

# **SCALETRONIX®**

**4302**

**ORGAN / TISSUE WEIGHING SYSTEM**

**SECOND GENERATION WEIGHING SYSTEM**

**OPERATING AND SERVICE MANUAL**

## **SPECIFICATIONS:**

### **4302- ORGAN/TISSUE SCALE**

The **SCALE-TRONIX® Model 4302 Organ/Tissue** Scale is designed for use in the operating theater for weighing organs, specimens and miscellaneous small body parts. The scale is a small battery powered rugged stainless steel scale with a flat weighing surface. It can be used with stainless steel or plastic bowls or trays. Push button zero capability is provided to zero out the container prior to weighing. The readout is controlled by a microcomputer which provides the functions such as automatic time out, kilogram/pound conversion, auto zero, etc.

Robust design incorporates 3 stainless steel handles for easy handling and protection of the weighing mechanism.

### **WEIGHING CAPACITY**

0-3000 GRAMS

### **ACCURACY**

1 gram

### **WEIGHT DISPLAY**

Large (.51") bright, light emitting diode (LED) display. Easily read in any lighting condition. Weight is displayed in grams, pounds (.001 lb.), or ounces.

**NOT POUNDS AND OUNCES.**

### **POWER SUPPLY**

Six (6) "C" size alkaline heavy duty batteries.  
(Duracell recommended)

### **DIMENSIONS**

Scale 11 x 10 x 3 inches  
Platform 8 1/2 x 8 1/2 inches

### **WEIGHT**

EIGHT (8) POUNDS

### **OPTIONS**

AC power adapter (see section 3.60 for specifications)  
For continuous operation.

### **WARRANTY**

One (1) year, all parts and labor.

### **FACTORY AND SERVICE**

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

### **MARKETING AND SALES**

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

### **SCALE-TRONIX WEB SITE**

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

# ORGAN / TISSUE WEIGHING SYSTEM

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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 **SECOND GENERATION ORGAN/TISSUE WEIGHING SYSTEM** manufactured by **SCALE-TRONIX®, INC.** This manual should be studied before installing or placing the scale in service. Please store in a safe, handy place for future reference. Additional manuals are available from **SCALE-TRONIX®, INC.** at a nominal charge. Refer to the scale serial and model numbers in any and all correspondence.

Feel free to call the factory for service and operational assistance - **630-653-3377.**

## GENERAL DESCRIPTION

### 1.0 GENERAL

**Congratulations!** You have just purchased the only modern and accurate organ/tissue scale available. The **SCALE-TRONIX® 4302** is one of a family of **Second Generation** weighing systems manufactured by **SCALE-TRONIX®, INC.**, an **ISO-9001** certified company.

The **4302** is the only scale available that was designed for this demanding application after consultation with surgeons and nurses. In this demanding environment you no longer have to use industrial or consumer type scales. This is a sophisticated and robust weighing system for the accuracy (one gram) required.

The stainless steel construction and multiple handles makes for easy use and transport. Self contained batteries provide reliable operation for over a year of aggressive use. The generous platform size (8-1/2" X 8-1/2" inches) provides convenience with any customer supplied bowl or basin in general use. Stainless steel construction insures easy cleaning and long life. Push button zero feature provides a one step quick procedure for zeroing out the empty container weight for accurate net weighing of the specimen. Specially programmed microcomputer provides many features and ease of operation.

Sensitive, yet rugged is a big feature of the **4302**. One gram or 0.001 pound resolution provides the utmost in precision weighing of small parts. Expanded capacity of **3000 grams** accommodates any size organ or specimen. Special overload protection protects the weighing mechanism from overloads and abuse.

The weighing mechanism used in this scale is a proprietary "co-planar beam" concept successfully used for many years by **SCALE-TRONIX®** in their other products. Co-planar technology provides rugged yet sensitive operation and extremely low profile construction. The scale is designed for many years of use with little or no maintenance.

The **4302** has a weighing capacity of 3000 grams (6.6 lb.). The weight is displayed on a large bright easy to read light emitting diodes (LED) making it easy to read even from a distance.

### 1.1 OTHER USES

The **4302** scale can also be used in areas where extremely accurate weight and blood loss data are required (weighing sponges or dressings for example).

This scale may also be used in the laboratory for weighing small animals such as mice or rats.

Other uses may include weighing of instruments and dressings.

The weighing tray is removable, and special trays can be supplied for special applications. Consult the factory if you have a specific application or requirement.

### 1.2 GENERAL DESCRIPTION

The scale contains the following major components:

- 1.21 Stainless steel flat weighing tray (removable).
- 1.22 Carrying handles for safe, convenient handling and protection.
- 1.23 Heavy duty stainless steel shielded enclosure.
- 1.24 Self contained battery holder for six (6) "C" size heavy duty alkaline batteries.

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## ASSEMBLY - SET UP

- 2.0 The scale is shipped completely assembled with batteries installed and is ready for use.
- 2.1 Carefully remove the scale from the packaging material and place on counter or table.
- 2.2 Turn the scale on by pressing the "ON" button. Turn on is announced by one beep. The display should illuminate with a display segment test of "888888". Then it will display its own model number (4302) for a few seconds. This verifies that the proper software program is active for this scale. After the model number, the scale will display a weight reading. If the reading is off zero, simply press the "ZERO" button and the scale will automatically go to zero and signal with two beeps.
- 2.3 To test the scale, place a light weight object (screwdriver, wallet or any object weighing less than 3000 grams) on the platform or bowl. The scale should commence the weighing sequence and settle on the weight within a few seconds. The display of weight is signaled with 3 beeps.
- 2.4 The units of measure may be changed by pressing the appropriate button (GRAMS, POUNDS OR OUNCES). The scale can be programmed to operate in any or all modes, customer's choice.
- 2.5 The scale will turn off automatically after a preprogrammed time delay. The factory default setting is 45 seconds, however this may easily be changed via front panel programming controls. Consult the technical section of this manual for details.
- 2.6 The scale may be forced off before the time delay by simply pressing and holding the "ON" pushbutton for five seconds.
- 2.7 Retain packaging materials in case scale ever needs to be returned for service.

