# SCIENTECH®

# Electronic Balance

# Setup and Operating Procedures
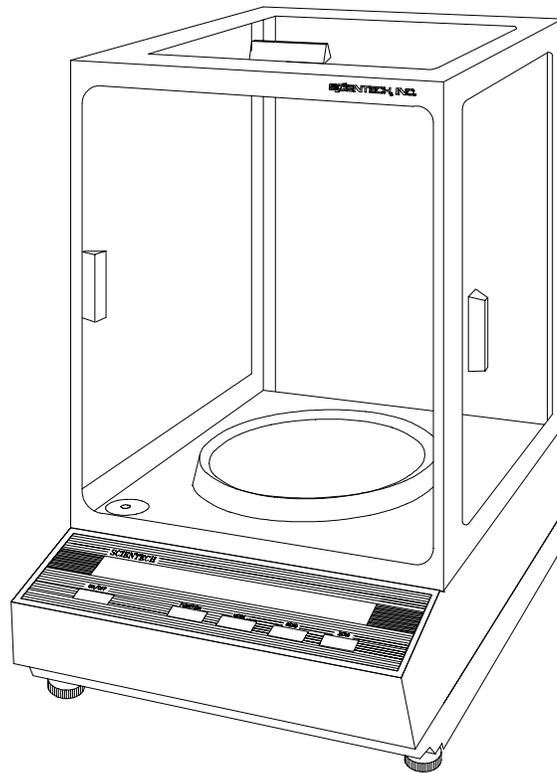
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Thank you for choosing a Scientech Electronic Balance. Scientech, an ISO9000 registered company, and its employees are pleased to provide you with a balance designed and manufactured for years of reliable service and proudly made in the U.S.A. The attractive quality of Scientech balances has been demonstrated by being certified to carry the "CE" mark of conformity.

Please read this manual completely before using your balance. This information will enable you to fully utilize your balance and should be located nearby to be used as a juice reference guide. The balance is intended to be used only in the manner outlined in this manual. Misuse of the balance may cause product failure.

<u>UNPACKING AND SETUP</u>

The balance, weighing pans, remote power supply, windscreen (standard on some models) and keyboard (optional) are packed in a foam support to protect them from shock during shipping and handling. Save and reuse all packing material for future damage-free shipments.
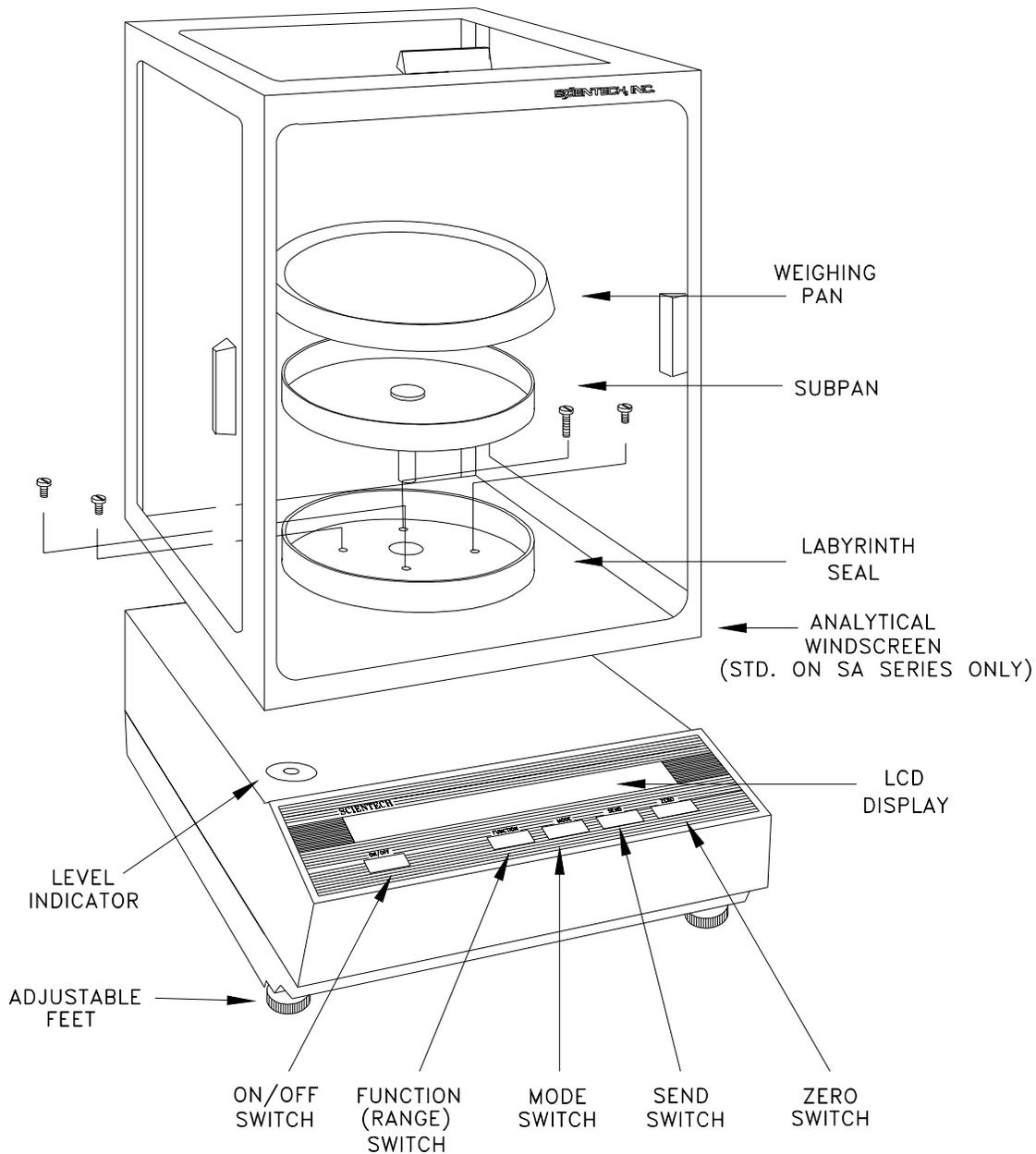


Figure 1    Balance Full View

**All balances are equipped with a special clamping screw that locks the balance suspension during shipping. This screw must be loosened before the balance can be operated (see Figure 2).**

1.  Locate the black knob, on the front center of the balance, underneath the display area.

2.  Remove the paper tag.

3.  Turn the knob, in the direction shown below, until finger tight.

**If the balance is ever shipped or moved long distances, the clamping screw should be retightened by turning the knob in the opposite direction until finger tight.**
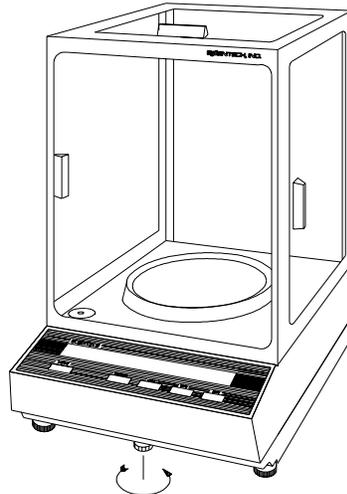


**Figure 2   Unlocking Clamping Screw**

The environment in which your balance is used is very important. Air movement, temperature changes, vibrations, direct sunlight, etc. influences the performance of high precision balances. Therefore, place your balance on a solid, sturdy surface that is free of air currents and vibration. The surface should not be magnetic and should be located away from doors, windows, heaters, air conditioners and fans.

Adjust (turn) the FRONT FEET (see Figure 3) to level the balance by centering the bubble in the LEVEL INDICATOR which is shown in Figure 1. Turning the foot as shown below raises that side of the balance and an opposite adjustment lowers it. When properly adjusted the metal center shaft of the assembly will protrude from the center of the plastic foot and will support the balance. The plastic foot will be raised up against the bottom of the balance and will not be touching the weighing table.



Thumbwheel turns but stays in the same position on case. The Shaft is what moves in and out but does not rotate. This design prevents walking of balance and scratching of table top while leveling.

