

# SCALE-TRONIX<sup>®</sup>

**4802**

## **PEDIATRIC SCALE**

**SECOND GENERATION WEIGHING SYSTEM**

**OPERATING AND SERVICE MANUAL**

(SERIAL NUMBERS 10001 AND UP)



## **SPECIFICATIONS: 4802 - PEDIATRIC SCALE**

### **GENERAL**

**SCALE-TRONIX® 4802 DIGITAL PEDIATRIC SCALE:** Completely self-contained scale; accurately weighs infants and toddlers.

The scale is contained in a portable, heavy-duty stainless steel enclosure, with integral electronic digital readout and a sturdy transparent acrylic weighing cradle with length gauge. The patient's weight is automatically locked-in and displayed during the weighing process, and simultaneously stored within the scale's memory for later recall. This feature allows the infant to be removed from the scale prior to charting the weight. A sealed membrane pushbutton assembly provides the operator with a choice of pounds/ounces or kilograms for the weight display. Other front panel pushbuttons provide on / off / zero, reweigh, and recall of the previous patients weight.

The scale can be operated directly from AC line power, or when portability is desired, from an internal rechargeable battery pack. Battery automatically recharges when the scale is plugged into an AC line. Features automatic shut-off when operating from battery to conserve battery life; continuous operation when powered from AC line. Sturdy handles provide for ease in transport.

### **WEIGHT DISPLAY**

Large, bright, 0.43" light-emitting diode display. Easily read in all lighting conditions. Selectable weight display in grams, kilograms, pounds, ounces or pounds/ounces. Weight units can be restricted by operator. Indicator light to show selected units. Previous weight held in memory for later recall.

### **WEIGHING CAPACITY**

10-20,000 grams (20 Kg.), 44 lbs.

### **ACCURACY**

10 Grams (0.01 KG).

### **OPTIONS**

RS-232 data port for computer or printer.  
Diaper option provides 1 gram resolution for weights less than 1 KG.

Manual part No. 070060 (-C) , revised 12/07/2004

### **POWER SUPPLY**

100-120 VAC 50/60 Hz.  
200-240 VAC 50/60 Hz available on special order.

Captive but replaceable line cord. Internal rechargeable battery with automatic charger; includes front panel "CHARGE" indicator and "LOW BATTERY" warning indicator. Optional: six (6) "D" size disposable alkaline cells (special order).

### **WEIGHING CRADLE**

Removable molded acrylic cradle. Smooth weighing surface provides easy cleaning and sanitary maintenance. Length measurement in centimeters and inches. Optional: Extra long or four-sided cradles.

### **DIMENSIONS**

Overall: 27½ x 16 x 7 inches.

### **WEIGHT** (uncrated)

25 pounds.

### **ACCESSORIES**

Matching stainless cart for mobile use.  
Disposable cradle liners.

### **WARRANTY**

One (1) year, parts and labor.

### **TESTING CERTIFICATION STANDARDS**

Meets UL544 standard.  
Meets Canadian Standards CSA C22.2 No. 125.  
Constructed to International Electrotechnical Commission IEC-601-1.

### **FACTORY AND SERVICE**

P. O. Box 15, Wheaton, IL 60189  
(630) 653-3377

### **MARKETING AND SALES**

200 E. Post Rd., White Plains, NY 10601  
(914) 948-8117

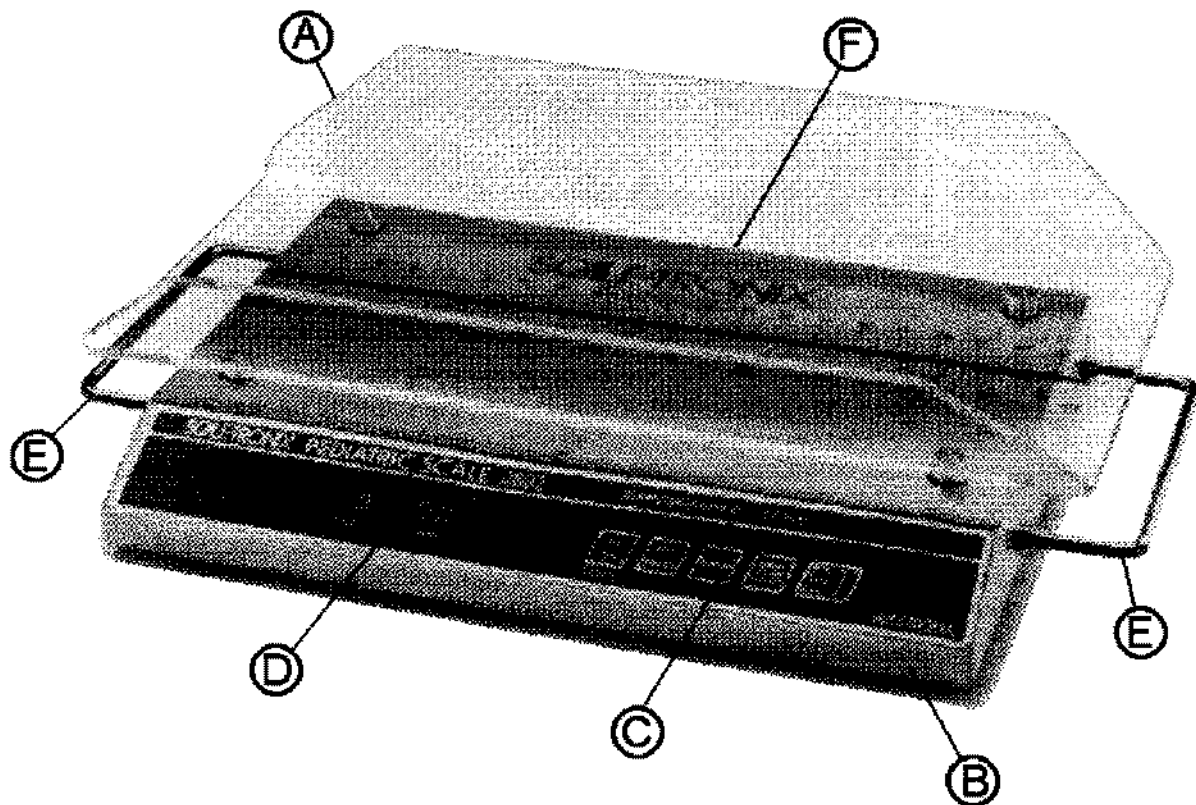
Internet: [www.scale-tronix.com](http://www.scale-tronix.com)

# **PEDIATRIC WEIGHING SYSTEM**

## **MODEL 4802**

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This User's manual is intended to provide all necessary information and data for the proper operation and service of the model **4802 SECOND GENERATION PEDIATRIC SCALE**. This manual should be studied before installing or placing the scale in service, and kept in a safe, handy place for future reference. Refer to the scale's serial and model numbers in any and all correspondence. Feel free to call for service and operational assistance.



## ILLUSTRATION 1

- A. Acrylic cradle with length gauge
- B. Stainless steel enclosure
- C. Front panel membrane pushbuttons
- D. Digital weight display with annunciators
- E. Carrying handles
- F. Line cord, cord wrap, rear handle (not shown)

# GENERAL DESCRIPTION

## 1.00 GENERAL

**Congratulations!** You have just purchased the only truly modern, full-featured Pediatric scale. The **SCALE-TRONIX® model 4802** is fully electronic in design with no moving parts to wear out or require calibration. The model **4802 PEDIATRIC SCALE** is the successor to the famous **SCALE-TRONIX® 4800**, employed in thousands of hospitals and known for its rugged construction and reliable operation. This second generation scale retains the desirable features of the original model **4800**, and adds many new ones for ease of operation and user convenience.

It can be operated from AC line power and left on continuously for fast convenient weights; or it can be transported on a cart, operating from its built-in battery for true portable operation. The scale's internal microcomputer will automatically keep the scale "on" when plugged in, and time out after a period of inactivity when operating from the battery. Successive weighings will automatically reset the timer and keep the scale turned on.

A flashing low battery annunciator signals when recharging is needed. An internal battery charger recharges the battery whenever the scale is plugged in, regardless of whether the scale is turned on or off. A front panel "**CHARGE**" indicator shows that the scale is plugged-in and recharging its internal battery.

A special order factory option provides operation from common alkaline "D" cells, providing thousands of weighings before replacement is necessary. Truly cordless, portable operation is thus obtained.

The clear acrylic weighing cradle readily unplugs from the scale for easy clean-up. A variety of cradle sizes and configurations are available to suit your weighing needs, including four-sided and oversized cradles. A length gauge, marked in both inches and centimeters, is conveniently provided on top of the cradle for measuring the infant's length during the weighing procedure. Disposable paper cradle liners are available to reduce clean-up and prevent cross-contamination.

The scale's enclosure is constructed of heavy gauge stainless steel for durability and minimum maintenance. Carrying handles are provided on both sides of the enclosure for safe, convenient movement. In addition to serving as a handle, the rear handle serves as a line cord holder, and as a rear bumper to prevent damage or interference with the scale if it is pushed against a wall or other surface.

A stainless steel weighing cart is available that makes the model **4802 PEDIATRIC SCALE** a self-contained mobile weighing station. The cart also features an optional dispenser for disposable scale liners.

The scale employs the latest in microcomputer control combined with user friendly software. This provides the operator with an accurate, rugged, and easy-to-use scale. Advanced Digital Signal Processing (DSP) provides accurate data at all times.

Audible response by a series of beeps provides excellent operator feedback for ease of operation. The beeper can be disabled if required.

An internal non-volatile memory stores the last patient's weight for later recall and charting. User programmable features allow the operator to select automatic shut-off times, weight resolution, weight units, etc.

An optional Data Port provides serial data output to a printer, personal computer, or data collection system. Consult the factory for further details.

## 1.10 MECHANICAL FEATURES:

A summary of the mechanical features follows:

- A. Heavy gauge stainless steel enclosure for durability and low maintenance. Angled front panel to maximize readability.
- B. Side handles for carrying convenience.
- C. Rear handle for carrying, cord storage, scale

protection.

time, beeper, etc.

D. Easily detachable acrylic cradle with length gauge. Variety of cradle sizes/configurations available.

J. Captive but readily replaceable AC line cord with IEC receptacle.

E. Optional matching cart turns scale into a mobile weighing station.

## 1.20 ELECTRONIC FEATURES:

A summary of the electronic features follows:

A. Microcomputer equipped electronics with digital signal processing.

B. Sealed membrane panel with touch pushbuttons.

C. Large, bright, light-emitting diode display with function annunciators.

D. Pushbutton control of turn-on, turn-off.

E. Pushbutton selection of weight units. Selection of weight units retained in memory for subsequent use.

F. Automatic weight lock-in and display. Reweigh function allows confirmation of weight without removing patient from scale. Weight stored in non-volatile memory for subsequent recall and display.

G. Pushbutton zero to remove weight of cradle and blankets, etc.

H. Operation from AC line or internal rechargeable battery. Battery recharges automatically when scale is plugged in. Automatic shut-off to conserve battery life. "CHARGE" and "LOW BATTERY" front panel annunciators.

Special option available from factory for disposable alkaline battery power, providing truly cordless operation.

I. User programmable "set-up" feature allows selection of weight units, resolution, shut-off

# ASSEMBLY - SET UP

## 2.00 GENERAL

The **SCALE-TRONIX®** model **4802 PEDIATRIC SCALE** is usually shipped with the scale and cradle in a single carton. If the oversized cradle option was ordered this cradle will be shipped in a separate carton. Please save the carton(s) and shipping materials for possible future use if the scale is ever to be returned to the factory for service or upgrades. Carefully inspect the carton(s) for shipping damage before unpacking. Contact the shipping company and **SCALE-TRONIX®** immediately if shipping damage is found. All claims must immediately be made directly with the shipper (not **SCALE-TRONIX®**).

