Table of Contents

Thank you for purchasing a Setra precision balance. The fine workmanship and durable construction should provide years of reliable service. While your balance is easy to operate, it is advisable to read this guide carefully before use. It is designed to help you perform weighing and related operations quickly and accurately.

This manual is divided into four major sections. Section One, "Installing Your Balance," explains where to put your balance, how to level it and install the pan, and how to get started. Section Two, "Understanding Your Balance," explains the various keys, displays, and messages you will encounter while using your balance. Section Three, "Using Your Balance," provides the detailed instructions necessary to perform various operations. Following Section Three are appendices which include initial balance setups, RS-232 information, accessory information, troubleshooting, specifications and a warranty statement.

Typographical conventions used in this manual include the following:

1. **BOLD UPPER CASE CHARACTERS** indicate specific keys on the balance keyboard.

2. "Quotation marks" enclose messages seen on the balance display.

Installing Your Balance

SETUP

1.Locating your balance...

> You should treat your balance as you would any piece of precision equipment, locating it on a clean, dry surface; away from extremes of draft and vibration.

2.Leveling your balance...

> The bubble level is located underneath the loading pan. Adjust the two front feet until the bubble is centered in the circle.

3.Installing the weighing pan...

> Next, place the pan support over the shaft in the center of the unit. Then, place the pan over the pan support.

4.Connecting your balance to an AC outlet...

> To power up your balance, insert the appropriate end of the AC adaptor into an electrical outlet. Now insert the connector end into the back of the balance. The balance draws very little current from an outlet, and should always remain plugged in. The display may be turned off by holding down the **TARE** key for five seconds. This keeps your balance always ready to use with no "warm up" time.

5.Display test...

> Each time your balance is powered on, it automatically runs through a display test lasting about thirty seconds, showing all possible segments which might be displayed, and then setting itself to zero. The balance is then ready to be used. For best accuracy allow the balance to warm up for 5 minutes prior to using or calibrating.

Understanding Your Balance

KEYBOARD FUNCTIONS

CAL   Instructs the balance to accept calibration data.

MODE   Factory programmed to select display response rate. Can be user programmed to hold a displayed weight.

PRINT   Sends to a printer or other peripheral device the information on the display.

UNITS   Converts weighing units (for example, changes from grams to ounces).

TARE/POWER   Assigns the pan and whatever is currently being weighed a value of zero. To turn the display off, hold this key down for five seconds. To turn the display on press this key again.

%   Instructs the balance to display percent weight.

LED INDICATORS

ok   Reading shown is stable.

g   Reading shown is given in grams.

oz   Reading shown is given in ounces (avoirdupois).

ct   Reading shown is given in carats.

%   Reading shown is given as a percent weight.

x   Reading shown is given in user-definable units.

Note: "x" units are preset at the factory to grams/second.

FAST   The display response rate is set to fast.

SLOW   The display response rate is set to slow.

DISPLAY MESSAGES

$- - - - - -$ The balance is developing a stable reading.

UnAbLE   The balance is unable to perform your requested operation. Press the **TARE** key and select another operation.

HHHHHH   The weight on the pan exceeds the capacity of the balance.

LLLLLL   The pan is not properly seated or has been removed.

Using Your Balance

BASIC WEIGHING

To weigh a sample on your balance, use the following procedure:

1. Press the **TARE** key to zero the display.

2. Place the object(s) to be weighed on the pan.

3. Wait for the "ok" indicator, then read the weight from the display.

WEIGHING WITH A CONTAINER

To weigh objects or liquids without including the weight of the container, use the following procedure:

1. Place the empty container on the pan. Press the **TARE** key, the scale will display "– – – – – –" and return to zero.

2. Wait for the "ok" indicator. Place or pour objects or liquids into the container.

3. Wait for the "ok" indicator, the net weight will be displayed.

CONVERTING WEIGHING UNITS

Your balance is capable of weighing in any of the units listed in the "LED INDICATORS" portion of this manual. To convert from one unit to another, simply press the **UNITS** key. Each time you press the key, the display converts to the unit next in line on the balance. Continue pressing the key until the unit you wish to use is displayed. The order of units is as follows: GRAMS — OUNCES — CARATS — "x" UNITS.

Note: If a weighing unit has been disabled, it will not be displayed. Refer to Appendix I: ENABLING UNITS OF MEASURE.

PERCENT DEVIATION

To calculate the amount by which a weight varies from a reference, follow this procedure:

1. Press **TARE**.

2. Place the reference weight on the pan.

3. Press the "**%**" key. After acquiring a stable reading, the display will read "100.000", "100.00" or "100.0" depending on the amount of weight applied and the % LED will be lit.

4. Press the **TARE** key. After acquiring a stable reading, the display will read "0.000 ", "0.00" or "0.0" depending on the amount of weight applied. The display now shows percent deviation.

5. Remove the reference weight.

6. Place the weight to be measured on the pan.

7. Wait for the ok LED to light. Read the display. The display indicates percent deviation from the reference.

8. Remove the weight.

9. Repeat Steps 6-8 as many times as desired.

10. Press **UNITS** to return to weighing.

NOTE: To display a % of a reference weight, skip step 4.

FILLING TO 100%

You may specify a weight as a given percentage of a total. To fill to 100%, proceed as follows:

1. Press **TARE**.

2. Place the reference filled container on the pan.

3. Press the **%** key. After acquiring a stable reading, the display will read "100.000", "100.00" or "100.0" depending on the amount of weight applied.

4. Remove the container.

5. Place the empty container on the pan.

6. Fill the container until "100%" is displayed and the ok LED is lit.

7. Empty the container.

8. Repeat Steps 5 - 7 as many times as desired.

9. Press **UNITS** to return to weighing.

CHANGING THE DISPLAY RESPONSE RATE

The **MODE** key is factory preset to allow you to modify the display response rate. The default is Automatic and provides a fast display response (short integration time) when the balance senses large changes in weight and a slow display response (long integration time) when sensing small changes in weight. The **MODE** key can be used to provide a constant FAST display response rate for filling operations or a SLOW display response rate for weighing in the presence of vibration. To change display response rates, simply press the **MODE** key repeatedly until you have selected the desired response rate.