Rotating Thumbwheel('s) as shown causes Shaft to extend out of case and RAISES Front of Balance.
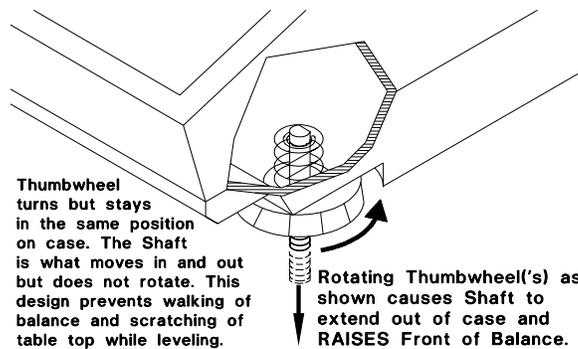
**Figure 3   Leveling**

Before making any connections, verify that the power (VAC) requirement shown on the remote power supply is compatible with the AC power outlet to which the balance will be connected. **First plug the round DIN connector into the rear panel receptacle. Then, plug the power supply into a grounded AC outlet. Do not alter or bypass the ground plug in any way. Doing so adversely affects the performance of the balance.**

NOTE:        **Your balance must be plugged in for at least one (1) hour, then calibrated, prior to use. Please see the Autocalibration instructions section for details.**
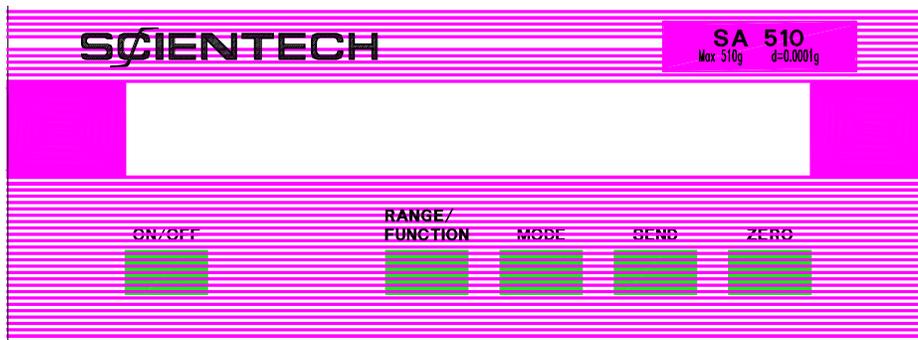
**Figure 4      Front Panel**

## THE ON/OFF SWITCH

Press the ON/OFF switch (see Figure 4) and observe the turn on sequence shown in Figure 5.  During this sequence the balance is doing an automatic systems checkout to insure it is functioning properly.

If your balance was purchased with the optional 9000-INT motorized internal calibration weight, all objects on the stainless steel pan must be removed before turning on the balance using the front panel ON/OFF switch. Press the ON/OFF switch and observe the turn on sequence shown in Figure 5.  With the 9000-INT installed, the balance will then load the internal weight on and off the weighing sensor in order for the internal weight to be positioned correctly. Please wait until all weight readings have stopped changing, the "OK" annunciator appears, and the motor is silent before zeroing the balance and starting weighing operations.
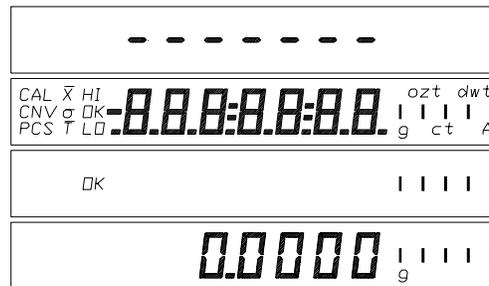


**Figure 5    Turn On Sequence**

## THE ZERO SWITCH

Pressing the ZERO switch (see Figure 4) at any time returns the display to zeros.  When a weighing that has been zeroed out is removed from the pan, a negative reading is displayed.  To return to zeros, press the ZERO switch.  An optional remote foot zero switch is available as an accessory.

## UNIT OF WEIGHT SELECTION

Pressing the MODE switch (see Figure 4) starts the unit of weight cycle as follows:  grams(g), carats(ct), pennyweights(dwt), troy ounces(ozt), and ounces(oz).  When the desired unit of weight appears, press the MODE switch a second time to select that unit of weight.

An optional, factory installed, user specified, custom unit of measure is available.  If you have this special unit of measure feature in your balance, (A) appears in the unit of weight cycle after ounces.  Press the MODE switch to select this function.

## THE SEND SWITCH

**NOTE:   Scientech balances are DTE (computer) devices.  If communicating to another DTE device (ie computer), a special Scientech RS232 cable (PN10697) is required.  If you are communicating to a DCE device (printer), a modem cable is required.  Scientech offers an optional modem cable (PN10170) for your convenience.**

Pressing the SEND switch (see Figure 4) sends the information on the display to an external device via the RS-232 interface.

You may send the time and date along with the weight reading when you press the SEND switch or you may send weight readings automatically at user specified time periods (see the Bi-directional RS-232 Command Set, Type 4 Commands section for details).  Weight readings may also be sent to a computer or printer continuously every 200 milliseconds (see the RS-232 Front Panel Configuration section for details).  Weight readings may be sent automatically when the balance reaches stability (see Selectable Filters section).  An optional, factory installed, remote foot send switch is also available.

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## RANGE SELECTION (dual range balances only)

Pressing the RANGE switch selects low (LO), high (HI) and autorange (HI LO). As a range is selected, it briefly appears at the left of the display. Autorange automatically switches from low range to high range when a weighing exceeds the capacity of the low range. The Floating Tare feature is only available in the LO range (see Floating Tare section for details).

## THE FUNCTION SWITCH

**NOTE:** **On dual range models, pressing the MODE and RANGE switches simultaneously will duplicate the functions of the FUNCTION switch found on single range models.**

Pressing the FUNCTION switch (see Figure 4) cycles the display through six functions as follows:

*PCS - front panel parts counting
HI OK LO - checkweighing
CAL 1 - autocalibration
CAL 2 - factory set - do not use
$\overline{T}$ - Live animal weighing
CAL 100 - % weighing

To access the desired function, press the MODE switch when it appears on the display.

* Parts counting through the front panel is not functional with an optional PDA or bi-directional RS-232 enabled.

## (CAL 1) AUTOCALIBRATION - Using an External Calibration Weight

**NOTE:** **If your balance has a motorized internal calibration weight (9000-INT), please use the procedure for Autocalibration Using 9000-INT Motorized Internal Calibration Weight.**

**NOTE:** **Dual range models must be placed in HI range before starting the calibration procedure.**

**NOTE:** **For correct calibration weight refer to specification charts in the back of the manual.**

**The balance should be warmed up for at least one (1) hour prior to calibration and leveled according to the Unpacking and Setup section. Perform autocalibration every time you move your balance.** Calibrate the balance using a recently certified external calibration weight. Metrology handbooks state that the calibration weight utilized to calibrate a balance should have a tolerance no larger than the readability of the balance divided by 4. Therefore, SA models need a ±0.025mg tolerance weight or better, SP models need a ±0.25mg tolerance weight or better, SL models need a ±2.5mg tolerance weight or better, and SG models need a ±25mg tolerance weight or better. In addition, these same handbooks recommend that all balances be calibrated using an external certified calibration weight even if the balance has an internal calibration weight.

| | | |
|---|---|---|
| 1. | Remove any containers or weighing samples so that nothing is on the stainless steel pan. Then press the ZERO switch. | Zeros are displayed. |
| 2. | Press the FUNCTION switch (or MODE and RANGE switches simultaneously for dual range models). | Display cycles repeatedly through PCS, HI-OK-LO, CAL1, CAL2, $\overline{T}$, and CAL 100. |
| 3. | Press the MODE switch when CAL1 appears. | CAL1 and a flashing 0 are displayed. |
| 4. | Wait 10 seconds. Then press the ZERO switch. | The display stops flashing. In about 10 seconds, either a single weight value or two alternating weight values will flash on the display. |
| 5. | Place one of the flashing calibration weights on the pan. | The display stops flashing and the selected weight is displayed. If Err 1 appears, the calibration weight is an incorrect weight. Remove the weight and use a proper weight. If Err 2 appears, the balance is not warm enough for calibration. Wait one hour before starting the calibration procedure again. |
| 6. | Wait 10 seconds. Then press the ZERO switch. | The weight continues to be displayed for about 10 seconds while the calibration takes place. Then the display blanks, displays "OK", and displays the calibration weight value. The balance is now calibrated. |
| 7. | Remove the calibration weight. | The display returns to zeros and the normal weighing mode. |

<div align="center">

**(CAL 1) AUTOCALIBRATION - Using 9000-INT Motorized Internal Calibration Weight**

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**NOTE:**    **Dual range models must be placed in HI range before starting the calibration procedure.**

**NOTE:**    **For correct calibration weight refer to specification charts in the back of the manual.**

**The balance should be warmed up for at least one (1) hour prior to calibration and leveled according to the Unpacking and Setup section.  Perform autocalibration every time you move your balance.**