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# OPERATION OF SCALE

## 3.00 GENERAL

The **SCALE-TRONIX®** second generation of special scales. The **4302's** readout utilizes computer controlled digital systems to provide such features as pushbutton zero, and units conversion.

The portable scales are truly cordless. Power cords have been eliminated where possible with no compromise on battery life. However, an external AC power adapter can be used if desired.

The typical operating procedure is very simple:

1. With scale empty and on a level surface, turn on by pressing the **"ON"** pushbutton (**ONE BEEP**).
2. Place container or bowl of your choice on the platform and press **"ZERO"** pushbutton (**TWO BEEPS**).
3. Place organ, specimen or tissue in the bowl and wait for the net weight to be displayed (**THREE BEEPS**).

That is all there is to it - **simple as 1,2,3** ! The scale will even shut itself off after 45 seconds of inactivity to conserve batteries, but will allow successive weighing of organs. The time delay before shutting off is selectable by the operator through the "set-up" programming feature (see section 3.70) and can be changed if desired.

The weight can be displayed in either grams, pounds or ounces by pressing the appropriate pushbutton. The scale will "remember" the selected weight units and turn on these units. By use of the "set-up" feature the operator can program the scale to display only in a particular unit.

Get in the habit of using the audible beeps to assist you in the simple and proper operation of the scale. The beeper can easily be disabled by means of the

set-up programming feature in those instances where its use isn't desirable.

## 3.10 POWER ON

Press the **"ON"** pushbutton located in the upper right-hand corner of the control panel to switch the scale on. The scale will beep once and then show **"888888"** with all annunciators illuminated as a test of the readout's display, then display the scale's model number **"4302"**. During this time a number of internal self-tests are performed.

If no other actions are performed the scale will automatically shut off after about 45 seconds. If additional operating time is required, simply press the **"ON"** pushbutton to momentarily reset the readout's internal timer. To turn the scale "off" before the automatic timer does, press and hold the scale's **"ON"** pushbutton for a few seconds.

## 3.20 ZEROING

It is a good technique to always turn the scale on when "empty" to verify if reading on display is zero. If a value other than "zero" is displayed, simply press the **"ZERO"** pushbutton to zero the scale. It is possible for the **4302** to have organs or specimens on the scale and then turned on, in this instance the scale simply displays the weight using the previous "zero" value.

It is also possible to zero the scale with the empty bowl or container and then take the bowl off the scale. Fill the container and replace on scale. Since the zero calibration of the scale is retained the true net weight will be displayed.

## 3.30 OBTAINING WEIGHT

Once items are placed on the scale it will automatically begin computing the weight. If more items are added, the reading will increment by the



amount of items added. Removing items is simple too: the scale will return back to "zero" when all items are removed or decrement current weight by the amount of items removed.

Once the weight is obtained the scale will beep three times.

### 3.31 WEIGHT UNITS

The weight may be displayed in either pounds, ounces, or grams by selecting the appropriate front panel pushbutton. Press the "LB" pushbutton twice to alternate between "POUNDS" and "OUNCES". An annunciator on the front panel of the readout will illuminate to show the currently selected units. The weight units may be selected at any time during the weighing process.

The scale will remember the selected units when it is turned off. Upon power up it will automatically default to this previously selected unit.

By use of the set-up feature (see section 3.70) the scale's weighing units can be turned on or off as desired. For example, it can be programmed to display in grams only. It can also be programmed to display in resolutions other than 0.001 pound (again see section 3.70).

### 3.40 ERROR MESSAGES: "**bAttrY**", "**O-LOAD**", "**E-FAIL**", "**r-FAIL**", "**A-FAIL**", "**n-FAIL**"

The internal microcomputer contained in the readout constantly monitors the scale's operation and uses the display to indicate error conditions when they arise. An explanation of these messages is given below:

- a.) "**bAttrY**" : Indicates the battery has become depleted to the point that it can no longer operate the scale. Replace the battery to continue operation.
- b.) "**O-LOAD**" : Shows that the scale platform's weighing capacity has been exceeded. Refer to the inside front cover specifications for maximum capacity.

- c.) "**E-FAIL**", "**r-FAIL**", "**n-FAIL**" : Shows that a memory failure has occurred in the internal microcomputer's memory. Requires service of the scale.
- d.) "**A-FAIL**" : Indicates that the internal analog to digital converter is not working. Requires service of the scale.

### 3.50 BATTERY REPLACEMENT

Heavy duty alkaline-type cells should be used in your **SCALE-TRONIX®** portable scale. These are commonly known as "Duracell type MN1400". A total of six (6) "C" size cells (ANSI/NEDA type L70, IEC type LR14) are installed in a plastic battery holder contained within the scale cabinet. A set of Duracell batteries will provide over 10,000 weighings in normal use. The use of less powerful carbon-zinc batteries is not recommended due to their higher internal resistance.

When the battery voltage drops below a preset level the "**LO BATT**" annunciator light will blink signaling the operator that the battery is wearing down. This is a preliminary warning. Immediate action is not required as there are several weighings left in the battery when the "**LO BATT**" warning is activated. The batteries should be replaced within a few days of this warning. Scale accuracy will not be compromised.

A second low battery condition is detected when the voltage is inadequate to accurately operate the scale. At this point the "**LO BATT**" annunciator will continue to blink, and the scale will display "**bAttrY**" on the weight display accompanied by a series of four long beeps. This is done to eliminate the possibility of displaying erroneous weights by preventing the scale from being used. If the batteries are replaced when the "**LO BATT**" signal activates this additional "low-low battery" signal will never be seen.

The batteries for the model **4302** are located under an access door on the bottom of the cabinet. Three philips head screws hold the cover in place. Use a philips screwdriver to loosen the screws. Replace all six (6) of the cells with fresh alkaline heavy-duty cells. Be sure to observe proper polarity of the cells

as they are installed. Replace the cover and fasten securely with the three philips head screws using the philips screwdriver. **Do not open the other bottom panel fastened with allen head screws.**

The date of battery replacement should be noted on the battery replacement label provided on the underside of the cover. In situations where the scale is not used extensively the batteries should be replaced annually just as a precaution.

