Operating instructions

Voyager **balances**

Ohaus Corporation, 29 Hanover Road, Florham Park, New Jersey, 07932, USA
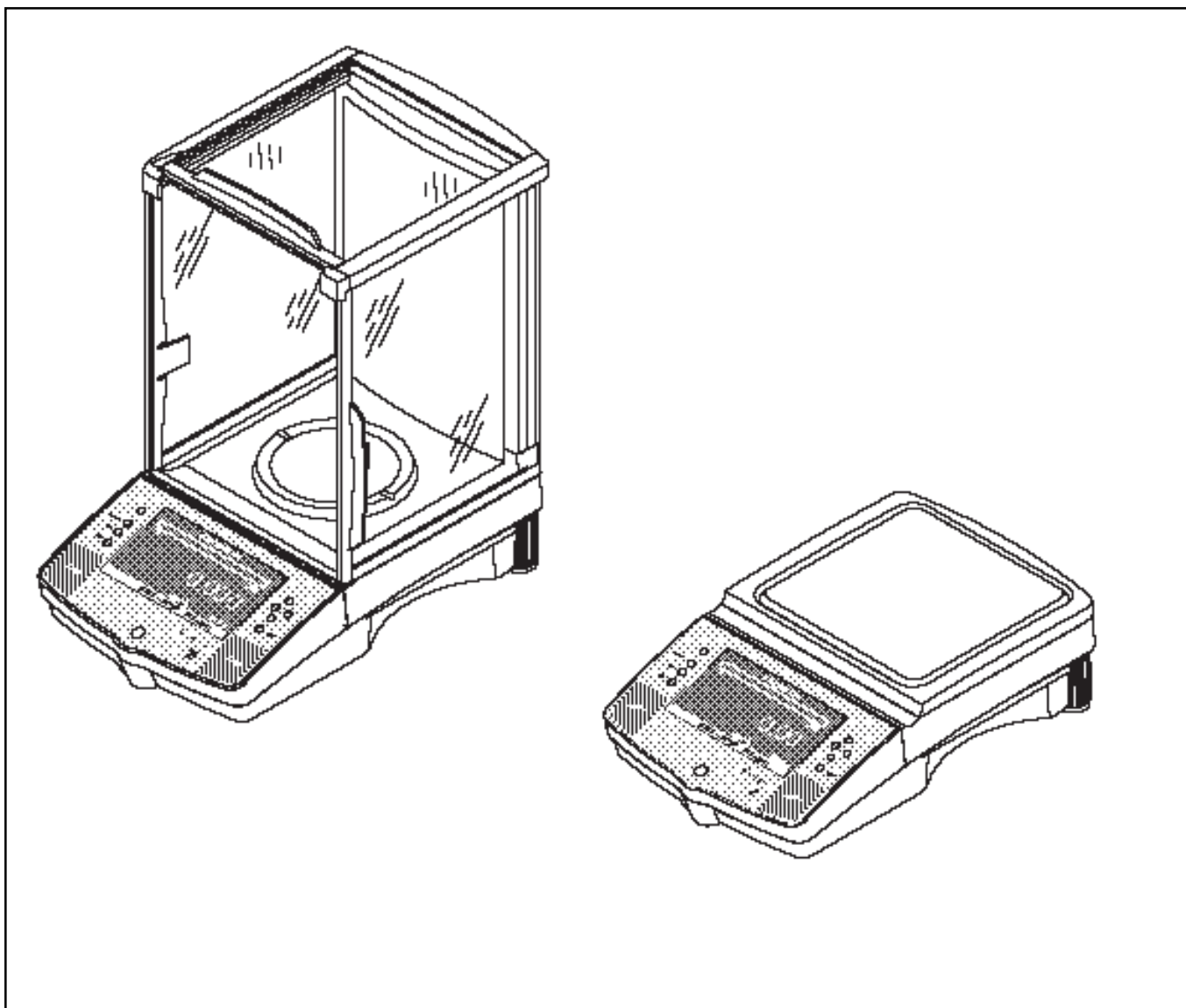
Declaration of Conformity   We, Ohaus Corporation, declare under our sole responsibility that the balance models listed below marked with "CE" - are in conformity with the directives and standards mentioned.

Konformitätserkärung   Wir, die Ohaus Corporation, erklären in alleiniger Verantwortung, dass die untenstehenden Waagentypen, gekennzeichnet mit "CE" - mit den genannten Richtlinien und Normen übereinstimmen.

Déclaration de conformité   Nous, Ohaus Corporation, déclarons sous notre seule responsabilité, que les types de balance ci-dessous cité - munis de la mention «CE» - sont conformes aux directives et aux normes mentionnées ci-après.

Declaración de Conformidad   Nosotros, Ohaus Corporation, declaramos bajo responsabilidad exclusiva que los modelos de balanzas indicados a continuación - con el distintivo ‚CE' - están conformes con las directivas y normas citadas.

Dichiarazione di conformità   Noi, Ohaus Corporation, U.S.A, dichiariamo sotto nostra unica responsabilità, che i tipi di bilance specificati di seguito - contrassegnati con la marcatura "CE" - sono conformi alle direttive e norme citate.

Balance Type/Waagentyp/Type de balance/Modelo de balanza/Tipo di biliancia **Explorer and Voyager**

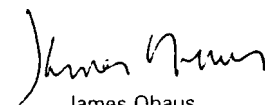| Marked with: Gekennzeichnet mit: Munis de la mention: Con el distintivo: Contrassegnati con la Marcatura:	Directive Richtlinie Directive Directiva Direttiva	Standard Norm Norme Norma Norma
Year of attachment of the CE mark Jahr der ersten Eichung Année de la premère vérification Año de la primera verificación annodella prima verifica **CE** $\mathbf{CE}^{96}$ 122 Ⓜ T2914	EU 73/23 Low Voltage EU 73/23 Niederspannung EU 73/23 Basse tension EU 73/23 Baja tensión EU 73/23 Bassa tensione EU 89/336, 92/31, 93/68 Electromagnetic compatibility EU 89/336, 92/31, 93/68 Elektromagnetische Verträglichkeit EU 89/336, 92/31, 93/68 Compatibilité électromagnétique EU 89/336, 92/31, 93/68 Compatibilidad electromagnética EU 89/336, 92/31, 93/68 Compatibilità elettromagnetica EU 90/384 NAWI EU 90/384 FNSW EU 90/384 BFNA EU 90/384 PBNA EU 90.384 BFNA	IEC1010-1 & EN60950:1992 Safety Regulations IEC1010-1 & EN60950:1992 Sicherheitsbestimmungen IEC1010-1 & EN60950:1992 Consignes de sécurité IEC1010-1 & EN60950:1992 Disposiciones sobre seguridad IEC1010-1 & EN60950:1992 Prescrizioni . di sicurezza EN55022:1987 Emissions EN45501:1992, EN50082-1:1992 Immunity EN55022:1987 Funkstörungen EN45501:1992, EN50082-1:1992 Immunität EN55022:1987 Emissions parasites EN45501:1992, EN50082-1:1992 Immunité EN55022:1987 Radiointerferencias EN45501:1992, EN50082-1:1992 Inmunidad EN55022:Verträglichkeit 1987 Radiointerferenze EN45501:1992, EN50082-1:1992 Immunità EN45501:1992 Non Automatic Weighing Instruments EN45501:1992 Für nicht selbsttätige Waagen EN45501:1992 Balances à fonctionnement non automatique EN45501:1992 Para balanzas no automátäcas EN45501:1992 Per bilance a funzionamento non automatics

ISO 9001 Certificate for Ohaus Corporation. Ohaus Corporation, USA, was examined and evaluated in 1994 by the Bureau Veritas Quality International, BVQI, and was awarded the ISO 9001 certificate. This certifies that Ohaus Corporation, USA, has a quality system that conforms with the international standards for quality management and quality assurance (ISO 9000 series). Repeat audits are carried out by BVQI at intervals to check that the quality system is operated in the proper manner.

ISO 9001-Zertifikat für Ohaus Corporation. Die Firma Ohaus Corporation, USA, wurde 1994 durch das Bureau Veritas Quality International BVQI geprüft, und erhielt das ISO 9001 Zertifikat. Dieses bescheinigt, dass Ohaus Corporation, USA über ein Qualitätssystem verfügt, welches den internationalen Normen für Qualitätsmanagement und Qualitätssicherung (ISO 9000er-Reihe) entspricht. Anlässlich von Wiederhol-Audits durch das BVQI wird periodisch überprüft, ob das Qualitätssystem zweckmässig gehandhabt wird.

Certificat ISO 9000 pour Ohaus Corporation. La société Ohaus Corporation, USA, a été contrôlée en 1994 par Bureau Veritas Quality International BVQI et a obtenu le certificat, degré ISO 9001. Celui-ci atteste que Ohaus Corporation, USA, dispose d'un système qualité correspondant aux normes internationales pour la gestion de la qualité et pour l'assurance qualité (degré ISO 9000). Des audits réguliers effectués par la BVQI vérifient si le système qualité est appliqué de facon appropriée.

