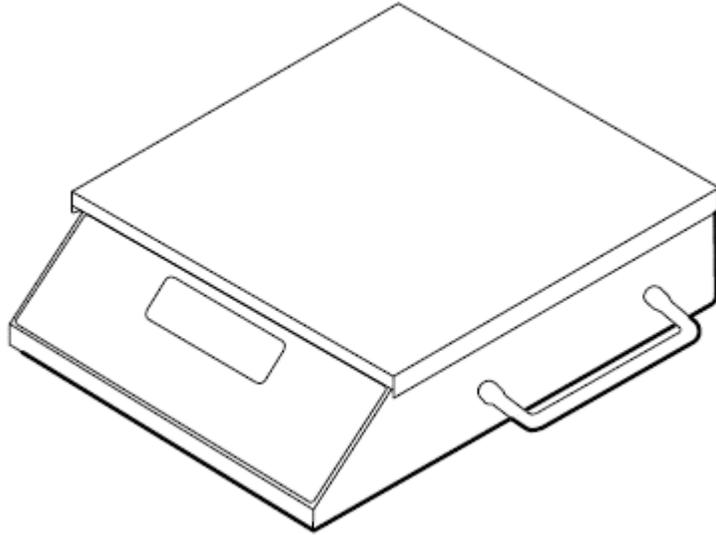


Welch Allyn Diaper and Organ 4302 Scale



Service Manual

Model 4302- Diaper and Organ Scale

WelchAllyn[®]

Advancing Frontline Care[™]

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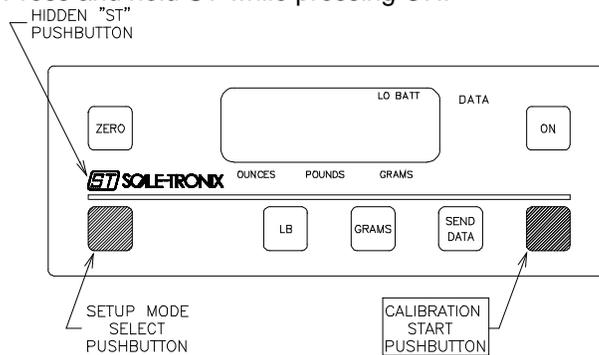
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Scale setup

You can customize the scale to best suit your needs. Configurations that can be selected include the automatic shut-off time, weighing units, weight resolution, and more.

Enter custom setup mode

1. Make sure the scale is powered down
2. Press and hold ST while pressing ON.



3. Once the scale powers up, press and release ST five times RAPIDLY. The scale displays SET-UP and produces a series of four long beeps.
4. The "SETUP MODE SELECT" pushbutton is used to select the particular option value.
5. 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.

Set the options

1. Enter the custom setup as described.
2. Press ST to scroll through the custom setup options.
3. The options displayed with each press are as follows:
4. Press the setup mode select button to turn these options On or OFF.

Note Options indicated with an asterisk (*) require an additional press of ST to change the value.

Option displayed Feature

SOFT This option displays the software version of your scale.

dAtE This option displays the release date of the software. The format is MM/DD/YY.

SCALE This option displays the model number of the scale.

AutOFF* This displays the number of seconds before the scale turns off. The Cont value prevents the

scale from turning off automatically.

AC con* This option causes the scale to remain on when plugged in to AC power.

rES This option allows you to change the resolution of weight. Pressing ST switches between the following options:

LBS	Grams	Ounces
0.001	0.4535924	0.016
0.002	0.9071847	0.032
0.005	2.267962	0.008
0.010	4.535924	0.160

UnitS* This option allows you to change the displayed weight unit.

Note Do not change the scale units if you have purchased the kilogram-only option.

POUNDS* This option allows the weight to display in Pounds.

OUNCES * This option allows the weight to display in Ounces

GRAMS* This option allows the weight to display in Grams

bEEPEr* This option determines the audible signal that occurs when a front panel button is pressed.

PC brd* This option displays the model number of the printed circuit board. A second press of ST displays the revision of the printed circuit board.

SEt-UP This option is displayed when you have cycled through all the options. Press and hold ON to power down the scale.

Enter Advanced Service Mode

1. To enter the "service" mode start with the scale turned off.
2. Note the small "ST" logo ("ST") located below the "Zero" pushbutton on the front panel of the readout.
3. This "ST" actually contains a small hidden pushbutton.
4. Next; press and hold the "Zero" pushbutton on the front panel while turning the power on with the "ON" pushbutton.
5. As soon as the scale turns on release the "Zero" pushbutton, then quickly press and release "ST" logo pushbutton 5 times.
6. The scale will display "SERVICE" and produce a series of four long beeps.
7. "Service" mode has now been entered.
8. Pressing the "ST" pushbutton will advance the display to the next item.
9. The scale will exit the service mode automatically after 3 minutes, or shut-off by pressing and holding the "ON" pushbutton for 3 or 4 seconds.
10. When the scale is turned back on, normal scale operation will resume.

Menu List for [Advanced Service Mode](#)

1. "A/D Out", and "A/D Adu" next window on display will show the raw A/D reading. As you press on the Platform the A/D reading will change. The weight change reading should be positive proportionally with the applied weight in pounds.
2. "Test", and the next window will start displaying the display test, Number will show across from 0 to 9 and repeat w/ DP, from right side to left side.
3. "Pr-OnS" = Power on start-up, next display will show the number of times the "ON" pushbutton has been depressed.
4. "COUnTS" = Weighing Counts, next display will show the number of times a weight reading has been achieved.
5. "OFFS" = Turned Off, next display will show the number of times the scale has been turned off by holding the "ON" pushbutton down.
6. "PrintS" = Prints, next display will show the number of times the "Print" pushbutton has been depressed.
7. "SEtUPS" = set-up mode, next display will show the number of times the unit has entered into the set-up mode.
8. "SEruES" = service mode, next display will show the number of times the unit has entered into the service mode.
9. "CALs" = Cal mode, next display will show the number of times the unit has entered into the Cal mode.

Support services

If you have a problem with the device that you cannot resolve, call the Welch Allyn Technical Support Center nearest you for assistance. A representative will assist you in troubleshooting the problem and will make every effort to solve the problem over the phone, potentially avoiding an unnecessary return. Technical support is available 9am-5pm EST..

Welch Allyn offers the following technical support services:

- Telephone support
- Replacement service parts
- Product service

For information on any of these services, go to www.welchallyn.com/en/servicesupport.html.

Warranty

Welch Allyn will warranty the weight scale to be free of defects in material and workmanship and to perform in accordance with manufacturer specifications for the period of one year from the date of retail purchase.

The warranty period shall start on the date of purchase. The date of purchase is: 1) the invoiced ship date if the device was purchased directly from Welch Allyn, 2) the date specified during product registration, 3) the date of purchase of the product from a Welch Allyn authorized distributor as documented from a receipt from said distributor.

This warranty does NOT cover damages caused by misuse or abuse, including but not limited to:

- Failure caused by unauthorized repairs or modifications
- Damage caused by shock or dropping during transportation

Damage caused by improper use of the power supply
Failure caused by improper operation not consistent with the instructions stated in the Directions
for use.

Should this device require maintenance (or replacement at our option) under warranty,
contact your local Welch Allyn representative: [http://www.welchallyn.com/en/other/
contact-us.html](http://www.welchallyn.com/en/other/contact-us.html)

Warranty service

All repairs on products under warranty must be performed or approved by Welch Allyn.