## 2.10 ASSEMBLY INSTRUCTIONS:

(Refer to Illustration 1)

The **SCALE-TRONIX®** model **4802 PEDIATRIC SCALE** is fully assembled at the factory and tested. The scale is shipped with the weighing cradle removed. This insures protection of the delicate weighing transducers.

Carefully remove the acrylic weighing cradle from the shipping carton. Remove the scale from the carton and place it on a counter top or stable cart. Position the cradle over the scale so the four metal mounting posts line up with the holes in the top of the scale. Note the length gauge and rotate the cradle if necessary so the length gauge is "right reading". Apply a gentle downward pressure to "plug-in" all four posts so that the cradle rests firmly on the scale.

## 2.20 CHECK-OUT

(Note: If your scale is equipped with the disposable dry cell option disregard the following references to AC line power, line cord, and charging/rechargeable battery operation)

Unwrap the line cord and plug it in to a wall receptacle. The "**CHARGE**" annunciator should be

illuminated in the upper left side of the display window. This indicates that power is being received by the scale and the battery is charging. The battery is designed for continuous charging and will not be damaged if the scale is plugged-in continuously.

1.) Turn the scale on by briefly pressing the "**ON / (OFF) / ZERO**" pushbutton on the front panel. A single "beep" will be heard. The scale should display "**888888**" and illuminate the "**KILOS**", "**POUNDS**", "**OUNCES**", "**PRIOR WEIGHT**" and "**LOW BATTERY**" annunciators as a test of their operation. Observe these digits and annunciators to insure they light. The scale will then briefly display its model number, "**4802**". During this short time period the scale also performs some internal checks of its operation.

2.) After a short period of settling the scale will then automatically establish its "zero" value, removing the weight of the cradle and any miscellaneous items left in the cradle. The display will show "**0.000 KILOS**" or "**0 POUNDS 0.0 OUNCES**" depending on its previous mode. A series of two beeps will be heard signaling the setting of zero.

3.) Place an object to be weighed on the cradle. A one or two liter bag of I.V. solution will do. A series of moving dashes ("—") will be noted on the display indicating motion of the cradle.

4.) The scale will calculate and display the value of weight on the cradle and signal it by sounding a series of three beeps. The weight will be displayed in either pounds/ounces or kilograms depending on the currently selected mode. To obtain the weight in the other units press the "**KILOS / POUNDS**" pushbutton on the front panel. Note the appropriate annunciator will illuminate as the weight is displayed.

5.) Place an additional small object on the cradle. Press the "**REWEIGH**" pushbutton on the front panel. The scale will calculate the new weight and re-display it as it sounds a series of three beeps.

6.) If your scale was purchased with the optional

**"DIAPER WEIGHING CAPABILITY"** perform steps 6, 7, and 8; else skip to step 9. Obtain a stack of about 25 standard sized (2" X 3½") business cards to use as test weights. Insure that the scale is properly placed on a steady surface and that there aren't any fans or overhead vents blowing on the cradle (with measurements as sensitive as this these, small breezes can effect the weight readings!) Remove all items from the cradle and press the **"ON / (OFF) / ZERO"** pushbutton on the front panel to obtain a zero reading. Set the weight mode to **"KILOS"** by pressing the **"KILOS / POUNDS"** pushbutton.

7.) Count out fifteen (15) of the business cards and place them on the cradle. Note the reading on the scale's display when it stabilizes. Normally this will produce a reading of about 15 grams. (Since the cards can vary in weight this is only an approximation.)

8.) Now toss an additional business card on the cradle and press the **"REWEIGH"** pushbutton. This will normally produce an increase in the weight reading of 1 gram. Repeat this process with additional cards, pressing the **"REWEIGH"** pushbutton each time and noting that the reading increases in steps of 1 gram. (Note: the exact weight of the cards may cause the reading to vary by 0, 1 or 2 grams.)

9.) When powered from an AC line the scale will remain on continuously. Press and hold the **"ON / (OFF) / ZERO"** pushbutton on the front panel until the scale turns off. Remove all objects from the cradle. Unplug the scale from the AC line. Turn the scale back on by briefly pressing the **"ON / (OFF) / ZERO"** pushbutton on the front panel.

10.) After the self-test and zero process the scale will return to displaying **"0.000 KILOS"** or **"0 POUNDS 0.0 OUNCES"** depending on its previous mode. Press the **"RECALL PRIOR WEIGHT"** pushbutton on the front panel. The weight value from the previous weighing, which was automatically stored in the scale's memory, will be displayed, along with a flashing **"PRIOR WEIGHT"** annunciator. The weight may be displayed in either kilograms or pounds/ounces by pressing the **"KILOS/POUNDS"** pushbutton.

11.) Leave the scale on and determine that it shuts off after a period of about 90 seconds. (Pressing any of the pushbuttons will reset the timer and start the

timing period over.) If the timing period is different from the specified 90 seconds see section 2.40, **"OPTION SET-UP"**.

12.) If the **"LOW BATTERY"** annunciator flashes during the process it indicates the internal battery needs recharging. Plug the scale back into the AC line and allow 10-12 hours for full recharging. If the scale is equipped with the disposable alkaline cell option it indicates that battery replacement is necessary.

13.) If the optional cart has been purchased follow the assembly instructions included with it. The model **4802 Pediatric Scale** can then be mounted on it.

14.) This completes the assembly and check-out procedure.

## 2.30 CALIBRATION

The **SCALE-TRONIX®** model **4802 Pediatric Scale** is fully tested and calibrated before leaving the factory. No further calibration is normally required. The calibration procedure is outlined in section 4.40.

## 2.40 OPTION "SET-UP"

The **SCALE-TRONIX®** model **4802 Pediatric Scale** incorporates a unique feature that lets you "customize" the scale to best suit your needs. This "set-up" mode allows the characteristics of the scale to match your particular requirements. Items that can be selected include the automatic shut-off time, weighing units, beeper, etc.

### 2.41 ENTERING THE "SET-UP" MODE

To enter the "set-up" mode start with the scale turned off. Note the **"ST"** logo (**"ST"**) located directly to the right of the **"RECALL PRIOR WEIGHT"** pushbutton on the front panel of the enclosure. This **"ST"** actually contains a hidden pushbutton. Press and hold this **"ST"** pushbutton on the front panel while turning the power on with the **"ON / (OFF) / ZERO"** pushbutton. Once the scale turns on release the **"ST"** pushbutton, then press and release it 5 more times. The scale will display **"SET-UP"** and produce a series of four long beeps. "Set-up" mode has now been



entered.

The **"RECALL PRIOR WEIGHT"** pushbutton is used to select the particular option value. Once this value is selected the scale can be advanced to the next option by again pressing the **"ST"** pushbutton or it can be shut-off by pressing and holding the **"ON / (OFF) / ZERO"** pushbutton.

## 2.42 SETTING THE OPTIONS

First enter the "set-up" mode as explained above.

1.) Press the **"ST"** pushbutton. The scale will display **"SOFT"** (software version). Press the **"ST"** pushbutton again. The software version will be displayed (e.i. **"U 1.00.4"**). This is provided as a reference aid in determining which features are contained within the software.

2.) Press the **"ST"** pushbutton. The scale will display **"dAtE"** (date). Again press the **"ST"** pushbutton. The release date of the software will be displayed. A display of **"07.15.97"** would correspond to July 15th, 1997. This is provided as a reference aid in determining which features are contained within the software.

3.) Press the **"ST"** pushbutton. The scale will display **"SCALE"**. Press the **"ST"** pushbutton again; the model number of the scale will be displayed, **"4802"**. This is provided as a reference aid to help with customer trouble-shooting and is set at the factory.

4.) Press the **"ST"** pushbutton. If the scale's serial number has been programmed at the factory the scale will display **"SEr no."** (serial number). Press the **"ST"** pushbutton again; the serial number of the scale will be displayed (e.i. **"10563"**). This is provided as a reference aid to help with customer trouble-shooting and is set at the factory. Newer versions of the software (10/07/95 or later) skip these displays if the serial number has not been entered at the factory.

5.) Press the **"ST"** pushbutton. The scale will display **"AutoOFF"** (automatic shut-off time). Again press the **"ST"** pushbutton. The currently selected number of seconds before the scale shuts-off will be displayed. This is normally set at the factory to be 90 seconds.

It can be altered in 15 second increments from 15 seconds to 180 seconds (3 minutes). An additional **"Cont"** (continuous) option is provided for some special applications; this prevents the scale from automatically shutting-off; the scale can then only be turned off by pressing and holding the **"ON / (OFF) / ZERO"** pushbutton. Use of the continuous mode of operation is not recommended since it will discharge the battery if the operator forgets to deliberately turn the scale "off".

To alter the length of the automatic shut-off time press the **"RECALL PRIOR WEIGHT"** pushbutton. The automatic shut-off time will advance through the available options. Stop at the desired time interval.

6.) Press the **"ST"** pushbutton. The scale will display **"AC con"** (AC power continuous operation). This feature is used in the model **4802 Pediatric Scale** to cause the scale to remain "on" as long as AC power is provided (automatic shut-off will not occur).

Pressing the **"ST"** pushbutton again will show this option selected as **"On"** or **"OFF"**. To alter the selection press the **"RECALL PRIOR WEIGHT"** pushbutton. (Note: This setting does not apply if your scale is equipped with the disposable alkaline battery option since it has no AC line power feature.)

7.) Press the **"ST"** pushbutton. The scale will display **"Units"** (weight units). This is the start of the various weight units (kilograms, pounds, ounces, pounds/ounces) that can be selected. Use the **"RECALL PRIOR WEIGHT"** pushbutton to set each weight unit **"On"** or **"OFF"**. Note: If all the units are set to **"OFF"** the scale will automatically default to **"KILOS"**.

8.) Press the **"ST"** pushbutton again. The **"KILOS"** annunciator will light and the display will show **"On"** or **"OFF"**. Setting this to **"On"** will allow display of the weight in kilograms with a display of **"0.000"**. Normal setting as shipped from the factory is **"On"**.

9.) Press the **"ST"** pushbutton again. The **"POUNDS"** and **"OUNCES"** annunciators will light and the display will show **"On"** or **"OFF"**. Setting this to **"On"** will allow display of the weight in pounds and ounces with a display of **"0 (pounds) 0.0 (ounces)"**. Normal setting as shipped from the factory is **"On"**.

10.) Press the **"ST"** pushbutton again. The **"POUNDS"** annunciator will light and the display will show **"On"** or **"OFF"**. Setting this to **"On"** will allow display of the weight in pounds with a display of **"0.000"**. Normal setting as shipped from the factory is **"OFF"**.

11.) Press the **"ST"** pushbutton again. The **"OUNCES"** annunciator will light and the display will show **"On"** or **"OFF"**. Setting this to **"On"** will allow display of the weight in ounces with a display of **"0.00"**. Normal setting as shipped from the factory is **"OFF"**.

12.) Press the **"ST"** pushbutton. The scale will display **"BEEPER"** (audio beeper). Press the **"ST"** pushbutton again. **"On"** or **"OFF"** will be displayed. This may be changed by pressing the **"RECALL PRIOR WEIGHT"** pushbutton. Setting this option to **"OFF"** will eliminate the audible signal that occurs when a front panel pushbutton is pressed or a weight is locked in. Normal setting as shipped from the factory is **"On"**.

13.) Press the **"ST"** pushbutton. If equipped at the factory with the optional data port the scale will display **"rS-232"**, indicating the start of the serial data port options. A separate addendum should be included with the scale that explains in detail the setting of these specific options.