Certificado ISO 9001 para Ohaus Corporation. La firma Ohaus Corporation, USA, ha sido inspeccionada por la Bureau Veritas Quality International (BVQI) y ha obtenido el certificado ISO 9001. Esto acredita que Ohaus Corporation, USA, dispone de un sistema de calidad que cumple las normas internacionales para gestión y garantfa de calidad (ISO serie 9000). Con ocasión de las inspecciones de repetibilidad por parte de la BVQI, se comprueba periódicamente si el sistema de calidad se manipula de forma correcta.

Certificato ISO 9001 per la Ohaus Corporation. Il sistema di garanzia della qualità della Società Ohaus Corporation, USA è certificato ISO 9001 sin dal 1994 dall Bureau Veritas Quality International BVQI, e così fomice la dimostrazione che il suo sistema die Garanzia Qualità soddisfa i massimi requisite. Il sistema della garanzia della qualità Ohaus Corporation viene verificato periodicamente dall BVQI, dando cosi evidenza di.

James Ohaus
President

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Notice

Certified scales, scales used for legal applications have the general type designation E...5 / V...5 and EU type Approval (T2914). The year of the initial verification is shown next to the CE mark. Such scales are verified in the factory and carry the "M" mark on the actual scale and the packaging. The year of the initial verification is shown next to the CE mark. If the letter M is shown against a solid background, the scale may be put into operation immediately. Should the background be partitioned and hatched, the scale must be verified at its place of use by the certified Ohaus service. If national regulations limit the duration of the validity of the verification certificate in individual countries, the end user of such a scale is personally responsible for arranging the repeat verification in good time.

Hinweise

Geeichte/eichpflichtige Waagen tragen die allgemeine Typenbezeichnung E... 5 / V...5. Für sie liegt eine EU Bauartzulassung vor (T2914). Das Jahr der ersten Eichung ist neben dem CE Zeichen aufgeführt. Solche Waagen sind ab Werk geeicht und tragen die Kennzeichnung "M" auf dem Gerät selbst und auf der Verpackung. Erscheint der Buchstabe M auf vollem Grund, darf die Waage sofort in Betrieb genommen werden. Ist der Grund geteilt und schraffiert, muss die Waage am Verwendungsort durch den zertifizierten Ohaus Service ortsgeeicht werden. Sofern gemäss den nationalen Vorschriften in den einzelnen Staaten die Gültigkeitsdauer der Eichung beschränkt ist, ist der Betreiber einer solchen Waage für die rechtzeitige Nacheichung selbst verantwortlich.

Remarques

Les balances vérifiées/admissibles à la vérification portent la désignation de modèle générale E...5 / V ... 5. Elles font l'objet d'une approbation de modèle UE (T2914). L'année de la vérification primitive est indiquée à côté de la marque CE. Ces balances sont vérifidées d'origine et portent la marque "M" sur l'appareil lui-même et sur l'emballage, Si la lettre M apparaît sur un fond totalement vert, la balance peut être mise en service immédiatement. Si le fond est divisé et hachuré, la balance doit être vérifiée sur le lieu d'ustilisation par le service après-vente Ohaus certifié. Dans les pays où la durée de validité de la vérification est limitée par des prescriptions nationales, l'utilisateur est lui-même responsable de la vérification ultérieure d'une telle balance en temps voulu.

Notas

Las balanzas verificadas/verificables llevan la designatión general E...5 / V ...5 y cuentan con una aprobación de modelo UE (T2914). EL año de la primera verficación está indicado al lado del distintivo CE. Estas balanzas están verificadas en fábrica y llevan la designatión "M" sobre el propio aparato y sobre el embalaje. Cuando la letra M aparece sobre fondo sólido, la balanza se puede poner inmediatamente en funcionamiento. Si el fondo está dividido y rayado, la balanza ha de ser verificada en el lugar de uso por el sevicio técnico Ohaus certificado. Si la duración de la validez de la verificación está limitada de acuerdo con las normas de los distintos países, el propio usuario de tal balanza es responsable de la verificación posterior a su debido tiempo.

Avvertenza

Le bilance approvate hanno la denominazione del modello E... 5 / V ...5. Per esse esiste un'appprovazione CE del tipo. L'anno delia prima verifica è indicato a fianco della marcatura CE. I tipi marcati con un contrassegno "M" su sfondo verde pieno possono essere impiegati da subito. I tipi marcati con ii contrassegno "M" su sfondo nero/barrato diagonalmente dovranno essere verificati sul luogo d'installazione da parte d'un tecnico autorizzato dal Servizio Assistenza Ohaus o ispettore dell'Ufficio Metrico. Queste bilance sono state verificate in fabbrica e recano il contrassegno "M" sull'apparecchio stesso, e sull'imballo. É obbligo dell'untente denunciare la detenzione dello strumento all'ufficio metrico competente per territorio e sottoporio alia prescritta verifica periodica come da disposizioni ministeriali.

Unauthorized changes or modifications to this equipment are not permitted.

Contents

Overview of controls

No.	Designation	Function
1	⓪	LCD display on off button.
2	Go Back button	Permits going back in menus.
3	Help button	Non functional.
4	Print button	When pressed, prints data either on an external printer or computer.
5	>O/T< button	When pressed, sets balance to zero.
6	(▲) button	When pressed, travels up through menu options and selects alphanumeric characters.
7	(▼) button	When pressed, travels down through menu options and selects alphanumeric characters.
8	(◄) button	When pressed, travels to the left through displays.
9	(►) button	When pressed, travels to the right through displays.
10	Enter button	When pressed, accepts item on display.
11	Leveling feet	Used to level the balance.
12	Leveling indicator	Indicates leveling position of the balance.

1. Getting to know your Voyager balance

This section provides you with detailed information on your Voyager balance. Please read through the section carefully even if you have experience with OHAUS balances and be sure to familiarize yourself with the safety notes.

1.1 Introduction

Thank you for deciding to purchase a Voyager Balance from Ohaus. Behind your instrument stands OHAUS, a leading manufacturer of precision Balances, Scales and Indicators. An Aftermarket Department with trained instrument technicians is dedicated to provide you with the fastest service possible in the event your instrument requires servicing. OHAUS also has a Customer Service Department to answer any inquiries regarding applications and accessories.

To ensure you make full use of the possibilities offered by your Voyager balance, please read the manual completely before installation and operation.

1.2 Overview of the Voyager balance

The Voyager balances offer a high level of operating convenience and useful functions to make accurate measurements.

The Voyager balances have the following features:

— Extremely rugged and chemically resistant construction.
— Convenient operating controls and large, easily readable display.
— Easy to follow menus for simplified operation.
— Go Back button permits going back in menus.
— Built-in functions for filling, percent weighing, piece counting, animal weighing, check weighing, density, pipette calibration, statistics, and SQC.
— Built-in leveling feet and level indicator for consistent operation on unlevel surfaces.
— Automatic internal calibration (on some models).
— Menu locks which prevent settings from being changed.
— Built-in RS232 interface.
— 14 units of measurement and custom units.
— Bar graph indicator for quick visual indication of values in addition to a large numerical readout.
— A variety of accessories includes in-use display cover kit, table mount, remote displays, interface communication cables and security device.

A brief word regarding standards, directives and procedures for quality assurance: Your Voyager balance conforms with all common standards and directives. It supports standard procedures, work techniques and records as required by GLP (Good Laboratory Practices) and SOP (Standard Operating Procedure). Recording of the sequences of operations and calibration work is highly important in this connection: we recommend use of OHAUS AS-142 Printer. Your Voyager balance has a CE declaration of conformity and OHAUS is registered to ISO 9001 - Management System.

1.3   What you should know about these instructions

These instructions contain orientation aids which represent certain functions, notices and controls. These graphic aids are not meant to be step by step operational procedures but simply a guide.

This symbol indicates pressing a button.
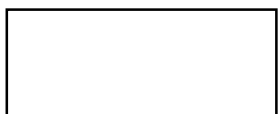
This representation symbolizes the current display of your balance.
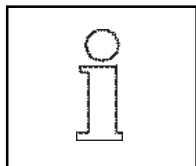
This symbol indicates additional information and instructions which facilitate your handling of the balance and contribute to proper and economical use.
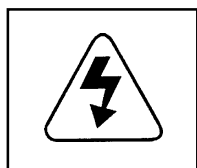
These symbols indicate safety and hazard instructions which must be complied with. Nonconformance with such instructions can lead to personal injuries to the user, damage to the balance or other tangible assets or to malfunctions.

1.4   Safety is first

Please note the following instructions for safe and problem-free operation of your balance.

Voyager balances may be used only indoors and only when attached to receptacle outlets with a ground connection.

The Voyager balances may not be operated in a hazardous environment.

Use only the AC adapter supplied with your Voyager balance and ensure that the voltage value printed on it matches the local line voltage.

Operate and use your Voyager balance only in accordance with these operating instructions.