**CAL 1 Using the Internal Weight   (This procedure calibrates your balance to the internal weight)**

| | |
|---|---|
| 1.  Remove any containers or weighing samples so that nothing is on the stainless steel pan.  Then press the ZERO switch. | 0.0000 is displayed. |
| 2.  Press the FUNCTION switch (or MODE and RANGE switches simultaneously for dual range models). | Display cycles repeatedly through PCS, HI-OK-LO, CAL1, CAL2, $\overline{T}$, and CAL 100. |
| 3.  Press the MODE switch when CAL1 appears. | CAL1 and a flashing 0 are displayed. |
| 4.  Wait 10 seconds.  Then press the MODE switch. | The display shows a flashing CAL.  This means that the automatic calibration procedure using the internal weight has begun.  The procedure will take about 30 to 90 seconds.  When the procedure is complete, the display will blank and then return to its normal weighing mode.  This means that your balance is now calibrated.  If the calibration cannot be completed due to air currents, an unstable environment (vibration), an incorrect weight, or any other reason; a brief "ERR" message will appear on the display and the balance will return to Step 3. |

**CAL 1 Using an External Weight   (This procedure calibrates your balance to the external weight and then calibrates the internal weight to the external weight)**

| | |
|---|---|
| 1.  Remove any containers or weighing samples so that nothing is on the stainless steel pan.  Then press the ZERO switch. | 0.0000 is displayed. |
| 2.  Press the FUNCTION switch (or MODE and RANGE switches simultaneously for dual range models). | Display cycles repeatedly through PCS, HI-OK-LO, CAL1, CAL2, $\overline{T}$, and CAL 100. |
| 3.  Press the MODE switch when CAL1 appears. | CAL1 and a flashing 0 are displayed. |
| 4.  Wait 10 seconds.  Then press the ZERO switch. | The display stops flashing.  In about 10 seconds, either a single weight value or two alternating weight values will flash on the display. |
| 5.  Place one of the flashing calibration weights on the pan. | The display stops flashing and the selected weight is displayed.  If Err 1 appears, the calibration weight is an incorrect weight.  Remove the weight and use a proper weight.  If Err 2 appears, the balance is not warm enough for calibration.  Wait one hour before starting the calibration procedure again. |
| 6.  Wait 10 seconds.  Then press the ZERO switch. | The weight continues to be displayed while the calibration takes place (about 10 seconds).  Then the display blanks, displays "OK" for one second, then shows CAL1 and a flashing 0. |
| 7.  Remove the calibration weight.  Then press the ZERO switch. | The display shows a flashing CAL and the internal weight recalibration begins.  The procedure will take about 30 to 90 seconds.  When the procedure is complete, the display will blank and then return to its normal weighing mode.  The balance is now calibrated to the external weight and the internal weight is calibrated to the external calibration weight. |

**RS-232 Command for CAL 1 Using the Internal Weight**

To initiate a CAL 1 using the motor driven internal calibration weight via a RS-232 command, issue the command ACAL[CR].  The automatic internal weight calibration will begin immediately without further user interaction.  For a more complete discussion about RS-232, please see the Bi-directional RS-232 Command Set section.

# (PCS) FRONT PANEL PARTS COUNTING

**NOTE:** **Access to the pieces function, via the front panel, is disallowed if a PDA is functional or bi-directional RS-232 is enabled. RS-232 is enabled by selecting local control (LC) OFF (see RS-232 Front Panel Configuration section for details). Local control ON means the front panel controls the balance.**

1. Press the FUNCTION switch (or MODE and RANGE switches simultaneously for dual range models).

   Display cycles repeatedly through PCS, HI-OK-LO, CAL1, CAL2, $\overline{T}$, and CAL 100.

2. Press the MODE switch when PCS appears on the display.

   PCS and 0 flash. This is a prompt to zero the balance with the container that will hold the pieces on the weighing pan.

3. Place the empty container on the pan, wait 10 seconds, and then press the ZERO switch.

   PCS and 10 flash. This is a prompt to place 10 pieces in the container.

4. Place 10 pieces in the container, wait 10 seconds, and then press the ZERO switch.

   PCS continues to flash and OK appears on the display while a stable weight is obtained. Then 10.000, or something very near it, appears on the display. The number of decimal places depends on the weight. PCS continues to flash. This prompts you that you may now increase the sample size in order to obtain a more statistical significant sample which yields a more accurate parts counting conversion factor. The decimal places aid you in rounding the piece count correctly as the sample size increases.

5. If you want a larger sample size to be used in computing the parts counting conversion factor, add pieces (the balance will count them) until the decimal part is near 0.7 or 0.3. Then press the ZERO switch.

   The balance will round to the nearest whole number but still show the decimal places. This step may be repeated as many times as you desire.

6. When you are satisfied the sample size is large enough, press the ZERO switch once again.

   The balance rounds to the nearest whole number, the decimal places disappear, and PCS lights steadily.

7. When you wish to count something else, press the MODE switch.

   You are now back at Step 2 with a flashing PCS and 0.

8. If you want to exit the counting mode, press the MODE switch again.

   You are now in the weighing mode you used just before selecting the parts counting mode.

# (HI-OK-LO) CHECKWEIGHING / PROCESS CONTROL LIMITS

1. Press the FUNCTION switch (or MODE and RANGE switches simultaneously for dual range models).

   Display cycles repeatedly through PCS, HI-OK-LO, CAL1, CAL2, $\overline{T}$, and CAL 100.

2. Press the MODE switch when HI-OK-LO appears on the display.

   HI, OK, and LO flash.

3. Press the ZERO switch.

   HI flashes and zeros are displayed.

4. Place weight on the pan which represents the upper control limit of the acceptable weight range.

   HI flashes and the upper weight is displayed.

5. Press the ZERO switch.

   LO flashes and the upper weight is displayed.

6. Remove the upper limit weight and place weight on the pan which represents the lower control limit.

   LO flashes and the lower weight is displayed.

7. Press the ZERO switch.

   HI-OK-LO briefly appears and then OK and the lower weight are displayed.

8. Remove the lower limit weight.

   LO appears and zeros are displayed.

The balance is now ready to checkweigh samples. The balance displays OK along with the weight of the sample if the sample is within the acceptable weight range. If the sample is too heavy, HI and the weight are displayed. If the sample is too light, LO and the weight are displayed. The weight limits are stored until the balance is turned off.

To exit check weighing, press the MODE switch. The balance then returns to normal operation.

## ($\overline{T}$) LIVE ANIMAL WEIGHING / SEVERE ENVIRONMENT WEIGHING

1. Press the FUNCTION switch (or MODE and RANGE switches simultaneously for dual range models).

   Display cycles repeatedly through PCS, HI-OK-LO, CAL1, CAL2, $\overline{T}$, and CAL 100.

2. Press the MODE switch when $\overline{T}$ appears in the display.

   $\overline{T}$ appears in the display and you are now in the time averaging weighing mode.

3. Place a container/cage on the pan.

   $\overline{T}$ appears in the display as well as a slowly increasing weight of the container/cage.

4. Press the ZERO switch to zero out the container/cage weight.

   $\overline{T}$ appears in the display as well as zeros.

5. Remove the container/cage and place the sample/animal in the container/cage.

   A slowly decreasing negative weight is displayed.

6. Replace the container/cage with the enclosed sample/animal on the weighing pan.

   After the sample/caged animal is placed on the pan, the weight reading will slowly stop decreasing and then slowly start increasing as the weight reading is averaged over time. When the weight stops drifting upward, you have reached the final time averaged weight reading.

7. If you want to reach the final time averaged weight reading more quickly, press the FUNCTION switch (or the RANGE switch on dual range models). This resets the time averaging mode.

   The final time averaged weight reading is reached more quickly.

8. If you want to exit the time averaging weighing mode, press the MODE switch.

   You are now in the weighing mode you used just before selecting the time averaging mode.


## (CAL 100) PERCENT WEIGHING

1. Place an empty container on the weighing pan and press the ZERO switch.

   Zeros are displayed.

2. Place the sample which represents 100% in the weighing container.

   Display indicates the weight of the sample in the unit of measure you have selected.

3. Press the FUNCTION switch (or MODE and RANGE switches simultaneously for dual range models).

   Display cycles repeatedly through PCS, HI-OK-LO, CAL1, CAL2, $\overline{T}$, and CAL 100.

4. Press the MODE switch when CAL 100 appears on the display.

   Display will indicate CAL and 100.00. This means that the weight on the pan now represents 100.00%. You are now in the percent weighing mode with all weight readings displayed as a percent of the weight of the sample used in Step 2.