14.) Press the **"ST"** pushbutton. The scale will display **"PC brd"** (printed circuit board). Pressing the **"ST"** pushbutton again will display the model number of the printed circuit board (i.e. **"23005"**). Another press of the **"ST"** pushbutton will show the revision level of the printed circuit (i.e. **"02"**). These are provided for informational trouble-shooting purposes and cannot be changed in set-up mode.

15.) Pressing the **"ST"** pushbutton one last time returns the scale to the introductory **"SET-UP"** mode. The scale may be turned off by pressing and holding the **"ON / (OFF) / ZERO"** pushbutton. If running on batteries the scale will automatically shut-off after three (3) minutes. (The selected automatic shut-off time is temporarily lengthened when the scale is operating in the special "set-up" mode.)

# OPERATION OF SCALE

## 3.00 GENERAL

The control panel of the **SCALE-TRONIX®** model **4802 Pediatric Scale** is designed for operator convenience. A brief outline of the controls and features is provided below:

### 3.01 ON / (OFF) / ZERO

This front panel pushbutton serves to turn the scale "on" from the "off" position by pressing it briefly. At the same time briefly pressing this pushbutton causes the scale to obtain "zero" by subtracting out the weight of the cradle and any miscellaneous items (liners, blankets, etc.) placed on it. Momentarily pressing this pushbutton also serves to reset the internal automatic shut-off timer when the scale is operating from its internal battery.

To turn the scale "off", whether operating from AC line or internal battery, press and hold the "ON / (OFF) / ZERO" pushbutton for several seconds until the display and annunciators turn off.

### 3.02 KILOS / POUNDS

This pushbutton is used to display the weight in the appropriate choice of units. Pressing this pushbutton switches the display from kilograms to pound/ounces and back again. The appropriate front panel annunciator(s) will illuminate to show the selected units. The scale's internal memory will store the selected weight unit and automatically operate the scale in this mode on power-up.

If the scale has been set-up to use some of the other units, such as pounds or ounces (see section 2.40), it will also display them in succession. If the scale has been set-up to display in a single unit only (example: kilograms only) the "KILOS/POUNDS" pushbutton will be inoperative.

### 3.03 REWEIGH

The "REWEIGH" pushbutton causes the scale to update the weighing cycle and lock-in a new weight

reading. This allows the patient to be weighed again without removal from the cradle. If you suspect the weight reading might be in error (perhaps you were touching the infant at the time of the weighing), pressing "REWEIGH" will cause a new weighing cycle to start.

### 3.04 RECALL PRIOR WEIGHT

This pushbutton displays the weight that has been stored in the scale's memory from the last patient. It is a useful feature that allows the operator to immediately return the infant to the bassinet or incubator, without having to pause to chart the patient's weight.

The last patient's weight can be displayed by simply pressing the "RECALL PRIOR WEIGHT" pushbutton and observing the display. The "PRIOR WEIGHT" annunciator on the front panel will flash simultaneously. The weight reading will display as long as the "RECALL PRIOR WEIGHT" pushbutton is held. The weight reading can then be charted or confirmed.

The patient's weight is stored into the scale's prior weight memory when that patient is removed from the scale's cradle, or if the scale is switched "off" with the weight being displayed. Use of the "RECALL PRIOR WEIGHT" feature allows comparisons to be made between "old" and "new" weights. This data can then be used to calculate infant feeding amounts.

### 3.10 BATTERY OPERATION

Note: The standard model **4802 Pediatric Scale** is equipped with a combination AC power supply/battery charger and a rechargeable battery pack. A special order option is also available from the factory with a battery holder that provides space for six (6) size "D" disposable alkaline cells. This special option also eliminates the AC power supply, line cord, "CHARGE" annunciator and rechargeable battery pack. When reading the following descriptions please refer to the section which relates to your specific

scale.

### 3.11 BATTERY OPERATION: STANDARD SCALES WITH AC LINE POWER AND RECHARGEABLE BATTERY PACK

The **SCALE-TRONIX®** model **4802 Pediatric Scale** contains an internal rechargeable battery pack that allows cordless, portable operation and powers the scale during periods of power outages. This battery is automatically charged whenever the scale is plugged into AC electric power. A front panel "**CHARGE**" annunciator will light when the scale is plugged in and the battery is charging. The scale may be left plugged-in indefinitely, either "on" or "off", without fear of overcharging the battery.

When operating from the internal battery the scale will automatically shut-off after 90 seconds of non-use. The automatic shut-off time is adjustable from 15 seconds to 3 minutes (see section 2.40). The scale may also be shut-off manually by pressing and holding the "**ON / (OFF) / ZERO**" pushbutton for several seconds until the display and annunciators turn off.

A "**LOW-BATTERY**" annunciator is provided on the front panel to warn the operator when recharging is needed. This will begin to flash when the battery is becoming weak. The scale will still perform several weighings at this point but recharging should be done soon. If the battery becomes depleted to the point of not being able to operate the scale properly, the weight display will show "**bAttrY**" and the scale will not function. A full recharge of the battery requires approximately 8-10 hours.

The AC line cord can be wrapped around the rear handle and the plug "tucked in" the cord bundle when the scale is operating from the battery.

Annual replacement of the rechargeable battery is recommended for optimum performance. See section "**3.91 BATTERY REPLACEMENT - (etc.)**", for replacement and ordering information.

### 3.12 BATTERY OPERATION: SCALES WITH DISPOSABLE ALKALINE CELL BATTERY OPTION

The scale will automatically shut-off after 90 seconds of non-use. The automatic shut-off time is

adjustable from 15 seconds to 3 minutes (see section 2.40). The scale may also be shut-off manually by pressing and holding the "**ON / (OFF) / ZERO**" pushbutton for several seconds until the display and annunciators turn off. Turning the scale off manually when patient weighing is completed will help to conserve battery life.

A "**LOW-BATTERY**" annunciator is provided on the front panel to warn the operator when the battery is becoming depleted. This will begin to flash when the battery is becoming weak. The scale will still perform several weighings at this point but battery replacement will soon be necessary. If the battery becomes depleted to the point of not being able to operate the scale properly the weight display will show "**bAttrY**" and the scale will not function.

### 3.13 AC LINE POWER OPERATION: STANDARD SCALES WITH AC LINE POWER AND RECHARGEABLE BATTERY PACK

Once plugged in the scale will begin recharging its internal battery (front panel "**CHARGE**" annunciator lights). Pressing "**ON / (OFF) / ZERO**" will turn the scale "on" and automatically cause it to operate from AC line power. Note that if the scale is "on" and AC line power is removed (such as unplugging or a power interruption), the scale will immediately switch to the battery to maintain scale operation, eventually timing out and shutting off after a period of non-use to conserve battery energy.

**NOTE:** Those of you familiar with the earlier version of the **SCALE-TRONIX®** model **4800 Pediatric Scale** will note the absence of the "**LINE POWER OPERATION**" toggle switch located on the right side of the enclosure. This has been eliminated in the interest of simplicity and durability. The scale can be turned "on" or "off" by use of the "**ON / (OFF) / ZERO**" pushbutton as described in section 3.01. The scale is normally programmed to run continuously when operating on AC line power by use of the "set-up" options. This can be altered if desired (see section 2.40).

### 3.20 AUDIBLE BEEPS

An audible beeper is provided to assist the operator in the weighing process. This is a useful

feature and indicates the scale's activity as follows:

- One beep: Acknowledgement of a pushbutton press.
- Two beeps: "Zero" weight has been obtained.
- Three beeps: Weight reading is obtained and displayed.

Beeps occur during some malfunctions, including the following:

- Four long beeps: Battery is too weak to operate scale
- Long/short beeps: Problem with scale. See section 4.60
- Continuous long beep: Problem with scale. See section 4.60

Note that the beeper can be turned "off" if desired. This eliminates a potential noise source for use in "low-stimulus" environments. See section 2.40, **OPTION "SET-UP"**, for more information.

### 3.30 DIAPER WEIGHING OPTION

A diaper weighing capability is available as an option on the **SCALE-TRONIX® model 4802 Pediatric Scale**. If your scale is equipped with this feature it allows the scale to display weights below one (1) kilogram with a resolution of one (1) gram, instead of the standard resolution of five (5) grams. Accurate measurement of urine output or other precise 1 gram measurements is available with this attribute. This "dual-ranging" feature requires no operator action and switches on automatically whenever the weight on the cradle is below the one kilogram level.

### 3.40 MOBILE WEIGHING CART

A mobile weighing cart is available from **SCALE-TRONIX®** to compliment the model 4802

**Pediatric Scale** and turn it into a mobile weighing station. Constructed of stainless steel, it matches the model 4802 in appearance and provides the same durable, easy-to-clean construction. Included with the cart are security brackets to fasten the scale directly to the cart, if desired. An optional dispenser shelf is also available for disposable scale liners. An illustration of the cart with the model 4802 is shown on page 24.

### 3.50 SCALE LINERS

Disposable scale liners are available to fit the cradle on the model 4802. These disposable paper liners help keep the cradle clean and protect against cross contamination. They can be ordered as **SCALE-TRONIX®** part number 48217.

### 3.60 WEIGHING PROCEDURE

The **SCALE-TRONIX® model 4802 Pediatric Scale** is very simple to use. A basic procedural sequence must be followed, however, to assure accurate weights. The basic procedure is outlined below. For your convenience the operating instructions are outlined on the top surface of the scale.

- 1.) Select a consistent time of day to obtain weights; for example, early morning, am, pm, etc.
- 2.) Position the scale in a convenient location. It may be located on a counter top in a central location and plugged in for continuous "on" operation, or may be used on a cart and wheeled about, operating on its own internal battery.
- 3.) Prepare the scale for weighing. Clean the cradle with a good quality cleaner, such as "409" or other non-abrasive product. **IMPORTANT: DO NOT CLEAN CRADLE WITH ALCOHOL.** Use of alcohol can attack the acrylic plastic used for the cradle and cause cracking and hazing.
- 4.) If desired, place a disposable scale liner or paper on the cradle.
- 5.) Prepare the infant for weighing. Remove clothing, dressings, etc. to insure consistency.

6.) Turn the scale on before placing the infant on the cradle. This must be done so the scale's internal computer can sequence through the power-up and automatic zero sequence, and applies to either line power or internal battery operation.

To turn the scale on simply press the **"ON / (OFF) / ZERO"** pushbutton.

7.) Note that **"ON / (OFF) / ZERO"** pushbutton does three things. It turns the scale "on" from the off position; if the scale is already on it performs the "zero" function; and if the pushbutton is held it will turn the scale "off". Should the scale not read zero (**"0.000 KILOS"** or **"0 POUNDS / 0.0 OUNCES"**) when empty, simply press the **"ON / (OFF) / ZERO"** pushbutton.

8.) If extraneous material is to be used on the scale, such as disposable covers, pads, mattress, etc., these items must be placed on the scale before it is turned on, or alternately, placed on the scale and the **"ON / (OFF) / ZERO"** pushbutton pressed to cause the scale to go to zero before placing the infant on the cradle.

9.) Transfer the infant to the scale, supporting the neck and trunk. Position the infant on the scale so the weight is distributed evenly in the approximate center of the cradle. Stabilize the infant as necessary with your hand. Remove your hand from the infant, but always keep your hands close in case re-stabilization is required. Do not touch the patient while the weighing is in process. **IMPORTANT: NEVER LEAVE THE INFANT UNATTENDED ON THE SCALE!**

10.) The scale will display a series of moving dashes ("-----") as it waits for stabilization and calculates the weight. Once the correct weight is obtained the scale will beep three times and display it on the front panel. If for some reason you suspect the weight reading may be in error (perhaps you were touching the infant) press the **"REWEIGH"** pushbutton to start another weighing cycle. If desired the weight units can be changed by pressing the **"KILOS / POUNDS"** pushbutton.