Use only optional equipment and peripherals supplied by OHAUS.

Your Voyager balance is ruggedly constructed, but is still a precision instrument. Treat it with the appropriate care and it will provide you with years of trouble-free operation.

2. Installation

In this section, you will learn how you unpack and install your new balance and prepare it for operation. On completion of the steps described in this section, your balance is ready for operation.

2.1 Unpacking and checking the standard equipment

Open the package and remove the instrument and the accessories. Check the completeness of the delivery. The following accessories are part of the standard equipment of your new Voyager balance.

	Analytical	Capacity		
Equipment	62g, 110g, 210g 210/100g	210, 410, 410/100g	610g - 4100g 4100/1000g	6100g -8100g
Pan 3.5″	●			
Pan 4.75″		●		
Pan 6″ (0.01g units)			●	
Pan 8″ (0.1g units)			●	●
Draft Shield	●	●		
Wind Shield (6" Pan Units, 0.01g)			●	
AC Power Adapter	●	●	●	●
Instruction Manual	●	●	●	●
Warranty Card	●	●	●	●

4100g, 6100g and 8100g balances with internal calibration are equipped with 6″ Pan and Windshield.

Remove packing material from the instrument.

Check the instrument for transport damage. Immediately inform your Ohaus dealer if you have complaints or parts are missing.

Store all parts of the packaging. This packaging guarantees the best possible protection for the transport of your instrument.

2.2 Selecting the location

The balance should always be used in an environment which is free from excessive air currents, corrosives, vibration, and temperature or humidity extremes. These factors will affect displayed weight readings.
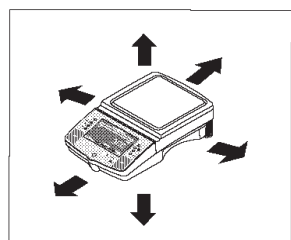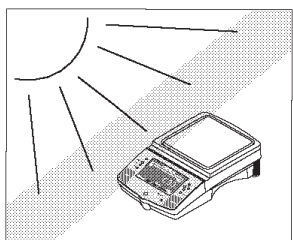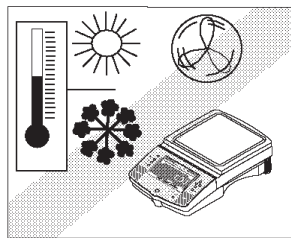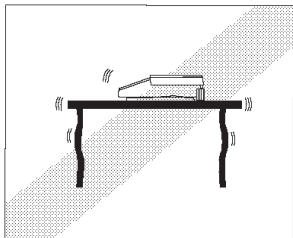
DO NOT install the balance:

• Next to open windows or doors causing drafts or rapid temperature changes.

• Near air conditioning or heat vents.

• Near vibrating, rotating or reciprocating equipment.

• Near magnetic fields or equipment that generates magnetic fields.

• On an unlevel work surface.

• In confined areas, allow sufficient space around the instrument for ease of operation and keep away from radiating heat sources.

2.3 Leveling the balance

Exact horizontal positioning and stable installation are prerequisites for repeatable results. To compensate for small irregularities or inclinations at the location, the instrument can be leveled.

Leveling
Indicator
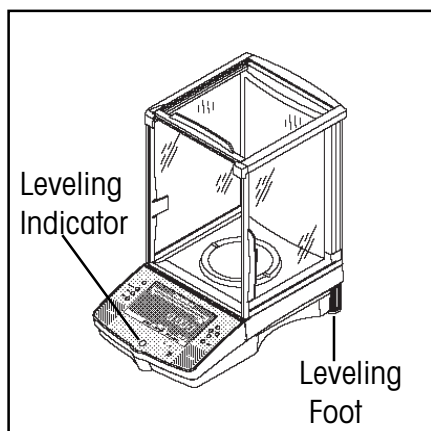
Leveling
Foot

Adjust the leveling feet at the rear of the balance until the air bubble in the indicator is centered.
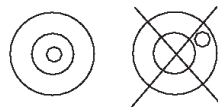
NOTE: The instrument should be leveled each time its location is changed.

2.4 Installing cover plate and pan

Pan
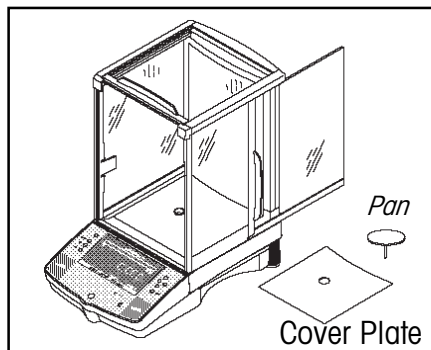
Cover Plate

 62g to 410g balances do not have the pan and protective cover plate installed.

On balances with a draft shield, open the door and place the cover plate into position. Insert the pan into the center hole.

Higher capacity balances with 6" or 8" pans do not have a cover plate.

2.5 Installing wind shield
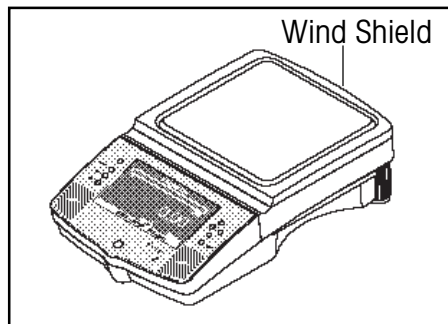
Wind Shield

On 610g to 4100g balances with 0.01g resolution, a wind shield is required to reduce the possibility of air currents from disturbing the pan. Make sure the wind shield is firmly snapped into place.

2.6 Power supply
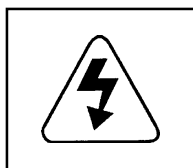
Check to ensure the voltage printed on the AC adapter matches your local line voltage. If this is not the case, on no account connect the AC adapter to the power supply, but contact your responsible OHAUS dealer.

Ensure that the AC adapter can never come into contact with liquids!

AC Adapter Connection
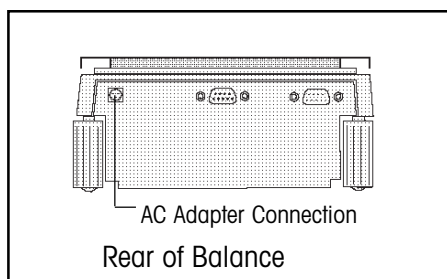
Rear of Balance

Connect the AC Adapter supplied to the three pin connector located at the rear of the balance.

The balance now performs a self-test, loads parameters, displays the software version, capacity, indicates if autocal is installed and the normal weight display then appears.
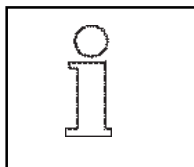
Allow your balance to warm up for at least 30 minutes to enable it to adapt itself to the ambient conditions. If the balance has been stored in a very cold environment before installation, it may require several hours for the balance to stabilize.

2.7 Switching the balance on and off

Your balance is on at all times when connected to a power source, the display is on initially and can be turned off.

```
      BASIC WEIGHING
┌────────────────────────┐
│                        │

                   0.000
```
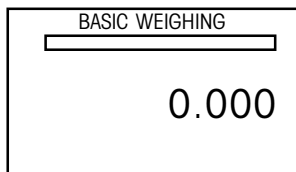
To **switch the balance on**, press the ⏻ button. As soon as the weight display appears, your balance is ready.

To **switch the balance off**, press the ⏻ button. After the balance has been switched off, your balance is in the standby mode. If you wish to perform a weighing, press the ⏻ button again.
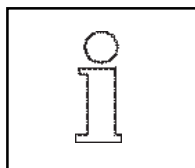
As your balance needs no warm-up time when in the standby mode and is immediately ready for weighing, we advise you to switch the display off by use of the ⏻ button and not to disconnect it from the power supply. This also ensures that the balance is always in thermal equilibrium.