Refer all warranty service to Welch Allyn Product Service or another authorized Welch Allyn Service Center.

Obtain a Return Material Authorization (RMA) number for all returns to Welch Allyn Product Service.

CAUTION Unauthorized repairs will void the product warranty.

Non-warranty service

Welch Allyn Product Service Centers and Authorized Service Providers support non-warranty repairs. Contact any Welch Allyn regional service center for pricing and service options.

Welch Allyn offers modular repair parts for sale to support non-warranty service. This service must be performed only by qualified end-user biomedical/clinical engineers.

Repairs

A Welch Allyn Service Center or Authorized Service Provider must perform all repairs on products under warranty unless you are a properly certified technician.

CAUTION Unauthorized repairs will void the product warranty.

Qualified service personnel or a Welch Allyn Service Center should repair products out of warranty.

If you are advised to return a product to Welch Allyn for repair or routine maintenance, schedule the repair with the service center nearest you.

Returning products

When returning a product to Welch Allyn for service, ensure that you have the following information:

- Product name, model number, and serial number. This information may be found on the product and serial number labels.
- A complete return shipping address.
- A contact name and phone number.
- Any special shipping instructions.
- A purchase-order number or credit-card number if the product is not covered by a warranty.
- A full description of the problem or service request.

1. Obtain an RMA number. Contact Welch Allyn and request.

Note Welch Allyn does not accept returned products without an RMA.

2. Ship the device to Welch Allyn, observing these packing guidelines:

Remove from the device the battery, all hoses, connectors, cables, sensors, power cords, and other ancillary products and equipment, except those items that might be associated with the problem.

Dispose of damaged or leaking batteries in an environmentally safe manner consistent with local regulations.

Note: To ensure safe receipt of your device by the service center and to expedite processing and return of the device to you, thoroughly clean all residues from the device before you ship it to Welch Allyn. For cleaning requirements, see the Cleaning instruction in the Directions for Use.

Welch Allyn thoroughly cleans all returned devices on receipt, but any device that cannot be adequately cleaned cannot be repaired.

3. Write the Welch Allyn RMA number with the Welch Allyn address on the outside of the shipping carton.

Scale Technical Description

General

Welch Allyn second generation scales utilize the latest developments in electronic scales and microcomputer technology, engineered to be easy to use. This section describes the technical aspects of these scales.

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. **Welch Allyn** uses proprietary designed load cells in most of the scales to optimize performance and reliability. One of three types of load cell transducers may be used in your scale depending on the model number.

Model 4302

The load cell employed in the 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 a 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.

Readout Electronics

The Welch Allyn second generation scales employ 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.

1. Readout electronics consist of the following:
2. Differential signal amplification.
3. Additional amplification and signal filtering.
4. Analog-to-Digital (A/D) converter and Clock circuit.
5. Battery and support circuitry, voltage regulators, power supplies, etc.
6. Microcomputer and support circuitry.
7. Display board.
8. Printer assembly.
9. Printer interface board.
10. Printer controller board.

Differential Signal Amplification

The weight dependent output signal produced by the load cell transducers in the weighing frame 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 cells is applied to the protection network consisting of diodes CR4/CR5/CR6/CR7. These diodes prevent destructive high 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 furnished compensation of U4 by reducing amplification at higher frequencies.

Additional Amplification and Signal Filtering

Components for an optional second gain stage may be added on the printed circuit board. If included, 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.

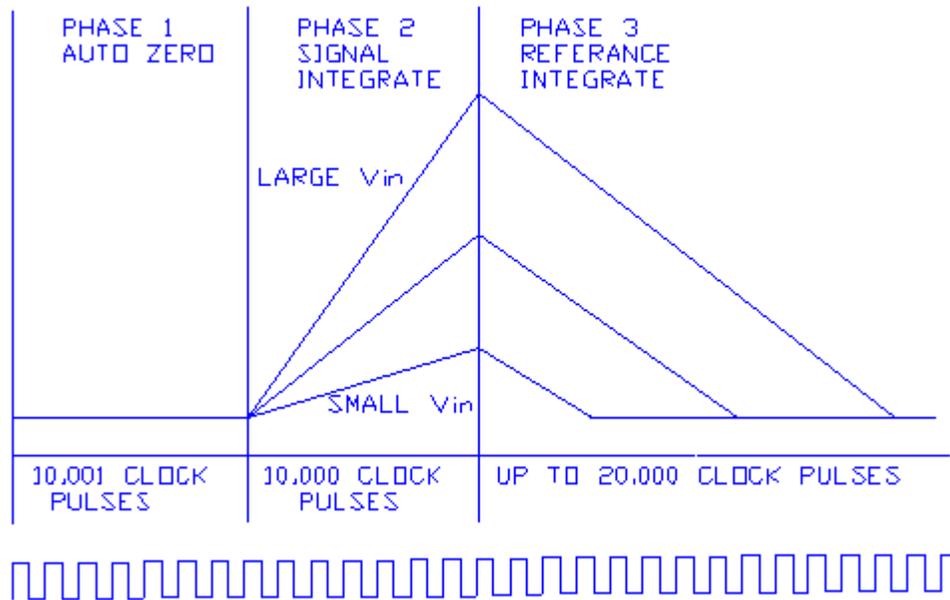
Resistors R24/R25 (optional) are used to increase gain; resistors R26/R27 (optional) are used to gain reduction. An additional low-pass filter stage furnished by resistor R34 and capacitor C23.

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 (4-1/2 digits). The weight signal voltage is applied to the analog input (pin 10) of U6.

A reference voltage for the conversions 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 time diagram when reading the following description.



A/D Convertor Timing Diagram 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).

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.

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.

Zero Integrate 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.

Clock Circuit

A clock is required for the A/D converter, integrated circuit U6.

A 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.

Power Switching, Voltage Regulation and Support Circuitry

Depending upon their configuration, WELCH ALLYN second generation scales may contain disposable primary cells. Additional circuitry is included to switch the battery supply, provide voltage regulation and detect low battery voltage conditions.

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 \overline{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.

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.

+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 the 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 produces a negative voltage. Diodes Cr8 and CR9 reduce the voltage slightly to obtain the desired -7.5 volts.

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 the "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.

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; U7, a peripheral port expander to furnish additional input/output lines; U9, a non-volatile memory which stores the previous weight reading; and U11 (23005 R02 only), 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.

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 number of milliseconds the microcomputer will execute that key's function.

A four position "DIP" (dual in-line package) switch, SW1, may be optionally included. It is connected to U7's "C" port, lines PC.0 through PC.3. It is used to select software contained in U7.

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.

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 may require lasting data retention (such as last weight recall) integrated circuit U 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 U 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.

Rest 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. The reset pulse is also connected to port expander U7.

Display Board

Presentation of the weight information is performed by the model 2DSDP 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, 0.51" high common cathode digits. 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", "OUNCES", or "GRAMS", 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 spacing. Some minor differences in connections to the terminals of the resistor networks were also made to improve spacing's.

Maintenance of Scale

Routinely perform the following preventive maintenance to keep your scale in working order.

- Check the calibration annually or as required.
- Inspect the scale for cracks or loose mounting hardware. Replace or repair as necessary.
- Visually inspect the scale enclosure for damage or loose or missing hardware.
- Replace or repair as necessary.
- If equipped, inspect the AC line cord for abrasions or other signs of wear.
- Do not expose the scale to excessive water or moisture.
- Do not store the scale where heavy objects can be placed on it.
- Replace the batteries annually or as required.
- Do not service or perform maintenance while the scale is in use with a patient.

