2.1 Mechanical check

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

2. Examine the scale for obvious signs of damage.

2.2 Center weight check

For best test accuracy enter the service screen and set the scale resolution, “Scale R”, to 5 grams, then shut off the unit and power it back up to enter normal weighing mode. 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.

2.3 Off center weight check

For best test accuracy enter the service screen and set the scale resolution, “Scale R”, to 5 grams, then shut off the unit and power it back up to enter normal weighing mode. Place a known test weight 10 cm (4”) from the center of the mattress in 4 positons 90 degrees from each other (for example- toward each corner of the matress) and check the reading at each position. Resulting weight readings should be within +/- 10 grams of previously obtained center weight reading.

Important: If the scale fails the weight checks, calibrate it according the procedure in section 3 and then perform the weight checks again.

Notes

3/Maintenance and Calibration

3.1 Maintenance Schedule

Annual	Perform checkout procedures in section 2. If the scales fails the weight check, perform the calibration procedure below.

3.2 Service Tools

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

A 5 kilogram (5000 gram) certified test weight is available from Ohmeda Medical (part number 6600-0209-800).

3.3 Scale Calibration

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"

8. Turn off the power to exit the service mode.

Notes

4/Troubleshooting

4.1 Error Codes

Error Code No.	Meaning	Possible Causes	Actions
Scale Failure “1”	Microcomputer random access memory failed test on power up.	Faulty RAM memory in microcomputer U10.	Replace microcomputer U10 on printed circuit board of scale.
Scale Failure “2”	Microcomputer program memory failed checksum test on power up.	Faulty flash EPROM memory in microcomputer U10.	Replace microcomputer U10 on printed circuit board of scale.
Scale Failure “3”	No output data from A/D converter.	A/D converter not running or defective.	Replace printed circuit board assembly of scale.
Scale Failure “4”	Output signal from A/D converter is over range.	Platform overloaded. Defective loadcell(s) or printed circuit board.	Remove any items from platform. Check load cells for high offset by checking “SR” value on service screen (see section 1.5). To determine specific load cell remove scale top and PC shield cover and disconnect/reconnect load cells (J1, J2, J3 & J4) one at a time until SR value returns to typical.
Scale Failure “5”	EEPROM memory has failed.	Problem with U9 EEPROM IC.	Replace printed circuit board assembly of scale.
Scale Failure “6”	Field Calibration data has been damaged.	Problem with U9 EEPROM IC.	Perform scale calibration. If problem persists replace printed circuit board.
Scale Failure “7”	Factory Calibration data has been damaged.	Problem with U9 EEPROM IC.	Replace printed circuit board assembly of scale.

4.2 Troubleshooting Table

Problem	Possible Cause	Action
Scale Icon does not appear on Giraffe control panel	Scale not plugged in.	Plug scale into Giraffe receptacle.
	Defective cable.	Check cable continuity. Repair or replace cable.
	Defective printed circuit board.	Replace printed circuit board.
	Scale receptacle on Giraffe defective.	Replace scale receptacle on Giraffe.
Scale causes Giraffe malfunction	Defective cable	Repair or replace cable.
	Defective printed circuit board.	Replace printed circuit board.
Scale icon disappears/reappears on control panel. Scale makes repeated clicking noise.	Scale connector not making good contact with Giraffe.	Check that connector is fully inserted. Check that LEMO connector is tightly assembled. Check for bent pins.
	Defective cable.	Check cable continuity. Repair or replace cable.
	Defective printed circuit board.	Replace printed circuit board.
	Scale receptacle on Giraffe defective.	Replace scale receptacle on Giraffe.

Problem	Possible Cause	Action
Scale never completes weighing cycle	External mechanical interference.	Check for interference with scale top weighing (patient tubing, wires, severe vibration). Place scale outside of Giraffe and check operation.
	Internal mechanical interference.	Remove scale top frame and check for interference between top frame, load cells and wiring.
	Defective load cell.	Check output of scale using service screen. Check “SR” (**S**cale counts **R**aw) display. Number displayed should not fluctuate by more than 4 counts when at rest. If excessive fluctuation is noted disconnect load cells one at a time to isolate; replace individual defective load cell.
	Defective printed circuit board.	Replace printed circuit board.
Patients weights inconsistent, erratic	Mechanical interference	Perform off center weight check to determine corner weight readings. Examine defective corner and correct interference.
	Defective load cell	Perform checkout procedure. If it fails, perform load cell check below. Replace load cell as needed.
	Defective printed circuit board.	Replace printed circuit board.

Load Cell Check

To test for a defective loadcell start by placing the test weight place in the center of the platform and perform a weighing. Then place the center of test weight directly over each loadcell and perform a “Reweigh”. (The center of the loadcell is where the mounting screw is located on the top platform; 4 places). All four readings should be similar. If not, the weight reading that’s off the most is likely the defective load cell.

Note: All four loadcell input connectors (J1, J2, J3 & J4) are parallel wired so load cell connection positions are interchangeable.