5. If you want to exit the percent weighing mode, press the MODE switch.

   You are now in the weighing mode you used just before selecting percent weighing.


## FLOATING TARE™ (dual range models only)

Floating tare is only active when the balance is in LO range. Floating tare yields low range resolution throughout the entire high range capacity of the balance. A typical example using floating tare would be where you combine different components by weight to produce compounds. The procedure is as follows.
1. Select LO range by pressing the RANGE switch until LO briefly appears in the display.
2. Place container on weighing pan. If the container weight exceeds LO range capacity, OL is displayed. If the container weight does not exceed the LO range capacity, the container weight is displayed.
3. Press ZERO switch. Display returns to zeros and LO range.
4. Add first component until target weight is reached. Then press ZERO.
5. Add second component until target weight is reached. Then press ZERO.
6. Continue until all components have been added.
Floating tare allows you to enter the LO range from anywhere within the full capacity range of the balance. This feature is particularly useful when adding small amounts to large tare loads and compounding where weights are accumulated. Floating tare is only active when the balance is in LO range. Pressing the ZERO switch returns the display to zeros in LO range. While you are using the floating tare feature, it is easy to lose track on how much capacity has been used. The Capacity Tracking feature is a helpful tool. Please see the following discussion.

## CAPACITY TRACKER

The capacity tracker provides a graphic display of the used and unused portions of the weighing range. Each segment represents 5% of the balance's capacity and is illuminated as that portion of the capacity is used. The larger segments, representing 1/4, 1/2, 3/4, and full load, flash as they are approached and then become solid again as they are exceeded.

## SELECTABLE FILTERS, STABILITY INDICATOR, AND SEND-WHEN-STABLE

All balances are equipped with three user-selectable vibration filters which reduce nervous readings in varying weighing conditions. The balance was delivered to you set in the high filtering mode (Fil HI). This is the most aggressive filtering mode. Normal filtering (Fil nor) and low filtering (Fil Lo) can be selected for quieter conditions and faster response.

The stability indicator, OK, is illuminated when the balance has determined that all readings are within the stability parameters as selected by the user. The balance was delivered to you with stability set at ±2 display counts, which is represented by a 0 in step 5 below. You may select stability from ±1 to ±10 display counts manually in step 5 below. If the weight readings are outside the acceptable limits, the stability indicator will not light. The stability indicator can be disabled, if desired. Also, the send-when-stable command sends the weight reading over the RS-232 interface whenever the OK light illuminates. The balance was delivered to you with the send-when-stable command OFF. When it is ON, the auto and continuous send commands (see RS-232 Front Panel Configuration for details) are not functional.

To enter the selection mode proceed as follows: To exit the selection mode and return to normal operation, turn the balance off and then back on again at any time.

1. Turn the balance off using the ON/OFF switch.

Display blanks.

2. Hold the MODE switch down while turning the balance on using the ON/OFF switch.

OK and the current filter, Fil nor (filtering normal), Fil Lo (filtering low), or Fil HI (filtering high) are displayed.

3. Press the SEND switch until the desired vibration filter is displayed. Then press the ZERO switch to save the setting.

OK SAVEd is displayed followed by the current stability indicator setting, Si on (stability indicator will turn on when reading is stable) or Si oFF (stability indicator will always be turned off).

4. Press the SEND switch until the desired stability indicator Si setting is displayed. Then press the ZERO switch to save the setting.

OK SAVEd is displayed followed by the current stability sensitivity setting SEnS (the default is ±2 display counts).

5. Press the SEND switch until the desired stability sensitivity display counts setting is displayed. Then press the ZERO switch to save the setting.

OK SAVEd is displayed followed by the current send-when-stable SS setting (oFF is the default).

6. Press the SEND switch until the desired send when stable SS command is displayed. Then press the ZERO switch to save the setting.

OK SAVEd is displayed. Then the balance cycles back to Step 2 and shows the current filter setting.

7. Press the ON/OFF switch.

The display blanks.

8. Press the ON/OFF switch.

The balance returns to normal operation with the new vibration filter and stability indicator settings in place.

## BELOW BALANCE WEIGHING

**Note:** **Please use care when installing Below Balance Weighing. The suspension can be damaged if over tightened. The overload protection built into the pan assembly is not available at the below balance hanging device. Therefore, care must be taken to avoid side shocks or pulling too hard on the hanging device.**

For applications requiring suspension of weighings below the balance, a 6-32 threaded screw is provided. To access the set screw, proceed as shown. Then mount the balance on a solid pedestal or surface with a hole under the balance to allow access to the hanger. While using the below balance weighing feature all other functions of the balance operate normally. The balance is capable of weighing both above and below simultaneously provided the capacity of the unit is not exceeded.



1. Remove all Pans
2. Gently set the Balance on its side.
3. Remove Plastic Hole Plug. (save, re-install when not using Below Balance weighing)
4. Gently attach hanging device.

Scientech PN 10484
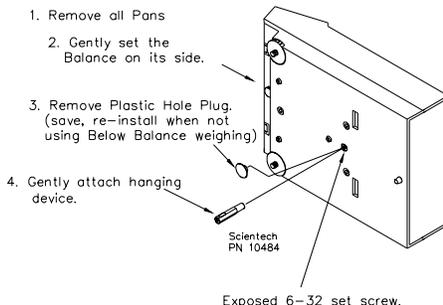
Exposed 6-32 set screw.

**Figure 6      Below Balance Weighing**

## SPECIFIC GRAVITY DETERMINATION

The below balance weighing apparatus shown previously is ideal for determining specific gravity. Specific gravity is the ratio of the mass of a body to the mass of an equal volume of water. Every mineral has its own specific gravity (SG). A list may be found in any Handbook of Chemistry and Physics. Specific gravity will classify or authenticate a substance. For instance, a diamond's SG is 3.50-3.53 while quartz's is 2.65.

To determine specific gravity using our balance:
1.  Install a below balance weighing hangar as shown in the previous section.
2.  Install a below balance weighing apparatus, such as a wire hook, including a pan suspended in a bowl of water. Insure that the pan and the hanger do not touch any part of the bowl and all are totally submerged. Then tare the balance.
3.  Then place the sample to be tested on the balance pan and record the weight reading shown on the display. You may use any unit of measure you desire.
4.  Then place the same sample to be tested on the pan suspended in the bowl of water. Make sure that the sample is completely submerged in the water and record the weight reading shown on the display.
5.  Subtract the reading in Step 4 from the reading in Step 3.
6.  Divide the reading in Step 3 by the number calculated in Step 5. The result is the SG of your sample.

> EXAMPLE:  Reading in Step 3  = 6.50
> Reading in Step 4  = 4.25
> Subtraction  = 2.25
> Division (Step 6)  = 6.50/2.25= 2.89 specific gravity

## DENSITY DETERMINATION

Scientech does not offer a density determination kit nor do you need one to determine density. Density is mass (grams) per unit volume (cubic centimeters).

In order to determine density of a solid, place a graduated flask with a known volume of water on the pan of the balance, tare the balance, and then place the solid in the flask of water. Divide the displayed weight in grams by the increased volume of water. The result is the mass per unit volume of the solid in g/cc.

To determine the density of a liquid, place an empty graduated flask on the balance weighing pan, tare the balance, then pour the liquid into the graduated flask. Divide the displayed weight in grams by the volume of the liquid. The result is the mass per unit volume of the liquid in g/cc.

## SECURITY BRACKET

A security bracket is provided on the rear panel. If needed, the bracket slides out of the rear of the balance providing a convenient method of securing the balance.

## OPTIONS

The Motorized Internal Calibration Weight (9000-INT), Remote Weighing (7000-04) and Custom Unit of Measure (9000-90) options must be installed at the factory or by personnel authorized by Scientech. Other options, such as a Scientech PDA and printers, may be purchased at any time. Please contact Scientech at (303)444-1361 or (800) 525-0522 or email us at inst@scientech-inc.com for information.

## OPTIONAL RS-232 PRINTERS
### (Printers must be serial)

There are a few different models to choose from. Please contact Scientech or one of our representatives for more information. A comprehensive manual is included with each printer when purchased. All printers are set for a 9600 baud rate. To change this setting please see the printer manual and the RS-232 Front Panel Configuration section. The balance display contents can be sent to the printer at any time by pressing the balance front panel SEND switch . Balances only communicate with serial printers.

Many other accessories are available. Please contact Scientech at 303-444-1361 or 800-525-0522 or email us at inst@scientech-inc.com for more information.