11.) Once the weight is displayed the infant may be removed from the scale and returned to the bassinet or incubator. The scale will continue to display the weight for a short time and then return to the "zero" display. It is not necessary to immediately chart the weight as the scale has stored it in its internal

memory.

12.) To re-display the just weighed infant's weight press the **"RECALL PRIOR WEIGHT"** pushbutton. The weight reading will be displayed along with a flashing **"PRIOR WEIGHT"** annunciator. This allows the operator to chart the weight after the baby has safely been returned to the bassinet or incubator.

13.) The **SCALE-TRONIX** model **4802 Pediatric Scale** allows for successive weighing of patients. When the patient is removed the scale will automatically return to a reading of "zero" after a few seconds in preparation for the next patient. If operating from the battery the internal shut-off timer is reset each time a patient's weight is locked in and displayed.

14.) A stationary display of "--" indicates a negative weight. Press the **"ON / (OFF) / ZERO"** pushbutton to set the zero.

15.) If the patient exceeds the weighing capacity of the scale the display will show **"O-LOAD"**. In extreme cases the scale may also display **"CABLE"**.

### 3.70 FIELD SET UP

Several of the features can be modified by the operator in the field to customize the scale to a particular requirement. These include the allowable weight units and the length of automatic shut-off time. The selection of these features is controlled by certain front panel pushbuttons. Detailed information is contained in the **ASSEMBLY - SET UP** section of this manual. See section 2.40 for specific feature option information.

### 3.80 STORAGE

The scale will normally be used and stored on its cart or a counter top. If not, the scale should be stored in a convenient storage facility or closet. At no time should the scale be lifted by grasping the cradle. It is desirable during storage or shipping to unplug the cradle from the scale to prevent damage to the scale's sensitive electronic transducers.

**DO NOT STORE HEAVY OBJECTS ON THE**

## **CRADLE. THIS IS A SENSITIVE SCALE!**

### **3.90 BATTERY REPLACEMENT**

The standard model **4802 Pediatric Scale** employs a rechargeable battery pack to complement its ability to operate on AC line power. A factory option is available that deletes the AC line power supply and rechargeable battery and replaces it with a disposable alkaline battery consisting of six (6) "D" cells. Refer to whichever following section describes your scale.

#### **3.91 BATTERY REPLACEMENT - STANDARD SCALE WITH AC LINE POWER AND RECHARGEABLE BATTERY PACK**

The model **4802 Pediatric Scale** contains an internal rechargeable battery pack. Annual replacement of this battery pack, while not necessary, is recommended for optimum performance. Replacement battery packs can be ordered directly from **SCALE-TRONIX®** (phone number and address of sales department on inside front cover). It is part number **20009**.

The replacement procedure can be performed as outlined below:

1.) Unplug the scale from AC line. Remove the cradle. Remove the top cover of the enclosure by removing the eight (8) #10 button head hex screws using a 1/8" Allen wrench.

2.) Unplug the old battery pack's connector from the power supply. Loosen the thumb screws that hold the old battery pack in place and remove it.

3.) Slide the new battery pack in place and tighten the thumb screws. Place the new battery pack's connector onto the mating pins of the power supply. Note that the connector is polarized and will only fit in one direction.

4.) Re-attach the top cover of the enclosure (make sure the operation label is facing the correct direction) by installing the eight (8) #10 hex head screws and tighten securely. Re-install the cradle by gently pressing downward. Plug the scale

into A.C. line power to allow the battery to recharge for a period of 8 - 12 hours before requiring battery operation. The scale may be used on A.C. line power during this time period. The front panel "CHARGE" annunciator should be lit. Failure of the "CHARGE" annunciator to light may indicate the battery is installed incorrectly.

5.) The old battery should be disposed of properly. Do not dispose of the battery by burning. Many communities offer recycling of these nickel-cadmium batteries.

#### **3.92 BATTERY REPLACEMENT - SCALES WITH DISPOSABLE ALKALINE CELL BATTERY OPTION**

If your scale has a factory option deleting the AC line power feature it is equipped with disposable alkaline dry cells. These are replaced as follows:

1.) Remove the cradle from the scale. Remove the top cover of the enclosure by removing the eight (8) #10 button head hex screws using a 1/8" Allen wrench.

2.) Remove the old alkaline cells from the battery holder and dispose of them.

3.) Install six (6), fresh, size "D" heavy duty alkaline cells in the battery holder. Observe the polarity of the cells and install them in the proper direction.

4.) Re-attach the top cover of the enclosure (make sure the operation label is facing in the correct direction) by installing the eight (8) #10 hex head screws and tighten securely. Re-install the cradle by gently pressing downward.

### **3.100 MAINTENANCE**

Contact the factory for electronic maintenance or operating problems. Most difficulties can be quickly diagnosed on the phone. Any repairs or replacements can be handled quickly at a reasonable cost.

To keep your scale in top working order the following preventative maintenance measures apply:

- 1.) Check calibration annually or as required.
- 2.) Inspect cradle for cracks or loose mounting hardware. Replace / repair as necessary. Do not clean cradle with Alcohol.
- 3.) Check scale's enclosure for damage or loose or missing hardware. Replace / repair as necessary.
- 4.) Inspect line cord for abrasion or other signs of wear.
- 5.) Do not expose scale to excessive water or moisture.
- 6.) Do not store the scale where heavy objects may be set on it.
- 7.) Replace rechargeable battery pack annually to insure optimum performance.

### **3.110 FACTORY RETURNS**

In returning any components to the factory, please use the original shipping containers designed for this purpose. You must call our service department (630-653-3377) for an RMA (Returned Material Authorization) number, shipping instructions, and special address.

**DO NOT SHIP ANYTHING TO THE  
WHITE PLAINS, NEW YORK,  
ADDRESS.**

**This will only cause delays and added expense to  
you for the items to be reshipped to the factory in  
Illinois.**

**RMA NUMBERS MUST BE OBTAINED FROM THE  
FACTORY PRIOR TO RETURNING ANY ITEM.**



# TECHNICAL DESCRIPTION

(23005R02 instrument board / 23PWR-6.0 ac power supply / 48901 display)

## 4.00 GENERAL

The **SCALE-TRONIX®** model **4802 Pediatric Scale** utilizes the latest developments in electronic scales and microcomputer technology to provide a highly reliable and accurate weighing scale, human engineered to be easy to use. This section of the manual describes the technical aspects of the scale as an aid in servicing. A schematic is included within this manual for help in understanding the circuitry.

## 4.10 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 display by the scale. **SCALE-TRONIX®** uses proprietary designed load cells in most of its scales to optimize performance and reliability.

This load cell employed in the model **4802** is known as a "Double Ended Bending Beam" ("DEBB"). It is constructed as a double bending beam with two strain gauges, forming a "half-bridge", mounted on each end of the beam, where the bending takes place in response to weight applied. The ends are interconnected to form the equivalent of a complete "Wheatstone bridge" configuration. Additional calibration and temperature compensating resistors are added in the DEBB's internal wiring.

## 4.20 SCALE ELECTRONICS

The **SCALE-TRONIX®** model **4802 Pediatric Scale** (serial numbers 10001 and up) employs the 23005R02 computer instrument board and the 48901 or 500043 display board, along with the 23PWR-6.0 power supply board (scales without disposable battery option).

Scale electronics consist of the following:

1. Differential signal amplification.

2. Additional amplification and signal filtering.
3. Analog-to-Digital (A/D) converter and Clock circuit.
4. Battery and support circuitry, voltage regulators, power supplies, etc.
5. Microcomputer and support circuitry.
6. Display board with keyboard

## 4.21 DIFFERENTIAL SIGNAL AMPLIFICATION

The weight dependent output signal produced by the load cell transducer in response to weight applied to the cradle 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 output signal from the load cell 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 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 C16/C17/C24 provide local bypassing of the power supplies used by instrumentation amplifier U4. Capacitor C18 furnishes compensation of U4 by reducing amplification at higher frequencies.

## 4.22 ADDITIONAL AMPLIFICATION AND SIGNAL FILTERING

Components for a second gain stage are included on the printed circuit. Operational amplifier U5 is used 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.

Some versions of the scale include the network of potentiometer P2 and resistor R23 to provide a variable "tare" adjustment to remove the weight of the cradle. Resistor R22 provides a fixed amount of "tare" adjustment to complement the P2 - R23 network. Tare offset is necessary on this scale because the entire A/D range of +20000 counts is needed for the scale's 20000 gram (20.000 kilogram) capacity.

Resistors R24/R25 are used to increase the gain of the circuit. An additional low-pass filter stage is furnished by resistor R34 and capacitor C23.

## 4.23 ANALOG-TO-DIGITAL (A/D) 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 (4½ 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, by the divider network consisting of resistors R29, R30, and potentiometer P1. Adjusting P1 sets the "span" or weight calibration of the scale.

The system clock, applied at pin 22 of U6, is used to precisely time and control the phases of the dual slope conversion process. Refer to the converter timing diagram when reading the following description.

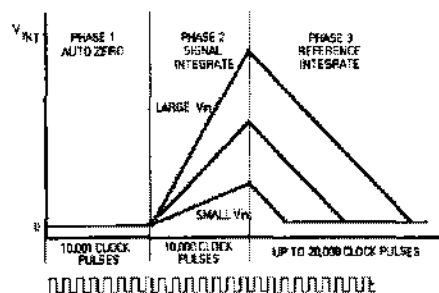
### 4.23.1 PHASE 1, AUTO ZERO

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).

### 4.23.2 PHASE 2, SIGNAL INTEGRATE

The input signal is reconnected and then integrated for exactly 10,000 clock pulses. On completion of the integration period, the voltage V 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.



A/D CONVERTER TIMING DIAGRAM

### 4.23.3 PHASE 3, REF. INTEGRATE, SIGNAL DE-INTEGRATE

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.

### 4.23.4 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.)

## 4.24 CLOCK CIRCUIT

A clock is required for the A/D converter, integrated circuit U6. The clock signal is generated internally in microcomputer U7 and appears on port pin "P1.0". The frequency is internally set by the microcomputer's software and is nominally 120 KHz.

## 4.25 POWER SWITCHING, VOLTAGE REGULATION, AND SUPPORT CIRCUITRY

Additional circuitry is included to switch the battery supply, provide voltage regulation, and detect low battery voltage conditions.

### 4.25.1 BATTERY SWITCHING

In order to conserve battery life the battery supply is switched on and off as needed by the scale.

Transistor Q1 is a series switch which applies battery voltage to the remainder of the circuitry. Q1 is controlled by transistor Q2, which, in turn, is controlled by "watchdog timer" circuit U11.

To initiate power-on Q1 is turned on through momentary closure of membrane pushbutton S1 ("ON / (OFF) / ZERO") and diode D2 (located on display board 48901/500043); diode D1 (located on display board) is used to signal input pin "P2" of I/O expander U4 (also on display board) that pushbutton switch S1 is pressed.

A secondary turn-on circuit occurs through diode D4 (located on the display board) and pushbutton S4 ("RECALL PRIOR WEIGHT") to allow display of the previously stored weight if the scale is presently turned "off". The pushbutton closure is also coupled through diode D3 (located on the display board) to signal input pin "P1" of I/O expander U4 (located on the display board) that the "RECALL PRIOR WEIGHT" pushbutton is pressed.

Once Q1 is on and voltage is applied to the circuit, watchdog timer U11 will keep transistor Q2 on through output line /WDO and resistor R5, subsequently keeping transistor Q1 energized. If no further action occurs an internal timer contained within watchdog timer U11 will time-out after approximately 1.6 seconds and switch off Q2, causing Q1 to turn off and remove power from the scale's circuitry.