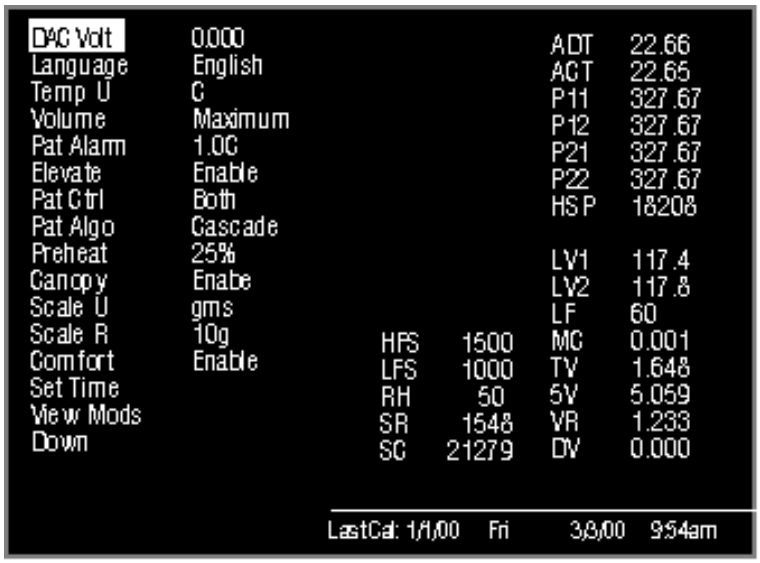
Load cell resistance readings are as follows:

Excitation:	green/black wires:	1000- 1300 ohms
Signal:	red/white wires:	975 - 1025 ohms

Note that the change in load cell resistance due to applied load is generally not measurable due to the bridge configuration and the very small values involved.

4.3 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.



SR Scale counts raw
SC Scale counts corrected

For more informatiom about SR and SC, see section 1.5 in this manual.

4.4 Indicator lamp array check

The scale printed circuit board contains an array of lamps that indicate data bus or scale activity. These can have application in trouble shooting problems. The lamps and their function is as follows:

+10: (+10 volt power supply) Indicates presence of voltage on the scales +10 volt dc power supply. The lamp does not actually indicate if the voltage is within proper limits.

+5V: (+5 volt power supply) Indicates presence of voltage on the scales two separate +5 volt dc power supplies. A lamp which is dimmer that the others may indicate a problem with one of the supplies. The lamp does not actually indicate if the voltage is within proper limits.

RST: (Reset) Indicates when a reset pulse is applied to the data bus “RESET” line. Will not show the reset pulse on Giraffe power up due to the slow turn of the scale electronics.

/SFL: (System failure) Indicates when the “SYSFAIL” line is activated on the data bus.

/INT: (Interrupt) Indicates when the scale is requesting an interrupt on the data bus. Does not indicate when other devices are requesting an interrupt. Does not actually monitor the data bus “INTERRUPT” line.

RCV: (Receive) Indicates when the scale has received a communication from the Giraffe. Does not show communication activity of other devices. Does not actually monitor other communications on the data bus.

XMT: (Transmit) Indicates when the scale has sent a communication to the Giraffe. Does not show communication activity of other devices. Does not actually monitor other communications on the data bus.

4/Troubleshooting

Normal operation of the scale can be observed as follows:

1. Giraffe is powered on. The scale's "+5V" and "+10" indicator lamps will slowly light to full brightness. This is an intentional "soft start" to prevent upsetting the Giraffe should the scale be plugged in with the Giraffe already running.

2. The scale's electronics will perform a self-test. After a few seconds the relays on the scale's printed circuit board will energize producing a "click" sound. The scale will request attention from the Giraffe by pulling the "Interrupt" line of the data bus low. The scale's "/INT" (Interrupt) lamp will light.

3. The scale's "/INT" (Interrupt) lamp will go out once the Giraffe communicates with the scale. The scale's "RCV" (Receive) lamp will flash as the Giraffe queries the scale.

4. The scale's "XMT" (Transmit) lamp will flash as the scale answers the Giraffe's query.

5. The Giraffe and the scale will communicate continuously at regular intervals of approximately 2 seconds. A flash of the "RCV" lamp followed immediately by a flash of the "XMT" lamp will be noted.

5/Repair Procedures

CAUTION ⚠ Always perform the checkout procedure after performing any type of repair and before placing the scale back in service.

5.1 Scale Top Frame Removal

Remove four button head screws with an 3/32” hex key. Screws are retained with red grade (permanent) thread locking compound. If difficulty is encountered in removal, the screw head may be heated with a soldering iron to soften the thread locking compound. In some cases the rubber pediatric load mount may unscrew from the load cell as the button head screw is turned; this is OK and can be reassembled without problem.

5.2 Scale Top Frame Attachment

Check that all wiring is properly dressed and will not interfere with movement of the load cells or top frame. Place top frame in position, aligning the four clearance holes with the threaded holes in the pediatric load mounts. The top frame is symmetrical and can mounted either way. Top frame is secured with four pieces of 8-32 x ¼” button head screw. Tighten screws securely, then loosen screws a ¼ turn. Press down firmly on each corner of the top frame to adjust the top frame for best fit.

5.3 Circuit Board Removal

Remove scale top frame as described in 5.1.

On plastic frame scales, remove 14 screws attaching the board guard and ground wires. Disconnect the four load cell connectors from the circuit board. Disconnect the cable connector from the circuit board. Lift the board off its four mounting posts. Remove board.