FILLING TO A TARGET WEIGHT

The **MODE** key is used to enter a FAST response rate for filling operations.

1. Press the **MODE** key. The FAST LED should be lit.

2. Place a container on the pan and press the **TARE** key.

3. Pour to the targeted weight.

4. Return to the automatic weighing mode by pressing the **MODE** key twice.

WEIGHING IN THE PRESENCE OF VIBRATION

The **MODE** key is used to enter a SLOW display response rate for weighing in the presence of vibration.

1. Press the **MODE** key twice. The SLOW LED indicator should be lit.

2. Perform any weighing procedure.

3. To return to the automatic weighing mode, press the **MODE** key.

FLOW RATE

The balance can monitor flow rates by calculating the weight change in weight per second. The factory default "x" user definable unit is set to grams/second. To select the "x" unit, press the **UNITS** key until the X LED indicator is lit. Refer to SETTING THE USER DEFINABLE UNIT OF MEASURE; SELECTING FLOW RATE in Appendix I: User Setups, to change the flow rate to other weight units per second.

HOLDING A DISPLAYED WEIGHT

The balance is capable of locking onto a displayed reading. The **MODE** key's function can be changed to act as a HOLD button. Refer to SETTING FUNCTION OF THE MODE KEY in Appendix I: User Setups, to change the function of the **MODE** key. The factory default setup for the **MODE** key is to select the display response rate.

INTERFACING WITH A COMPUTER

Your balance has a male DB9 RS-232 serial port and is designed to interface with computer equipment. If your balance is connected to a computer, follow the instructions in Appendix II.

PRINTING OUT INFORMATION

Your balance is designed to print out the displayed weight when connected to an optional serial printer. To print using the CoStar SETRA 250 thermal receipt/label printer, follow the instructions below:

1. Connect the printer's AC adaptor to the proper electrical outlet.

2. Make sure the printer is turned on (as indicated by the printer's green light). If the printer is not on, press the blue power button on the front of the printer.

3. Load the appropriate paper or label stock into the printer. (See printer instructions for details).

4. Connect the printer to the balance's RS-232 connector using the cable provided.

5. Perform the necessary weighing procedures on the balance.

6. Press the **PRINT** key on the balance.

NOTE: If using label stock, the form feed command must be programmed in User Setups (see Appendix I). When using a printer other than the CoStar SETRA 250, set the baud rate and parity of your balance to match the printer (see Appendix I, User Setups to select the print mode, baud rate and parity).

REPETITIVE PRINTING

It is sometimes desirable to measure weight at fixed intervals of time. One use of this procedure is evaporation studies. To print out weight at fixed intervals, refer to SETTING THE PRINT FUNCTION in Appendix I: User Setups. Once the time interval has been selected proceed as follows:

1. Press **PRINT** to begin the repetitive printing procedure.

2. Press **PRINT** again to stop the procedure.

User Setups

The outline below represents the balance's menu structure. To enter the menu press and hold the **TARE** key and then press the **MODE** key. To view the current menu options, press the **TARE** key repeatedly. To select the displayed option, press the **MODE** key.

CAL
- Full Scale
- Lower Weights
- Unspan
- Escape

MODE

FUNC *sets function of mode key*
- Speed
- Hold
- Escape

PRINT
- Stable
- Instant
- Interval — 0... ...600, Escape
- Line Feed — 1... ...18, Escape
- Escape

BAUD *set for RS-232 interface*
- 300
- 600
- 1200 — Parity — None, Even, Odd, Escape
- 2400
- 4800
- 9600
- Escape

UNITS
- Enable — grams yes/no, Escape; ounces yes/no, Escape; carats yes/no, Escape; User U yes/no, Escape
- User U
- Per Sec — Rate On, Rate Off, Escape
- Escape

TARE POWER

REF *Displays current software version*

FACDEF *Restores all factory defaults*

CUSTOM *Environmental Customization*
- Speed — Fast, Slow, Auto, Escape
- CAL T — Fac TP; User TP — Hot Cal; Escape
- Escape

ESCAPE *Returns to weighing mode*

CALIBRATION

To perform a span calibration, use the following procedure:

STEP 1.

$$0.00 \longrightarrow \boxed{\text{MODE}} \; \boxed{\substack{\text{TARE} \\ \text{POWER}}} \longrightarrow 0.00$$

Press the **TARE** key to zero the balance.

STEP 2.

$$0.00 \longrightarrow \boxed{\text{CAL}} \longrightarrow 4000$$

Press the CAL key and the balance will display its full scale capacity calibration point. To calibrate the balance at full scale go to step 3. To calibrate at one half of the full capacity, go to step 4.

STEP 3.

$$4000 \longrightarrow \boxed{\text{CAL}} \longrightarrow ACAL$$

Place the calibration weight on the pan and press the **CAL** key. The display will read "ACAL" and then display the value of the weight on the pan. The balance is now in the normal weighing mode. Once the weight is removed from the pan, the display will return to zero.

To restore the factory calibration, press the **TARE** key twice in Step 3 to display "UnSPAn" then press the **MODE** key. To escape, press the **TARE** key three times in Step 3 to display "ESCAPE" then press the **MODE** key.

STEP 4.

$$4000 \longrightarrow \boxed{\text{MODE}} \; \boxed{\substack{\text{TARE} \\ \text{POWER}}} \longrightarrow 2000$$

Press the **TARE** key and the balance will display the capacity which is half of full scale. Go to step 3. to finish the calibration procedure.

Note: If the test weight varies by ±1% from the factory calibration, the span calibration will not be accepted and "noCAL" will be displayed.