Once energized and properly running, microcomputer U10 will keep resetting watchdog timer U11 by periodically pulsing U11's input line, labeled "WDI". Should the scale's operating program call for shut-off, or a hardware/software failure of microcomputer U10 occurs, the reset pulses to U11 will no longer occur and 1.6 seconds later U11 will time-out and cause the circuit power to switch off.

Resistors R1, R2, R3, R5, and R14 are included for proper circuit biasing. Capacitor C6 is used as an output filter.

### 4.25.2 VOLTAGE REGULATION

Voltage regulators VR1 and VR2 render regulated sources of +5 Volts D.C. for operation of the analog (VAA) and digital (VCC) circuits, respectively. Use of two separate +5V regulators helps to prevent noisy digital signals from entering the sensitive analog circuits. Capacitors C3 and C8 are used to insure regulator stability.

### 4.25.3 +9.5V/-7.5V SUPPLY

Integrated circuit U2 is used to convert +5 Volts D.C. to +9.5V and -7.5 Volts D.C. for use in the analog circuits. It contains an internal oscillator (operating at approximately 8 KHz) and a series of switches. During one half of the cycle capacitor C25 is connected between VAA and ground, charging C25 to VAA's potential of +5 Volts. During the other half cycle capacitor C25 is reconnected between VAA and pin 8 (negative lead of C25 to VAA) so that its voltage adds to VAA and charges filter capacitor C26 to approximately twice VAA or 9.5 to 10 Volts.

The remainder of U2 is used to generate a negative supply voltage. Capacitor C28 is connected between ground and the +9.5 Volt source on pin 8 during one half cycle of the internal oscillator. During the other half cycle it is reconnected between ground and pin 4 such that its negative lead is connected to pin 4. This transfers C28's charge into filter capacitor C27 and produces a negative voltage. Diodes CR8 and CR9 reduce the voltage slightly to obtain the desired -7.5 Volts.

### 4.25.4 BATTERY MONITOR

Integrated circuit U3 is included to monitor the

voltage of the battery and provide an indication to the scale's operator when battery replacement is required. Two states of weak battery operation are detected; "low-battery" (battery is usable but will soon need replacing) and "low-low battery" (battery is too weak to properly operate the scale).

Pins 1, 2 and 3 of U3 are connected to a voltage divider network consisting of R8, R9 and R10, to form the "low-battery" detector. The output of this circuit (pin 1) is normally low when the battery is good and switches high when the battery is low. It is coupled to I/O pin "P2.6" of microcomputer U10. Operating software in U10 will process this signal and after a slight delay cause the "LOW BATTERY" annunciator on the display board to flash.

The remaining half of U3, pins 5, 6, and 7, are connected to resistors R11, R12, and R13 to form the "low-low battery" detector. The output on pin 7, which is normally "high" with a good battery, goes "low" when the battery is too weak to reliably operate the scale. This output is connected to I/O pin "P2.4" on microcomputer U10 to signal the microcomputer that "low-low" battery has been recognized.

Microcomputer U10 will process the "low-low" battery signal and cause "bAttrY" to appear on the scale's front panel display, in addition to the "LOW BATTERY" annunciator.

#### 4.25.5 CHARGE MONITOR CIRCUIT

An additional circuit is included on the instrument board. Transistor Q4, along with resistors R56 and R57, is used to monitor the "CHARGE" annunciator line which illuminates the front panel indicator. Q4's collector is connected to I/O pin "P2.5" of U10 to tell the microcomputer when the front panel "CHARGE" indicator is on. Software contained in U10 recognizes this and prevents the scale from automatically shutting-off when AC power is present. When AC power is not present, the "CHARGE" indicator is not energized, and the scale will shut off after some period of inactivity to prevent discharging the battery.

An option in the scale's set-up software (see section 2.40, "AC con") is also provided to disable/enable this continuous "on" feature.

## 4.26 MICROCOMPUTER AND SUPPORT CIRCUITS

To attain various additional features such as automatic zero tare, pounds/kilograms conversion, weight lock-in, previous weight memory, etc., a microcomputer is employed to additionally process the data supplied by the A/D converter. This microcomputer system consists of U10, a microcomputer; U9, a non-volatile memory which stores the previous weight reading; 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 input lines P1.1 through P1.7). The microcomputer also continually scans the keyboard (using U4 on the display board) looking for closed switches. If a key press is sensed the microcomputer executes whatever action is called for in its program. After processing the A/D data the microcomputer assembles it for viewing and transfers it to the front panel display.

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. Crystal XTAL1 and capacitors C29/C30 form the clock oscillator which controls the internal timing of the microcomputer.

### 4.26.1 THE I<sup>2</sup>C SERIAL DATA BUS

The SCALE-TRONIX® model 4802 Pediatric Scale makes extensive use of serial data transmission to send data to the display, read the keyboard status, read/write information to the non-volatile memory, etc. This particular serial data format is referred to as "I<sup>2</sup>C", which stands for "Inner-integrated circuit". This bus consists of only two wires, which are labeled "SDA" (serial data), and "SCL" (serial clock).

Multiple integrated circuit devices can be attached to the same I<sup>2</sup>C serial bus. A device will only activate when its specific address is sent. Each device has a unique pre-assigned address (inherent to the specific type of integrated circuit) plus additional pins to set a unique address for multiple devices of the same type.

By manipulation of the SCL and SDA lines, the master device controlling the I<sup>2</sup>C bus (in this case microcomputer U10) can send and receive data to all the other devices on the bus. Specific timing of the SDA and SCL lines can also reset, start, and stop transmission to devices attached to the bus.

#### 4.26.2 NON-VOLATILE MEMORY

The internal memory of microcomputer U10 does not retain data when the power is switched off. Because some features of the scale require lasting data retention (such as last weight recall) integrated circuit U9 is included. This device, called an "electrically erasable programmable read-only memory", or "EEPROM" will store selected 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 "I<sup>2</sup>C" bus, 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 clock pulse. U9 shares these lines with other devices within the scale by having a unique address which is controlled by the setting of pins "A0", "A1", and "A2".

Resistors R54/R55 are provided as pull-ups on the SCL/SDA lines to insure the data and clock pulses are properly shaped. Capacitor C36 improves power supply bypassing.

#### 4.26.3 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".

A reset pulse of approximately 200 mS is automatically generated by "watchdog timer" U11 when the Vcc level rises above 4.65 volts. If VCC is below 4.65 volts the reset line stays "high", keeping the microcomputer U10 in an inactive state.

#### 4.27 BEEPER

A small audio annunciator is driven by transistor Q5, which in turn is controlled by U10's

output pin P2.3. The annunciator gives a (short)/(long) beep(s) as audible recognition of a key being pressed, a zero or weight lock-in, a warning of low-low battery, etc. The length of the beep and its various sequences are controlled by U10's software.

#### 4.28 DISPLAY BOARD AND KEYBOARD

Presentation of the weight information is performed by the display board assembly. It incorporates LED (light-emitting diode) digits and annunciators to provide a clear, bright, easy-to-read display. The hardware for detecting key presses on the front panel is also contained on this board. The scale may incorporate a version 48901 or 500043 printed circuit board; both are equivalent and interchangeable.

##### 4.28.1 DIGIT DISPLAY

The weight value is displayed on six, 0.43" high common anode digits. These are driven in a multiplexed fashion (one digit on at a time) by LED drivers U1 and U3. U1/U3 receive the digit display information from microcomputer U10, by connecting to the "I<sup>2</sup>C" serial data bus consisting of line SCL (Serial Clock) and SDA (Serial Data). A data bit (a high or low level) is sent and received on SDA when the SCL line provides a clock pulse. U1 & U3 share these lines with other devices within the scale by having a unique address which is controlled by the setting of pin "ADDR".

U1 & U3 automatically perform the multiplexing necessary to properly illuminate each LED digit. Once the correct segment data is loaded into U1/U3 the display will continue without further intervention from U10. An internal clock to control the multiplexing is generated by capacitors C1 and C3 on pin "C EXT".

Transistors Q1, Q2, Q3, and Q4 are used as digit drivers to increase the current from U1/U3. Segment current is internally limited within U1/U3. Later versions of the display board (p/n 500043) incorporate resistor networks RN7/RN8/RN9 to provide additional current limiting. Capacitors C2 and C4 provide high-frequency bypassing of noise on the Vcc power supply lines.

## 4.28.2 ANNUNCIATOR DISPLAY LAMPS

A variety of LED annunciator lamps are contained on the front panel to indicate "POUNDS", "OUNCES", "KILOS", "RECALL PRIOR WEIGHT", and "LOW BATTERY". (Scales Equipped with the optional RS-232 data port may also have the "DATA" annunciator, ANN2.) These annunciator lamps contain multiple LED's to provide an evenly illuminated surface. They are driven by integrated circuit U2. U2 receives the on/off information for the annunciators from microcomputer U10 via the "I<sup>2</sup>C" serial data port lines "SCL" (Serial Clock) and "SDA" (Serial Data). The address for U2 is controlled by pins "A0", "A1", and "A2". Resistor packs RN1 through RN6 provide current limiting for annunciators ANN2 through ANN7.

The "CHARGE" annunciator, ANN1, is powered directly from the power supply through current limiting resistors R5, R6, R7, and R8. Note that the "CHARGE" annunciator will not illuminate if the battery or power supply are disconnected.

## 4.28.3 KEYBOARD INPUT

The front panel keyboard is attached to the display board assembly by connector J3, and connected directly to integrated circuit U4, an I/O expander port. U4 communicates with microcomputer U10 via the "I<sup>2</sup>C" serial data port lines "SCL" (Serial Clock) and "SDA" (Serial Data). The address for U4 is controlled by pins "A0", "A1", and "A2".

The front panel keyboard consists of five (5) normally open switches. The common side of the keyboard is connected to ground. The port pins of U4 are set to a high (+5V) level by communication with microcomputer U10. If a key is pressed it pulls it's respective port pin of U4 to ground.

Microcomputer U10 periodically communicates with U4 to look at the condition of the switches on the front panel. A closed switch will be detected by U10's software. If the switch remains closed for a period of time it will be validated by U10 ("debounced") and the appropriate action called for will be executed.

Diodes D1 and D3 are used to turn the scale "on" when either the front panel "ON / (OFF) / ZERO" or the "RECALL PRIOR WEIGHT" pushbuttons are pressed. They connect the "ON" line present on the

expansion bus connector J1 to ground momentarily to cause the power to the instrument board to become active. Diodes D2 and D4 are included to couple the pushbutton closures to I/O expander U4 so that the microcomputer U10 can determine which pushbutton has been activated and take the appropriate action.

## 4.29 MODEL 23PWR-6.0 POWER SUPPLY

The model 23PWR-6.0 power supply is used to provide line power operation for the model 4802 pediatric scale and simultaneously recharge the 6.0 volt, 550 Milli-amp hour nickel-cadmium battery pack that powers the scale during cordless operation.

Voltage step-down and isolation is provided by power transformer T301. A dual primary winding is provided to allow operation at either 120 VAC or 240 VAC. The power supply is protected against faults by fuses F301 and F302 wired into the primary circuit.

A special safety rated capacitor, "CF" is used to remove noise from the AC line which might interfere with the scale's operation. An additional capacitor, and a ferrite toroid, are added to the primary wiring to form a complete line filter.

Full-wave rectification of the transformer's secondary voltage is provided by diodes D301 and D302. Capacitor C301 provides filtering. A power-on indicator is provided by light-emitting diode LED301 and resistor R301. Diode D303 prevents the battery from discharging into the power-on indicator and connects the rectified, filtered DC voltage to output connector J301 for use by the scale's instrument board.