### 3.60 USE OF AC POWER ADAPTER

The model **4302** Organ/Tissue scale has an external DC power jack mounted on the rear of the cabinet. This allows the scale to be powered without use of the internal battery. This is particularly useful in situations where it may be desirable to leave the scale on continuously, such as when used in a laboratory.

The scale will remain on continuously when powered from the external AC power adapter. Unplugging the external AC power adapter from the scale will automatically switch the scale back to operation on its internal battery. An option in the scale's set-up menu allows the scale to remain "ON" continuously when powered from the external AC power adapter.

An external AC power adapter is **not** included with the purchase of the scale, but may be provided on special order. An external AC power adapter suitable for use with the scale can be readily purchased at local retail or electronics stores. The required specifications are shown below. An appropriate device may be purchased at neighborhood **Radio Shack®** stores, as part number **273-1651D**, rated at 9V DC, 500 mA. Use the 2.1 x 5.5 mm co-axial adapter with the tip set to "+" (positive) polarity. Use only this size connector.

#### Specifications for AC power adapter:

|                 |   |
|-----------------|---|
| <u>Voltage:</u> | Minimum of 7.5 Volts DC;<br>Maximum of 12.0 Volts DC.                   |
| <u>Current:</u> | Minimum of 200 milli-amperes (200 mA); maximum of 1.0 ampere (1000 mA). |

#### Connector:

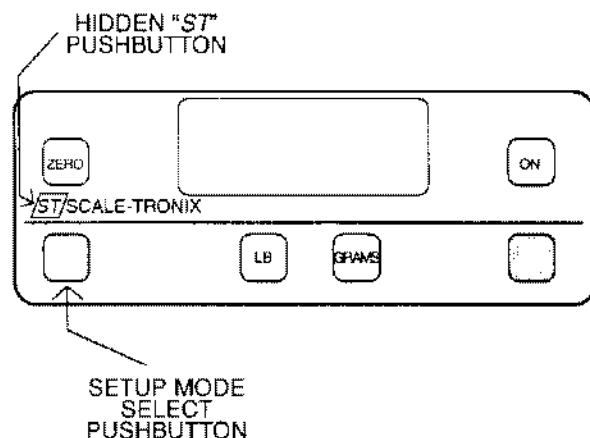
Co-axial style power plug, 2.1 mm inside diameter, 5.5 mm outside diameter; inside tip is positive (+) polarity, outside barrel is negative (-) polarity. (Important).

### 3.70 SPECIAL PROGRAMMING FEATURES

Your **SCALE-TRONIX®** second generation weighing 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, weight resolution, weighing units, etc.

#### 3.71 PUSHBUTTONS USED FOR THE "SET-UP" MODE

The set-up mode requires the use of several front panel pushbuttons which are not identified. An illustration of the front panel pushbutton layout is shown below.



There is an unmarked hidden pushbutton on the front panel, located 1½ inches (35 cm) directly beneath the "ZERO" pushbutton (horizontally in-line with the "LB" & "GRAMS" pushbuttons; see the front panel illustration). This is the setup mode select pushbutton. An additional "hidden" pushbutton is located under the **SCALE-TRONIX®** "ST" logo (the "ST" in a box).

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

To enter the "set-up" mode start with the scale turned off. Press and hold the hidden "**ST**" pushbutton on the front panel while turning the power on with the "**ON**" 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 accessed.

The **SET-UP MODE SELECT 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**" pushbutton, this will save the selection data. When the scale is turned back on, normal scale operation will then resume using the newly programmed features.

### 3.73 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 1.03**"). 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 "**10.26.98**" would correspond to October 26th, 1998. 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 (i.e: "**4302**"). 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 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 45 seconds. It can be altered in 15 second increments from 15 seconds to 180 seconds (3 minutes). An additional "**Conf**" (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**" pushbutton. Use of the continuous mode of operation is not recommended since it will discharge the battery. Do not confuse this with the "**AC con**" option.

To alter the length of the automatic shut-off time press the set-up mode select 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 provided on the model **4302** scale so that it will remain on continuously when operated with an external AC power Adapter (see section 3.60) (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 set-up mode select pushbutton. This option is normally set at "**On**".

7.) Press the "**ST**" pushbutton. The scale will display "**rES**" (resolution of weight). Press the "**ST**" pushbutton again. The "**POUNDS**" annunciator will light and a number will be displayed. This number represents the selected resolution of the scale. Pressing the set-up mode select pushbutton will allow the following selections:

0.001 pounds (1 gram)  
0.002 pounds (1 gram)  
0.005 pounds (approx 2.2 grams)  
0.010 pounds (approx 4.5 grams)

Normal factory selection is 0.001 pounds.

8.) Press the "**ST**" pushbutton. The scale will display "**Units**" (weight units). Press the "**ST**" pushbutton again. The "**POUNDS**" annunciator will light, and the display will show "**On**" or "**OFF**", indicating whether or not the pounds weight units are enabled or not. Press the set-up mode select pushbutton to change this option.

9.) Press the "**ST**" pushbutton again. The "**OUNCES**" annunciator will light, and the display will show "**On**" or "**OFF**", indicating whether or not the ounces weight units are enabled or not. Press the set-up mode select pushbutton to change this option.

10.) Press the "**ST**" pushbutton again. The "**GRAMS**" annunciator will light, and the display will show "**On**" or "**OFF**", indicating whether or not the grams weight units are enabled or not. Press the set-up mode select pushbutton to change this option.

11.) 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 set-up mode select 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.

12.) 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.

13.) 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**" pushbutton, or the option list may be run-through another time. If left alone 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.)

14.) The selected parameters will be saved in memory when the scale shuts off.