2.8   Weigh below preparation

The Voyager balance is equipped with a weigh below hook at the bottom of the balance. To use this feature, remove power from the balance and remove the protective cover underneath the balance. See illustration for location. The balance can be supported using lab jacks or any other convenient method. Make sure the balance is level and secure. Apply power and operate the balance. Attach items to be weighed to the hook underneath the balance.
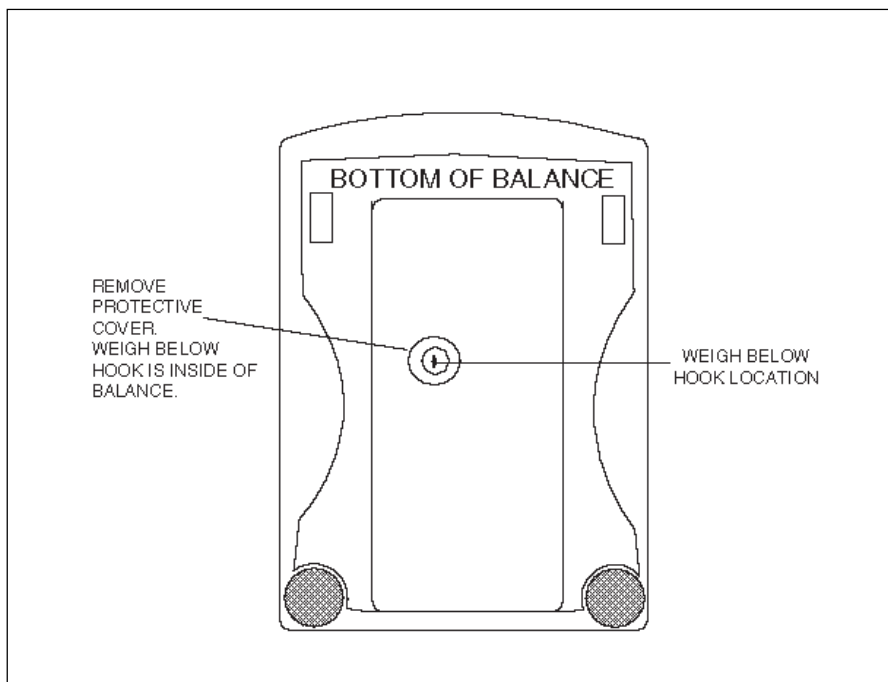
3. The menu

3.1 What is the menu?

The menu allows you to match your balance to your specific weighing needs. In the menu, you can change the settings of your balance and activate functions. The Main Menu contains 7 selections.

CHANGE MODE	CHANGE UNITS	SET BALANCE	CUSTOM MENU	LIBRARY	CALIBRATION	CONTRAST
Basic weighing	Milligrams	Readout	Run	Contains list of	Span	LCD contrast/
Parts counting	Grams	Interface	Setup custom menu	stored setups	Linearity	brightness adjust
Filling	Kilograms	Print option	Exit to weigh		User	
Animal weighing	Pennyweight	Setup GLP			Calibration test	
Check weighing	Carats	Set time/date			Autocal	
Diff weighing	Ounces	Autocal enable			Autocal delta correction	
Formulation	Troy ounces	Print current settings			Exit to weigh	
Quick check	Grains	Reset				
Statistics	Hong Kong taels	Lockout				
Density	Singapore taels	Software version				
SQC	ROC taels	Exit to weigh				
Pipette	Mommes					
	Pounds					
	Newtons					
	Ticals					
	Custom units					
	Exit to weigh					

1. **Change mode**:   Permits setting the balance to one of 12 different operating modes.
2. **Change units:**   Allows balance to measure in any of 15 selected measuring units and custom units.
3. **Set balance:**
   Readout: Permits setting averaging level, stability level, auto zero and legal for trade.
   Interface: Communication settings of baud, data, parity and stop bits can be set.
   Print option: Includes auto print, stable & numeric data, date, time and reference.
   Setup GLP: Project name, user name and GLP print options can be entered.
   Set time/date: Allows balance to be set to current time and date with options on date types.
   Autocal enable: Automatic calibration can be set to on or off (when balance is equipped with autocal).
   Print current settings: When selected, current balance settings can be printed.
   Reset: Allows resetting of readouts, RS232, print option, GLP or all to factory defaults.
   Lockout: Units, calibration and functions can be set to on or off.
   Software version: Indicates software version installed in balance at time of manufacture.
4. **Custom menu:**   Permits running a custom menu and setting up of a custom menu.
5. **Library:**   Contains a list of stored setups which can be recalled for operating the balance.
6. **Calibration**:   Span, linearity, user, calibration test, auto calibration can be selected to calibrate the balance. Autocal delta correction permits user to adjust internal calibration weight to match local standard.
7. **Contrast:**   Allows LCD screen contrast to be set for best viewing conditions.

3.2 Menu operation

In this section you will learn how to work with the menu. Information regarding the individual menu options and available settings can be found in the following sections.

```
     BASIC WEIGHING
   [                    ]

           0.000
   GRAMS          STABLE
```
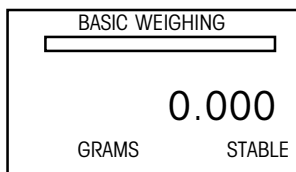
How to change from the weighing mode to the main menu

The balance is operating in the basic weighing mode.

Enter

```
        MAIN MENU
   CHANGE MODE
   CHANGE UNITS
   SET BALANCE
   CUSTOM MENU
   LIBRARY
   CALIBRATION
   CONTRAST
```
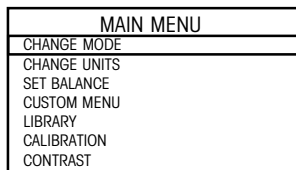
Press the **Enter** button. The main menu is displayed with the first option highlighted.

(▲) or (▼)
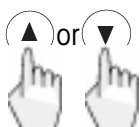
How to select the menu options

Press either the up or down arrow buttons and scroll to the desired option.

Each time the arrow (▼) button is pressed, the balance switches to the next menu option. Each time the (▲) arrow button is pressed, the balance switches to the previous menu option.

Enter

```
        MAIN MENU
   CHANGE MODE
   CHANGE UNITS
   SET BALANCE
   CUSTOM MENU
   LIBRARY
   CALIBRATION
   CONTRAST
```
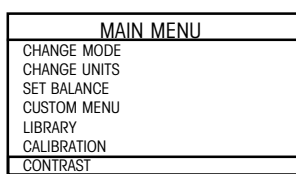
How to enter the menu option

Press the **Enter** button when the desired menu option is highlighted.
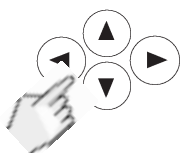
How to enter alpha numeric data

Certain menu options can have names or numerical entries made. When prompted to enter information, use the arrow buttons as follows:
Press the (▲) and (▼) arrow buttons to scroll through numbers or alphabet.

Press the (►) arrow button to advance to the next character in the display.

Press the (◄) arrow button to go back to the previous character in the display.

Enter Press the **Enter** button to accept entry.

Go Back Press the **Go Back** button to cancel entry.

Enter

MAIN MENU

SAVING
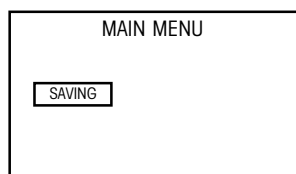
How to save your settings and quit the menu

Certain menu options have ON and OFF settings. In these options, pressing the **Enter** button saves the setting after you make a selection.

In options which offer various settings, after you have selected a setting, press the **Enter** button.   SAVING is momentarily displayed and the display returns to the same option.

Go Back

BASIC WEIGHING

0.000

GRAMS   STABLE
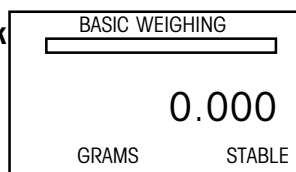
How to back out of a menu

You can back out of a menu and return to the weighing mode at any time with the **Go Back** button. Use the **Go Back** button to cancel a number, alphanumeric entry or to leave a mode.

3.3   Library

Approximately 200 names can be stored in the library. Eight functions in the balance have provisions for storing a library name, they are: Advanced Counting, Check Weighing, Statistics, Differential Weighing, Formulation, Density, SQC and Pipette. When a library name is selected, the associated function is also displayed. A Library menu is provided which allows the selected library name and function to be run, deleted or delete all entries. If you have accessed the library and do not want to run or delete a name, an exit to weighing selection can be made by pressing the **Go Back** button which does not affect the library

MAIN MENU
CHANGE MODE
CHANGE UNITS
SET BALANCE
CUSTOM MENU
LIBRARY
CALIBRATION
CONTRAST

LIBRARY 15.21% USED		
P1	PIP	1.26%
P2	PIP	1.26%
SQ1	SQC	3.17%
SQ2	SQC	3.17%
SQ3	SQC	3.17%
SQ5	SQC	3.17%
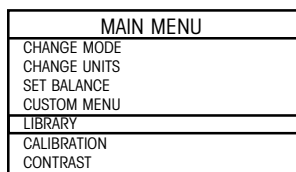
From main menu

Select LIBRARY, then press the **Enter** button. Display advances to LIBRARY % USED menu indicating all previously entered names, their corresponding functions and the percentage of the library which has been used.

The sample shown indicates six library entries. Entries are stored in alphabetical order.

LIBRARY
RUN
DELETE
DELETE ALL
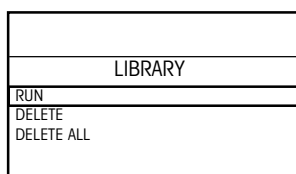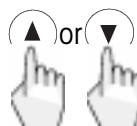
Accessing library function

Select LIBRARY function and press the **Enter** button. Display advances to LIBRARY menu with RUN, DELETE and DELETE ALL options shown.

Select either RUN, DELETE, or DELETE ALL. When RUN is selected, that particular balance operation is enabled and can be run. When a particular name is selected and the DELETE selection is made, that particular name and function with all parameters is removed from the library. DELETE ALL, when selected, removes the *entire* contents of the library.