On metal frame scales, remove two screws attaching the shield box cover and ground wires to the shield box bottom. Disconnect the four load cell connectors from the circuit board. Disconnect the cable connector from the circuit board. Remove the four screws (thumb nuts on early versions) that retain the circuit board. Remove board.

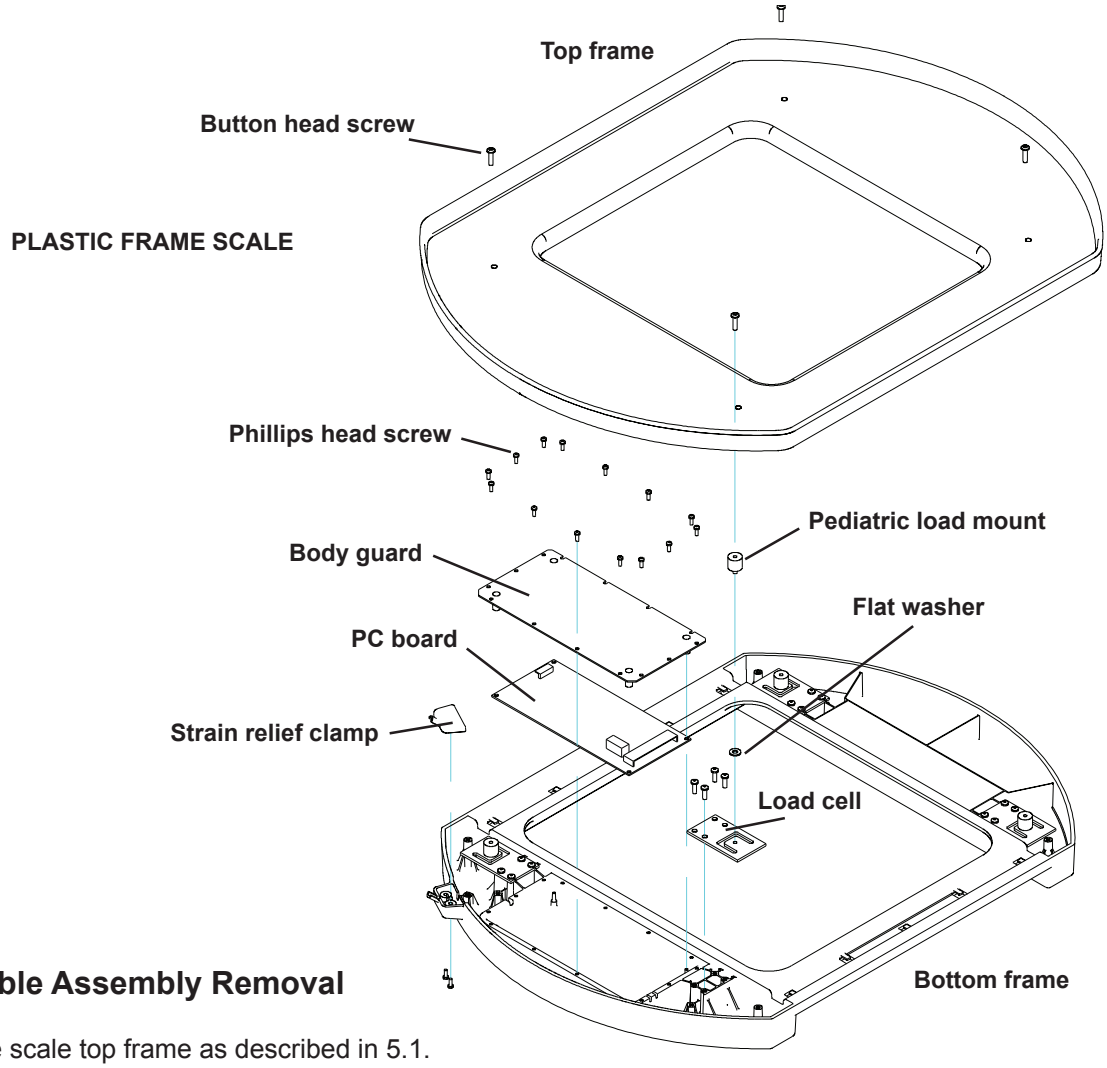
5.4 Circuit Board Replacement

Note: Replacement circuit boards are not supplied with chip U10. Remove chip U10 from old board and install it on the replacement board before installing the new board.

Note: Early versions of the scale employed four nylon male/female hex spacers that supported the circuit board and shield box. Later production was switched to a female hex spacer and a metal core nylon/steel screw. It is recommended to upgrade early versions to the hex spacer and nylon/steel screw.

On plastic frame scales, place the new board on the four mounting posts. Connect the load cell connectors to the circuit board positions J4A, J4B, J4C, J4D (all positions are equivalent; order doesn’t matter). Connect the cable connector to position “J20” on the circuit board. Align the board guard by placing the four threaded spacers on the guard over the board mounting posts. Attach the board guard and ground wires ring terminals with the 14 screws.