### 3.80 STORAGE

The scale should be stored in a safe place such as equipment storage room, closet, etc. It is no longer necessary to store the scale near an electrical outlet as in the past for recharging of the batteries. **Do not store items on top of the weighing platform.** Remove batteries if stored for an extensive period of time.

### 3.90 MAINTENANCE

Contact the factory for electronic maintenance or operating problems. Most problems 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 scale for obvious signs of damage or loose or missing hardware.
- 3.) Replace batteries annually or as required.
- 4.) Do not expose scale to excessive water or moisture.
- 5.) Do not store the scale where heavy objects may be set on it

### **3.100 FACTORY RETURNS**

In returning any components to the factory, please use the original shipping containers designed for this purpose.

You must call our factory service department at 630-653-3377 for a proper RMA (Returned Material Authorization) number and shipping instructions and special address.

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

When calling the factory for service assistance, the serial number and model number of the scale must be mentioned 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 adhered to the side of the scale.)

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

**This will only cause delays as the items will be returned to you.**

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

# TECHNICAL DESCRIPTION

(Employing 23005R02 instrument board and 22DSDPR01/02/03 display board)

## 4.00 GENERAL

**SCALE-TRONIX®** **SECOND GENERATION SCALES** utilize the latest developments in electronic scales and microcomputer technology to provide highly reliable and accurate weighing scales, human engineered to be easy to use. This section describes the technical aspects of the scale.

### 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 readout. **SCALE-TRONIX®** uses proprietary designed load cells in most of its scales to optimize performance and reliability.

The load cell employed in the **SCALE-TRONIX®** model **4302** is referred to as a "co-planar beam". This transducer is fabricated from a single, flat piece of aluminum stock. Special areas are machined into the beam to cause it to bend in response to applied weight. Strain gauges are bonded to these areas to convert the change in length caused by the bending into an electrical signal.

A total of four strain gauges are used in order to maximize signal output and provide a very linear output. Use of four gauges also helps to insure an accurate weight output regardless of the position of the load on the weighing platform. These gauges are interconnected to form the familiar "Wheatstone bridge" configuration. Additional components are contained within the co-planar beam's wiring to compensate for temperature effects.

### 4.20 READOUT ELECTRONICS

The **SCALE-TRONIX®** model **4302** Organ/Tissue Scale employs the model

23005 computer instrument board and the 22DSDP display board. **Note:** Different revision levels of these boards may be incorporated in your scale depending on its manufacturing date. Differences between these boards will be noted in the description where applicable.

Readout 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.

### 4.21 DIFFERENTIAL SIGNAL AMPLIFICATION

The weight dependent output signal produced by the load cell transducer 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 over-voltages 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

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 vibration or motion of the weighing platform. U5, like U4, is "chopper-stabilized" to correct internal offset and drift errors.

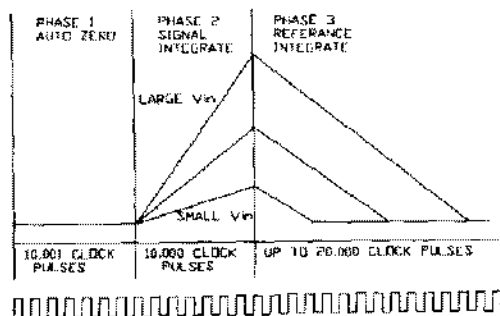
Resistors R24/R25 are used to increase gain. An additional low-pass filter stage is furnished by resistors R34 and R34A, and capacitor C23.

## 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.

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.



## A/D CONVERTER TIMING DIAGRAM

### 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.

### 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 count.

#### 4.23.5 CLOCK CIRCUIT

A clock is required for the A/D converter, integrated circuit U8. A clock signal is generated internally in microcomputer U10 and appears on port pin "P1.0". The frequency is internally set by the microcomputer's software and is nominally 120 KHz.

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

The **SCALE-TRONIX®** model 4302 Organ/Tissue Scale is powered by a battery consisting of six (6) disposable size "C" alkaline cells. A jack is also provided for connection of an external AC power adapter. Additional circuitry is included to switch the battery supply, provide voltage regulation, and detect low battery voltage conditions.

#### 4.24.1 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 switch S9 ("ON") and diode CR10; diode CR13 is used to signal input pin "PB.7" of port expander U7 that the "ON" switch 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.

#### 4.24.2 VOLTAGE REGULATION

Voltage regulators VR1 and VR2 render regulated sources of +5 Volts DC 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.

#### 4.24.3 +9.5V/-7.5V SUPPLY

Integrated circuit U2 is used to convert +5 Volts DC to +9.5V and -7.5 Volts DC 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.

#### 4.24.4 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 the busy signal of U6 (pin 21) through resistor R36 to the driver for the front panel "**LO BATT**" indicator. This causes the "**LO BATT**" indicator to flash when the battery is low.

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 an I/O pin on microcomputer U10 to signal the microcomputer that "low-low" battery has been recognized.

The 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 flashing "**LO BATT**" annunciator.

#### 4.24.5 EXTERNAL POWER SUPPLY JACK

A jack is mounted on the rear of the scale's cabinet in order to accept an AC power adapter. An AC power adapter is useful for situations where the scale is operated continuously and battery operation would therefore be impractical. A combination of hardware and software in the scale will prevent it from automatically shutting-off, if desired, when operating on an external power supply.

The external AC power adapter is not included with the purchase of the scale, but a suitable unit can be found at many local retail stores. See section 3.60 for the requirements of the external AC power adapter.

When operating on the internal battery a switch within the external power supply jack connects the negative side of the battery to the negative power input of the instrument board. When the external AC power adapter is plugged into the jack the switch disconnects the battery from operation, preventing it's discharge.

External DC power from the jack is connected to the instrument board through a schottky diode. This diode provides additional reverse polarity protection, and isolates the battery from the external power sense line. When the external supply is connected and energized it also provides voltage to the external power sense line. This line is used to detect operation of the external power supply, as explained in the following section, 4.24.6.