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4. Calibration

Your balance can be calibrated with an internal mass (optional) or external masses. The balance can also be checked by a test with internal or external masses. If you have a printer attached to your balance, the data of the calibration and the results are printed out following GLP recommendations. A choice of six calibration methods are available: Span, Linearity, User, Test, Automatic AutoCal™ and AutoCal™ with Delta Correction.

```
            CALIBRATE
   SPAN
   LINEARITY
   USER
   CALIBRATION TEST
   AUTOCAL
   AUTOCAL DELTA CORRECTION
   EXIT TO WEIGH
```

Span - Span calibration ensures that the balance reads correctly within specifications using two weight values: zero and a weight value at 100% of the balance's full capacity.

Linearity - Linearity calibration minimizes deviation between actual and displayed weights within the balance's weighing range. Three weight values are used: zero, a weight value at midpoint of the balances weighing range, and a weight value at or near the balance's specified capacity.

User - User calibration is a method where the balance can be calibrated using a mass of known value by entering that value into the balance.

Test - Calibration test allows the stored calibration data to be tested against the current mass being used for the test.

AutoCal™ On balances equipped with AutoCal™, automatic calibration of the balance is accomplished by an internal mass.

AutoCal™ W/Delta Correction On balances equipped AutoCal™, a software feature allows the internal calibration mass to be adjusted ± 100 divisions at full scale capacity. This permits adjusting the balance using an external Class I mass which is traceable to a certified standard.
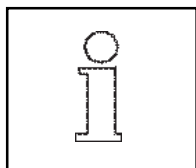
Calibration Menu Protection

Calibration may be locked out to prevent unauthorized personnel from changing calibration under LFT (Legal for Trade) mode. If calibration has been locked out, you can only access Internal Weight Calibration and Calibration Test.

To lock out calibration menu, after calibration, refer to paragraph 7.14 titled Menu Lock-Out Protection.

Linearity, Span and User calibration are disabled for Type Approved/LFT balances.

Calibration Masses

Before beginning calibration, make sure masses are available. If you begin calibration and realize calibration masses are not available, exit the menu. The balance will retain previously stored calibration data. Calibration should be performed as necessary to ensure accurate weighing. Masses required to perform the procedures are listed in the following table.

CALIBRATION MASSES

CAPACITY	LINEARITY CAL POINT	SPAN ONLY CAL POINT
62g	20g/50g	50g
110g	50g/100g	100g
210g	100g/200g	200g
410g	200g/400g	400g
610g	200g/500g	500g
2100g	1000g/2000g	2000g
4100g	2000g/4000g	4000g
6100g	2000g/5000g	5000g
8100g	4000g/8000g	8000g

Masses must meet or exceed ASTM Class 1 Tolerance. Calibration masses are available as accessories.

4.1   Span calibration

Span calibration normally requires that calibration be made using a mass equal to the full capacity of the balance, however, the Voyager balance can be calibrated using other lesser values as specified on the display.

Enter

CALIBRATE
SPAN
LINEARITY
USER
CALIBRATION TEST
AUTOCAL
AUTOCAL DELTA CORRECTION
EXIT TO WEIGH

From main menu

Scroll to CALIBRATION and press the **Enter** button. Display advances to CALIBRATE with SPAN highlighted.

Enter

SPAN CALIBRATION
PLEASE CLEAR THE PAN. . .   AND PRESS <ENTER>.

Clear the pan.

Enter

SPAN CALIBRATION
PLEASE PUT 400.000 GRAMS ON PAN AND PRESS <ENTER… OTHER WEIGHTS MAY BE USED: 300 200 100

Place indicated mass value on pan.

Enter

SPAN CALIBRATION
PLEASE WAIT. . . THE DIFFERENCE BETWEEN THIS CAL AND THE LAST CAL IS: 0.000 GRAMS PRESS <ENTER> TO CONTINUE

Display indicates the difference between the present calibration and the last calibration.

Enter

BASIC WEIGHING
0%   100%
400.000
GRAMS   STABLE
PRESS <ENTER> FOR MENU

Display indicates weight of the calibration masses. Remove masses from pan. Balance returns to a weighing mode.

4.2 Linearity calibration

Linearity calibration utilizes three calibration points, one at zero, center span and full span. This method minimizes deviation between actual and displayed weights within the balance's weighing range. Three weight values are used; zero, a weight value at midpoint of the balance's weighing range and a weight value at or near the specified capacity.

Enter

```
          CALIBRATE
SPAN
LINEARITY
USER
CALIBRATION TEST
AUTOCAL
AUTOCAL DELTA CORRECTION
EXIT TO WEIGH
```

From main menu

Scroll to CALIBRATION and press the **Enter** button. Display advances to CALIBRATE with SPAN highlighted. Scroll to LINEARITY.

Enter

```
   LINEARITY  CALIBRATION

PLEASE CLEAR THE PAN. . .
   AND PRESS <ENTER>.
```

Clear the pan.

Enter

```
   LINEARITY  CALIBRATION

PLEASE PUT 200.000 GRAMS
ON PAN AND PRESS <ENTER...
```

Place indicated mass value on pan.

Enter

```
   LINEARITY  CALIBRATION

PLEASE PUT 400.000 GRAMS
ON PAN AND PRESS <ENTER...
```

Place indicated mass value on pan.

Enter

```
   LINEARITY  CALIBRATION

PLEASE WAIT. . .
THE DIFFERENCE BETWEEN THIS CAL
AND THE LAST CAL IS: 0.000 GRAMS
PRESS <ENTER> TO CONTINUE
```

Display indicates the difference between the present calibration and the last calibration.

Enter

```
      BASIC WEIGHING

0%                    100%
      400.000
    GRAMS      STABLE
PRESS <ENTER> FOR MENU
```

Display indicates weight of the calibration masses. Remove masses from pan. Balance returns to a weighing mode.

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4.3 User calibration

User calibration is used when it is desired to calibrate the balance using a mass of known value. To use this calibration feature, proceed as follows:

Enter

```
          CALIBRATE
SPAN
LINEARITY
USER
CALIBRATION TEST
AUTOCAL
AUTOCAL DELTA CORRECTION
EXIT TO WEIGH
```

From main menu

Scroll to CALIBRATION and press the **Enter** button. Display advances to CALIBRATE with SPAN highlighted. Scroll to USER.

Enter

```
       USER CALIBRATION

USER CALIBRATION RANGE:
100-400 GRAMS
PRESS <ENTER. TO CONTINUE.
```

User calibration range is specified.

```
       USER CALIBRATION

ENTER CAL VALUE IN GRAMS
 200.000        200.000
```

Enter the calibration value.

Enter

```
       USER CALIBRATION

PLEASE CLEAR THE PAN. . .
   AND PRESS <ENTER>.
```

Clear the pan.

Enter

```
       USER CALIBRATION

PLEASE PUT 200.000 GRAMS
ON PAN AND PRESS <ENTER…
```

Place selected mass value on pan.

Enter

```
       USER CALIBRATION

PLEASE WAIT. . .
THE DIFFERENCE BETWEEN THIS CAL
AND THE LAST CAL IS: 0.000 GRAMS
PRESS <ENTER> TO CONTINUE
```

Display indicates the difference between the present calibration and the last calibration.

Enter

```
       BASIC WEIGHING

0%                     100%
      200.000
    GRAMS      STABLE
PRESS <ENTER> FOR MENU
```

Display indicates weight of the calibration masses. Remove masses from pan. Balance returns to a weighing mode.

4.4 Calibration test

Calibration test feature allows a check of a known calibration mass against the last stored calibration information in the balance.

Enter

CALIBRATE
SPAN
LINEARITY
USER
CALIBRATION TEST
AUTOCAL
AUTOCAL DELTA CORRECTION
EXIT TO WEIGH

From main menu

Scroll to CALIBRATION and press the **Enter** button. Display advances to CALIBRATE with SPAN highlighted. Scroll to CALIBRATION TEST.

Enter

CALIBRATION TEST
PLEASE CLEAR THE PAN. . .   AND PRESS <ENTER>.

Clear the pan.

Enter

CALIBRATION TEST
PLEASE PUT 400.000 GRAMS ON PAN AND PRESS <ENTER...

Place indicated mass value on pan.

Enter

CALIBRATION TEST
PLEASE WAIT. . . THE DIFFERENCE BETWEEN THIS CAL AND THE LAST CAL IS: 0.000 GRAMS PRESS <ENTER> TO CONTINUE

Display indicates the difference between the present calibration and the last calibration.

Enter

BASIC WEIGHING
0%   100%
200.000
GRAMS   STABLE
PRESS <ENTER> FOR MENU

Display indicates weight of the calibration masses. Remove masses from pan. Balance returns to a weighing mode.

4.5 Auto calibration (AutoCal™)

On balances equipped with the AutoCal™ feature, calibration can be accomplished using an internal calibration mass. Auto calibration can be performed at any time providing the balance has warmed up to operating temperature.