**NOTE:    Scientech balances are DTE (computer) devices.  If communicating to another DTE device (ie computer), a special Scientech RS232 cable (PN10697) is required.  If you are communicating to a DCE device (printer), a modem cable is required.  Scientech offers an optional modem cable (PN10170) for your convenience.**

Your balance is equipped with a bi-directional RS-232 compatible interface. The interface is uni-directional (balance send only) when the local control is set to ON.  To enable the bi-directional interface, set the local control to OFF (see the following RS-232 Front Panel Configuration section).  The RS-232 connector is a 9 pin D subminiature connector located on the balance rear panel.  The pinout and pin descriptions are shown in Figure 7.
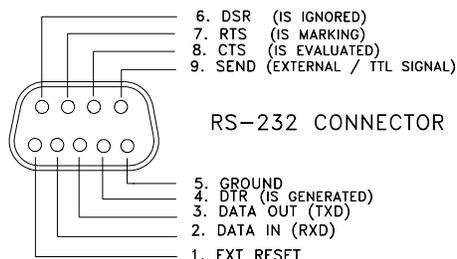


**Figure 7    Connector Pinout**

**NOTE:  The Ext reset function is disabled in all balances when they are delivered.  To enable the feature pin 1 of the internal dipswitch must be closed.  Please contact customer service with any questions.**

The balance will not output any information under any circumstances unless pin 8 (CTS) is held in an ON state (+3 to +15 VDC).  Interfaces not utilizing the CTS handshake may tie pin 8 to pin 7 or pin 8 to pin 4 to defeat it.

This interface does not strictly adhere to the official RS-232 standard.  However, it emulates what has become commonplace in the microcomputer industry.

**RS-232 SPECIFICATIONS**

| | |
|---|---|
| Type | EIA-RS-232C, DTE |
| Method | Half-duplex, Asynchronous Transmission, Bi-directional |
| Format | 300, 600, 1200, 2400, 4800, 9600 and 19,200 baud rate selectable (default is 9600) |
| | Code:  ASCII |
| | For parity Even or Odd:   Data bit 7, Stop bit 1. |
| | For parity none:       Data bit 7, Stop bit 2. |
| Note: | Parity none, Data bit 8, Stop bit 1 does function, but is not technically correct. |

**RS-232 FRONT PANEL CONFIGURATION**

Before using the RS-232 feature of your balance, it is necessary to configure the interface properly for your application.  The RS-232 Configuration Mode allows you to set baud rate, front panel control, software protocol, parity, auto send, continuous send, and display blanking.  The balance is configured with defaults at the factory.  The default modes are shown in parenthesis below.

It is not necessary to follow the entire configuration procedure if only one parameter is to be changed.  Follow Steps 1 and 2, then use the MODE switch to select the parameter to be changed, skipping the others.  Select the desired setting using the SEND switch, save the setting using the ZERO switch, then turn the balance off and then on again with the ON/OFF switch.

To enter the RS-232 configuration mode via the front panel, proceed as follows:

1.    Turn the balance off using the ON/OFF switch.          Display blanks.

2.    Hold the SEND switch down while turning the          OK and the current baud rate, br300, br600, br1200, br2400, br4800,
      balance on using the ON/OFF switch.                    br9600, or br19,200 is displayed.

3.    BAUD RATE SELECTION (9600 is default).
         Press the SEND switch until the desired
         baud rate is displayed.    Then press the          OK SAVEd is displayed followed by OK and the chosen baud rate.
         ZERO switch.

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4. LOCAL CONTROL SELECTION (LC on is default). "LC on" means that the front panel switches control the balance. To enable a computer to control the balance, "LC oFF" must be selected.
Press the MODE switch.

OK and the current front panel control setting , LC on or LC oFF is displayed.

Press the SEND switch to choose between on or off. Then press the ZERO switch.

OK SAVEd is displayed followed by OK and the chosen setting.

5. PROTOCOL or HANDSHAKE SELECTION (Pr on is default).
Press the MODE switch.

OK and the current software protocol setting, Pr oFF or Pr on is displayed.

Press the SEND switch to choose between on or off. Then press the ZERO switch.

OK SAVEd is displayed followed by OK and the chosen setting.

6. PARITY SELECTION (PA nonE is default).
Press the MODE switch.

OK and the current parity setting, PA EVEn, PA odd, or PA nonE is displayed.

Press the SEND switch to choose between EVEn, odd, or nonE. Then press the ZERO switch.

OK SAVEd is displayed followed by OK and the chosen setting.

7. AUTO SEND SELECTION (AS oFF is default). "AS on" means the balance will automatically send the display contents over the RS-232 interface at the selected time interval placed into register 89. This time interval may be inputted via the optional PDA or through Type 4 RS-232 commands. Refer to these sections for instructions. A time and date stamp may also be sent at the same time (see Type 4 RS-232 Commands section). The auto send selection is not functional if the send-when-stable command is on (see Selectable Filter section).
Press the MODE switch.

OK and the current auto send setting, AS oFF or AS on is displayed.

Press the SEND switch to choose between on or off. The press the ZERO switch.

OK SAVEd is displayed followed by OK and the chosen setting.

8. CONTINUOUS SEND SELECTION (CS oFF is default). "CS on" means the balance will automatically send the weight reading over the RS-232 interface at the baud rate selected. Display readings are updated every 200 milliseconds. The continuous send selection is not functional if the send-when-stable command is on (see Selectable Filter section).
Press the MODE switch.

OK and the current continuous send setting, CS oFF or CS on is displayed.

Press the SEND switch to choose between on or off. Then press the ZERO switch.

OK SAVEd is displayed followed by OK and the chosen setting.

9. DISPLAY BLANKING SELECTION (bL on is default). "bL on" means that every time data is sent over the RS-232 interface, the display will blink.
Press the MODE switch.

OK and the current display blanking setting, bL on or bL oFF is displayed.

Press the SEND switch to choose between on or off. Then press the ZERO switch.

OK SAVEd is displayed followed by OK and the chosen setting.

10. Press the ON/OFF switch.

The display blanks

11. Press the ON/OFF switch.

The balance returns to normal operation with the new RS-232 configuration.

**USING BI-DIRECTIONAL COMMUNICATIONS**

Scientech electronic balances, interfaced to a computer via the RS-232 port, can be controlled by a computer program in the same way an operator would control the balance using a PDA. Any programming language with access to the RS-232 interface can be used to program this control. The balance expects ASCII character instruction strings and responds with ASCII character data strings. All characters with an ASCII value less than the space character (decimal 32 of hex 20), are ignored by the balances.

If local control has been enabled (LC on) via RS-232 front panel configuration, RS-232 communication is limited to balance sending only as all incoming RS-232 command strings are ignored by the balance. To enable bi-directional RS-232 communication, set the local control to off (see RS-232 Front Panel Configuration section).

**BI-DIRECTIONAL RS-232 COMMAND SET**

The following commands can be sent to the balance in any combination of upper and lower case characters. No action is taken by the balance until it receives a carriage return indicating the end of the command string. Each command's syntax is described using this notation; keywords are in upper case; items in [ ] are required; when one item must be chosen from a list, each choice is enclosed in ( ); CR means the carriage return or enter character; LF means the line feed character; and _ indicates a single space character. A command string or entry is considered to be a keyword (and/or a numeric string) followed by a carriage return. The commands are listed by type. Type 1 commands are balance control functions. Type 2 are balance input functions. Type 3 are balance output functions. Finally, Type 4 are clock/calendar functions. Where a balance response is given, no attempt has been made to show the actual message formats. You should refer to the section on balance message formats for detailed information. Numbers stored in the registers are classified by the balance software as being additive, multiplicative, or unflagged. Additive numbers are used by the balance software in addition and subtraction operations. Multiplicative numbers are used in multiplication and division operations. Unflagged numbers aren't used in any arithmetic functions. If you try to use an additive number in a function which requires a multiplicative number the balance responds with the register contents (if applicable) and a ? and the instruction is ignored.