#### 4.24.6 EXTERNAL POWER MONITOR CIRCUIT

Transistor Q4, along with resistors R56, R57, and R58, is used to monitor the external power sense line. Q4's collector is connected to an I/O pin of U7 to tell microcomputer U10 when the external power supply is connected and energized. Software contained in U10 recognizes this and prevents the scale from automatically shutting-off when external DC power is present. When external DC power is not present, the external power sense line is not energized, and the scale will shut off after some period of inactivity to prevent discharging the battery. (Note: This feature is software selectable; see section 3.73)

## 4.25 MICROCOMPUTER AND SUPPORT CIRCUITS

To attain various additional features such as automatic zero tare, pounds/grams/ounces conversion, automatic shut-off, weight calibration, etc., a microcomputer is employed to additionally process the data supplied by the A/D converter. This microcomputer system consists of U10, a microcomputer; U7, a peripheral port expander to furnish additional input/output lines; U9, a non-volatile memory which stores information required for scale operation; 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 P1.0 through P1.6). The microcomputer also continually scans the keyboard (using U7) 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.

### 4.25.1 PORT EXPANDER/KEYBOARD/BEEPER

Integrated circuit U7 is included to supplement the I/O (input/output) of the microcomputer system. U7 contains additional I/O lines (referred to as "ports"). Microcomputer U10 reads (from input lines) or writes (to output lines) data to U7 periodically by use of the data bus (lines DB0 through DB7) and the /RD and /WR lines.

The front panel keyboard is attached to some of U7's input port pins (PB.0 through PB.7, and PC.4). Resistor networks R42/R43 serve as "pull-ups" and

keep the input pins at a "high" state (+5V) until a key switch is pressed; this pulls the respective input pin "low" (0V). The microcomputer will recognize this key press when it reads the input pins from U7 and if the key remains closed for a number of milliseconds the microcomputer will execute that key's function.

A small audio annunciator is driven by transistor Q3, which in turn is controlled by U7's output pin PA.7. The annunciator gives a short beep as audible recognition of a key being pressed. The length of the beep and its various sequences are controlled by U10's software. Additional output lines of U7 are used to control the driver for annunciator lamps on the display.

### 4.25.2 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 weight calibration data) 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 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. Capacitor C36 improves power supply bypassing.

### 4.25.3 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, "RS/Vpd", 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. The reset pulse is also connected to port expander U7 pin 4, "RST".

#### 4.30 DISPLAY BOARD

Presentation of the weight information is performed by the model 22DSDP display board. It incorporates LED (light-emitting diode) digits and annunciators to provide a clear, bright, easy-to-read display.

The weight value is displayed on six large (0.51") bright, light emitting diode (LED). These are driven in a multiplexed fashion (one digit on at a time) by LED driver U1. U1 receives the digit display information from the microcomputer's parallel data bus (DB0-DB7) and automatically performs the multiplexing function. Resistor package RP1 sets the operating current level for the displays.

A variety of LED annunciator lamps are contained on the front panel to indicate "POUNDS", "GRAMS", "OUNCES", and "LO BATT". 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 port expander circuit U7. Resistor packs RP2 and RP3 provide current limiting for the annunciators.

Display boards 22DSP R01, 22DSP R02, and 22DSP R03 are all equivalent in operation with some minor changes in board layout to improve spacings. Some minor differences in connections to the terminals of the resistor networks were also made to improve spacings.

#### 4.40 TROUBLE SHOOTING PROCEDURES

The following simplified trouble shooting 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 24 hours. Call first to discuss the problem.

##### 4.40.1 DISPLAY DOES NOT ILLUMINATE

Check that known good cells are properly installed in the battery holder. If an external AC power adapter is employed check that its plug is fully inserted into the power jack and that it is energized.

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 DC supply voltages can be made with a DVM or analog multimeter.

##### 4.40.2 WEIGHT READING NOT ACCURATE

This can commonly be caused by a mechanical obstruction of the weighing platform. Check that the platform 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").

##### 4.40.3 SCALE DISPLAYS "O-LOAD"

This indicates the scale's internal microcomputer has received a signal in excess of its expected value. "O-LOAD" indicates the weight signal is larger than the maximum value assigned to that particular model (see specifications on inside front cover). If the weight value is within the specified range this indicate a damaged transducer or defective instrument board.

The "O-LOAD" can also indicate a signal outside the range of the internal A/D converter has been applied. This is most likely caused by a damaged or disconnected transducer cable. Check the internal connection of the load cell transducer to the "J4 LOAD CELL" connector.

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

Check that the load cell transducer is plugged into the instrument board. The platform cable, connector or load cell transducer may be defective. The load cell transducer's resistance can be checked with an ohmmeter after unplugging from the instrument board. 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) | 340-360 $\Omega$ |
|------------------|------------------|

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.

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

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

If a particular function does not work (example: no gram units) check if that particular function is turned off in the "SET-UP" mode (see section 3.70).

#### 4.40.6 ERROR MESSAGE DISPLAYED: "E-FAIL", "r-FAIL", "A-FAIL", "n-FAIL", or "C-FAIL"

This indicates a failure of the internal microcomputer's memory system 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.

"n-FAIL" signifies a defective non-volatile memory ic, U9. Replacement of the ic is normally required.

"A-FAIL" implies a failure of the scale's Analog to Digital converter. Repair of the instrument board is required.

"C-FAIL" denotes a loss of the calibration constant stored in the scale's non-volatile memory. Re-calibration is required.

#### 4.50 CALIBRATION

Your scale has been carefully calibrated at the factory. This calibration involves matching and tuning of the load cell 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®.**

**THREE (3) 1000 GRAM (1.000 KILOGRAM) TEST WEIGHTS ARE RECOMMENDED.**

**TEST WEIGHTS MAY BE ORDERED FROM SCALE-TRONIX (PART NO. 41029).**

While three (3) 1000 gram test weights are recommended, other values can also be used. Since the maximum capacity of the scale is limited to 3000 grams (3.000 Kilograms) or 6.6 pounds, this limit cannot be exceeded with the total value of test weights.

Large changes in calibration often indicate a damaged load cell or faulty electronic component. In these situations it is best to return the scale to the factory for service.