Battery replacement

Battery Replacement

The batteries 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.

Caution: Do not open the other bottom panel fastened with Allen head screws.

In situations where the scale is not used extensively, the batteries should be replaced annually just as a precaution.

Typical battery life is in excess of one year depending on usage. 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 weighing’s left in the battery when the “LO BATT” warning is activated. The batteries should be replaced within a few days of this warning.

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.

CAUTION Use only size C disposable alkaline batteries. The use of any other battery will void the warranty.

1. Use a screwdriver, remove the two fasteners on the access door located on the rear of the mast and remove the door.
2. Install six new batteries in the battery holder. Make sure to follow the polarity instructions.
3. Re-attach the access door.

Use of AC power adaptors

The model 4302 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 batteries. This is particularly useful in situations where it may be desirable to leave the scale on continuously.

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 batteries. An option in the scale's set-up menu allows the scale to remain "ON" continuously when powered from the external AC power adapter.

Specifications for AC power adapter:

Voltage: Minimum of 7.5 Volts DC; Maximum of 12.0 Volts DC.

Current: Minimum of 200 milli-amperes (200mA); maximum of 1.0 ampere (1000mA).

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.

Calibration of Scale

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 WELCH ALLYN 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 Weights are available from Welch Allyn or readily available on the internet.

Three (3) 1000 Gram or 1 Kilogram are recommended. Welch Allyn part number 41029. (1.0 kg Test Weights)

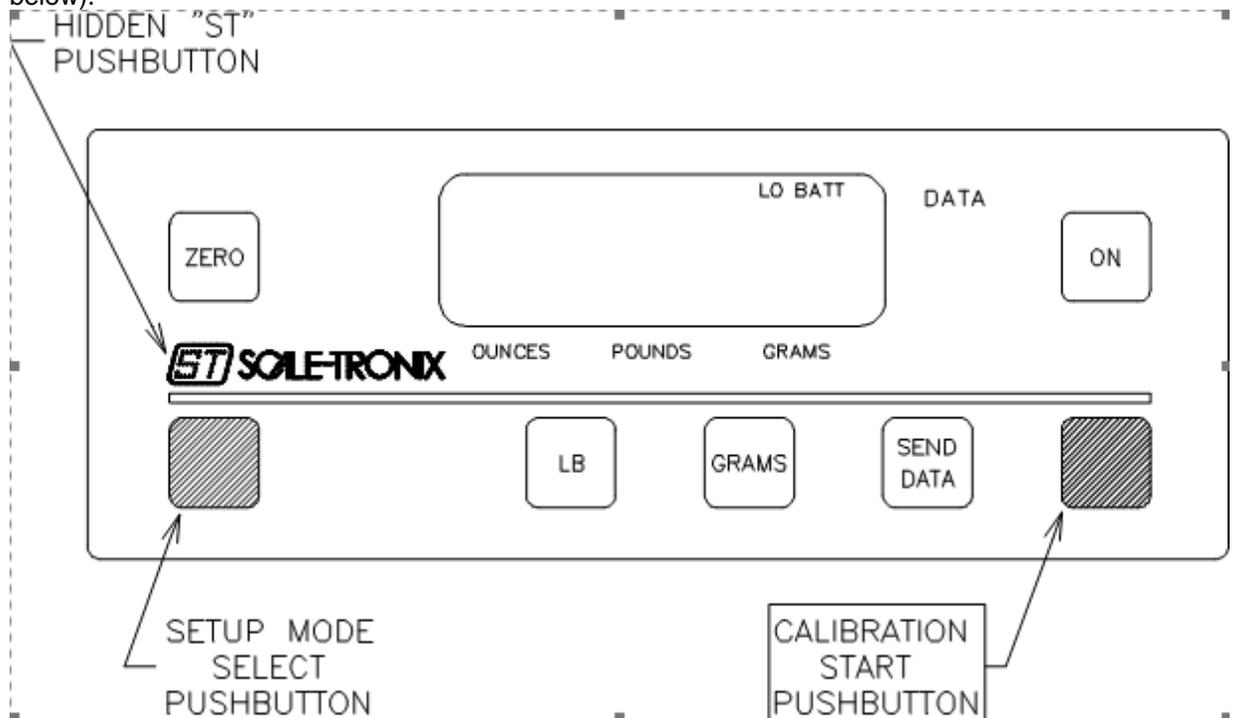
Large changes in calibration often indicate a damaged load cell or faulty readout component. It is generally recommended that if calibration is necessary for your scale it should be returned to the factory. Calibration procedure follows for those situations where it is not desirable. Calibration should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

Calibration Procedure

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

1. Be sure scale is off. The scale should be placed on a flat, level surface and the weighing platform must not touch another object.

- 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 DC power supply, since it will remain on continuously.)
- 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 above). 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 below).



- 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)
- 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".
- 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.
- 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.
- 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 (lbs or Kg only).
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.
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.

Disassembling of Scale

Required Tools:



From left to right

- 5/32" Allen wrench
- 1/8" Allen wrench
- 10 mm socket
- #1 Phillip screwdriver
- #2 Phillip screwdriver
- ¼" Ratchet driver with extension

TORQUE SPEC: 53.13 INCH LBS

Power down the scale and remove any A/C power

CAUTION: Do not apply extra force to the base of the scale. The load beam capacity can overload and cause damage to the load beam.

Note: Whenever the scale is opened for repair purposes a Calibration must be performed.

1. Pull the top plate up to remove it



2. Use a #1 Phillip screwdriver to remove the three screws on the battery access door



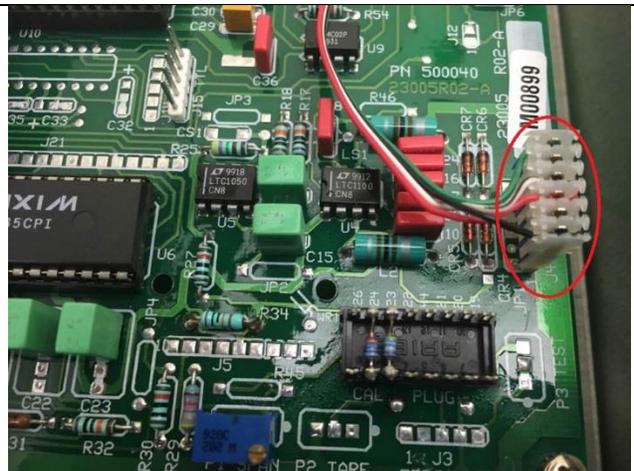
3. Remove batteries



4. Use a 1/8" Allen wrench to remove the five screws on the bottom cover panel



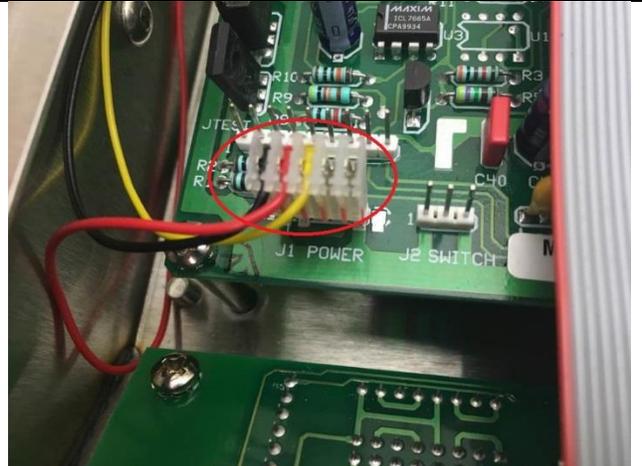
5. Disconnect the J4 Load Cell connector from the board