The 6.0 volt nickel-cadmium battery, composed of five (5) size "AA" cells, is charged by the current through resistor R302. Schottky diode D304 is used as a "switch" to couple the battery voltage to output connector J301 when AC line power is removed and the battery is need to operate the scale.

A charge indicator circuit is provided by transistor Q301 and light emitting diode LED302. The voltage across charging resistor R302 is monitored by Q301, a high gain pnp transistor. Resistor R303 provides current limiting for Q301's base. When the battery is properly connected and charging, Q301 will be switched "on" and provide a current path through

limiting resistor R304 and the "CHARGE" indicator located on the front panel of the readout. Note that if the battery is disconnected from the power supply board; or the power cable, instrument board, display cable, or display board are disconnected, then the LED302 "CHARGE" indicator will not light.

#### 4.30 TROUBLESHOOTING PROCEDURES

The following simplified troubleshooting procedures are recommended for identifying defective system components. Certain corrective measures are provided. More complicated servicing should only be performed by the factory or authorized service facilities. Most problems can be solved on the telephone. Problems requiring factory service are usually handled quickly and the scale is on its way back within 48 hours. Call first to discuss the problem.

##### 4.31 DISPLAY DOES NOT ILLUMINATE

Check that the readout is plugged in. Check if the internal power-on L.E.D. is illuminated; if not check the line fuse(s).

Check that the battery connector is properly connected to "J1 POWER" on the instrument circuit board. Check that the cable between the display board and instrument board is connected. Check that the membrane keyboard is connected to the display board. Measurements of the D.C. supply voltages can be made with a DVM.

##### 4.32 WEIGHT READING NOT ACCURATE

This is commonly caused by a mechanical obstruction of the weighing cradle. Check that the cradle is not touching some foreign object so that it is restricted in its downward movement. Also check that the connecting cable is firmly plugged into the instrument circuit board (marked "J4 LOAD CELL").

##### 4.33 WEIGHT READING TAKES EXCESSIVE TIME TO DISPLAY

If the cradle is in motion the scale will wait for it to settle before displaying the weight. This can be caused by excessive patient motion.

Also check that the transducer cable is firmly plugged into the instrument board. Examine that the cradle is

not rubbing against a foreign object. Check that the scale is not subject to excessive vibration or breezes from overhead fans or ventilation outlets.

##### 4.34 SCALE DISPLAYS "CABLE" OR "O-LOAD"

The message "O-LOAD" indicates the weight signal is larger than the maximum value allowed (see specifications on inside front cover). If the weight value is within the specified range this could indicate a damaged transducer or defective instrument board.

The "CABLE" display indicates a signal outside the range of the internal a-d converter has been applied. This can be caused by a weight that is well in excess of the scale's capacity or a damaged or disconnected transducer cable. Check the internal connection of the four wire cable to the "J1 LOAD CELL" connector.

##### 4.35 READING DOES NOT CHANGE WHEN WEIGHT APPLIED

The load cell transducer, connector or cable may be defective. The load cell transducer's continuity and resistance can be checked with an ohmmeter after unplugging from the readout. The proper resistance values are listed below:

| WIRE COLORS (PIN no.)                         | RESISTANCE       |
|-----------------------------------------------|------------------|
| GRN(1)/BLK(2)/WHT(3)/RED(4)<br>to scale frame | >10M $\Omega$    |
| GRN(1) to BLK(2)                              | 350-450 $\Omega$ |
| WHT(3) to RED(4)                              | 325-375 $\Omega$ |

Consult factory if readings differ from those shown.

**NOTE:** Ohmmeters will not indicate a change in resistance of the load cell transducer when weights are applied to scale. This is due to the extremely small change in resistance of the strain gauges employed (<1 ohm) and the fact that the bridge configuration presents a constant value of resistance when measured from its terminals.

##### 4.36 NON-FUNCTIONING KEY(S)

Check the front panel keyboard for visible

signs of damage (punctures, dents, etc.). Check that keyboard tail with connector is properly inserted into the display board.

If a particular function does not work (example: no kilogram units) check if that particular function is turned off in the "SET-UP" mode (see section 2.40)

#### **4.37 ERROR MESSAGE DISPLAYED: "E-FAIL" or "r-FAIL"**

This indicates a failure of the internal microcomputer's memory during the start-up self-test. "E-FAIL" indicates a failure of the microcomputer's eprom memory during the checksum test. "r-FAIL" shows a failure of the random access memory. Both conditions require replacement of the microcomputer.

#### **4.40 CALIBRATION**

Your scale has been carefully calibrated at the factory. This calibration involves matching and tuning of the load cells and readout electronics. The scale calibration should be checked annually. Only use calibrated, certified scale test weights for this purpose. Traction or physical therapy weights are **NOT** acceptable since their actual weight can often be in error as much as +/-10%. Calibration weights may be purchased from **SCALE-TRONIX®** or a local scale dealer. An alternative to calibration weights is the weight comparison method. This requires a known accurate, calibrated scale. A fixed weight is "weighed" on the calibrated scale; then the same weight is placed on the scale for comparison.

**PRECISION TEST CALIBRATION WEIGHTS ARE AVAILABLE FROM SCALE-TRONIX®.**

**TWO (2) 10 KILOGRAM TEST WEIGHTS ARE RECOMMENDED.**

**ORDER PART NO. 390025 / 20022 : 10 Kilogram Test Weight (1)**

If only "pound" test weights are available conversion is as follows:

1.0 Pound = 0.454 Kilograms  
5.0 Pounds = 2.268 Kilograms  
10.0 Pounds = 4.536 Kilograms

20.0 Pounds = 9.072 Kilograms  
25.0 Pounds = 11.34 Kilograms

Large changes in calibration often indicate a damaged load cell or faulty readout component. It is generally recommended that if calibration is necessary for your scale it should be returned to the factory. Calibration procedure follows for those situations where this is not desirable. Calibration should not be attempted by those not having the proper tools or knowledge of electronic systems and their attendant shock hazards.

#### **4.41 PREPARING FOR CALIBRATION**

Unplug the scale from the AC line. Unplug the cradle from the scale. Detach the top cover of the scale's enclosure by removing the eight (8) #10 button head screws. The scale's instrument board should now be in full view. Note the location of the trimmer potentiometer, "P1 Span".

#### **4.42 ENTERING THE CALIBRATION MODE**

Enter the "calibration mode" by following **exactly** the procedure outlined below:

1. Be sure scale is off.
2. Press and hold in the "REWEIGH" pushbutton.
3. While pressing the "REWEIGH" pushbutton press and release the "ON / OFF / ZERO" pushbutton.
4. **NOTE:** The "ST" pushbutton is a special hidden programming and test pushbutton located under the **SCALE-TRONIX®** logo ("ST") located to the right of the front panel "RECALL PRIOR WEIGHT" pushbutton.

After the scale displays the test pattern of "888888" release the "REWEIGH" button and press the "ST" pushbutton five (5) times. This will cause the readout to enter the calibration mode. The display will indicate "CAL".

5. Press the "ST" pushbutton once more; the display will indicate "A-d". This indicates the start of the "raw" analog-to-digital converter data being inputted to the micro processor.



6. Press the "ST" pushbutton one more time. The number displayed is now the "raw" analog to digital data. Each "count" of the display is equivalent to 1 gram.
7. The automatic turn-off timer has also been programmed for an extended "on" period to give you time to calibrate the scale. This time period is three minutes. The scale may be turned off before this time period by simply pressing and holding the "ON / (OFF) / ZERO" pushbutton. Hold it in for several seconds until the power shuts off. If additional time is needed to complete the calibration procedure, press the "ON / (OFF) / ZERO" pushbutton briefly. This will reset the timer for an additional three minutes. If the scale is operated from AC line power it will normally remain on continuously.

The readout is now displaying a number, which represents the zero offset value of the platform and load cell transducers, in kilograms (0.001 kilogram = 1 gram).

#### 4.43 CALIBRATION PROCEDURE

- 1.) Momentarily press the "ON / (OFF) / ZERO" pushbutton to reset the internal self-test timer. Re-attach the scale's cradle. Note the currently displayed weight reading on the front display. Record this zero offset reading.
- 2.) Lay the two (2) 10 kilogram test weights side-by-side in the center of the cradle. Note the new number displayed. Subtract the original zero offset value from this new number to obtain the scale's displayed value of the calibration weight.

**(Example:** The zero offset value is "-1.230 KILOS" (representing -1.230 Kilograms). Adding the specified two 10 kilogram test weights (equivalent to 20.000 kilograms) to the cradle produces a reading of "18.763 KILOS". The difference is  $18.763 - (-1.230) = 19.993$  (equivalent to 19.993 kilograms). This would indicate the calibration is  $20.000 - 19.993 = 0.007$  kilograms "low".

Using the specified two 10 kilogram test weights a difference of 20.000 kilograms  $\pm 0.003$  kilograms (3 grams) should be obtained. If necessary adjust

potentiometer P1 (span adj.) on the instrument board until the correct value is obtained.

If the display shows "*Ad our*" (A/D overrange), try repeating the process with a single 10 kilogram weight until the calibration becomes close; the calibration can then be "fine-tuned" with both 10 kilogram weights.

(If using weights other than the two specified 10 kilograms, make the necessary adjustments to the calibration procedure.)

- 3.) Momentarily press the "ON / (OFF) / ZERO" pushbutton to reset the internal self-test timer. Remove the test weight and recheck the zero offset value. Note that adjusting P1 SPAN may also alter the zero offset value. Repeat the process as necessary to obtain the correct difference.

- 4.) Now you may turn the scale off by pressing the "ON / (OFF) / ZERO" pushbutton and holding it in for a few seconds. That will force it to turn off. Re-attach the top cover of the enclosure using an Allen wrench and the eight (8) #10 button head screws. Replace the cradle. The scale may now be checked for normal operation with the test weights

#### 4.50 FACTORY SERVICE HELP

If service information is to be obtained by calling the factory, the serial number and model number of the scale must be communicated at the beginning of the call to allow our service staff to quickly access the manufacturing records, calibration data, service records, and other pertinent information concerning that particular scale. (These numbers can be found on the data label attached to the rear of the enclosure.)