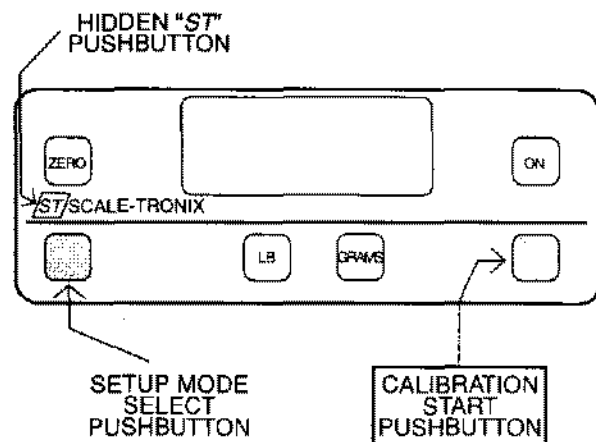
#### 4.51 HOW THE SCALE CALIBRATION WORKS

The **SCALE-TRONIX®** model **4302** employs a software technique to perform weight calibration. This turns the weight calibration into a simple procedure, eliminating the need for tools and making it unnecessary to open the scale's cabinet.

The internal microcomputer will automatically calculate the correct calibration factor needed for accurate operation when a known weight is applied to the platform and the calibration procedure is properly followed. This calibration factor is then stored in the non-volatile memory located on the instrument board, ic U9, for use by the scale.

When weight calibration is performed at the factory the calibration factor is additionally stored in a special register which cannot be overwritten by the user. This allows the user to restore the original factory calibration factor should this become necessary.

#### 4.52 CALIBRATION PROCEDURE



To perform the calibration procedure it is necessary to press some front panel pushbuttons which are not identified. To assist in this process an illustration of the scale's front control panel is shown above.

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

1. Be sure the scale is off. The scale should be placed on a flat, level surface and the weighing platform must not touch another object.
2. 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" 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" pushbutton briefly. This will reset the timer for an additional three minutes. (This does not apply if the scale is being powered by an external AC power adapter, since it will remain on continuously.)
3. There is an unmarked pushbutton on the front panel, located 1½" inches (35 cm) directly beneath the "ON" pushbutton (Horizontally in-line with the "LB" & "GRAMS" pushbuttons; see front panel illustration.) This is the CALIBRATION START pushbutton. An additional "hidden" pushbutton is located behind the **SCALE-TRONIX®** "ST" logo (the "ST" in a box; see front panel illustration).
4. While pressing the CALIBRATION START pushbutton, press and release the "ON" pushbutton. (The calibration start pushbutton will not be used in the remainder of this procedure)
5. After the scale displays the test pattern of "888888" release the CALIBRATION START pushbutton and press the "ST" pushbutton five (5) times. This will cause the scale to enter the calibration mode. The display will indicate "CAL".
6. There is an unmarked pushbutton on the front panel, located 1½" inches (35 cm) directly beneath the "ZERO" pushbutton

(Horizontally in-line with the "LB" & "GRAMS" pushbuttons; see the front panel illustration). This is the SETUP MODE SELECT pushbutton.

7. Press the "ST" pushbutton once more; the display will indicate "**rEstor**" (restore). This mode will provide restoration of the original factory calibration constants should this be desired. To continue with a complete field calibration skip to step 9.
8. To restore the original factory calibration press the "ST" pushbutton one more time. The scale will beep three times and display "**done**" (done), indicating the factory calibration constants have been restored. The scale can then be shut-off by pressing and holding the "ON" pushbutton. The process is finished.
9. To continue with a complete field calibration press the hidden SETUP MODE SELECT pushbutton. The scale will display "**do CAL**". Press the "ST" pushbutton and the scale will display "**CLEAR**" (clear). The scale now requires a "zero" reference to begin calculating the calibration factors. Remove all items from the top of the weighing platform.
10. Press the "ST" pushbutton again. A series of moving dashes ("- - - -") will be displayed as the scale measures the zero value of the platform. If the platform is in motion it will extend the time needed to obtain the reading. Once a stable value has been acquired the scale will beep twice and advance to the next step.
11. The scale will now display "**LOAD**" (load), indicating it is time to apply the calibrated test weight load to the platform. Apply the total amount of test weight to the center of the weighing platform.
12. Press the "ST" pushbutton again. A series of moving dashes ("- - - -") will be displayed as the scale measures the test weight(s) on the platform. If the platform is in motion it will extend the time needed to obtain the reading. Once a stable value has been acquired the scale will beep three times and advance to the next step.
13. The scale will now display "**EntEr**" (enter), indicating it requires the operator to enter the total of the test weight(s). Press the "ST" pushbutton again, the scale will show a value of "**1000 GRAMS**", with the "1" digit flashing.
14. Select the units that your test weights are marked in, either "LB" (pounds) or "GRAMS" (grams; kilograms X 1000), by pressing the appropriate front panel pushbutton.
15. Enter the total marked value of your test weight(s) by use of the "ST" pushbutton and the setup mode select pushbutton. The digit that is flashing will be incremented by pressing the setup mode select pushbutton. As an example, if "**1000 GRAMS**" is displayed, with the "1" flashing, pressing the setup mode select pushbutton twice will display "**3000 GRAMS**".
16. To adjust the remaining digits of the display press the "ST" pushbutton to select the digit that needs setting. This will be shown by the respective digit flashing. Repeat this process until the all the digits have the desired value.
17. Press the "ST" pushbutton until the displayed weight has no digits blinking. This indicates the entered value is correct and ready to be used in the calibration process. Press the setup mode select pushbutton to continue.
18. If the calibration has been successfully the scale will display "**done**" (done). The scale can then be turned off by pressing and holding the "ON" pushbutton.
19. If the calibration was not successful, the scale will display "**Error**" (error). This may be due to an error in following the calibration procedure, or an incorrectly entered value of test weight. Press the "ST" pushbutton to restart the calibration procedure.