6. Disconnect the J6 Display cable connector from the board



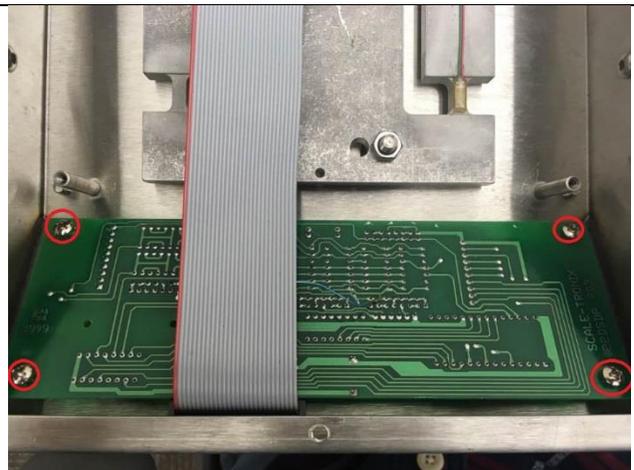
7. Disconnect the J1 Power connector from the board



8. Use a #1 Phillip screwdriver to remove the screws on each corner of the board



9. Use a #1 Phillip screwdriver to remove the screws on the display board



10. Unplug the blue-ribbon cable

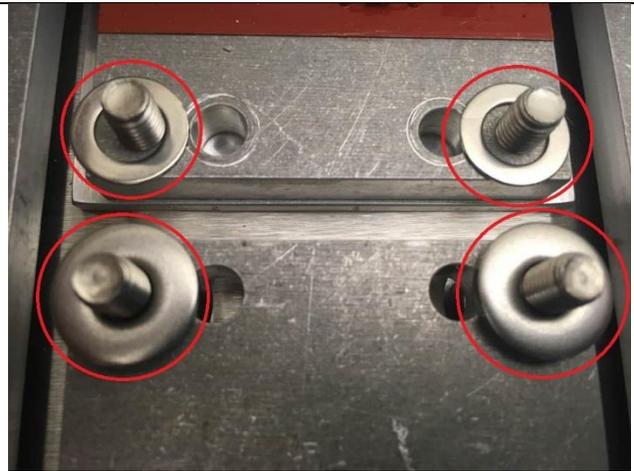


11. Use a 10mm socket to remove the nuts

CAUTION: Do not apply extra force to the base of the scale. The load beam capacity can overload and cause damage to the load beam.



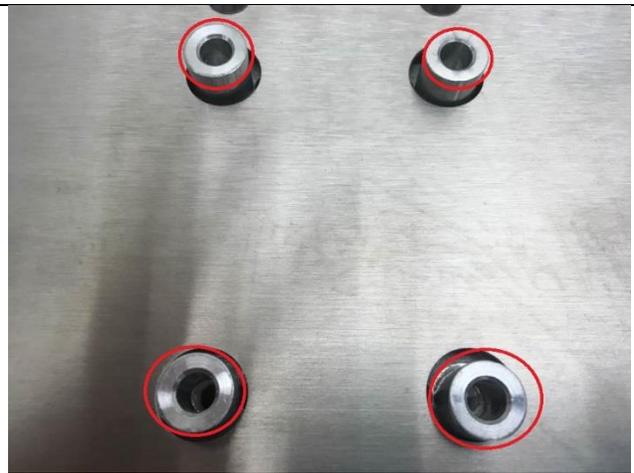
12. Remove the washers



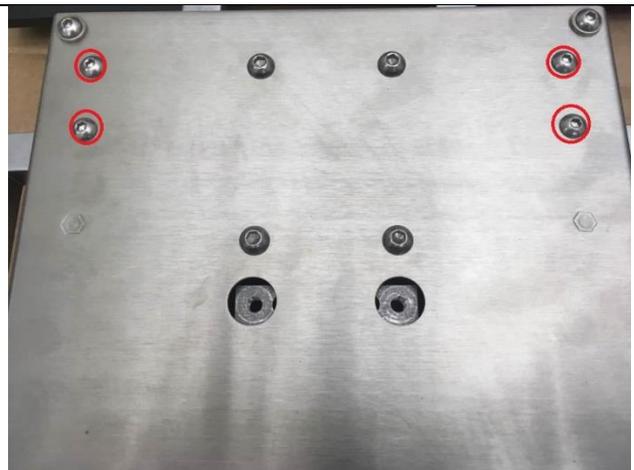
13. Use a #2 Phillip screwdriver to remove the four screws on the weighting platform



14. Remove the four spacers



15. Use a 1/8" Allen wrench to remove these screws

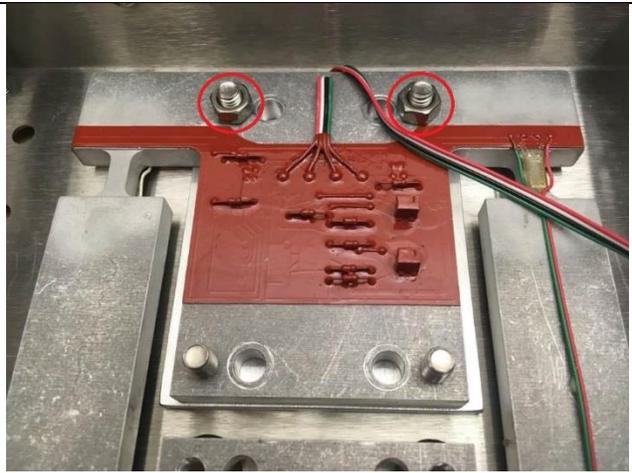


16. Remove the battery holder

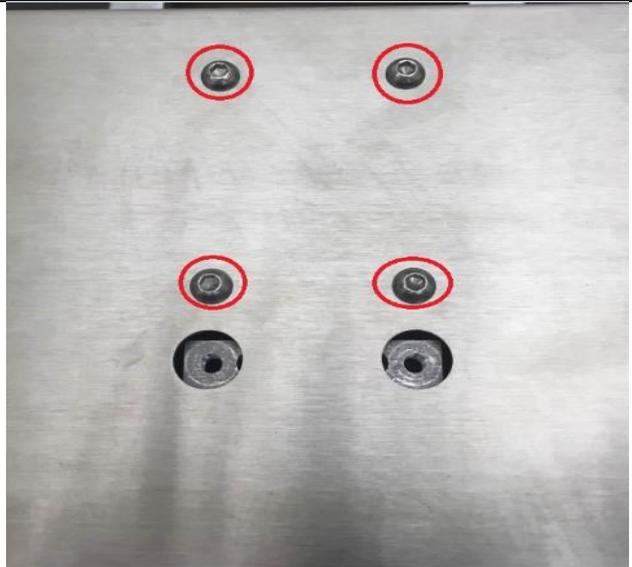


17. Remove the two remaining nuts on the load beam using a 10mm socket

CAUTION: Do not apply extra force to the base of the scale. The load beam capacity can overload and cause damage to the load beam.