## TYPE 1 COMMANDS (balance control functions)

| COMMAND | RESPONSE | PURPOSE |
|---|---|---|
| CLEAR [CR] | None | Clears the previous command and resets the balance to normal operating mode. The Tare register is cleared to zero and the balance is zeroed. |
| HI_RANGE[CR] or LO_RANGE[CR] or AUTO[CR] | None | Set the balance range. |
| GRAMS[CR] or CARATS[CR] or DWT[CR] or OZT[CR] or OZ[CR] or A[CR] or LIMITS[CR] or CAL1[CR] or CAL2[CR] | None | Places the balance in the indicated mode or units. To abort any of the CAL sequences or the LIMITS modes use CLEAR[CR]. |
| ZERO[CR] | None | The balance takes whatever action it would in response to a push of the front panel zero switch. Normally tares the balance. |
| TARE[CR] | None | If the balance is in the weighing mode, this command tares the balance, otherwise it is ignored. |
| [decimal number]_HI[CR] | None | Sets the checkweighing high limit register (register 88) to the decimal number entered in the current units. Register 88 is undefined at every ON/OFF cycle. |
| [decimal number]_LO[CR] | None | Sets the checkweighing low limit register (register 87) to the decimal number entered in the current units. Register 87 is undefined at every ON/OFF cycle. |

| | | |
|---|---|---|
| [decimal number]_CONVERT[CR] | None | Loads the number entered, as a "last front panel units" relative multiplier, into the CONVERT register and enters the CONVERT mode. CLEAR exits the convert mode and undefines the convert register. |
| [decimal number]_CAL[CR] | None | Loads a computed number based on the entered number, as a "last front panel units" relative multiplier, into the CAL register and enters the CAL mode. The display must be non-zero when this command is issued. If the display is zero, a 3 second "Err" message is displayed and the balance returns to its normal weighing mode. The current weight reads as the number entered with the appropriate sign. CLEAR exits the CAL mode and undefines the CAL register. |
| [integer]_PIECES[CR] | None | Loads a computed number based on the entered number, as a "last front panel units" relative multiplier, into the PIECES register and enters the PIECES mode. The display must be non-zero when this command is issued. If the display is zero, a 3 second "Err" message is displayed and the balance returns to its normal weighing mode. CLEAR exits the pieces mode and undefines the pieces register. |
| [Decimal number]_ENTER_[integer]_PIECES[CR] | None | Accepts the decimal number as a weight in "last front panel units" per integer pieces. If the balance is not in PCS mode, it goes into PCS mode using the decimal number/the integer as the weight. If used when the balance is already in PCS mode, the display digits are blanked for about 1 second while the PCS an "last front panel units" annunciators are lit. The balance then resumes normal PCS operation using the decimal number/the integer as the unit weight. |
| [register number]_RCL_[(CONVERT) (CAL) (PIECES)][CR] | REG XXX :[register contents][MULT.] | Puts the recalled register contents into the specified mode register and enters that mode. |
| TAVG[CR] | None | Clears the TBAR registers and enters the TBAR mode. |
| RESET_TAVG[CR] | None | Clears the TBAR registers. If the balance is in the TBAR mode, the process keeps running. |
| XAVG[CR] | None | Accumulates the current weight in the XBAR registers. |
| RESET_XAVG[CR] | None | Clears the XBAR registers. |
| GLP[CR] | Sends GLP header | Puts balance in the GLP mode. |
| XAVG[CR] | Sends weight while in GLP | Accumulates the current weight in the XBAR registers. |
| RCL_XAVG[CR] | Sends statistics and signature line | Terminates GLP mode. |
| ISO[CR] | Sends ISO header and waits for target weight entry | Puts balance in ISO mode. |
| xxx.xx_Targ[CR] | Sends target weight (g) | Enter target weight value in grams. |

| | | |
|---|---|---|
| SEND[CR] | Sends weight, difference between weight and target, and signature line | Terminates ISO mode. |
| ACAL[CR] | None | Starts the automatic internal calibration weight calibration routine. |

## TYPE 2 COMMANDS (balance input functions)

| COMMAND | RESPONSE | PURPOSE |
|---|---|---|
| [register number]_STORE[CR] | None | Stores the current weight, at the greatest possible resolution, in the specified register. |
| [Decimal number]_ENTER_[register number]_STORE[CR] | None | Stores the number entered, in the current units, as an additive constant in the register specified. |
| [decimal number]_ENTER_CONVERT_[register number]_STORE[CR] | None | Stores the number entered, as a "last front panel units" relative multiplier, in the specified register. |
| [decimal number]_TARE[CR] | None | Adds the number entered, in current units, to the TARE register. CLEAR [CR] zeroes the TARE register. |

## TYPE 3 COMMANDS (balance output functions)

| COMMAND | RESPONSE | PURPOSE |
|---|---|---|
| SEND[CR] | See the RS-232 Balance Message Formats section.. | Returns the contents of the display register. |
| [register number]_RCL[CR] | REG XXX:[register contents][current units or 'MULT.'] [CR] [LF] | Sends the contents of the specified register in the current units if it is additive or with the designator 'MULT.' if it is multiplicative. An unflagged number is sent with no designator. An undefined register returns a ? with a [CR][LF]. |
| RCL_TARE[CR] | REG 091:[TARE register contents] [current units][CR][LR] | Return the TARE register's contents. |
| RCL_[(CONVERT)(CAL)] | REG XXX:[contents of specified register][MULT.][CR][LF] | Returns indicated register contents, if in that mode. If not in that mode then a ? with a [CR][LF] is returned. |
| RCL_PCS[CR] | REG XXX:[contents of pieces register][last FP units/pc][CR][LF] | Returns pieces register contents expressed as last front panel units/pc, if in that mode. If not in that mode then a ? with a [CR][LF] is returned. |
| [register number]_RCL_TARE[CR] | REG XXX:[register contents][current units][CR][LF] | Adds the specified register contents to the TARE register. |
| RCL_XAVG[CR] | [average weight] [current units] AVX[CR][LF]. [2 second delay]. [number of samples taken] ###[CR][LF]. [2 second delay]. [standard deviation] [ current units] SDEV[CR][LF]. [2 second delay]. [relative standard deviation] COV[CR][LF]. | Sends the results of a standard deviation run. The TBAR mode, if in use, is temporarily suspended while this process is going on. |

## TYPE 4 COMMANDS (clock/calendar functions)

| COMMAND | RESPONSE | PURPOSE |
|---|---|---|
| [six digit integer] _ENTER_100_STORE[CR] | None | Sets the calendar function, if available, to the specified date. The date must be specified in the MMDDYY format and no delimiters. |
| 100_RCL[CR] | REG 100: MM.DD.YY DATE[CR][LF] | Returns the date. |
| [six digit integer] _ENTER_101_STORE[CR] | None | Sets the clock function, if available, to the specified time. The time must be specified in the HHMMSS format using military 24 hour time format. |
| 101_RCL[CR] | REG 101: [HH:MM:SS] TIME[CR][LF] | Returns the current time, using military 24 hour time format, once for each request. |
| [1 to 6 digit integer] _ENTER_89_STORE[CR] | None | Sets the auto send register to the specified send time interval. For the auto send feature to be operational, you must set the auto send selection to ON (see RS-232 Front Panel Configuration section for details). The format used is HHMMSS with no delimiters. For instance, to set the auto send interval to 5 minutes and 25 seconds, you would send this command string: 525 ENTER 89 STORE[CR]. Also you must have the auto Send selection set to ON before the auto Send will work (see RS-232 Front Panel Configuration Section). |
| 89_RCL[CR] | REG 089: [HH:MM:SS] INTV[CR][LF] | Returns the auto SEND time interval currently set. |
| [(1)(0)]_ENTER_79_STORE[CR] | None | A 1 in register 79 disables the date/time stamp feature of any SEND. A 0 in register 79, enables the date/time stamp. |

## RS-232 BALANCE MESSAGE FORMATS

The balance will respond to a SEND command by transmitting a message in one of three formats depending on how the SEND command was issued. The following discussion defines four types of SEND commands and the three message formats.

1. The first case typically applies to a balance with RS-232 connected to a printer and an external print switch. If the SEND is initiated by activation of the hardware SEND line on the RS-232 I/O module and the display shows the current weight, then the response will be a format B. If the display does not show the current weight (i.e., date, time, or a register RCL), the hardware SEND is ignored.

2. This case typically applies to a balance with the RS-232 interface connected to a printer. If the SEND is initiated by a time or auto SEND and the display shows the current weight, then the response will be a format B. The date/time stamp is included in format C if register 79 has been set to 1 prior to setting register 89 to the desired time interval. To stop auto sending set register 89 to 0. If the date/time stamp is enabled and the display doesn't show the current weight, the date/time stamp is still sent. Nothing is sent if the date/time stamp is disabled and the display doesn't show the current weight.

3. This case typically applies to a balance with the RS-232 interface connected to a computer. There are several RS-232 I/O commands containing the keyword RCL. These commands, issued by the computer, all cause a single format C or a sequence of format C send to occur.

4. This case also typically applies to a balance with the RS-232 interface connected to a computer. A SEND command issued over the RS-232 I/O channel, by the computer, causes an unconditional format A send.