#### **4.60 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 adhered to the side of the scale.)

**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.

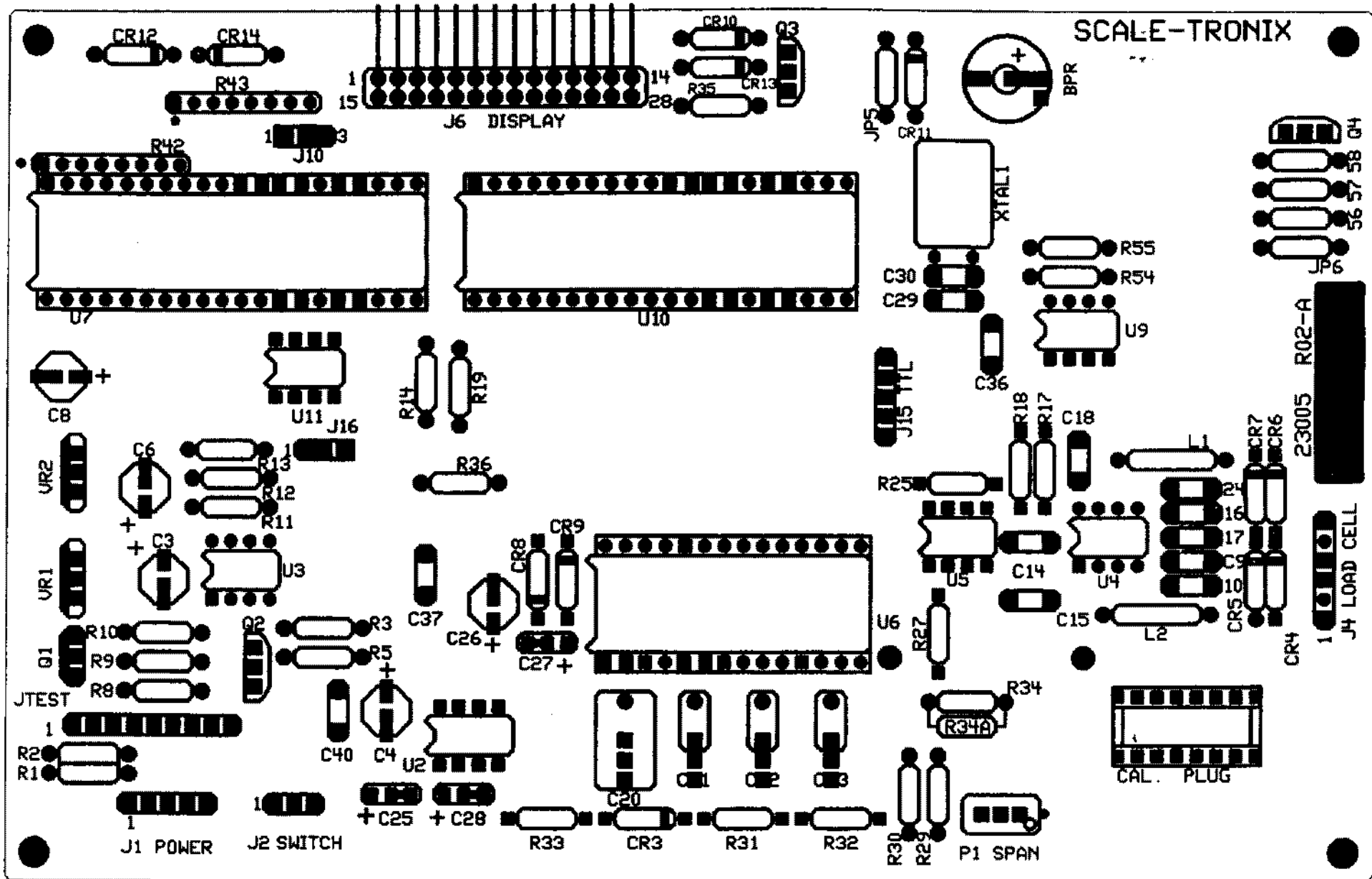
| PART NO. | DESCRIPTION                              |
|----------|--|
| 700058   | MAIN PCB CPU ASSEMBLY                    |
| 700027   | DISPLAY PCB ASSEMBLY                     |
| 720008   | FRONT PANEL & SWITCH ASSEMBLY            |
| 630008   | BATTERY HOLDER & BRACKET ASSEMBLY        |
| 630035   | BATTERY HOLDER & EXT POWER JACK ASSEMBLY |
| 750066   | POWER JACK & CABLE ASSEMBLY              |
| 255014   | CALIBRATION PLUG                         |
| 070070   | OPERATION & SERVICE MANUAL               |
| 030119   | WEIGHING TRAY FLAT                       |
| 039277   | BATTERY ACCESS PANEL                     |
| 030118   | CABINET                                  |
| 030112   | SUB-DECK                                 |
| 030123   | SPACER LOAD CELL                         |
| 66011    | RUBBER FOOT                              |
| 41002    | HANDLES                                  |
| 400035   | LOAD CELL, CPB 6 KG                      |
| 750014   | CABLE (MAIN TO DISPLAY)                  |
| 450016   | EPROM IC CHIP AT U10                     |
| 130231   | DC EXTERNAL POWER JACK                   |