On metal frame scales, align the holes in the shield box bottom with the four hex spacers. As an alignment aid, place a toothpick or small rod (shaft of a cotton swab, straightened paper clip, or the like) in each of the hex spacer holes. Place two nylon washers on each of the four alignment aids. Place the circuit board over the alignment aids. Remove the alignment aids one at a time and replace each with a nylon/steel screw. Connect the load cell connectors to the circuit board positions J4A, J4B, J4C, J4D (all positions are equivalent; order doesn’t matter). Connect the cable connector to position “J20” on the circuit board. Replace the shield box cover. Attach the shield box cover with two screws, placing the ring terminals of the ground wires on the body of the screw. Do not over tighten.



5.5 Cable Assembly Removal

Remove scale top frame as described in 5.1.

On plastic frame scales, remove the two screws that holds the strain relief clamp in place. Remove the 14 screws from the board guard. Disconnect cable from connector J20. Remove the screw from the nylon cable clamp that secures the cable toroid assembly. Remove the cable.

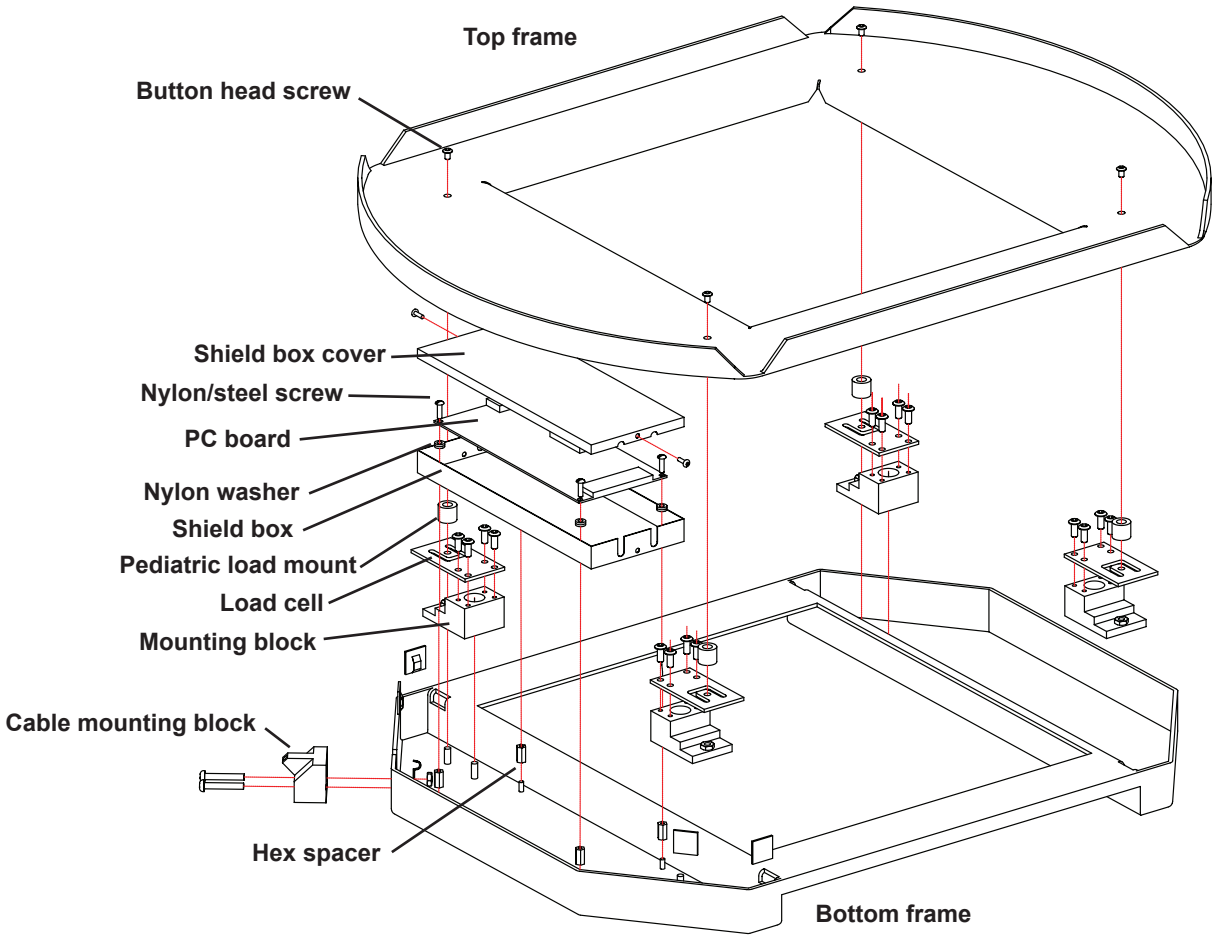
On metal frame scales, remove two screws from shield box cover and remove cover. Disconnect cable from connector J20. Remove cable from shield box; retain rubber grommet for use with new cable (grommet is split for removal). Cut nylon cable tie from around cable toroid assembly. Remove two 10-32 Phillips head screws from cable exit cable mounting block. A wrench or needle nose pliers may be necessary to keep Keps nuts from turning as screw is removed. Remove cable with cable exit cable mounting block attached. Retain screws, nuts, and “jiffy” clip used to secure cable.