SETTING FUNCTION OF MODE KEY FOR DISPLAY RESPONSE RATE OR HOLD

The **MODE** key may be set to change the balance's display response rate or hold a displayed weight. If set to the hold feature, the balance will attain a stable weight then lock the display until a key is pressed.

To set the function of the **MODE** key, use the following procedures:

STEP 1:

$$0.00 \rightarrow \text{MODE} \quad \text{TARE POWER} \rightarrow \text{FUnC}$$
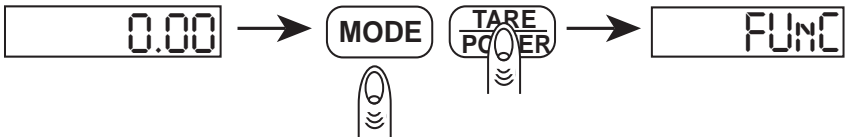
Hold down the **TARE** key then press the **MODE** key. Release both keys, the display will read "FUnC" for function.

STEP 2.

$$\text{FUnC} \rightarrow \text{MODE} \quad \text{TARE POWER} \rightarrow \text{SPEEd}$$

Press the **MODE** key to select the function menu. The display will read "SPEEd" for available display response rates. Proceed to step 3a. to program the **MODE** key to change the display response rate. Go to step 3b. to program the **MODE** key to perform the hold function.

Note: To escape anytime during this procedure, press the **TARE** key until "ESCAPE" is displayed, then press the **MODE** key.

STEP 3.

$$\text{SPEEd} \rightarrow \text{MODE} \quad \text{TARE POWER} \rightarrow 0.00$$

  a. Press the **MODE** key to select the display response rate function.

$$\text{SPEEd} \rightarrow \text{MODE} \quad \text{TARE POWER} \rightarrow \text{HOLd}$$
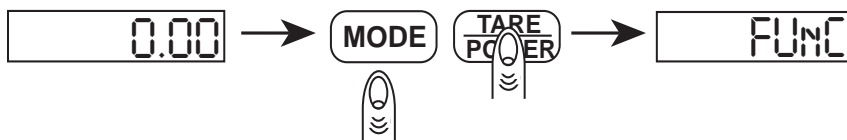
  b. Press the **TARE** key to display "HOLd" then press the **MODE** key. The balance will return to the normal weighing mode. Each time the **MODE** key is pressed the weight will be displayed until a key is pressed.

SETTING THE PRINT FUNCTION

The **PRINT** key can be setup to send readings to a printer or computer under different parameters via the RS-232 port. The selectable print functions are: *stable print* which will only print once a stable reading is attained, *instant print* which will print immediately after the **PRINT** key is pressed (note: the reading may not be stable) and *interval print* which may be programmed to print at predetermined time intervals. The number of *line feeds* may also be set for label printing. The print function is separate from the line feed setup, i.e., set the print function first then re-enter the print menu to program the number of line feeds.

To set the **PRINT** key function, use the following procedures:

STEP 1:

Hold down the **TARE** key then press the **MODE** key. Release both keys, the display will read "FUnC".

STEP 2.

Press the **TARE** key again and the display will read "PrInT" for the print menu.

Note: To escape anytime during this procedure, press the **TARE** key until "ESCAPE" is displayed, then press the **MODE** key.

STEP 3.

Press the **MODE** key to enter the print menu. The display will read "STAbLE" for stable print.

STEP 4:

$$\boxed{\text{5TAbLE}} \longrightarrow \boxed{\text{MODE}}\ \boxed{\substack{\text{TARE}\\\text{POWER}}} \longrightarrow \boxed{\text{0.00}}$$

a. *For stable print*
Press the **MODE** key to select the stable print mode. The balance will return to the normal weighing mode.

b. *For instant print*
Press the **TARE** key once to display "InSTAn" for instant and then press the **MODE** key. The balance will return to the normal weighing mode.

c. *For interval print*
Press the **TARE** key twice to display "InTEr" for interval print and then press the **MODE** key. Proceed to step 5.

d. *For line feed*
Press the **TARE** key three times to display "LInEFd" for line feed and then press the **MODE** key. Proceed to step 6.

STEP 5:

$$\boxed{\text{InTEr}} \longrightarrow \boxed{\text{MODE}}\ \boxed{\substack{\text{TARE}\\\text{POWER}}} \longrightarrow \boxed{\text{90 SEC}}$$

To view the predetermined print intervals (in seconds) press the **TARE** key repeatedly. When the desired time interval is displayed, press the **MODE** key. (Select zero for continuous printing.) The balance will then return to the normal weighing mode. Pressing the **PRINT** key will print the displayed weight after each selected time interval (e.g., every 90 seconds). To interrupt the interval printing press the **PRINT** key again. To reactivate, press the **PRINT** key.

Note: Print intervals can vary up to $\pm.2$ seconds depending on weight variations.

STEP 6:

$$\boxed{\text{LInEFd}} \longrightarrow \boxed{\text{MODE}}\ \boxed{\substack{\text{TARE}\\\text{POWER}}} \longrightarrow \boxed{\text{LF 4}}$$

To view the preset number of line feeds available (0-18) press the **TARE** key repeatedly. To program a form feed command for the CoStar SETRA 250 printer, select "LF 0" as the number of line feeds. When the desired number of line feeds is displayed, press the **MODE** key. The balance will then return to the normal weighing mode.

SETTING THE BAUD RATE

The balance is capable of interfacing with a wide variety of computer devices. To set the baud rate (the rate at which the scale communicates with a computer or printer) and parity, use the following procedure:
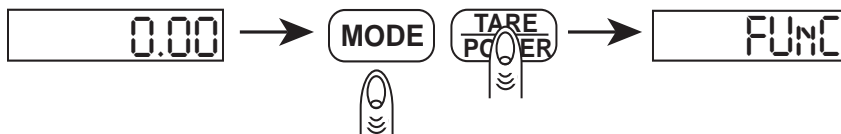
STEP 1.

$$\boxed{0.00} \longrightarrow \fbox{MODE} \; \fbox{TARE POWER} \longrightarrow \boxed{FUnC}$$

Hold down the **TARE** key then press the **MODE** key. Release both keys, the display will read "FUnC".