18. Use a 5/32" Allen wrench to remove these four screws to remove the load beam.



Troubleshooting of Scale

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 over the telephone. Problems requiring factory service are usually handled quickly and the scale is on its way back. Call first to discuss the problem.

Display does not illuminate

Check that known good "C" size Duracell alkaline cells are properly installed in the battery holder. If an external D.C power supply 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 D.C supply voltages can be made with a DVM or analog multimeter.

Weight 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"). On those scales with masts check the mast cable for a firm connection to the base.

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. If the weight value is within the specified range, this indicates 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.

Reading doesn't change when weight applied

Check that the weight platform is plugged into the readout. 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 readout. The proper resistance values are listed below:

WIRE COLORS (PIN NO.)	RESISTANCE
GRN(1)/BLK(2)/WHT(3)/RED(4)	>10M Ω
GRN(1) TO BLK(2)	350-450 Ω
WHT(3) TO RED(4)	340-360 Ω

Consult Welch Allyn 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.

Non-Functioning Keys

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.

Error Message Displayed: "E-FAIL", "r-FAIL", "A-FAIL", "n-FAIL", or "C-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.

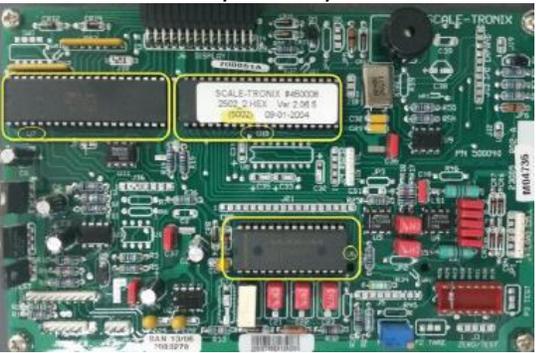
"**n-FAIL**" signifies a defective non-volatile memory ic, U9. Replacement of the ic is normally required.

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

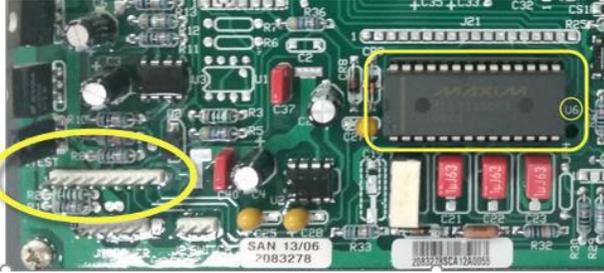
"**C-FAIL**" denotes a loss of the calibration constant stored in the scale's non-volatile memory. Re-calibration is required.

Symptoms and solutions

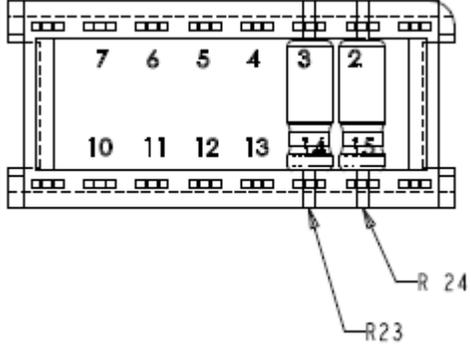
Symptom	Possible Cause	Corrective Action
Scale Does not turn on; Blank Display	Dead Batteries "C" Cell Alkaline Batteries	<ul style="list-style-type: none"> ▪ Check to make sure batteries are properly seated in battery holder. Reseat if necessary. ▪ Replace the "C" Duracell Alkaline batteries.
	Batteries with External Power Adapter (EPA)	<p>If you have the External Power Adapter (EPA). The optional EPA will bypass the C cell batteries. Plug EPA into outlet, and to the back of the unit, Press “ON” button for a second to see if unit turns-on/power-up.</p> <p>Use a voltage meter to check the “C” Cell batteries, should be 9.5 VDC (High) to 6.5 VDC (low), lower than 6.2 VDC batteries should be replaced.</p> <p>If Yes - Replace the "C" Duracell Alkaline batteries.</p> <p>If No – unplug EPA from outlet, and back of unit; Perform the below Steps.</p> <ol style="list-style-type: none"> 1. Check J1 Power connector on Main PC Brd; ensure Battery connector is correctly plugged into J1 Power on PC Brd, 5 pin header.

Symptom	Possible Cause	Corrective Action
		<ol style="list-style-type: none"> Verify the EPA output voltage. Replace if Necessary. Replace Main Board
	Cracked Battery Holder	Replace the Battery Holder Assembly.
	Display Cable	Check the pins in the cable to make sure the Display cable is properly aligned and seated
No Display, may have beep	Main PC Board	<ol style="list-style-type: none"> Main Board Check the U6, U7, and U10, IC Chips to make sure they are fully seated in IC Sockets.  <ol style="list-style-type: none"> Test for +5 Volts across pins 1 and 8 of JTest connector, for VR1, after pressing the "On" button. Test for +5 volts on VR2 Regulator Pin 3 for the Voltage to Microprocessor and the Display board, if no + 5 Volts, replace regulators, VR1, or VR2. Check U10 chip across pins 20 to Pin 18 (2.31V), across Pin 20 to Pin 19 (2.33V) +/- 0.1 Volts Check the crystal chip to ensure it is operational and functional. If one of the pins is at 0 or 5 volts, then the scale will not turn on. Replace the Board if necessary.
	Display Cable	Check the pins in the cable to make sure the Display cable is properly aligned and seated
Faint Low Battery Light	Crystal	<ol style="list-style-type: none"> Check U10 chip across pins 20 to Pin 18 (2.31V), across Pin 20 to Pin 19 (2.33V) +/- 0.1 Volts.

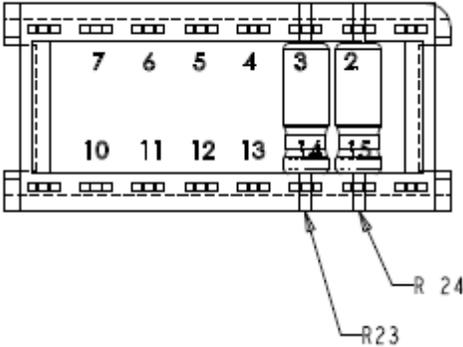
Symptom	Possible Cause	Corrective Action
		<p>Check the crystal chip to ensure it is operational and functional. If one of the pins is at 0 or 5 volts, then the scale will not turn on. Replace the Board if necessary.</p>
<p>No Display/ Intermittent Display, Scale turns on for a moment then shuts off</p>	<p>Front Panel Switch Assembly</p>	<p>Visually inspect the front panel, to determine if any switches are indented concaved, nicked, battered, beat up, poked, jabbed, bruised, crushed or cracked. If so replace the front panel switch assembly.</p> <p>If the switch assembly looks good press on the U6, U7 and U10 IC chips to make sure they are fully seated.</p> <p>Test switch assembly. Unplug the switch connector from J2 on the Display board and short pins 1 and 10 together for one second to turn scale on</p>  <p>If Scale turns on replace the switch assembly. Follow the below instructions to replace the switch assembly.</p> <ol style="list-style-type: none"> 1. Remove front panel switch assembly, there are two Screws on top of front panel with 1/8" Allen Key. 2. Check to make sure the Black and Red battery cable is connected to J1 Power. Unhook J1 Power from the main board.  <ol style="list-style-type: none"> 3. Unplug the J4 Load Cell Connectors from the Main Board.