5.6 Cable Assembly Replacement - Plastic Frame Units

Place the cable in the entry slot in the bottom frame and secure it with the strain relief clamp and two screws. Wrap the nylon cable clamp around the cable toroid assembly and secure it the Phillips screw. Route the cable through the slot in the molded well around the circuit board and connect it to J20 on the board. Attach the board guard and ground wires ring terminals with the 14 screws. Before replacing the top frame, check that all lead wires are carefully dressed and do not interfere with the load cell or top frame movement.

5.7 Cable Assembly Replacement - Metal Frame Units

Place cable exit cable mounting block into position on bottom frame. Block should be oriented so that cable



exit points “up”. Place the two Philips head screws into the recess in the cable exit support block and locate them through the clearance holes in the scale bottom frame. The “jiffy” clip should be placed on the exposed thread of the left (as viewed from the outside of the scale) screw with the recess in the clip oriented towards the outer wall of the bottom frame. Apply both Keps nuts with the serrated side toward the frame.

The cable assembly has a black stripe on the cable wire to provide for the proper length adjustment. Align the black stripe with the cable slot in the bottom frame. Fold the cable at an angle to the left so it is retained by the “jiffy” clip on the left screw. The “jiffy” clip should be mounted vertically so the curved recess “traps” the cable between the recess and the bottom frame. A nylon Heyco bushing on the cable should have its head on the inside of the scale bottom frame, and its body passing through the cable slot in the scale frame bottom, and the body end inserted into the cable hole of the cable exit block. The head of the Heyco bushing should also be retained by the “jiffy” clip. If the Heyco bushing is split orient the split to the right. Align all the components, then tighten the two Philips head screws to retain the cable. A wrench or needle nose pliers may be necessary to keep the nuts from turning while being tightened. When properly assembled the cable can neither be pulled or pushed from the outside of the scale.

Form the inside end of the cable into a loop and place the toroid of the cable (covered in shrink tubing) onto the mounting pad on the bottom frame. Tuck the loop between the load cell mounting block and bottom frame wall. Secure the toroid with a cable tie. Place the split rubber grommet around the end of the cable and dress it into the slot of the shield box. Connect the cable assembly to “J20”.

Replace the shield box top, being careful to orient the shield box top so the notches for the load cell leads and cable are properly aligned. Secure the shield box top with two screws, placing the ring terminals of the load cell ground wires (2) and cable ground wire on the screw bodies. Do not over tighten the screws.

Before replacing the top frame, check that all lead wires are carefully dressed and do not interfere with the load cell or top frame movement.

5.8 Load Cell Removal

Remove top frame as described in 5.2. Remove board shield or shield box cover. Unplug load cell from printed circuit board. Remove split rubber grommet from load cell cable. On metal frame scales, depending on specific load cell to be removed it may be necessary to remove printed circuit board and shield box bottom; see removal procedure outlined above.

Remove four button head screws securing load beam assembly to the mounting block.

On metal frame scales, remove wires from wire clips as necessary. Cut cable tie securing wire bundle, located under shield box, as necessary. Gently pull wires through wire tunnel in bottom frame as needed. Save tubing sleeves, rubber isolator mount and washer for replacement.

5.9 Load Cell Replacement

Straighten and smooth cable on replacement load cell to remove any knots or kinks. If needed, bundle cable on replacement loadcell to match original. Tape bundle to retain.

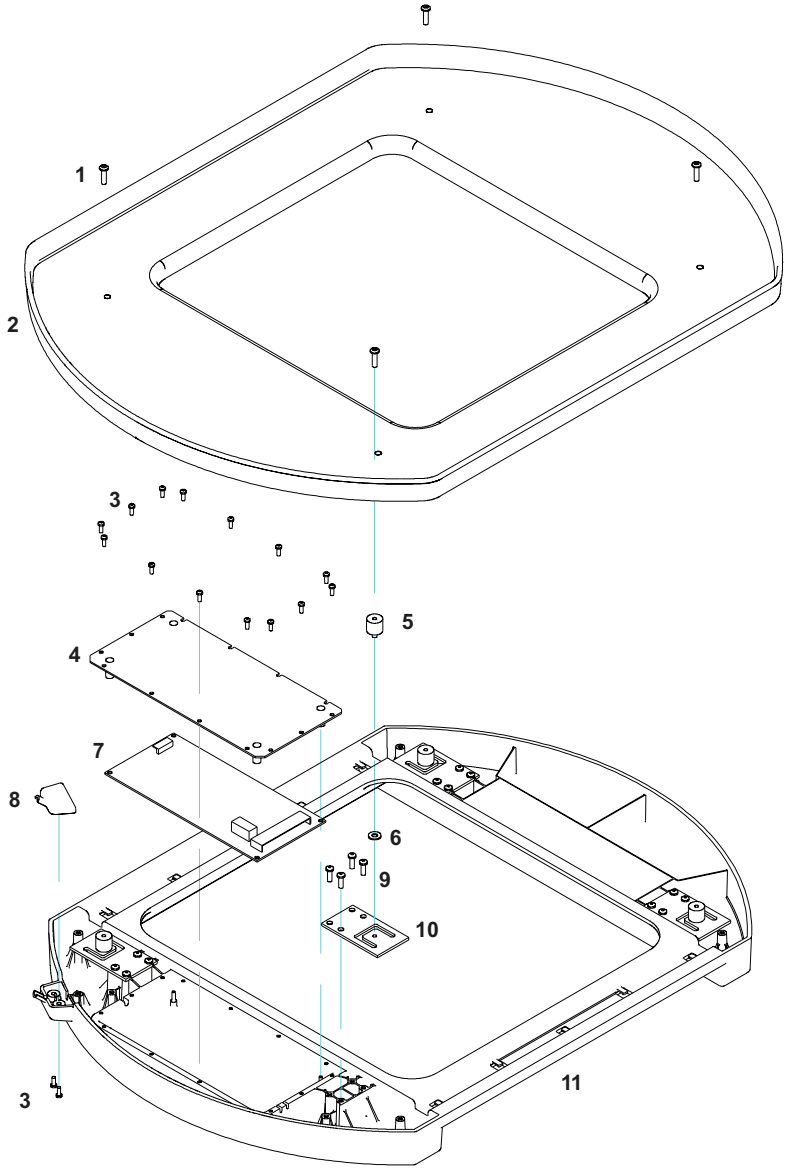
Route load cell cable as required. On plastic frame scales, dress the cable though the adhesive wire clips and molded routing clips.