STEP 2.

$$\boxed{FUnC} \longrightarrow \fbox{MODE} \; \fbox{TARE POWER} \longrightarrow \boxed{bAUd}$$

Press the **TARE** key twice, the display will read "bAUd" for baud rate.

Note: To escape anytime during this procedure, press the **TARE** key until "ESCAPE" is displayed and press the **MODE** key.

STEP 3.

$$\boxed{bAUd} \longrightarrow \fbox{MODE} \; \fbox{TARE POWER} \longrightarrow \boxed{300}$$

Press the **MODE** key to enter the baud rate menu. The display will read 300. To view the other baud rates press the **TARE** key repeatedly.

STEP 4.

$$\boxed{2400} \longrightarrow \fbox{MODE} \; \fbox{TARE POWER} \longrightarrow \boxed{PArITY}$$

When the desired baud rate is displayed, press the **MODE** key to select it. The display will then read "PArITY".

STEP 5.

Press the **MODE** key to enter the parity menu. The display will read "nOnE" for no parity. To view the parity menu press the **TARE** key.
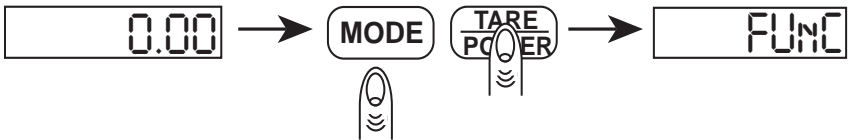
STEP 6.

When the desired parity (none, odd, even) is displayed, press the **MODE** key. The balance will then return to the normal weighing mode.

ENABLING UNITS OF MEASURE

The UNITS function can be programmed to turn certain weighing units on or off. To enable or disable certain units of measure, perform the following procedure.

STEP 1.

Hold down the **TARE** key then press the **MODE** key. Release both keys, the display will read "FUnC".

STEP 2.

Press the TARE key three times, to display "UnITS" for the units menu.

Note: To escape anytime during this procedure, press the **TARE** key until "ESCAPE" is displayed and press the **MODE** key.

STEP 3.

Press the **MODE** key to enter the units menu and the display will read "EnAbLE".

STEP 4.


Press the MODE key. The first selection displayed is "g yES" which represents grams enabled. To enable grams press the MODE key. To disable grams, press the TARE key to display "g nO" , then press the **MODE** key. These yes/no selections are also displayed for ounces (O), carats (C) and user definable units (U).

Note: To enable or disable any unit of measure, the procedure outlined above must be completed for each unit. If you make a change and escape before finishing the complete procedure (which ends with U units) the change will not take effect.

SETTING THE USER DEFINED UNIT OF MEASURE

A user defined unit can be programmed for any unit of measure, such as ml for measuring volume or $ for measuring value. To measure in "x" units, first calculate the ratio you wish to enter. If your ratio is in "x" units per gram, you would enter a factor (positive conversion number). If your ratio is in grams per "x" unit enter a divisor (negative conversion number). To define the "x" unit perform the following procedure.
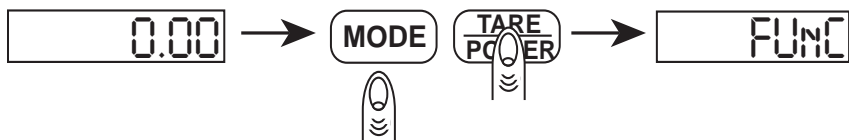
STEP 1.

Hold down the **TARE** key then press the **MODE** key. Release both keys, the display will read "FUnC".

STEP 2.

$$FUnC \longrightarrow (MODE) (\underset{POWER}{TARE}) \longrightarrow UnITS$$

Press the **TARE** key three times to display "UnITs".

Note: To escape anytime during this procedure, press the **TARE** key until "ESCAPE" is displayed and press the **MODE** key.

STEP 3.

$$UnITS \longrightarrow (MODE) (\underset{POWER}{TARE}) \longrightarrow EnAbLE$$

Press the **MODE** key to select "UnITS"", the display will read "EnAbLE".

STEP 4.

$$EnAbLE \longrightarrow (MODE) (\underset{POWER}{TARE}) \longrightarrow USEr U$$

Press the **TARE** key to display "USEr U" for user defined units, then press the **MODE** key. The display will read "SET dP.".

STEP 5.

$$SET dP. \longrightarrow (MODE) (\underset{POWER}{TARE}) \longrightarrow SE.T dP$$

While "SET dP." is displayed, press the **TARE** key repeatedly to move the decimal point from right to left to set the precision of your conversion number (a maximum of six digits can be used.) For example, to set the decimal point to four decimal places, press the **TARE** key four times until the display reads "SE.T dP".

STEP 6.

$$SE.T dP \longrightarrow (MODE) (\underset{POWER}{TARE}) \longrightarrow 0.0000$$

Press the **MODE** key to lock in the decimal point position. The display will then read zero and wait for a conversion number to be entered. Following the above example, the display would read "0.0000".

STEP 7.

$$\boxed{\text{0.0000}} \rightarrow \boxed{\text{MODE}}\ \boxed{\substack{\text{TARE}\\\text{POWER}}} \rightarrow \boxed{\text{-0.0648}}$$

By holding down the **MODE** key, the displayed reading will increase. Holding down the **TARE** key will decrease the reading. If the conversion number is a factor ("x" units per gram), enter a positive number by holding down the **MODE** key until the number is displayed. If the conversion number is a divisor (grams per "x" unit), enter a negative number by holding down the **TARE** key until the number is displayed.

Note: For example, to measure in grains per gram, calculate the conversion; 1 grain is equal to 0.0648 grams and enter the divisor -0.0648. The same result can be obtained using 15.43 grains/gram in which case you would enter the positive factor 15.43.