Enter

CALIBRATE
SPAN
LINEARITY
USER
CALIBRATION TEST
AUTOCAL
AUTOCAL DELTA CORRECTION
EXIT TO WEIGH

From main menu

Scroll to CALIBRATION and press the **Enter** button. Display advances to CALIBRATE with SPAN highlighted. Scroll to AUTOCAL.

Enter

INTERNAL CALIBRATION
PLEASE CLEAR THE PAN. . .
AND PRESS <ENTER>.

Clear the pan.

INTERNAL CALIBRATION
PLEASE WAIT...

Please wait is displayed while the balance is calibrating. If the balance is unstable, a message indicating this appears. The balance will continue self calibration until successful.

INTERNAL CALIBRATION
PLEASE WAIT. . .
THE DIFFERENCE BETWEEN THIS CAL
AND THE LAST CAL IS: 0.000 GRAMS
PRESS <ENTER> TO CONTINUE

Display indicates if calibration was successful and the difference between the last calibration. It is not necessary to press the **Enter** button, the balance returns to a weighing mode automatically.

BASIC WEIGHING
0%   100%
0.000
GRAMS   STABLE
PRESS <ENTER> FOR MENU

Balance returns to a weighing mode.

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4.6 AutoCal™ delta correction

Balances with AutoCal™ contain software which allows the internal calibration mass to be adjusted $\pm$ 100 divisions at full scale capacity. This permits calibrating the balance using an external ASTM Class 1 mass which is traceable to a certified standard.
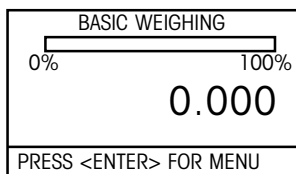
->0/T<-	BASIC WEIGHING 0%　　　　　　　　　100% 0.000 PRESS <ENTER> FOR MENU	Tare the balance, then place an ASTM Class 1 mass equal to the span calibration value of the balance. Note the reading. If the reading is higher or lower than the value of the mass, proceed as follows:
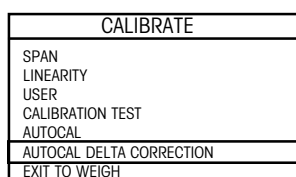
Enter

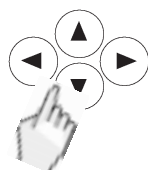| CALIBRATE |
|---|
| SPAN |
| LINEARITY |
| USER |
| CALIBRATION TEST |
| AUTOCAL |
| AUTOCAL DELTA CORRECTION |
| EXIT TO WEIGH |

From main menu

Scroll to CALIBRATION and press the **Enter** button. Display advances to CALIBRATE with SPAN highlighted. Scroll to AUTOCAL DELTA CORRECTION.

CALIBRATE
AUTOCAL DELTA CORRECTION
▮ 2 ▮　　　2
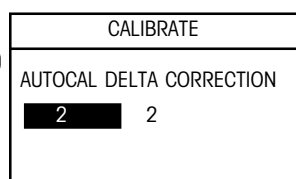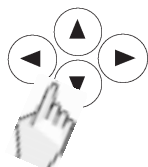
Enter the number of digits shown between the span calibration value of the balance and the actual reading. For example, on a 400g balance, the reading is 400.002g. The difference is 0.002g. This indicates a correction of 2 divisions is required.

Enter

INTERNAL CALIBRATION
PLEASE CLEAR THE PAN. . . AND PRESS <ENTER>.
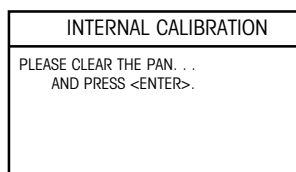
Clear the pan. Internal calibration starts.
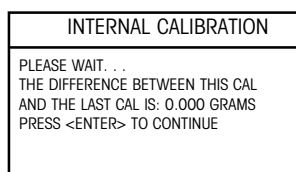
INTERNAL CALIBRATION
PLEASE WAIT. . . THE DIFFERENCE BETWEEN THIS CAL AND THE LAST CAL IS: 0.000 GRAMS PRESS <ENTER> TO CONTINUE

Display indicates if calibration was successful and the difference between the last calibration. It is not necessary to press the **Enter** button, the balance returns to a weighing mode automatically. If a difference still exists, repeat the procedure. The difference should be 0.000 grams.

BASIC WEIGHING
0%　　　　　　　　　100% 0.000 GRAMS　　　STABLE PRESS <ENTER> FOR MENU
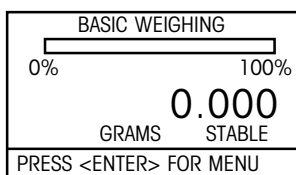
Balance returns to a weighing mode.

5. Weighing made simple

In this section, you will learn how to select a weighing unit, tare the balance, perform simple weighings and enter a custom unit.

5.1 Selecting a weighing unit

In this menu option you specify which weighing unit is to be displayed. There are a total of 15 measuring units and custom units which can be selected.

```
     BASIC WEIGHING
┌─────────────────────┐
│                     │
└─────────────────────┘

         0.000

 GRAMS          STABLE
```
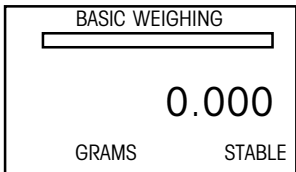
The balance shows the result in grams

Enter

```
        MAIN MENU
CHANGE MODE
CHANGE UNITS
SET BALANCE
CUSTOM MENU
LIBRARY
CALIBRATION
CONTRAST
```
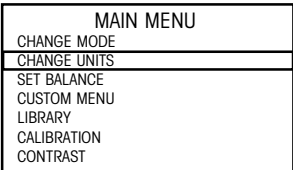
From main menu

Select CHANGE UNITS. Scroll to the desired measuring unit and press **Enter** button. If a custom unit is desired, refer to paragraph 5.4. The following units are available:

Display/Designation	Comments
milligrams	with mg balances only
grams	
kilograms	with higher capacity balances only
penny weight	
carats	
ounces	
troy ounces	
grains	
Hong Kong taels	
Singapore taels	
ROC taels	
mommes	
pounds	
newtons	
ticals	
custom units	available in library

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5.2 Taring the balance

The weight of any container can be tared by the press of a button. The taring range covers the entire weighing range of your balance.

->0/T<-

To tare a container, place it on the weighing pan.

Close all draft shield doors (if draft shield is used).

Press the **>0/T<** button to start the taring operation.

BASIC WEIGHING

0.000

GRAMS   STABLE
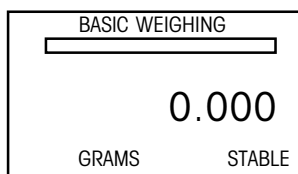
You cannot tare the balance when the weighing pan is unstable. On completion of taring, the word **STABLE** appears in the lower right hand portion of the display and the numerical display indicates zero.
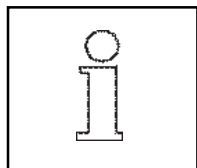
Remember, when taring a container, the weight of the container is subtracted from the total capacity of the balance.

5.3 Performing a simple weighing

The balance always starts in a weighing mode when first turned on.
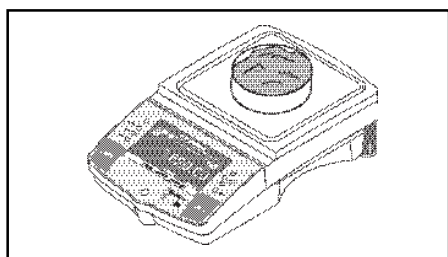
After taring the balance, place sample on the pan. Wait until display indicates STABLE. Now read the weight in the display.
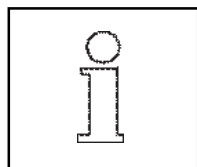
If the balance is in another mode, press the **Go Back** button repeatedly to get back to the weighing mode.

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5.4 Custom unit

Custom unit allows the creation of your own custom weighing units. It permits entering a conversion factor which the balance will use to convert grams to the desired unit of measure. Custom Units are stored in the Library. Values for up to fifteen different custom units can be entered.

Conversion Factor x Weight in grams = Weight in custom unit

Conversion factors are expressed in scientific notation and entered into the balance in three parts:

1) a number between 0.1 and 1.999999 called the mantissa
2) a power of 10 called the exponent
3) a least significant digit (LSD)

SCIENTIFIC NOTATION				
Conv. Factor	Number Between 0.1 and 1.999999	Power of 10	Man- tissa	Exp.
123.4	= .1234 x	1000 =	.1234 x	10^3
12.34	= .1234 x	100 =	.1234 x	10^2
1.234	= .1234 x	10 =	.1234 x	10^1
.1234	= .1234 x	1 =	.1234 x	10^0
.01234	= .1234 x	.1 =	.1234 x	10^{-1}
.001234	= .1234 x	.01 =	.1234 x	10^{-2}
.000123	= .123 x	.001 =	.123 x	10^{-3}

EXPONENTS	
E-3	Moves decimal point 3 places to the left.
E-2	Moves decimal point 2 places to the left.
E-1	Moves decimal point 1 place to the left.
E0	Leaves decimal point in normal position.
E1	Moves decimal point 1 place to the right.
E2	Moves decimal point 2 places to the right.
E3	Moves decimal point 3 places to the right.