On metal frame scales, feed through wire tunnel in bottom frame. Shrink tubing sleeves should be oriented in exits of wire tunnel in bottom frame to protect load cell cable from sharp edges. Place load cell cable in wire clips and dress cable as needed.

Mount the load beam assembly to mounting block with four button head screws. Replace printed circuit board as outlined in section 5.4. Place washer under isolator and attach rubber isolator mount to load cell.

6/Illustrated Parts

6.1 Service Parts

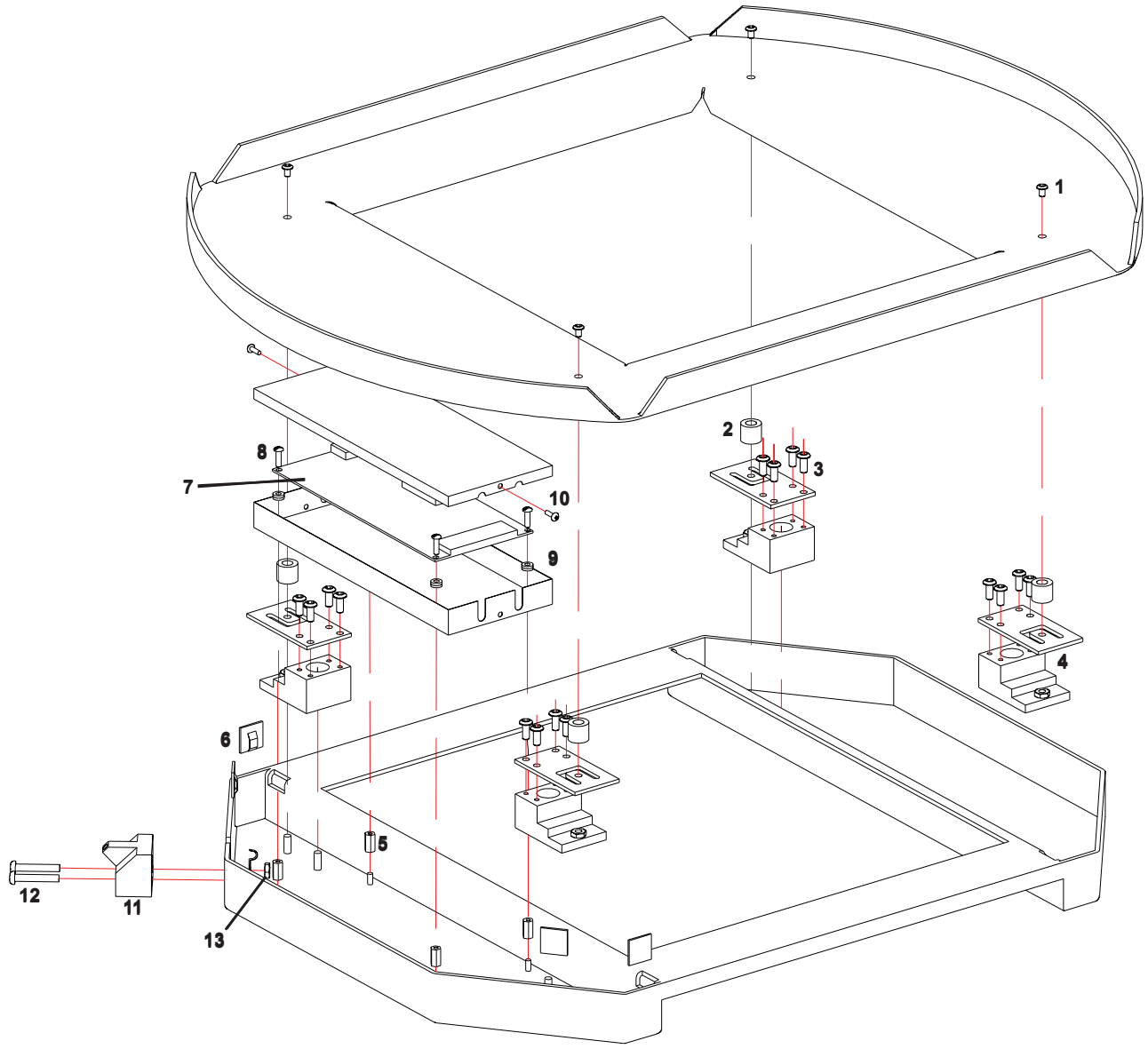


1. Screw, 8-32 x 1/4” btn hd 6600-0962-210
2. Top frame, plastic M1050633
3. Screw, M3 x 8, Phillips oval hd, PT M1050624
4. Board guard M1050638
5. Pediatric load mount 6600-0962-203
6. Flat washer.....0202-0095-300
7. Scale P C Board.....6600-0962-204
   Micro-computer (U10) 6600-0962-205
8. Clamp, strain relief M1050627
9. Screw, M4 x12, Phillips oval hd, PT M1050604