STEP 8.

$$\boxed{\text{-0.0648}} \rightarrow \boxed{\text{MODE}}\ \boxed{\substack{\text{TARE}\\\text{POWER}}} \rightarrow \boxed{\text{-0.0648}}$$

Once the conversion number is displayed, select it by pressing both the **MODE** key and the **TARE** key **simultaneously**.

STEP 9.

$$\boxed{\text{-0.0648}} \rightarrow \boxed{\text{MODE}}\ \boxed{\substack{\text{TARE}\\\text{POWER}}} \rightarrow \boxed{\text{0.00}}$$

The number will flash on the display. If you need to adjust this flashing number, press the **TARE** key and return to step 7. If the flashing number is correct, press the **MODE** key. The balance will return to the normal weighing mode and display the weight in "x" units.

Note: If setting a user unit other than a flow rate (per second reading) the flow rate must be turned off following the instructions in the next section.

SELECTING FLOW RATE (PER SECOND)

The factory default of the "x" user defined unit is for flow rate displayed in grams per second. Flow rate can be enabled or disabled at will using the following procedure. When the flow rate is disabled, the "x" unit will display weight in the unit of measure it was last set to display. The factory default for "x" with flow rate disabled is grams.

STEP 1.
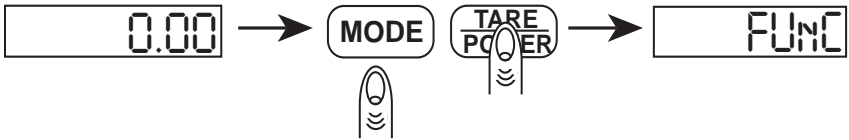
Hold down the **TARE** key then press the **MODE** key. Release both keys, the display will read "FUnC".

STEP 2.

Press the **TARE** key three times to display "UnITs".

Note: To escape anytime during this procedure, press the **TARE** key until "ESCAPE" is displayed and press the **MODE** key.

STEP 3.

Press the **MODE** key to select "UnITS" and enter the units menu. The display will read "EnAbLE".

STEP 4.

Press the **TARE** key twice to display "PEr SEC", then press the **MODE** key. The display will then read "rATE y" for rate yes.

STEP 5.

$$\boxed{\text{rATE y}} \longrightarrow \boxed{\text{MODE}} \; \boxed{\text{TARE} \atop \text{POWER}} \longrightarrow \boxed{0.00}$$

To select the "x" units as a flow rate, press the **MODE** key and the balance will return to the normal weighing mode.

STEP 6.

$$\boxed{\text{rATE n}} \longrightarrow \boxed{\text{MODE}} \; \boxed{\text{TARE} \atop \text{POWER}} \longrightarrow \boxed{0.00}$$

To disable the "x" units as a flow rate, press the **TARE** key to display "rATE n" for rate no and then press the **MODE** key. The balance will return to the normal weighing mode.

Note: Flow rate can be displayed in other weight units per second such as ounces per second, grains per second, milligrams per second, etc. Refer to the previous section SETTING THE USER DEFINED UNIT OF MEASURE to convert the user defined unit to the weight unit of choice, then follow the procedure above to enable flow rate.

FIRMWARE VERSION

The operating software in your balance has a reference number. To display this number, follow the procedure outlined below.

STEP 1.
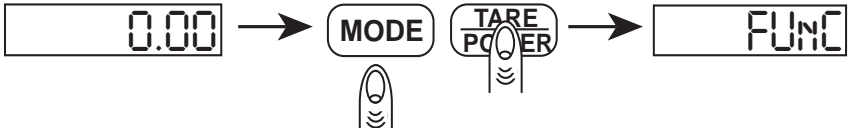
$$0.00 \longrightarrow \boxed{\text{MODE}} \; \boxed{\begin{array}{c}\text{TARE}\\\text{POWER}\end{array}} \longrightarrow \text{FUnC}$$

Hold down the **TARE** key then press the **MODE** key. Release both keys, the display will read "FUnC".

STEP 2.

$$\text{FUnC} \longrightarrow \boxed{\text{MODE}} \; \boxed{\begin{array}{c}\text{TARE}\\\text{POWER}\end{array}} \longrightarrow \text{rEF}$$

Press the **TARE** key repeatedly to display "rEF" for reference number.

Note: To escape anytime during this procedure, press the **TARE** key until "ESCAPE" is displayed and press the **MODE** key.

STEP 3.

$$\text{rEF} \longrightarrow \boxed{\text{MODE}} \; \boxed{\begin{array}{c}\text{TARE}\\\text{POWER}\end{array}} \longrightarrow \text{rEF2.00}$$

Press the **MODE** key to display the software reference number, then press the **TARE** key to return to the normal weighing mode.

RESTORING THE FACTORY DEFAULT SETUPS

The many features in this section allow the user to customize the balance to suit a particular application. However, in doing this it is possible to inadvertently set up the balance in such a way that it does not operate as expected. To reset the factory defaults so that the: **MODE** key will select display response rate; **PRINT** key will print a stable reading; 2400 baud, no parity; all units enabled with "x" units set to grams per second; perform the following steps.
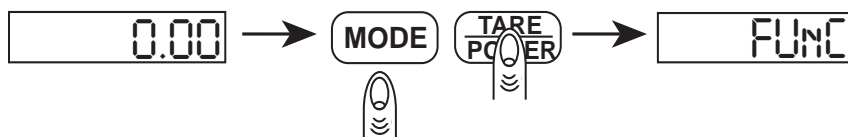
STEP 1.

```
0.00  ──▶  (MODE) (TARE POWER)  ──▶  FUnC
```

Hold down the **TARE** key then press the **MODE** key. Release both keys, the display will read "FUnC".

STEP 2.

```
FUnC  ──▶  (MODE) (TARE POWER)  ──▶  FACdEF
```

Press the **TARE** key repeatedly until the display reads "FACdEF" for factory defaults.