**NOTE: IN ALL CASES, CALL THE FACTORY BEFORE RETURNING ANY PARTS OR SCALES FOR REPAIRS. MOST PROBLEMS CAN BE DIAGNOSED AND SOLVED ON THE PHONE BY MAKING A FEW TESTS.**

**IT IS ALWAYS NECESSARY TO CONTACT THE FACTORY FOR A RETURN AUTHORIZATION NUMBER, SHIPPING INSTRUCTIONS AND ADDRESS. CALL 630-653-3377.**

**DO NOT SHIP SCALE TO THE NEW YORK  
FACILITY.**

# PARTS LIST AND SCHEMATIC

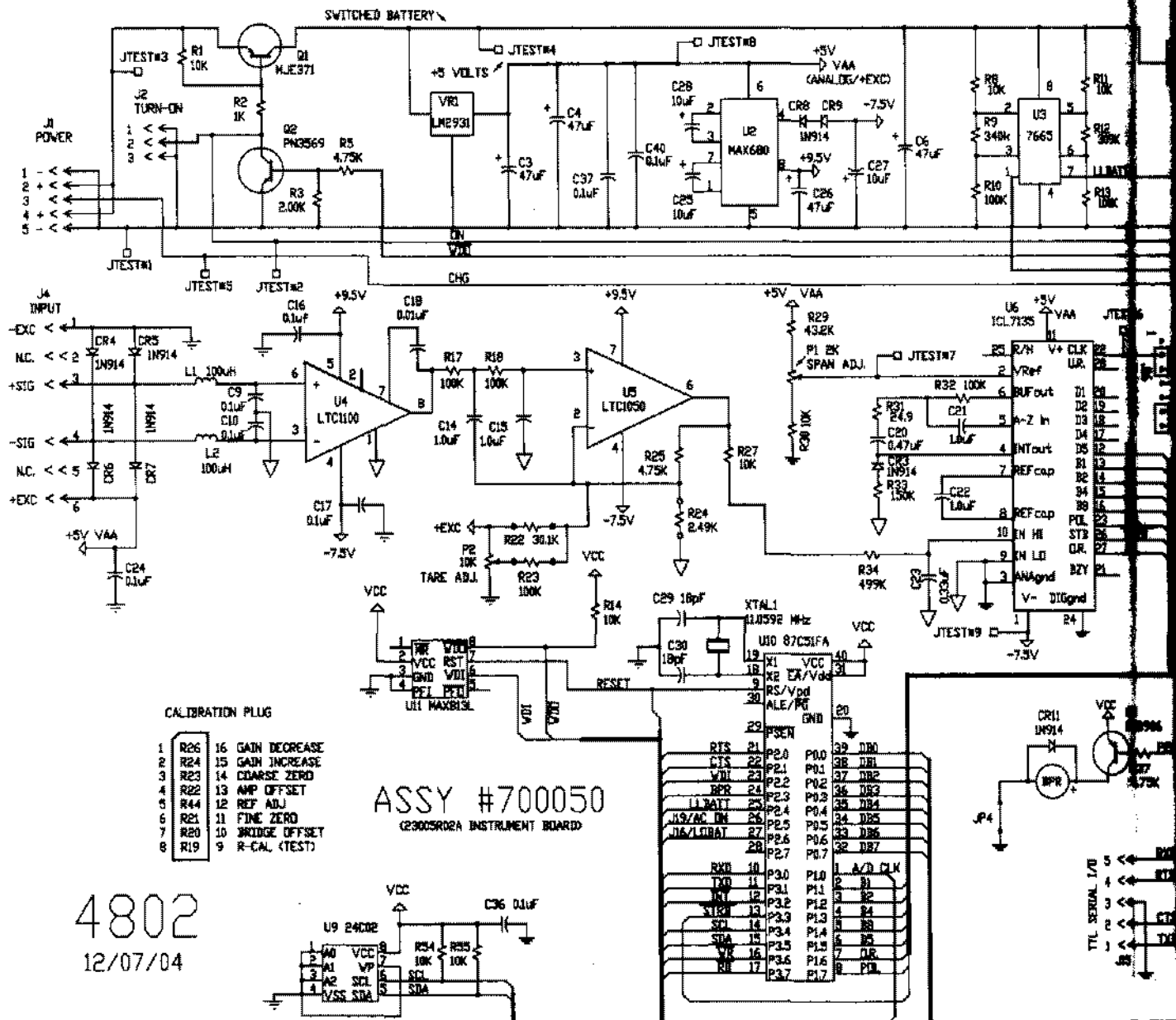
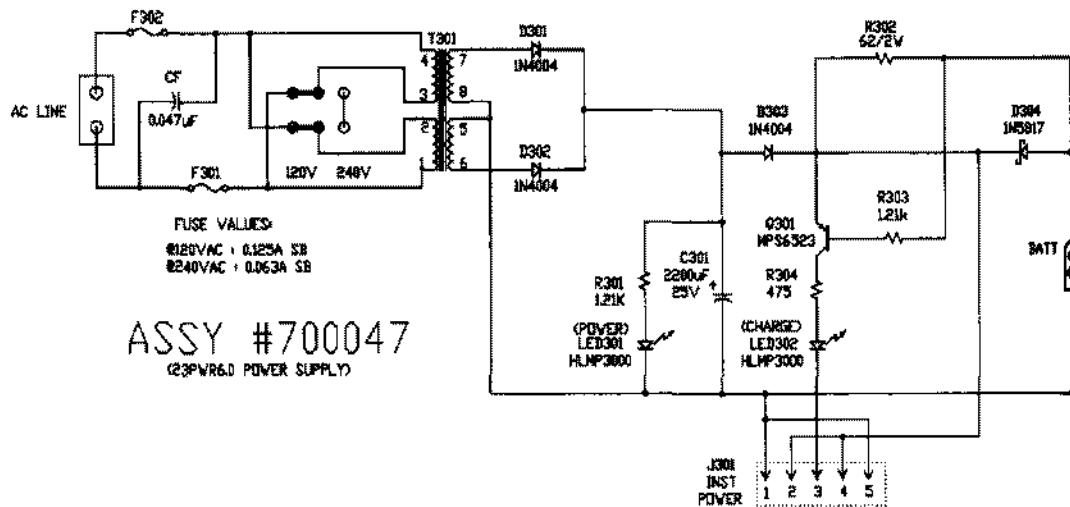
**Note:** Call the factory service department for those parts not listed. Due to revisions and improvements it is suggested that you confirm the part number with the factory service department before placing an order. Phone number for factory service is located on inside front cover.

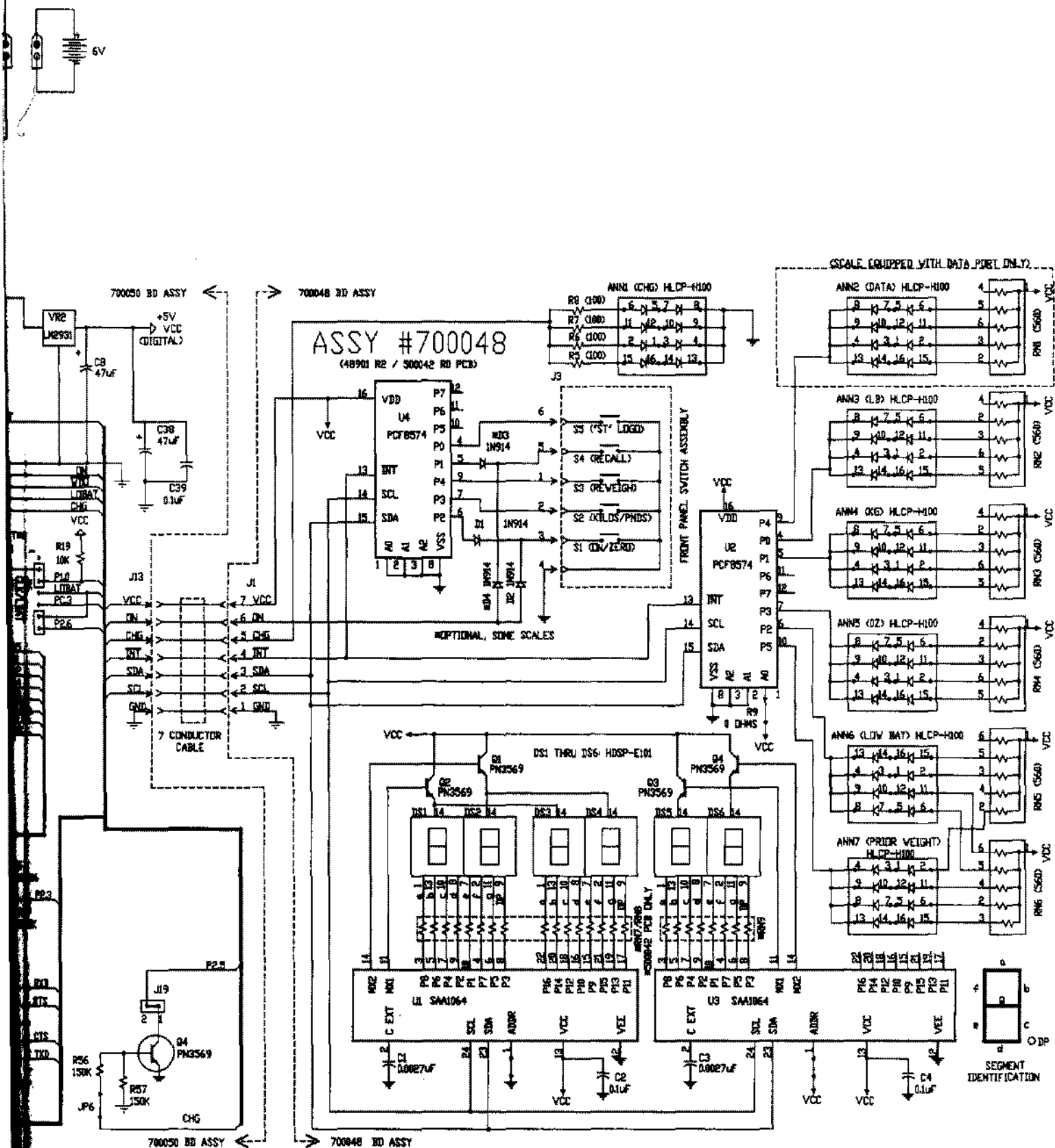
| PART NUMBER | DESCRIPTION                                                        | PART NUMBER | DESCRIPTION                                             |
|-------------|--------------------------------------------------------------------|-------------|---------------------------------------------------------|
| 48200       | Standard cradle, 25" long                                          | 20009       | Battery pack, rechargeable                              |
| 48220       | Four-sided cradle                                                  |             |                                                         |
| 48222       | Oversize cradle, 32" long                                          | 23009       | Battery clamp (3.5" hole centers)                       |
|             |                                                                    | 019007      | Battery clamp (3.1" hole centers)                       |
| 48205       | Mounting post (for cradle)                                         | 130222      | 6-32 x ¾" captive screw                                 |
| 40477       | 10-32 x 1" set screw                                               |             |                                                         |
|             |                                                                    | 700050      | Instrument board assembly                               |
| 030075      | Enclosure base                                                     | 450012      | Microcomputer w/ software, V X.XX.4                     |
| 48110       | Enclosure cover                                                    | EU1022      | 7135 A/D converter IC                                   |
| 720005      | Front panel overlay w/ switch                                      | 350038      | LTC1100 instrument amp IC                               |
|             |                                                                    | EU1025      | LTC1050 operational amp IC                              |
| 48106       | Side handle                                                        |             |                                                         |
| 48118       | Ferrule (for side handle)                                          | 700048      | Display board assembly                                  |
| 48122       | Handle shim, U-channel                                             | EDS1005     | HDSP-E101 LED 7 segment digit,<br>0.43", red            |
| 48112       | ¼-20 x ½" button head screw                                        | ELD1033     | HLCP-H100 0.35" x 0.75" LED light<br>bar, red           |
| 48107       | Rear handle                                                        | 350002      | SAA1064 display driver IC                               |
| 48137       | Spacer 2" x ½" dia                                                 | 350003      | PCF8754 I/O expander IC                                 |
| 48138       | ¼-20 x 3" flat head screw                                          |             |                                                         |
| 270022      | Power entry module                                                 | 700047      | Power supply assembly                                   |
| 40517       | Power cord                                                         | 40531       | Fuse, ½ Amp, 3AG, slow-blow                             |
|             |                                                                    | 48311       | Fuse cover                                              |
| 66011       | Rubber foot w/ washer                                              | 380031      | Power transformer IF-14-16                              |
| 20108       | 10-32 x ½" button head screw                                       |             |                                                         |
| 48502       | Load cell transducer DEBB- 100                                     | 48217       | Scale liners, carton of 500                             |
| 48511       | 10-32 x 1½" socket head cap screw                                  | 48800       | Mobile weighing cart for 4802                           |
| 48503       | Loading arm                                                        | 48859       | Scale liner dispenser shelf for mobile<br>weighing cart |
| 48508       | ¼-20 x ½" socket head cap screw                                    |             |                                                         |
| 48504       | Loading block                                                      | 530181      | Operating instruction label                             |
| 50511       | 5/16 x ¾" socket head shoulder bolt,<br>¼"-20 thread, 1 1/16" long | 070060      | Operating and Service manual                            |