		 <p>4. Remove 4 Philips head screws to pull back the display board and remove the blue ribbon cable from J2 of Display.</p> <p>5. Peel off the front panel switch assembly from the front side of the faceplate</p>  <p>Replace Switch Plate Assemble if necessary</p>
<p>No Weight Change Scale Only Reads "0.0"</p>	<p>Cable Assembly</p>	<p>Test Cable:</p> <ol style="list-style-type: none"> 1. Remove front panel and unplug the J4 Load Cell Connector 2. Turn scale on <p>IF Scale displays "Cable" or "O-Load" Replace the MAST Cable</p> <p>IF Scale display remains at "0.0"</p> <ol style="list-style-type: none"> 1. Test with DC Volt Meter across pins 1 and pin 7 of JTest <ul style="list-style-type: none"> • Voltage .985 or +/- .01 and stable 2. Test mV reading from Pin 1 of JTEST to pin 10 of U6 approximately 100 lbs is 100 mV 
	<p>C21, C22 & U6 on the Main Board</p>	<p>IF the above test of pins 1 and pin 7 have the 100 mv reading then the components to check are C21, C22 and U6. Replace C21, C22 and U6 or Replace the main board</p>

<p>Inaccurate Weight Readings with the 4 Corner Test being stable and consistent</p>	<p>Mechanical Hang-up on Platform Assembly</p>	<p>4 corner platform test using 1KG certified weight</p> <ol style="list-style-type: none"> 1. Apply weight evenly on the center of the scale. Press "REWEIGH" two times and record your weight reading each time. 2. Remove weight from center and apply weight on each 4 corners one at a time and Press "REWEIGH" two times and record weight reading each time. <p>Examine your corner readings</p> <p>Plot all readings should be within +/- 1 count/gram, 999 to 1001 grams at 1000 grams (1 kg TW).</p> <p>If reading is high or lower and stable, then try to calibrate.</p> <p>Mechanically check to see if top tray is in the correct position, there should be a space between front of scale and tray. Look at tray edge and one side should be shorter, that is the front of tray.</p> <p>Next, carefully lift tray up off of scale, and check for mechanical hang-ups between bottom of tray and top of scale.</p> <p>Check sub-tray to make sure the hardware is properly secured by the Four Philip screws.</p>
<p>Inaccurate Weight Readings with the 4 Corner Test "Not" stable</p>	<p>Bad Load Cell</p>	<p>Removing the top plate, the load cell will be visible</p> <ol style="list-style-type: none"> 1. Enter into "Cal Mode" from the front panel 2. Press and hold the Reweigh button 3. Turn the Scale on 4. Release the Reweigh button immediately 5. Immediately go to the ST logo and press 5 X 6. Display should say "CAL" 7. Press ST Logo two more times to display A/D Readings <p>A/D reading (may be negative, should be low and stable).</p>

		<p>Note: A/D reading without a load. Look for a low stable weight reading that is not drifting or unstable. Replace the load cell if necessary.</p> <p>Note: A/D reading with a load. Add 1 kg test weight (1000 grams) and check to see if reading increase 1000 count. If readings are good re-calibrate scale. Replace the load cell if necessary.</p>									
	<p>Cal Chip</p>	<p>Check Gain Resistor R23 & R24 on the Cal Chip, Replace Cal chip if necessary.</p>  <table border="1" data-bbox="781 976 1425 1073"> <thead> <tr> <th>ASSEMBLY MATERIAL</th> <th>LOCATION</th> <th>RESISTOR VALUE</th> </tr> </thead> <tbody> <tr> <td>255014</td> <td>R24</td> <td>2.37K 1% 1/8W</td> </tr> <tr> <td>255014</td> <td>R23</td> <td>49.9K 1% 1/8W</td> </tr> </tbody> </table>	ASSEMBLY MATERIAL	LOCATION	RESISTOR VALUE	255014	R24	2.37K 1% 1/8W	255014	R23	49.9K 1% 1/8W
ASSEMBLY MATERIAL	LOCATION	RESISTOR VALUE									
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255014	R23	49.9K 1% 1/8W									
<p>Display says "Cable or O-Load" Flashes or Beeps</p>	<p>Cable</p>	<p>Try to Zero first:</p> <ol style="list-style-type: none"> 1. Check to make sure that the connection to the J4 Load Cell 6 pin connector is correct. 2. Gently press all the chips on the Display board to make sure they are seated. <p>Test Electronics</p> <ol style="list-style-type: none"> 1. Unplug J4 Load Cell connector  2. Short the two center pins 3 and 4 3. IF the electronic display goes to 0.0 this verifies that the electronics are working as expected. The problem is external. Check the continuity of the cable. IF cable is open replace cable. 									

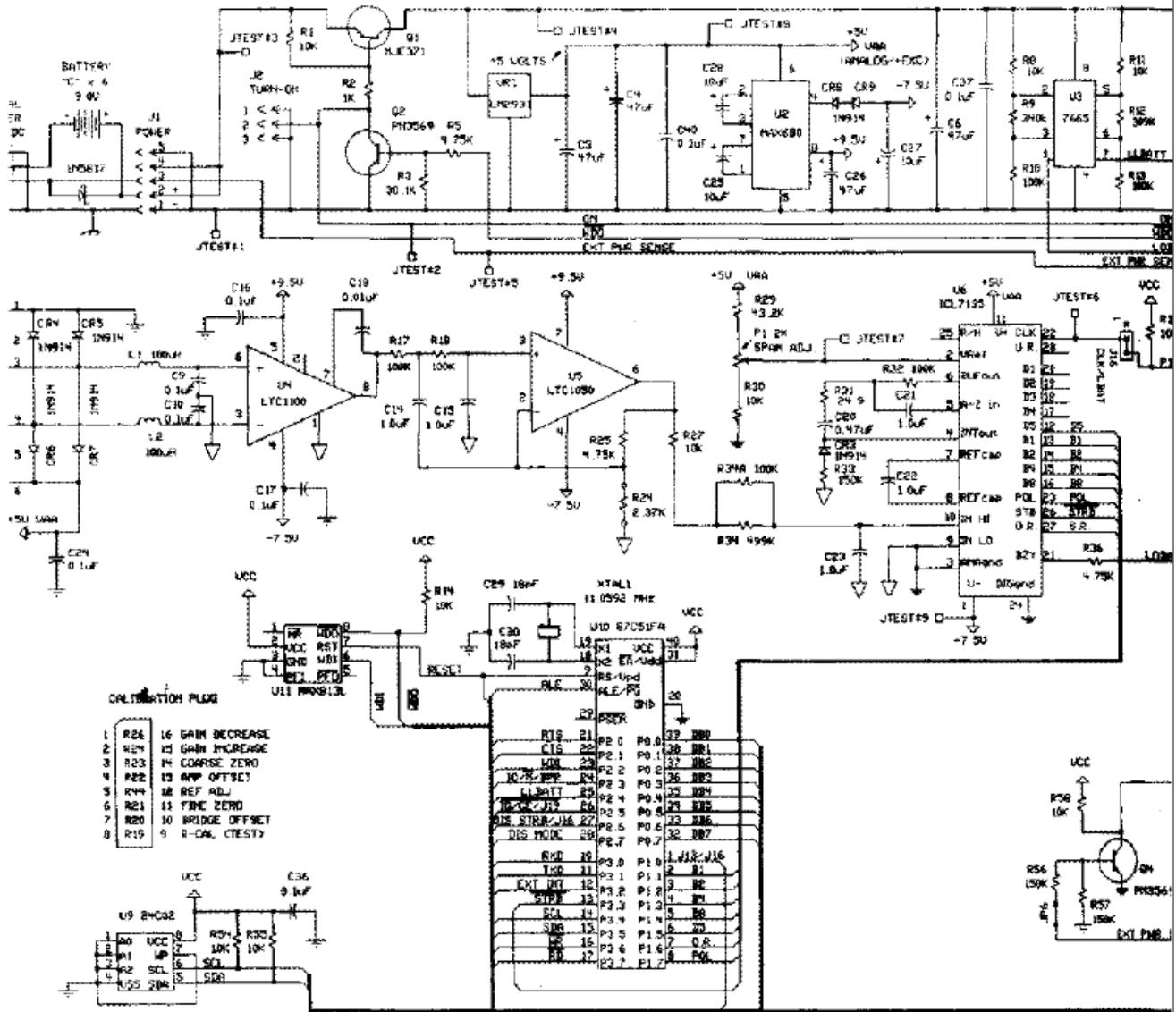
		<p>4. Ohm out pins 1 and 6 of J4 connector. The reading should be approximately 270 – 290 Ohm to be stable. If outside of this range test the Load cells and replace as necessary.</p> <p>5. Ohm out pins 3 and 4. The reading should be approximately 250 Ohm's. If outside of this range test the Load cells and replace as necessary.</p>
	Too much weight has been put on scale, or Bad Load cell	Replace the Load Cell if Necessary
Letters or Numbers across the Display	IC Chips may be loose	U1 on the Display Board – Reseat the IC chip (U1) on display or replace Display board
All the numbers are not lighting up (Missing Segments of the Numbers)	LED	<p>Remove the Display Board (see directions above)</p> <ol style="list-style-type: none"> 1. Gently, lift a working 7 Segment LED chip with a flat head screw driver and exchange with a non-working LED chip. 2. IF the trouble follows the LED chip replace the chip 3. IF the trouble stays in the socket replace the display board.
	Display Board	Replace Display PCB
-----	A/D Readings are unstable	<p>Removing the top plate, the load cells will be visible</p> <ol style="list-style-type: none"> 1. Enter into “Cal Mode” from the front panel 2. Press and hold the Reweigh button 3. Turn the Scale on 4. Release the Reweigh button immediately 5. Immediately go to the ST logo and press 5 X 6. Display should say “CAL” 7. Press ST Logo two more times to display A/D Readings <p>A/D reading (may be negative, should be low and stable).</p>