Note: To escape anytime during this procedure, press the **TARE** key until "ESCAPE" is displayed and press the **MODE** key.

STEP 3.

```
FACdEF  ──▶  (MODE) (TARE POWER)  ──▶  0.00
```

Press the **MODE** key to restore the original factory defaults. The balance will display "buSY" and then return to the normal weighing mode.

Note: Restoring the factory defaults will return your balance to all of the factory span and temperature calibration settings. You MUST recalibrate (span) your balance after restoring the factory defaults. If you are experiencing a temperature induced offset, you should also run the temperature compensation calibration procedure.

ENVIRONMENTAL CUSTOMIZATION

Most high precision balances are used in stable environments, away from drafts and vibration. You may customize the balance with regards to its environmental conditions. The balance's response rate can be set to fast, slow or auto, depending on your application.

The balance is factory set to the auto mode which is recommended for most applications and will provide good stability and response.

The fast mode will provide a faster response than the auto mode and is suitable for applications such as filling to a target weight. In environments where draft and vibration are present, the displayed weight may not be as stable as required.

The slow mode will provide maximum stability especially in a noisy or drafty environment; however, the response rate may be slower.

To permanently set the display response rate for your environment or particular application, perform the following steps:
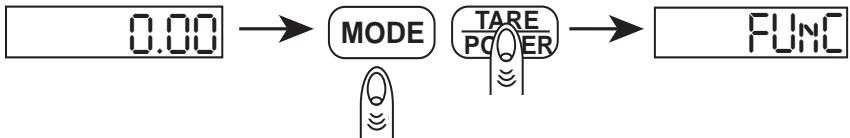
STEP 1.

Hold down the **TARE** key then press the **MODE** key. Release both keys, the display will read "FUnC".

STEP 2.

Press the **TARE** key repeatedly until the display reads "CUSTOn" for the customization menu.

Note: To escape anytime during this procedure, press the **TARE** key until "ESCAPE" is displayed and press the **MODE** key.

STEP 3.

Press the **MODE** key to enter the customization menu and the display will read "SPEEd" for the balance's response rate setting.

STEP 4.

Press the **MODE** key to enter the response rate menu and the display will read "FAST" for a fast response rate.

For fast response
> Perform Step 4., then press the **MODE** key to select the fast response rate. The balance will return to the normal weighing mode.

For slow response
> Perform Step 4., then press the **TARE** key once to display "SLO", then press the **MODE** key to select the slow response rate. The balance will return to the normal weighing mode.

For auto response
> Perform Step 4., then press the **TARE** key twice to display "AUTO", then press the **MODE** key to select the auto response rate. The balance will return to the normal weighing mode.

TEMPERATURE COMPENSATION CALIBRATION

If your balance is frequently moved from one location to another or if the room temperature varies more than a few degrees during the day, the balance may display a slight temperature induced offset. Your Setra balance is capable of compensating for this offset so that varying temperatures will not affect its performance.

If your balance is used in different locations, leave it where the temperature is either higher or lower than the operating environment for at least four hours. Otherwise, perform this calibration first thing in the morning or last thing in the evening so the balance experiences the largest possible temperature fluctuation. Then, place the balance in its operating environment and run this calibration procedure. Over the next three hours it will monitor any weight fluctuations that occur and record these temperature induced variations into memory. During this calibration period the balance cannot be used and must not be disturbed. Once this calibration procedure is completed, the balance will be able to internally compensate for the offset. To perform the temperature compensation calibration, follow the steps below.

STEP 1.

Leave the balance for at least four hours in the initial environment as explained above. The balance does not have to be powered on.

STEP 2.

Move the balance to its operating environment. Unplug the balance (if powered on) for 10 seconds and then power on. The balance will count down and should display 0.00.

Note: The 0.00 reading may not be very stable if the balance is warming up or cooling down.

STEP 3.
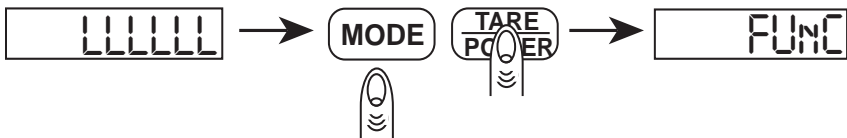
Remove the weighing pan and pan support. Hold down the **TARE** key then press the **MODE** key. Release both keys, the display will read "FUnC".

STEP 4.

$$FUnC \longrightarrow \boxed{MODE} \boxed{\frac{TARE}{POWER}} \longrightarrow CUSTOn$$

Press the **TARE** key repeatedly until the display reads "CUSTOn" for the customization menu.

Note: To escape anytime during this procedure, press the **TARE** key until "ESCAPE" is displayed and then press the **MODE** key.

STEP 5.

$$CUSTOn \longrightarrow \boxed{MODE} \boxed{\frac{TARE}{POWER}} \longrightarrow SPEEd$$

Press the **MODE** key to enter the customization menu. The display will read "SPEEd" for the balance's response rate setting.

STEP 6.

$$SPEEd \longrightarrow \boxed{MODE} \boxed{\frac{TARE}{POWER}} \longrightarrow CAL\ T$$

Press the **TARE** key once and the display will read "CAL T" for the temperature calibration menu.

STEP 7.

$$CAL\ T \longrightarrow \boxed{MODE} \boxed{\frac{TARE}{POWER}} \longrightarrow FAC\ TP$$

Press the **MODE** key to select the temperature calibration menu and the display will read "FAC TP" for the factory temperature calibration. Proceed to Step 8 to calibrate the balance to its operating environment.

Proceed to Step 10 to restore the factory temperature calibration.

STEP 8.

USEr TP → **MODE** **TARE POWER** → HOTCAL

Press the **TARE** key to display "USEr TP", then press the **MODE** key. The display will read "HOTCAL" to begin the temperature calibration. Let the balance sit, without being disturbed, for approximately three hours to monitor the temperature variations and weight fluctuations.