10. Load cell.....6600-0962-202
11. Bottom frame, plastic M1050635

Parts not shown

- Cable assembly with T-handle M1050630
- Cable clamp, 3/4 nylon (for toroid assy.)..... M1050640
- Ground wire..... M1050642

Figure 6-1
Service parts- plastic frame



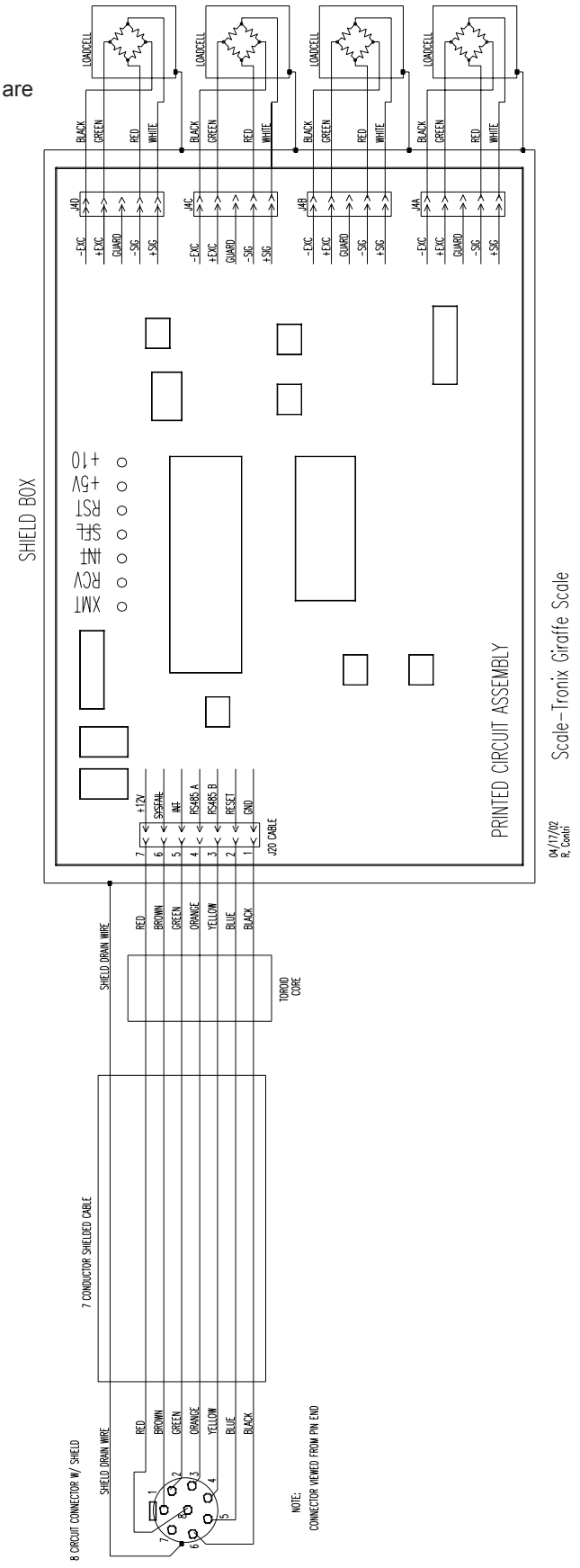
1.	Screw, 8-32 x 1/4” btn hd	6600-0962-210
2.	Pediatric load mount	6600-0962-203
	Flat washer	0202-0095-300
3.	Screw 10-32 x 1/2” btn hd	6600-0962-211
4.	Load cell	6600-0962-202
5.	Hex spacer, 6-32 x 1/2” nylon*	6600-0962-207
6.	Self adhesive wire clip	6600-0962-212
7.	Scale P C Board	6600-0962-204
	Micro-computer (U10)	6600-0962-205
8.	Screw, 6-32 x 1/2” nylon/steel*	6600-0962-206
9.	Washer, 6-32 x 32 x 0.315” nylon	6600-0962-208
10.	Screw, M3 x 10mm Phillips Pn Hd	6600-0962-209
11.	Cable assembly (includes mounting block)	6600-0962-201
12.	Screw, 10-32x 1-1/8” Rd Phillips Hd	6600-0006-400
13.	Keps nut, 10-32	6600-0066-400