		<p>Note: A/D reading without a load. Look for a low stable weight reading that is not drifting or unstable. Replace the load cell if necessary.</p> <p>Note: A/D reading with a load. Add 1 kg test weight (1000 grams) and check to see if reading increase 1000 count. If readings are good re-calibrate scale. Replace the load cell if necessary.</p>									
	Load Cell/Calibration	(OHM out Load Cells) See Calibration procedure this Service Manual									
Only displays Scale Model #	Bad A/D Chip	<p>U10 Microprocessor not communicating U6</p> <p>Check to make sure the U6 and U10 chips are seated all the way. Replace the Main Board if necessary.</p>									
Weight Remains the same	Memory Chip or Microprocessor	U9 and EM1033 or Microprocessor – Replace the Main Board									
Beeping and Buzzing	Bad U7 Chip	Check U7 Chip seating or replace the Main Board									
Unable to Calibrate	Cold Solder on the Calibration Plug	<p>Check Gain Resistor R23 & R24 on the Cal Chip, Replace Cal chip if necessary.</p>  <table border="1" data-bbox="732 1581 1417 1677"> <thead> <tr> <th>ASSEMBLY MATERIAL</th> <th>LOCATION</th> <th>RESISTOR VALUE</th> </tr> </thead> <tbody> <tr> <td>255014</td> <td>R24</td> <td>2.37K 1% 1/8W</td> </tr> <tr> <td>255014</td> <td>R23</td> <td>49.9K 1% 1/8W</td> </tr> </tbody> </table>	ASSEMBLY MATERIAL	LOCATION	RESISTOR VALUE	255014	R24	2.37K 1% 1/8W	255014	R23	49.9K 1% 1/8W
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Repair Parts

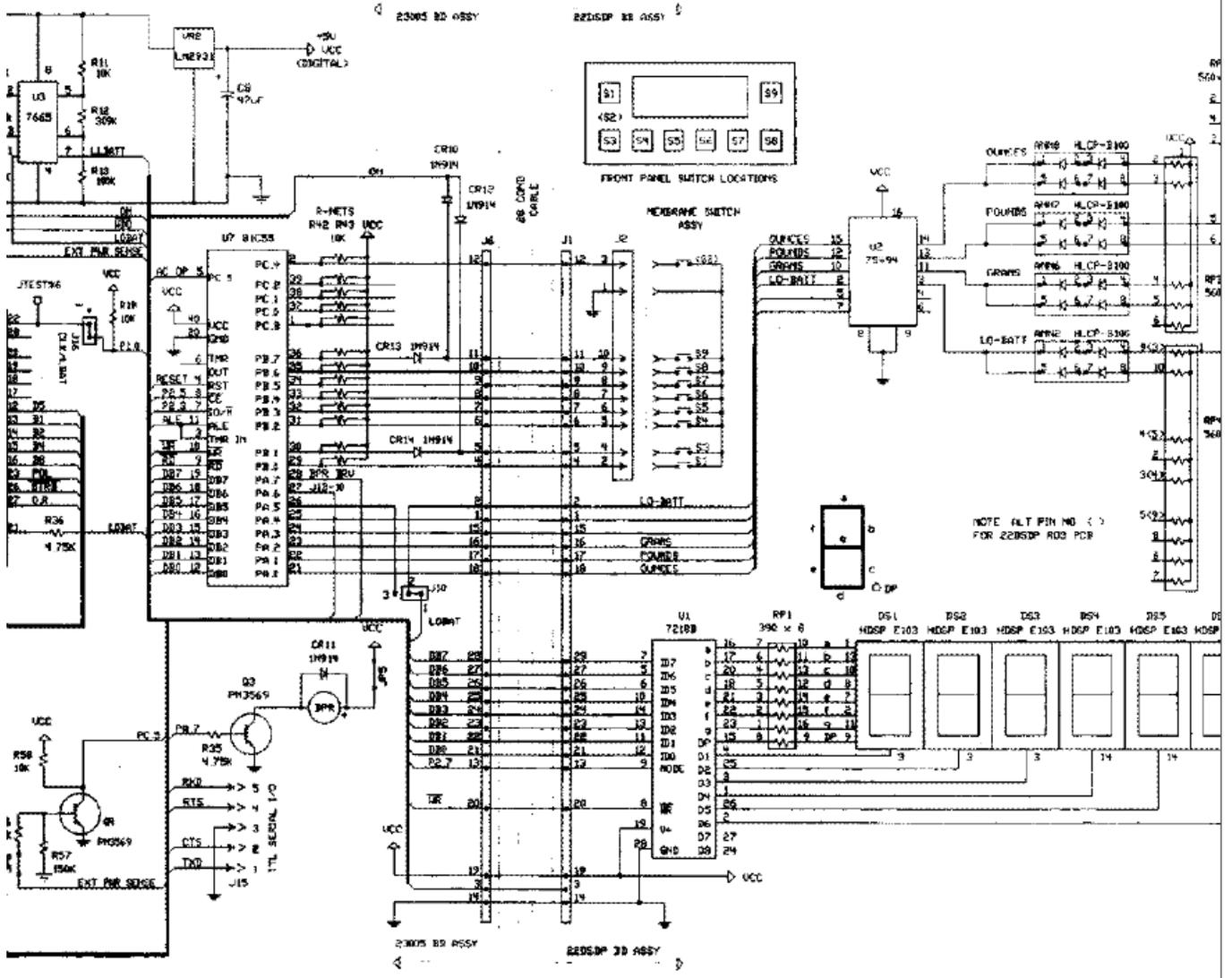
PART NO.	DESCRIPTION
341004	External Power Adaptor, 12V US (optional)
030122W	DECK, SUB SCALE-T
039277W	PANEL, BATTERY ACCESS
136017	HANDLE, KEYSTONE #7144
136018	FERRULE, KEYSTONE #7163
66011	FOOT RUBBER
255014-KIT	CALIBRATION PLUG
705057	ALKALINE "C" CELLS
400035	LOAD BEAM, CPB-6KG 4302/4502
450016	FIRMWARE, 3502/4302/4502
700058	MAIN PCB BRD ASSY (No Firmware, or Cal Chip)
700115W	PCB, ASSEMBLY DISPLAY
720008	FRONT PANEL AND SWITCH ASS'Y
411703	FRONT PANEL AND SWITCH ASS'Y GRAMS
EM1038	Display Cable (Main to display, 28 pin 8")
724527	SCALE BATTERY DOOR LABEL, C
630008	Battery Holder & Bracket Ass'y
412258	ASSY 700058 MAIN PCBA FOR 4302, STD LB/KG (Cal & Firmware chips preprogramed)