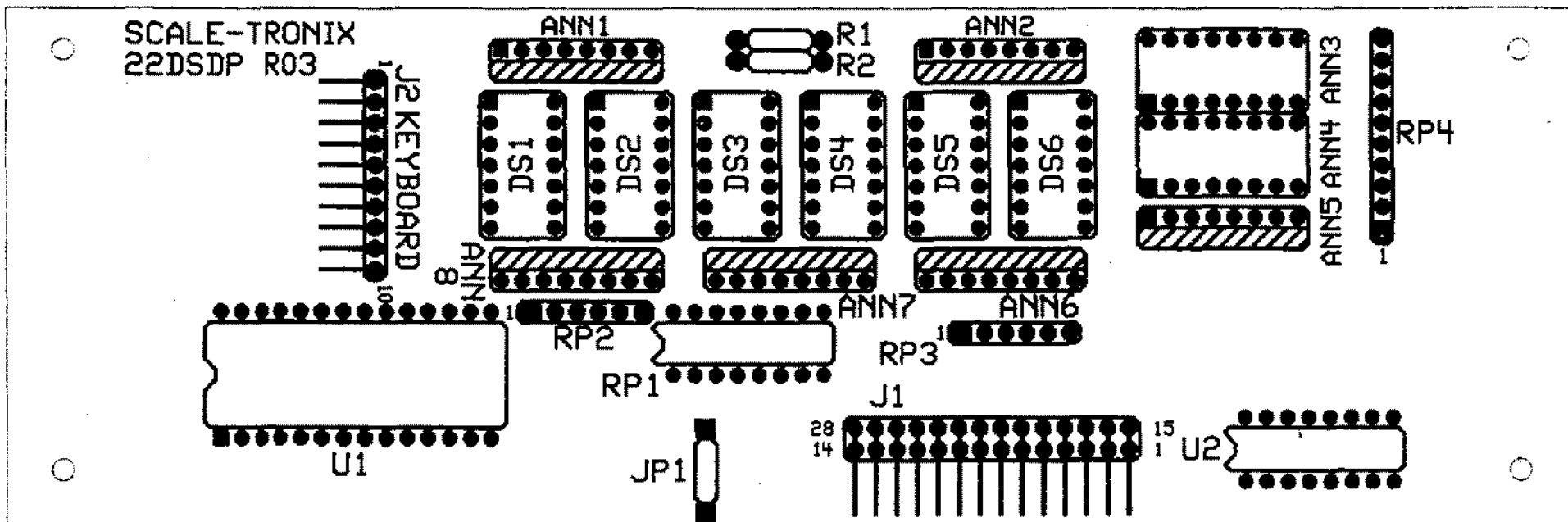
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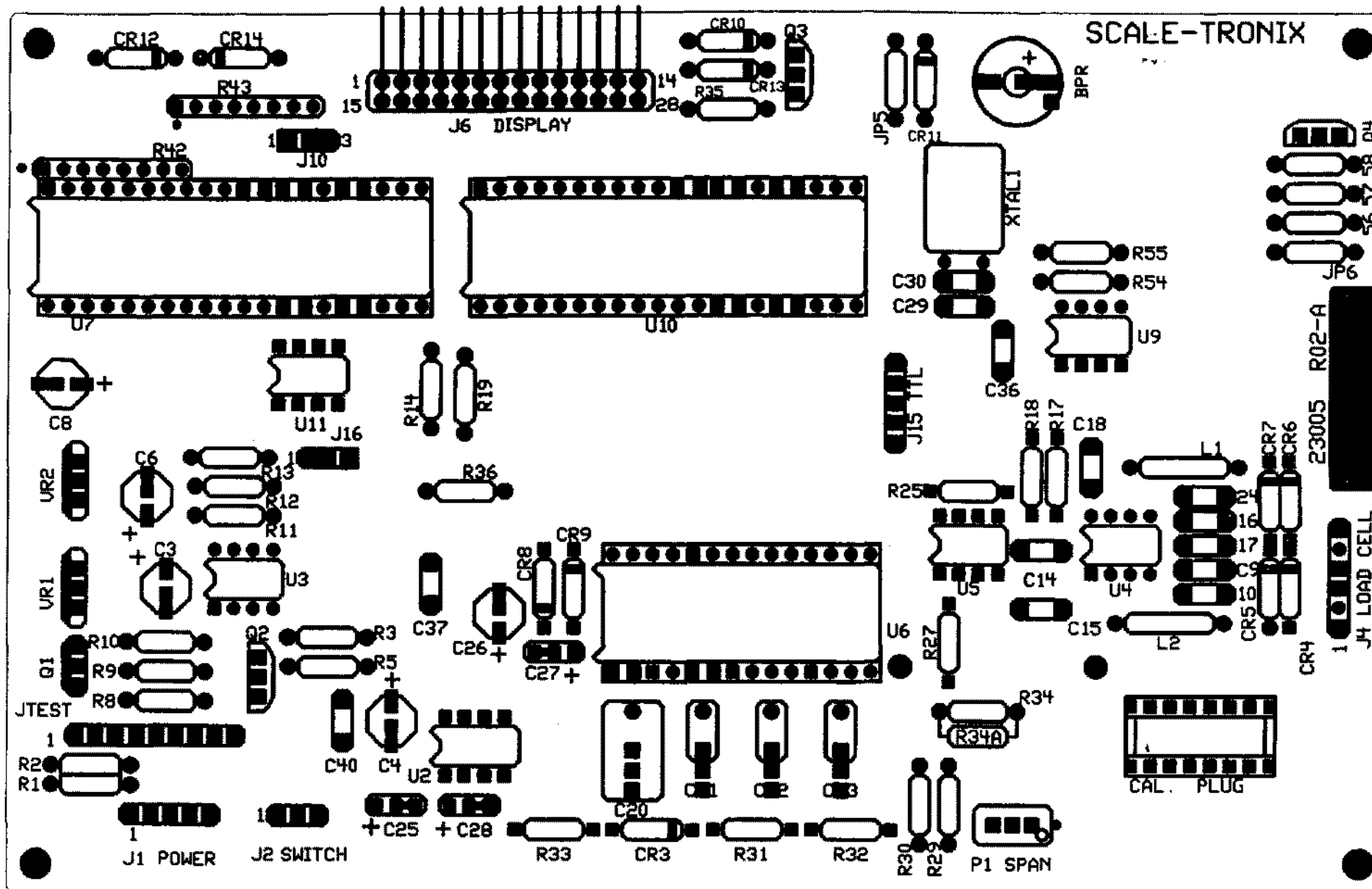




Note: Some annunciator lamps may be omitted depending on scale model & option.



22DSDPR03 DISPLAY BOARD COMPONENT LAYOUT  
(22DSDPR01 & 22DSDPR02 SIMILAR)



# 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.