STEP 9.

0.03 → **MODE** **TARE POWER** → 0.00

At the end of approximately three hours, the balance will display a number such as "0.03". This number represents the maximum temperature induced offset that occurred as the balance acclimated itself to the operating environment. Press the **TARE** key and the balance will return to the normal weighing mode.

STEP 10.

FAC TP → **MODE** **TARE POWER** → 0.00

To restore to the factory temperature calibration, press the MODE key. The balance will restore the factory temperature calibration and return to the normal weighing mode.

RS-232 Serial Data Communications

The balance keyboard functions can be accessed via the RS-232 interface. The following commands are available:

u = **UNITS** key   t = tare function   a = auto display response rate
m = **MODE** key   p = print function   f = fast display response rate
% = **%** key   # = immediate print   s = slow display response rate

Receiving Data Using the Immediate Print Symbol

When a balance is connected to a computer, it is suggested that immediate print ("#") be used. In response to this command the balance will transmit whatever number or message appears on the balance display. The "string format" output is shown below:

+/- 1 2 3 4 5 6 . c0 c1 c2 c3 CR LF

The first six digits represent the number field. A sign (+ or -) always precedes the number and a decimal point is always transmitted. Numbers less than six digits long are preceded by spaces. (Messages, when transmitted, are sent in the number field.)

Note: The position of the decimal point will depend on the readability and units the balance is displaying. The sign will be adjacent to the leading digit.

"c0" is a space.

"c1" is also a space as long as the balance is in the automatic display response mode. If the display response rate is set to Fast, then "c1" will be an F, and if the display response mode is set to slow, then "c1" will be an S.

 "c2" is the "units" character. It describes the units of the number being transmitted. Your balance will transmit G for grams, O for ounces (avoirdupois), C for carats and X for "x" units.

"c3" is the "stability" character. This character corresponds to the "ok" indicator on the display. A (space) means the reading is not stable. "S" means the reading is stable.

The immediate print output is always transmitted with a carriage return and line feed. If the balance is set to a specific number of line feeds, these will be transmitted with a carriage return.

The RS-232 Interface Hardware

Although Setra balances can communicate with almost any RS-232 device, the built-in interface does not include the complete protocol. Only the transmit and receive lines of the standard interface are used. This should not present any interfacing problems in most applications.

The data format is: 1 start bit
                        8 data bits including parity
                        <u>1 stop bit</u>
                        10 bits per frame (framing errors ignored)

Note: The balance will transmit using the parity selected; however it does not check the parity it receives. Use an RS-232 cable to connect the external device to the balance, or construct one following the instructions below.

Connect a high quality, shielded cable with a DB9S (D-Subminiature 9 pin female connector) using the following pinout:

1 2 3 4 5	PIN	DESCRIPTION
• • • • •	2	TXD - scale transmits data
• • • •	3	RXD - scale receives data
6 7 8 9	5	GRD - signal ground

Note: "Handshake" signals, such as "Clear To Send" (CTS), are not used. The peripheral must have a minimum buffer (15 characters).

Shielded cables must be used with this unit to ensure compliance with the Class A FCC limits.

Computers which require handshaking need a connection between two pins on the computer's connector named DTR and DSR (Data Terminal Ready and Data Set Ready). CTS may also need to be jumpered to RTS at your computer interface (Clear To Send and Request To Send). The maximum recommended cable length is 15 meters. The cable can be longer if it has < 2,500 pF capacitance. The load impedance of the device connected should be between 3,000 and 7,000 ohms with no more than 2,500 pF shunt capacitance.

Accessories and Options

The following accessories are available for the BL series of precision balances. Contact your dealer for current price information.

Part #	Description
401160	CoStar SETRA 250 Printer - 2.25" wide receipt/label thermal printer. Direct connect for weight only printing. Dimensions: 4"W x 8"L x 6.25"H (100mm x 200mm x 160mm).
401907	Receipt Paper - 300' Roll (100 m).
401908	Labels - 2.25"w x 1.25"H (57mm x 32mm). Adhesive backed labels, 1000/roll.
407910	3 Way Sliding Glass Door Draftshield - Detachable glass and stainless steel compartment provides static-free protection from draft-created instability. Three sliding doors, including a top opening for tall vessels makes it easy to fill to a desired weight. For use on 410 gram balances only.
407210	Replacement Glass Cylinder Draftshield – Detachable glass draftshield provides static-free protection from draft-created instability. Removable stainless steel cover (p/n 407212-02) has a small opening for taller vessels. For use on 410 gram balances only.
407900	Security Lock Kit - Secure your balance to a bench or table top. Combination lock (not provided) can be used to permit removal of instruments.
407901	Dustcover - Chemically resistant rubber membrane cover protects balance from powder dust and spills.

In Case of Difficulty

If the balance will no longer follow your instructions, unplug it from its power source; then, plug the unit in again. If any unusual messages appear during warm up, or if the balance does not return to normal operation, contact your dealer or Setra Systems, Inc.

If the balance displays "– – – – – –" for an extended period of time, or the displayed reading is unstable, too much vibration or draft may be present. Relocate the balance away from the source of vibration or shield the balance from draft. If it continues, service may be required.

If the balance displays "nOCAL" during calibration, check to make sure you are using the correct calibration weight. (This calibration procedure can only correct for ± 1% span shift.)

If you are experiencing difficulty in calibrating or printing, check the set up of the balance. To restore the factory default setups:

1. Hold down the **TARE** key then press the **MODE** key. Release both keys, the display will read "FUnC".

2. Press the **TARE** key repeatedly until the display reads "FACdEF" for factory defaults.

3. Press the **MODE** key. The balance should display "buSY" and return to the normal weighing mode.

If the RS-232 interface does not function correctly, first make certain the RS-232 cable is securely fastened to both the balance and the peripheral device. Next, reset the balance's baud rate and parity to match the external device and make certain the data formats are identical. If data transmission or reception is still not possible, check that the cable is the correct type. (It may be necessary to "cross" the receive and transmit lines of the interface. That is, the receive line of the balance must connect to the transmit line of the external device. Likewise, the transmit line of the balance must connect to the receive line of the external device. Special cables can be purchased for this purpose from a computer dealer.) See Appendix II for detailed information.