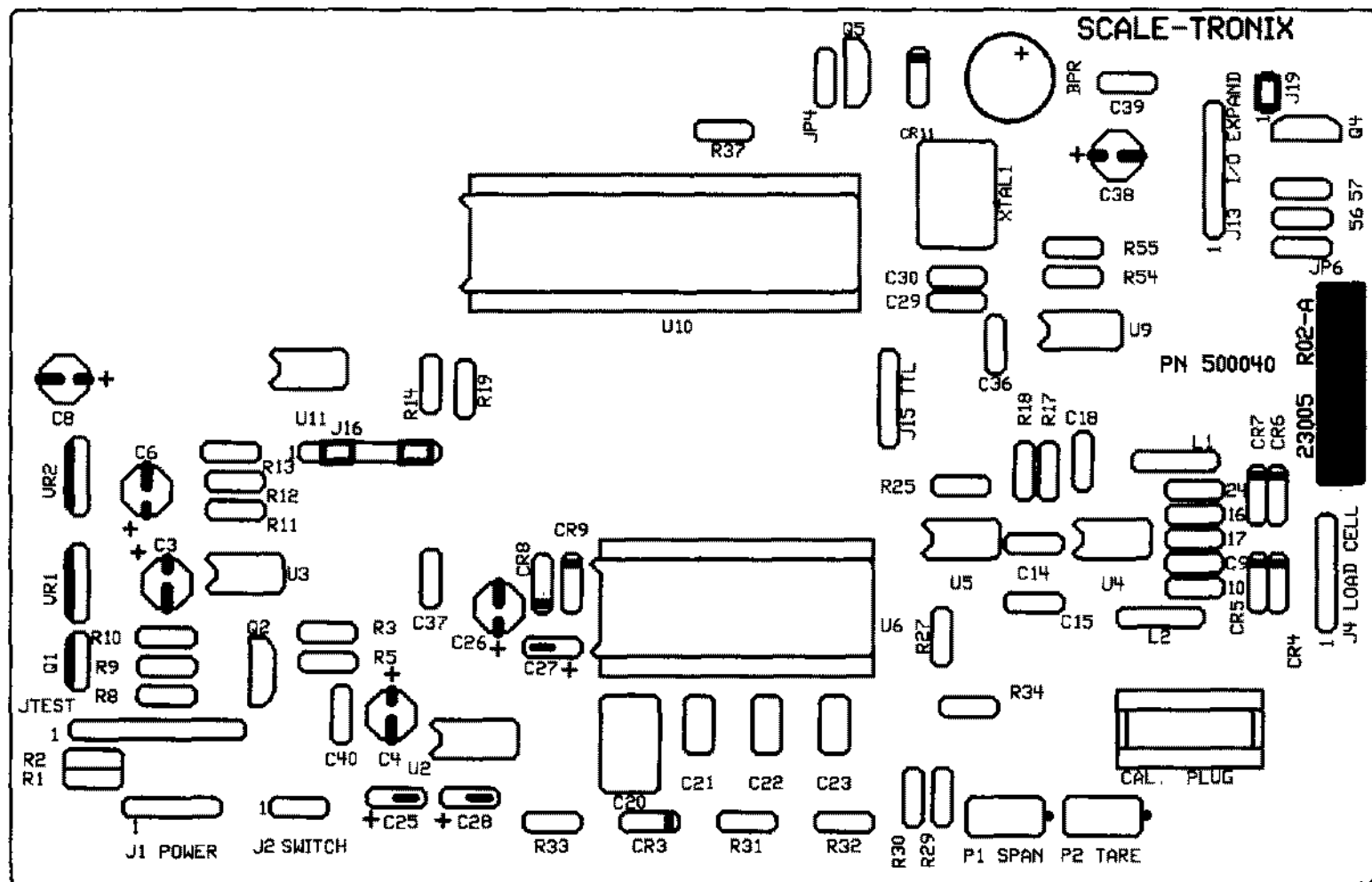


## ILLUSTRATION 2

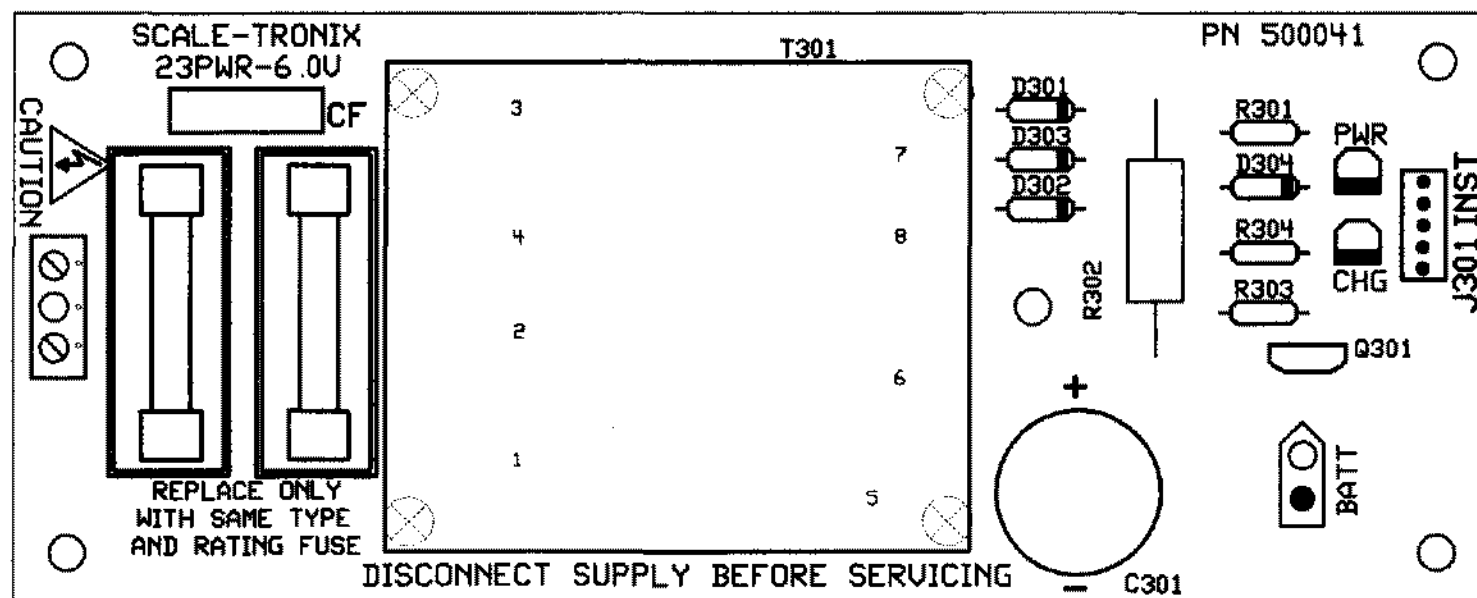
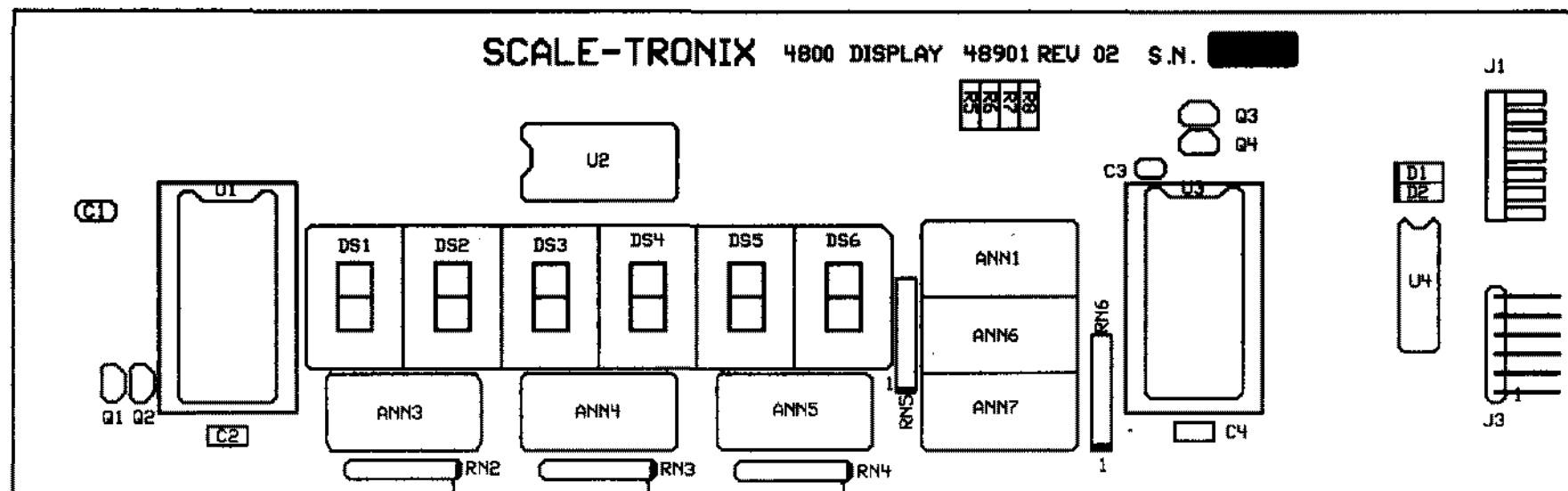
MODEL 4802 INFANT SCALE SHOWN ON OPTIONAL CART  
CART EQUIPPED WITH OPTIONAL CRADLE LINER DISPENSER  
MODEL 4802 SHOWN WITH OPTIONAL FOUR-SIDED CRADLE







ASSEMBLY NUMBER 700050: 23005R02A INSTRUMENT BOARD





# WARRANTY

## 6.00 WARRANTY

THE MANUFACTURER warrants all scales to be free from defects in parts and workmanship. Its obligation under this warranty is limited to repairing or replacing an improperly operating unit, providing the scale has been under normal usage and service.

**The following terms and conditions apply:**

1. The warranty period is for one year starting on the date of shipment to the purchaser.
2. The warranty covers parts and factory labor to repair the scale, except where parts failure is caused from abuse or misuse of the scale, or load sensors.
3. Notice of the alleged defect must be given during the warranty period and must state the model number, serial number, date of purchase, and installation date. The scale or portion thereof is to be shipped prepaid back to the factory.  
**The customer must first contact the factory for return authorization number and receive proper packing/shipping instructions and shipping address.** The seller accepts no responsibility for loss or damage to any product or part in transit, nor will any claim be honored unless the product or part is received intact with no evidence of previous attempts at repair.
4. The seller's sole obligation under this warranty shall be, at its option, to repair, replace or refund the purchase price of the equipment.
5. The obligations of the manufacturer under this warranty does not include responsibility for any transportation expense of equipment or field labor or expenses that may be requested by the purchaser in lieu of returning the scale to the factory.
6. The seller shall not be responsible for:
  - (a) consequential, collateral, or special losses or damages.
  - (b) defects caused by fair wear and tear, abnormal conditions of use, accident, neglect or misuse.
  - (c) improper operating, maintenance, or repair.
  - (d) batteries.
7. This warranty and any obligation of liability shall cease and terminate immediately if:
  - (a) any unauthorized modification, alteration, or substitution of any part or parts of the product is made;  
or
  - (b) the serial number of the product is altered or defaced.
8. No employee or agent of the seller has any authority to add to, subtract from, or change any portion of this warranty and the seller's obligation is limited strictly to these terms as written and defined by the seller.
9. This warranty is the sole warranty of the seller and any other warranties expressed, or implied in fact, are hereby specifically excluded.