Enter

```
                CUSTOM UNITS
GO TO LIBRARY
SETUP
EXIT TO WEIGH
```

From main menu

Select CHANGE UNITS. Scroll to CUSTOM UNITS and press **Enter** button. The display indicates GO TO LIBRARY.
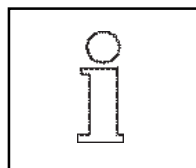
When using the balance for the first time, the library is empty and does not contain any custom units. Later, after you have performed the setup procedures, you will be able to select a custom unit by a name you have assigned. Proceed to SETUP.

Enter

```
                CUSTOM UNITS
GO TO LIBRARY
SETUP
EXIT TO WEIGH
```

Scroll to SETUP and press **Enter** button. UNIT NAME is displayed.

28
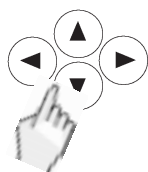
Unit name

```
         UNIT NAME

  UNIT1
<LEFT> / <RIGHT> TO MOVE CURSOR
<UP> / <DOWN> TO SCROLL
CHARACTERS
PRESS <ENTER> TO ACCEPT
```

Enter a unit name. The name you enter and custom unit characteristics will be stored in the library when you complete all entries. Display returns to CUSTOM UNIT SETUP with ENTER FACTOR highlighted.
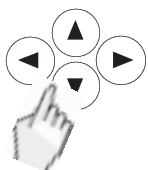
Factor

```
      CUSTOM UNIT SETUP

UNIT NAME        UNIT1
ENTER FACTOR     1.0000
SELECT DP        E-2
SELECT LSD       LSD1
RETURN
```

Enter the factor number. This can be a number between 0.1 and 1.999999. For conversion factors outside of this range, the exponent will be used to move the decimal point.

Decimal point

```
      CUSTOM UNIT SETUP

UNIT NAME        UNIT1
ENTER FACTOR     1.0000
SELECT DP        E-2
SELECT LSD       LSD1
RETURN
```

Scroll to SELECT DP, press **Enter** button. SELECT DP LOCATION is displayed.

```
     SELECT DP LOCATION

E-3
E-2
E-1
E0
E1
```

Select a decimal point. Scroll to either E-3, E-2, E-1, E0, E1, E2, or E3, and press **Enter** button. Display returns to CUSTOM UNIT SETUP with UNIT NAME highlighted.

Least significant digit

```
      CUSTOM UNIT SETUP

UNIT NAME        UNIT1
ENTER FACTOR     1.0000
SELECT DP        E-2
SELECT LSD       LSD1
RETURN
```

Scroll to SELECT LSD which is the **L**east **S**ignificant **D**igit, press **Enter** button. SELECT LSD is displayed.

LSD's	
LSD 0.5	Adds one decimal place display counts by 5's.
LSD 1	**Display counts by 1's.**
LSD 2	Display counts by 2's.
LSD 5	Display counts by 5's.
LSD 10	Display counts by 10's.
LSD 100	Display counts by 100's.
RETURN TO SETUP	

```
        SELECT LSD

LSD    0.5
LSD    1
LSD    2
LSD    5
LSD    10
```

Select the least significant digit. Scroll to either LSD 0.5, LSD 1, LSD 2, LSD 5 or LSD 10 and press **Enter** button. Display returns to CUSTOM UNIT SETUP with UNIT NAME highlighted.

```
     CUSTOM UNIT SETUP

UNIT NAME        UNIT1
ENTER FACTOR     1.0000
SELECT DP        E-2
SELECT LSD       LSD1
RETURN
```

Scroll to RETURN, press **Enter** button. CUSTOM UNITS menu is displayed with GO TO LIBRARY highlighted.

Enter

```
       CUSTOM UNITS

GO TO LIBRARY
SETUP
EXIT TO WEIGH
```

At this point, you can select the custom unit you just entered from the library or exit to weigh. When LIBRARY is selected, scroll to the custom unit you entered, press **Enter** button and select RUN from the menu. The abbreviation for custom units in the display is CU.

6. Balance modes

Your balance has 11 additional modes of operation in addition to basic weighing. These built-in modes expand the possibilities of your balance and facilitate your daily work. The following sections will acquaint you with these modes.

6.1 Parts counting

Your balance can be set to either Easy Count or Advanced Count parts method.

6.1.1 Easy count

Easy count is a simplified method for counting parts. After specifying a sample size, the balance will display the actual number of samples placed on the pan. Accuracy is based on the average piece weight (APW) of a single part. All parts must be reasonably uniform in weight.

Enter

CHANGE MODE
EASY PARTS COUNTING

From main menu

Enter CHANGE MODE, scroll to PARTS COUNTING and select EASY PARTS COUNTING.
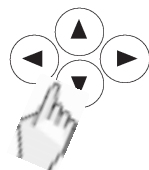
PARTS COUNTING
SAMPLE SIZE
▮

Enter numeric sample size and press **Enter** button.

PARTS COUNTING
APW 0.3898   WEIGHT: 3.900
SIZE 10
10
PIECES   STABLE

Place specified number of samples on the pan. After a few seconds, the display indicates the number of pieces based on the sample size. Repeated batches of samples may be placed on the pan and counted.

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6.1.2 Advanced counting
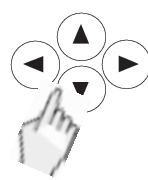
Advanced Count contains a number of entries which include assigning a library name, filling and sorting applications and statistical information which can be printed. Once a library name is assigned, this particular counting function can be recalled at any time.

Enter

PARTS COUNTING
ADVANCED PARTS COUNTING

From main menu
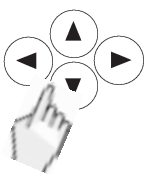
Enter CHANGE MODE. Select PARTS COUNTING and then select ADVANCED PARTS COUNTING. Display advances to PARTS COUNTING SETUP with LIBRARY NAME highlighted.

PART COUNTING SETUP
LIBRARY NAME
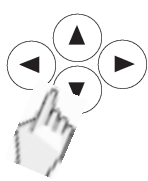
Library name

Enter library name, up to 8 characters and press **Enter** button. The library name can be recalled later and the same type of items can be counted at any time. The display advances to APW/SIZE.

APW/SIZE
SAMPLE SIZE
SET A.P.W.

APW/Size
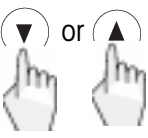
Enter APW/SIZE. You have a choice of entering a sample size or average piece weight. Enter required data. Display advances to TARE WEIGHT.

PART COUNTING SETUP
TARE WEIGHT

Tare weight
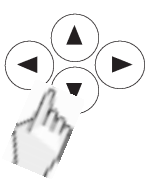
Enter the tare weight. This is the tare weight of the container holding the samples.

PARTS COUNTING SETUP
AUTO OPTIMIZATION   ON

Auto optimization

An ON or OFF function. When set ON, optimizes the accuracy based on sample size. After selecting, the display advances to FUNCTION LINK.

FUNCTION LINK
OFF
FILLING
CHECK WEIGHING
STATISTICS

Enter

PARTS COUNTING SETUP
APW/SIZE
TARE WT
AUTO OPTIMIZATION
FUNCTION LINK
RUN

Function link

Four options are available, OFF, FILLING, CHECK WEIGHING and STATISTICS.

When FILLING is selected, a target weight is entered which is shown as 100% on the bar graph on the display. When material is added to the balance pan, it is displayed as a percentage and weight. When CHECK WEIGHING is selected, a separate display has entries for nominal pieces, over pieces, under pieces, run and exit. This type of function permits checking of individual pieces against the stored information in the balance. When STATISTICS is selected, provides display of Standard Deviation, either population or sample, Mean, Sum, High, Low and Difference readings. Each can be individually set ON or OFF. RUN when selected starts the program.

6.2 Filling

Filling permits you to enter a target reference weight, then view other loads as a percentage of the reference which has been set in the balance parameters. The load placed on the pan is displayed as a percentage of what was entered into the balance. A twin bar display indicates to 89% on the first bar and to 110% on the second bar.

Enter

```
         MAIN MENU
CHANGE MODE
```

From main menu

Enter CHANGE MODE.

▼

```
        CHANGE MODE
FILLING
```

Select FILLING, display advances to TARGET.