### Format A:  Balance in the normal weighing mode

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | CR |
|---|---|---|---|---|---|---|---|---|----|----|----|
| X | X | X | X | X | X | X | - | - | -  | Y...... | LF |

X = a digit (0-9) or a decimal point or a space or a minus sign.

Y = an upper case alphabetic character (A-Z). The first character of the units or mode annunciator in the display, followed by the rest of the characters of the annunciator.

If the display shows a minus sign, it is the first character in the balance message. In this case the least significant digit of the displayed number is in position 8 followed by only two spaces instead of three. The 1st character of the units annunciator is still in the 11th position.

Here are some examples. The notation used here is that CR means the carriage return or enter character;  LF means the line feed character; and _ indicates a single space character. Note that all space characters are shown explicitly.

Display shows 5.15 g
Message is         _ _ _5.15_ _ _G CR  LF

Display shows 211.05 dwt
Message is         _211.05_ _ _DWT  CR  LF

Display shows -211.05 dwt
Message is         -_211.05_ _DWT  CR  LR

Display shows .0035 A
Message is         _ _.0035_ _ _A_SPEC.  CR  LF


### Format A:  Balance in a special weighing mode

Display shows 1250 PCS
Message is         _ _1250_ _ _ _ _PCS  CR  LF

Note that, in these special weighing modes, the least significant digit of the numeric field is in the 6th (or 7th position if the number is negative) and that the leftmost character of the annunciator is in the 12th position.

Display shows -100.00 CAL
Message is         -100.00_ _ _CAL  CR  LF

Display shows sigma Tbar 0.00 g
Message is         _ _ _0.00_ _ _G_SIGMA_ _TBAR_  CR  LF

**Format B:  Balance in normal weighing mode**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|
| X | X | X | X | X | X | X | _ | _ | _  | Y  | Y  | Y  | _  | _  | Y  | Y ...CR LF |

Display shows 5.15 g and balance in high range
Message is     _ _ _5.15_ _ _G_ _HIGH  CR  LF


**Format B:  Balance in a special weighing mode**

Display shows 1250 PCS and balance in low range
Message is     _ _1250_ _ _ _PCS_ _LOW  CR  LF

Note that, in these special weighing modes, the least significant digit of the numeric field is in the 6th (or 7th position if the number is negative) and that the leftmost character of the annunciator is in the 12th position.


**Format C:**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| R | E | G | : | _ | X | X | X | _ | _  | X  | X  | X  | X  | X  | X  | X  | _  | _  | _  | Y  | Y  | CR LF |

Display shows the contents of register 24 as 102.56, an additive constant, with units in grams
Message is        REG:_024_ _ _102.56_ _ _G  CR  LF

Display shows 12:03:35 as the time
Message is        REG:_101_12:03:35_ _ _TIME  CR  LF


**BI-DIRECTIONAL RS-232 ERROR MESSAGES**

There are three single character error messages that the balance issues when certain errors occur during bi-directional communications. Each error character is followed by CR LF.

1.     ! is issued when the input buffer is full.  Normally this occurs because a CR is lost or the command string is too long.  The balance has a 37 character input buffer which is sufficiently long for all valid command strings.  The ! is issued as soon as the buffer is full and is repeated after each successive character until a CR is received.  In response to the CR, a ? and CR/LF is sent and the balance input buffer is cleared.

2.     : is issued when a parity, overrun, or framing error is detected by the interface since the last CR.  The : is sent after the CR ending the command string which caused the error has been received.

3.     ? is issued when a syntax error occurs or when an illegal character is received or when some other procedural error is detected.  The ? is sent after the CR ending the command string which caused the error has been received.

Power up errors are not detectable over the RS-232 I/O channel.  The only way to detect such errors is to attempt to communicate with the balance and have the ability to recognize that the communication is failing.  Displayed error messages are only available by polling the balance using the SEND command.  The balance would respond by transmitting the displayed error (i.e., Err 1, Err 2).

# TROUBLESHOOTING GUIDE

**NOTE:** **Many problems such as the balance remaining in the turn on sequence, "weird" characters on the display or "garbage" on the display are caused by connecting the power supply to the balance incorrectly. The proper procedure is to connect the round DIN connector on the power supply cable to the balance then plug the power supply into the wall outlet.**

| PROBLEM | POSSIBLE CAUSE | POSSIBLE SOLUTION |
|---|---|---|
| The display is blank | *Balance not turned on<br>*Power cable not plugged in<br>*No power from AC outlet | *Press ON/OFF switch<br>*Plug in power cable<br>*Turn on circuit breaker<br>*Change AC outlets |
| OL appears in display | *Maximum capacity exceeded | *Reduce container weight<br>*Weigh sample in smaller increments<br>*Switch to high range (dual range units) |
| | *Shipping clamp is on | *Loosen clamp (see page 4) |
| UL appears in display | *Pan is not in place<br>*Balance is out of range<br>*Shipping clamp is on | *Insure pan is positioned properly<br>*Press ZERO switch<br>*Loosen clamp (see page 4) |
| The display is unstable | *Drafts (air currents are present)<br>*Vibrations are present | *Install windscreen, relocate balance<br>*Isolate balance from vibration, relocate balance |
| Weight readings are incorrect | *Balance is out of calibration<br>*Balance is not level<br>*Display was not zeroed before weight was placed on pan<br>*Object being weighed is touching windscreen or balance case top<br>*Unit of weight selection is incorrect | *Recalibrate balance<br>*Level balance<br>*Press ZERO switch before weighing<br><br>*Reposition object<br><br>*Select proper weighing mode |
| Display stays in turn on sequence | *Pan not in place<br>*Drafts or vibrations present<br>*New windscreen has been installed<br>*Shipping clamp is on<br>*Power supply connected to wall outlet before balance connector | *Place pan on balance<br>*Isolate or relocate balance<br>*Raise pan height<br>*Loosen clamp (see page 4)<br>*Unplug power supply from wall then replug into wall |
| Err 1 appears in display | *Calibration weight is incorrect | *Use calibration weight that appears in balance display |
| Err 2 appears in display | *Balance not warmed up enough for calibration to be performed | *Plug in and turn on balance for 1 hour |
| Err 3 through 14 appears in display | *Service is required | *Call Scientech's Service Department at (800) 525-0522 or (303)444-1361 or email us at inst@scientech-inc.com. |

## ENVIRONMENTAL REQUIREMENTS

This product is intended for indoor use at altitudes up to 2000 meters, Pollution Degree 1 or 2 in accordance with IEC 664 and transient overvoltages according to Installation Categories (Overvoltage Categories) I, II and III.  For mains supply, the minimum and normal category is II.

## SPECIFICATIONS SA SERIES ANALYTICAL BALANCES

| Model | SA 80 | SA 120 | SA 210 | SA 310 | SA 410 | SA 510 | SA 210D | SA 525D |
|---|---|---|---|---|---|---|---|---|
| Weighing Mode | Single Range | | | | | | Dual Range (Floating Tare™) | |
| Capacity | 80g | 120g | 210g | 310g | 410g | 510g | 100g 200g | 250g 500g |
| Readability | .0001g | | | | | | .0001g .001g | |
| Tare Range | 0-80g | 0-120g | 0-210g | 0-310g | 0-410g | 0-510g | 0-200g 0-200g | 0-500g 0-500g |
| Repeatability (Standard Deviation) | .0001g | .0001g | .0001g | .00015g | .00015g | .0002g | .0001g .0005g | .00015g .0005g |
| Linearity | ±.0002g | | | | | | ±.0002g ±.0005g | |
| Stabilization Time | User Selectable | | | | | | | |
| Weighing Speed | Adaptive | | | | | | | |
| Display Update Interval | 200ms | | | | | | | |
| Data Interface | RS-232 bidirectional interface is standard. Baud rates are 300, 600, 1200, 2400, 4800, 9600 and 19,200. | | | | | | | |
| Pan Size | Circular 3.5 inch diameter | | | | | | | |
| Operating Temperature | 5°C to 40°C | | | | | | | |
| Relative Humidity | 80 % for temperatures up to 31°C decreasing linearly to 50 % at 40°C | | | | | | | |
| Power Supply | 115 Volts/60 Hz ± 10 % 230 Volts/50Hz or 60 Hz ± 10 % | | | | | | | |
| Windscreen | 7.5W x 8.25D x 9.5H | | | | | | | |
| Calibration Weight | 80g 50g | 100g 50g | 200g 100g | 300g 200g | 400g 200g | 500g | 200g 100g | 500g 200g |
| Housing (WxDxH) | 7.5" x 11.25" x 3.25" | | | | | | | |
| Weight | ~ 13.8 lbs | | | | | | | |