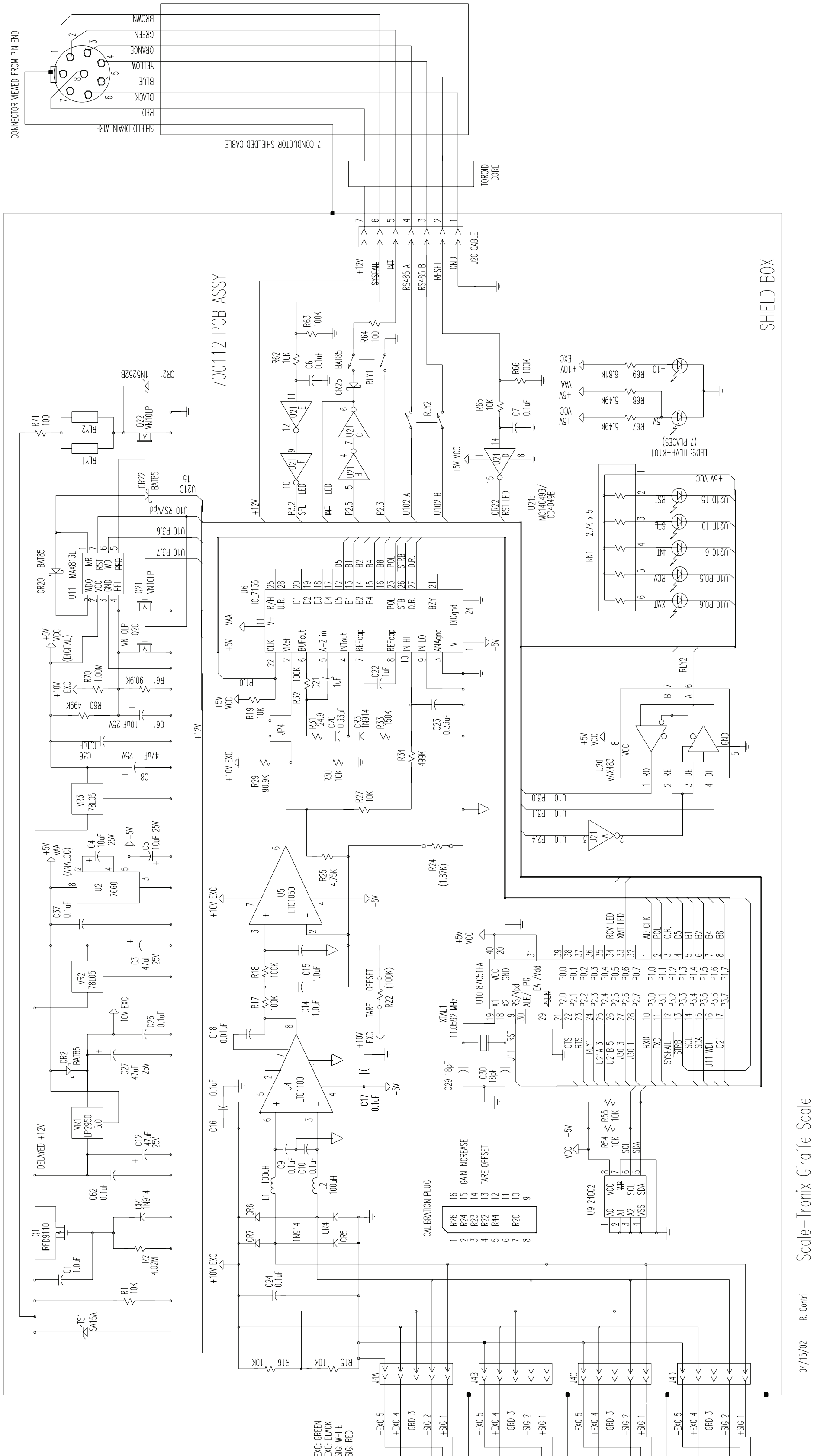
*4 each required to upgrade earlier version.

Figure 6-2
Service parts-metal frame

6.2 Wiring Diagrams

Note: Loadcell positions are interchangable




700112 PCB ASSY
SHIELD BOX
Scale-Tronix Giraffe Scale
R. Contri
04/15/02
CONNECTOR VIEWED FROM PIN END
7 CONDUCTOR SHIELDED CABLE
TOROID CORE
J20 CABLE
CALIBRATION PLUG
LOADCELL

Appendix 1: Additional Safety Information

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.

Directives

CE 0086	Ohmeda Medical, a division of Datex-Ohmeda, Inc., has declared that this product conforms with the European Council Directive 93/42/EEC Medical Device Directive when it is used in accordance with the instructions provided in the Operation and Maintenance Manual.
	This symbol indicates that the waste of electrical and electronic equipment must not be disposed as an unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of your equipment.

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CE 0086

Giraffe Scale Service Manual
Printed in USA

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- Giraffe OmniBed (INTL): 6600-0834-802
- Giraffe Incubator (US): 6600-0847-801
- Giraffe Incubator (INTL): 6600-0847-802

6600-0372-000
Revision 102

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