If the problem still persists, contact your dealer or Setra Systems, Inc.

Specifications

Model	BL-410S	BL-4100S
Capacity (g)	410	4100
Readability (g)	0.001	0.01
Repeatability (g)	±0.001	±0.01
Linearity (g)	± 0.002	± 0.02
Keyboard	six key	six key
Pan Size	4" dia.	6.25" dia.
Draftshield	standard	N/A
Security Lock Kit	option	option
Size WxHxD (in.)	7 x 5.75 x 11	7 x 2.5 x 11
Weighing Modes	g, oz, carats, %, user unit, user unit/second	
Interface	Bidirectional RS-232, (standard on all models)	
Display	0.57" LED (all models)	
Power	7.2 VDC (115 VAC, 60Hz adaptor provided)	

Span Range: ± 1% of factory calibration

Display Update Speed: Up to 5 times per second

Selectable Baud Rates: 300   600   1200
2400   4800   9600

Selectable Parity: none/odd/even

Pan: Stainless Steel

Operating Temperature: 40˚ to 110˚F (5˚ to 43˚C)

Shipping Weight: 10 lbs.

Limited 3 Year Warranty

Setra Systems, Inc. warrants the BL balances it manufactures to be free from defects in material and workmanship. Upon return, transportation charges prepaid, to an Authorized Service Center within three (3) years of the date of purchase, Setra or its Authorized Agent will repair or replace, at its option, any balance which it determines to contain defective material or workmanship and will return said balance to purchaser, transportation prepaid. Setra shall not be obligated, however, to repair or replace balances which have been repaired by unauthorized parties, abused, improperly installed, altered, or otherwise misused or damaged, even if by accident, in any way. Setra will not be responsible for any dismantling, reassembly or reinstallation charges.

Nothing in this warranty shall be construed as a warranty for merchantability or fitness for any specific use or purpose, and this warranty is in lieu of all other warranties, expressed or implied. Setra shall not be held liable under the terms of this warranty for any special, indirect, incidental or consequential damages claimed in connection with the balances' performance or availability.

Setra Systems, Inc.
Weighing Systems Division
159 Swanson Road • Boxborough, MA 01719

FCC WARNING

Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area may cause harmful interference in which case the user will be required to correct the interference at their own expense.

Shielded cables must be used with this unit to ensure compliance with the Class A FCC limits.

CE Compliance Statement

Top Loading Balances

Setra Systems, Inc. manufactures high accuracy weighing equipment and distributes its products worldwide. In an effort to meet the demands of the market, Setra Systems continues to improve its products following the guidelines set forth by various governmental bodies and regulatory agencies. One such guideline has been established by the European Community, effective 1 January 1996. This guideline is known as the EMC Directive.

The EMC Directive requires compliance with various published standards for electromagnetic compatibility. Such standards specify testing to be done in the following areas:

1. EN50081-1 and EN50081-2 1994
    Electromagnetic Compatibility, Generic Emission Standard
    Industrial, Scientific and Medical Equipment
    a) EN55011, Radiated Radio Frequency (RF)

2. EN50082-1 1995
    Electromagnetic Compatibility, Generic Immunity Standard
    Residential, Commercial, Light Industrial Environments
    a) IEC801-2, Electro Static Discharge (ESD)
    b) IEC801-3, Radiated Radio Frequency (RF)
    c) IEC801-4, Transient Burst

Setra Systems, Inc. has tested and certified its top loading precision balances for compliance with the EMC Directive. This certification is evidenced by the CE label on the product and the Declaration of Conformity on file. There may be applications where EMC effects are not a concern. However, some applications may require optimum performance under certain conditions specified in the standards. The results of testing verifies that this product complies with the EMC guidelines, not withstanding the fact that there may be some effect on accuracy under certain conditions. This Application Note contains the results of the EMC Directive testing for this product to verify compliance with applicable standards.

Any questions on this Application Note can be directed to the supplier of this product in your country. See the following page for the results of the EMC testing.

Results of Compliance Testing for EMC Directives

Products: Top Loading Balances

Model   EL-200S
Model   EL-410S
Model   BL-410S
Model   EL-2000S
Model   EL-4100S
Model   BL-4100S
Model   EL-410D
Model   EL-4100D

EMC Directive 1994 EN 50081-1 and EN 50081-2 Electromagnetic Compatibility
Generic Emission Standard for Industrial, Scientific and Medical Equipment

Test No.	Level	Criteria	Results
EN55011 Radiated RF	30-230 MHz	< 30 dB uV/m	*Pass
EN55011 Radiated RF	230-1000 MHz	< 37 dB uV/m	*Pass

EMC Directive EN 50082-1 1995 Electromagnetic Compatibility
Generic Immunity Standard for Residential, Commercial, Light Industry

Test No.: IEC801-2 ESD	Level: 8kV Air Discharge	
Criteria: B - Must Resume Normal Operation After Test	Results: Pass	
Test No.: IEC801-2 ESD	Level: 4kV Direct Discharge	
Criteria: B - Must Resume Normal Operation After Test	Results: Pass	
Test No.: IEC801-3 Radiated RF	Level: 3V/m 27-500 MHz	
Criteria: A - Must Operate As Specified	Results: **Pass	
Test No.: IEC801-4 Transient Burst	Level: 5 ms Burst, 5KHz	
Criteria: B - Must Resume Normal Operation After Test	Results: Pass	

* Use of ferrite bead on power lead required.

** Typical susceptibility to radiated frequencies is < 0.0005% FS. At certain discreet frequen-
   cies there is the potential for a maximum effect of 0.18% FS.