Schematics

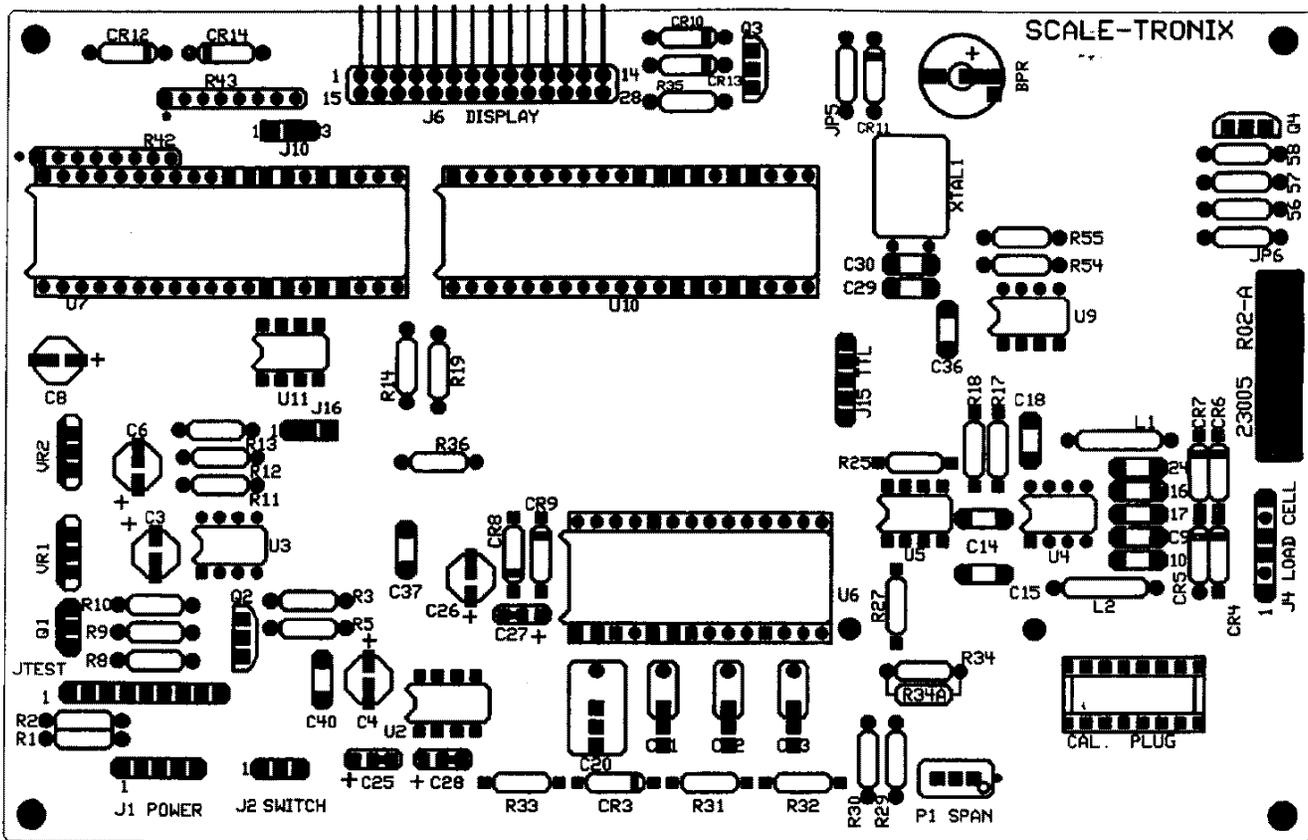


4302/4502 with

04/27/99

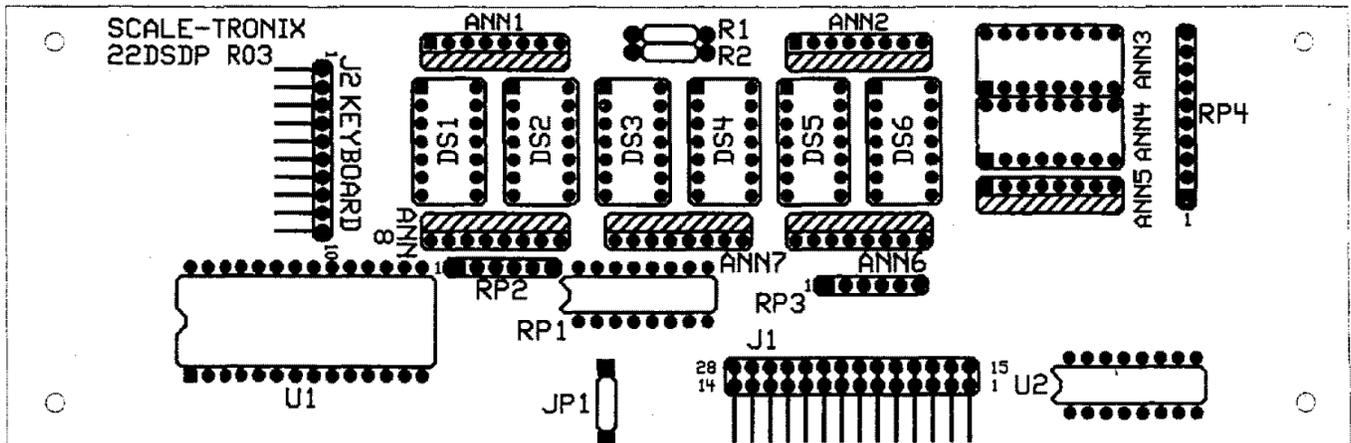


2 with 23005 R02(A) PCB



#70058 INSTRUMENT BOARD FOR 4302/4502

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



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