**SPECIFICATIONS SP SERIES PRECISION BALANCES**

| Model | SP150 | SP250 | SP350 | SP500 | SP1000 | SP1500 | SP404D | SP510D | SP2050D |
|---|---|---|---|---|---|---|---|---|---|
| Weighing Mode | Single Range | | | | | | Dual Range (Floating Tare™) | | |
| Capacity | 150g | 250g | 350g | 500g | 1000g | 1500g | 40g<br>400g | 100g<br>500g | 500g<br>2000g |
| Readability | 0.001g | | | | | | 0.001g<br>0.01g | | |
| Tare Range | 0-150g | 0-250g | 0-350g | 0-500g | 0-1000g | 0-1500g | 0-400g<br>0-400g | 0-500g<br>0-500g | 0-2000g<br>0-2000g |
| Repeatability (Standard Deviation) | 0.001g | | | | | | 0.001g<br>0.005g | | |
| Linearity | ±0.0015g | | | | | | ±0.0015g<br>±0.005g | | |
| Stabilization Time | User Selectable | | | | | | | | |
| Weighing Speed | Adaptive | | | | | | | | |
| Display Update Interval | 200 ms | | | | | | | | |
| Data Interface | RS-232 bidirectional interface is standard. Baud rates are 300, 600, 1200, 2400, 4800, 9600 and 19,200 | | | | | | | | |
| Pan Size | Circular 4.5 inch diameter | | | | | | | | |
| Operating Temperature | 5°C to 40°C | | | | | | | | |
| Relative Humidity | 80 % for temperatures up to 31°C decreasing linearly to 50 % at 40°C | | | | | | | | |
| Power Supply | 115 Volts/60 Hz ± 10 %<br>230 Volts/50 Hz or 60 Hz ± 10 % | | | | | | | | |
| Windscreen | Circular 6 inch diameter x 3.25 inches high | | | | | | | | |
| Calibration Weight | 150g<br>100g | 250g<br>200g | 350g<br>200g | 500g | 1000g<br>500g | 1500g<br>1000g | 400g<br>200g | 500g<br>200g | 2000g<br>1000g |
| Housing (WxDxH) | 7.5" x 11.25" x 3.25" | | | | | | | | |
| Weight | ~ 9.5 lbs | | | | | | | | |

**SPECIFICATIONS SL SERIES LABORATORY BALANCES**

| Model | SL400 | SL600 | SL1000 | SL2000 | SL3000 | SL5000 | SL6000 | SL3100D | SL5200D |
|---|---|---|---|---|---|---|---|---|---|
| Weighing Mode | Single Range | | | | | | | Dual Range (Floating Tare™) | |
| Capacity | 400g | 600g | 1000g | 2000g | 3000g | 5000g | 6000g | 1000g 3000g | 2000g 5000g |
| Readability | 0.01g | | | | | | | 0.01g 0.1g | |
| Tare Range | 0-400g | 0-600g | 0-1000g | 0-2000g | 0-3000g | 0-5000g | 0-6000g | 0-3000g 0-3000g | 0-5000g 0-5000g |
| Repeatability (Standard Deviation) | 0.01g | | | | | | | 0.01g 0.05g | |
| Linearity | ±0.015g | | | | | | | ±0.015g ±0.05g | |
| Stabilization Time | User Selectable | | | | | | | | |
| Weighing Speed | Adaptive | | | | | | | | |
| Display Update Interval | 300 ms | | | | | | | | |
| Data Interface | RS-232 bidirectional interface is standard. Baud rates are 300, 600, 1200, 2400, 4800, 9600 and 19,200 | | | | | | | | |
| Pan Size | Circular 4.5 inch diameter | | | | Circular 6.5 inch diameter | | | | |
| Operating Temperature | 5°C to 40°C | | | | | | | | |
| Relative Humidity | 80 % for temperature up to 31°C decreasing linearly to 50 % at 40°C | | | | | | | | |
| Power Supply | 115 Volts/60 Hz ± 10 % 230 Volts/50 Hz or 60 Hz ± 10 % | | | | | | | | |
| Windscreen | Optional | | | | | | | | |
| Calibration Weight | 400g 200g | 600g 500g | 1000g 500g | 2000g 1000g | 3000g 2000g | 5000g 2000g | 6000g 5000g | 3000g 2000g | 5000g 2000g |
| Housing (WxDxH) | 7.5" x 11.25" x 3.25" | | | | | | | | |
| Weight | ~ 8.5 lbs | | | | | | | | |

| Model | SG3000 | SG5000 | SG8000 | SG12000 | SE250 | SE2500 |
|---|---|---|---|---|---|---|
| Weighing Mode | Single Range | | | | | |
| Capacity | 3000g | 5000g | 8000g | 12000g | 250g | 2500g |
| Readability | 0.1g | | | | 0.001g | 0.01g |
| Tare Range | 0-3000g | 0-5000g | 0-8000g | 0-12000g | 0-250g | 0-2500g |
| Repeatability (Standard Deviation) | 0.1g | | | | 0.001g | 0.01g |
| Linearity | ±0.15g | | | | ± 0.0015g | ± 0.015g |
| Stabilization Time | ~ 3 seconds | | | | | |
| Weighing Speed | Adaptive | | | | | |
| Display Update Interval | 300 ms | | | | | |
| Data Interface | RS-232 bidirectional interface standard.  Baud rates are 300, 600, 1200, 2400, 4800, 9600 and 19,200 | | | | | |
| Pan Size | Rectangular 7.5"W x 8.0"D | | | | 4.5" plus 2 removable plastic | 4.5" |
| Operating Temperature | 5°C to 40°C | | | | | |
| Relative Humidity | 80 % for temperatures up to 31°C decreasing linearly to 50 % at 40°C | | | | | |
| Power Supply | 115 Volts/60 Hz ± 10 %  230 Volts/ 50 Hz or 60 Hz ± 10 % | | | | | |
| Windscreen | Not Available | | | | 7.5Wx8.25Dx9.5H | Optional |
| Calibration Weight | 3000g 2000g | 5000g 2000g | 8000g 5000g | 10000g 5000g | 250g 200g | 2500g 2000g |
| Housing (WxDxH) | 7.5" x 11.25" x 3.25" | | | | | |
| Weight | ~ 10.0 lbs | | | | ~ 9.0 lbs | ~ 8.5 lbs |

## CE Mark

All Scientech Electronic Balances carry the CE Mark and conform to the requirements of the following standards:

EN 55011: 1998          Limits and Methods of Measurement of Radio Disturbance Characteristics of Industrial, Scientific and Medical (ISM) Radio-frequency Equipment

EN 61326-1: 1997       EMC Requirements for Electrical Equipment for Measurement, Control and Laboratory Use

EN 61010-1: 1993       Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use

## LIMITED WARRANTY

All Scientech Electronic Balances and their accessories are warranted against defects in materials and workmanship within North America for three (3) years and all other areas for two (2) years from the date of delivery. During the warranty period, Scientech will repair, or at its option replace at no charge, components that prove to be defective. The equipment must be returned, shipping prepaid, to Scientech's product service facility. This limited warranty does not apply if the equipment is damaged by accident or misuse or as a result of service or modification by other than a Scientech service facility. The foregoing warranty is in lieu of all other warranties expressed or implied including but not limited any implied warranty of merchantability, fitness, or adequacy for any particular purpose or use. Scientech, Inc. shall not be liable for any special incidental or consequential damages whether in contract, tort or otherwise.

## EXTENDED WARRANTY

Extended warranty coverage can be purchased in a one or two year term at the time of balance purchase. Details are available by calling Scientech at (800) 525-0522.

## RETURNED GOODS PROCEDURE

Should it become necessary to return any item to Scientech for any reason, please contact our Product Service Department at (800) 525-0522 or (303) 444-1361 or Fax (303) 444-9229 or E-mail inst@scientech-inc.com. When you contact us, please be ready to provide the model number, serial number and a description of the problem. Frequently we can provide self-help information that will eliminate the need for returning the unit.

If equipment return is required, please pack the items in the original box and packing material. As an alternate, place equipment in a snug fitting box, then pack that box in a larger box with at least four inches of packing material between the two boxes. Scientech does not assume responsibility for underpacked items.

Please include the name and phone number of the person we should contact regarding repair question(s).

Normally, products are repaired and shipped within 5 working days after their arrival at the product service facility. This is an average time and could vary depending on the workload.

Shipping Address:       Scientech, Inc.
                         5649 Arapahoe Avenue
                         Boulder, CO  80303
                         U.S.A.

PN10597E

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