▲ ◄ ►
▼
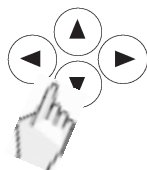
```
          FILLING


      TARGET

████████
```

Enter the target weight, up to 8 characters and press **Enter** button. The display advances to FILLING with a dual bar display.

```
           FILLING
┌──────────────────────┐
0%                    90%
90%          ↑        110%
            0.000
TARGET:           DIFF:
GRAMS                STABLE
```
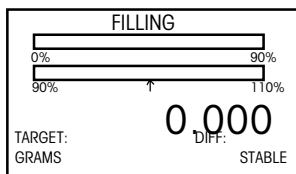
Place filling material on the balance pan, the display indicates on the bar graph as a percentage and displays the actual load weight numerically. Target and difference weights are also displayed.
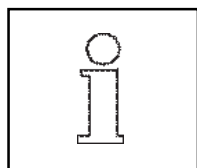
After you have completed the filling procedure, you have choices at the bottom of the display to either enter a new target value, change mode or return to the main menu.

33

6.3 Animal weighing

This feature permits weighing small animals directly on the balance. If an animal cage is used, the balance can be tared (weight of cage is subtracted) and then the subject is placed in the cage and weighed. An averaging filter compensates for animal movements. The filter can be set in a range from Good to Best. The large numeric display indicates the weight of the subject and the bar graph indicates balance capacity used.

Enter

```
        MAIN MENU
CHANGE MODE



```

From main menu

Enter CHANGE MODE. Select ANIMAL WEIGHING, display advances to ANIMAL WEIGHING SETUP.

Enter

```
   ANIMAL WEIGHING   SETUP
AVERAGING LEVEL    5
AUTO SAMPLE        OFF
RUN


```

Enter AVERAGING LEVEL, display advances to AVERAGING LEVEL FILTER.

or ▶

```
   ANIMAL WEIGHING SETUP

   AVERAGING LEVEL FILTER

GOOD ██████ ■ ██████ BEST
            5
```

A setting of GOOD is used for subjects which are inactive. The balance will respond quickly and present an average reading. When a setting of BEST is used, the balance responds slowly providing a much longer averaging time for very active subjects. Select filtering level and press **Enter** button.

Enter

```
   ANIMAL WEIGHING   SETUP
AVERAGING LEVEL    5
AUTO SAMPLE        OFF
RUN


```

AUTO SAMPLE when selected and set ON permits placing subjects on pan one after another with the weight showing automatically after each subject. When OFF is selected, user must press **Enter** button after each subject is placed on the pan.

▼

```
   ANIMAL WEIGHING   SETUP
AVERAGING LEVEL    5
AUTO SAMPLE        OFF
RUN


```

Enter

Select RUN. Place animal on the pan, press **Enter** button, START SAMPLE is highlighted at the bottom of the display. An averaged reading is displayed after a count-down. The count-down time is affected by the averaging level filter setting.
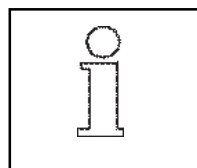
When AUTO SAMPLE has been selected, it is not necessary to press the **Enter** button to activate sampling.

6.4 Check weighing

Check weighing is used when items are checked against preset balance parameters. This feature permits you to weigh an item, assign a library name, set balance parameters such as the nominal weight, over weight and under weight. Library recall eliminates the need to enter the weighing parameters again. A bar graph at the top of the Check

Weighing screen indicates UNDER, ACCEPT and OVER for items being checked.

Enter

```
         MAIN MENU
 CHECK WEIGHING



```

From main menu

Enter CHANGE MODE. Select CHECK WEIGHING, display advances to LIBRARY NAME.
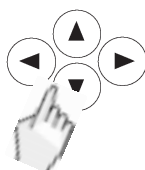
```
    CHECK WEIGHING SETUP


      LIBRARY NAME
  CW1

```

Enter a Library Name, up to 8 characters and press **Enter** button. Display advances to NOMINAL WT entry. If a previous name was entered and selected, the balance displays the parameters which were set.

```
    CHECK WEIGHING SETUP
 LIBRARY NAME
 NOMINAL
 OVER
 UNDER
 RUN
```

Enter the Nominal option.
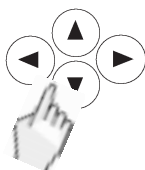
```
    CHECK WEIGHING SETUP


      NOMINAL WT
  200.000

```

Enter the nominal weight and then enter over and under weights. Press **Enter** button after each entry.

```
   CHECK  WEIGHING  SETUP
 LIBRARY NAME
 NOMINAL
 OVER
 UNDER
 RUN
```

Select RUN.

Enter

```
    CHECK  WEIGHING
 ▭▬▬▬▬▬▬▬▬▬▬▬▬▭
  UNDER   ACCEPT    OVER
 OVER: 202.000    NOMINAL: 200.00
 UNDER: 199.000   DIFF: 0.026
         200.026
```

Place the item to be checked on the balance pan, the display indicates the over, under, nominal and difference weight of the item. The bar graph indicates UNDER, ACCEPT and OVER.

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6.5 Differential weighing

Differential weighing stores tare and weight values so samples can be dried or processed and the difference in weight calculated at a later time. Up to 80 samples can be stored. The balance has the capability to work with one or two different containers or no container at all. A Sieve Analysis procedure is also included in Appendix A-1 for this type of application. Samples can be added to the applications library or extracted by name using the previously stored data. The balance can be used for other applications during processing time.

Enter

CHANGE MODE
DIFF   WEIGHING

From main menu

Enter CHANGE MODE. Select DIFF WEIGHING, display advances to LIBRARY NAME.
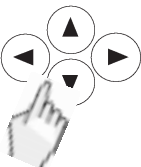
DIFF WEIGHING SETUP
LIBRARY NAME
▮

Library name

Enter a Library Name, up to 8 characters and press **Enter** button. Display advances to DIFF STARTUP. If a previous name was entered and selected, the balance displays the parameters which were set.

▼

DIFF STARTUP
SETUP
RESUME

For first time entries, select SETUP. Display advances to DIFF WEIGHING SETUP. RESUME will bring you directly to RUN which starts the program. Do
not use RESUME initially.

Enter

DIFF   WEIGHING SETUP
LIBRARY NAME
TARE SETUP
AUTO SAMPLEOFF
DIFF RESULT   WEIGHT
NUMBER OF SAMPLES
VIEW RESULTS
CLEAR ALL DATA
RUN

Enter TARE SETUP.

▼

TARE SETUP
NO TARE
SINGLE TARE
DUAL TARE
RETURN

TARE SETUP offers a choice of NO TARE (no container is used), SINGLE TARE (one container used during entire process), and DUAL TARE (two containers used, one at the start of a process and a different container at the end of a process). DUAL TARE is also used for sieve analysis. Select the appropriate tare option for your process.

Enter

TARE SETUP
NO TARE
SINGLE TARE
DUAL TARE
RETURN

Select RETURN. Display returns to DIFF WEIGHING SETUP.

Enter

```
      DIFF WEIGHING SETUP
LIBRARY NAME
TARE SETUP
AUTO SAMPLE      OFF
DIFF RESULT      WEIGHT
NUMBER OF SAMPLES
VIEW RESULTS
CLEAR ALL DATA
RUN
```

Automatic sampling

Enter AUTO SAMPLE. Auto Sampling permits repetitive sampling automatically. Select ON or OFF. Display advances to DIFF RESULT.

Enter

```
      DIFF WEIGHING SETUP
LIBRARY NAME
TARE SETUP
AUTO SAMPLE      OFF
DIFF RESULT      WEIGHT
NUMBER OF SAMPLES
VIEW RESULTS
CLEAR ALL DATA
RUN
```

Difference result

Enter DIFF RESULT. Difference result enables final weighing results to be shown by weight, percentage (for sieve analysis), or % retention. Select appropriate result for your process.

Enter

```
      DIFF WEIGHING SETUP
LIBRARY NAME
TARE SETUP
AUTO SAMPLEOFF
 DIFF RESULT  WEIGHT
NUMBER OF SAMPLES
VIEW RESULTS
CLEAR ALL DATA
RUN
```

Select RETURN and press **Enter**. Display advances to DIFF WEIGHING SETUP with NUMBER OF SAMPLES highlighted. Enter the NUMBER OF SAMPLES display.
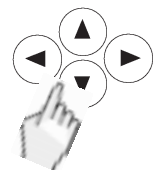
```
      DIFF WEIGHING SETUP


   NUMBER OF SAMPLES

   ███████████
```

Enter number of samples

Enter the number of samples you want to test. A maximum of 80 samples can be run per library entry. After specifying number of samples, press **Enter** button, display returns to DIFF WEIGHING SETUP with RUN highlighted.

Processing the samples

Since there are three options of taring, each procedure will be covered separately. Follow either NO TARE, SINGLE TARE or DUAL TARE methods depending upon which you have selected.

Enter

```
      DIFF WEIGHING SETUP
LIBRARY NAME
TARE SETUP
AUTO SAMPLE      OFF
DIFF RESULT      WEIGHT
NUMBER OF SAMPLES
VIEW RESULTS
CLEAR ALL DATA
RUN
```

No Tare - Initial weighing

After pressing the **Enter** button, the display indicates PUT INITIAL SAMPLE # 1 ON PAN. This first sample is your unprocessed sample.

```
        DIFF WEIGHING
┌──────────────────────────┐
TARE WT:          TARE WT:
IN IT WT:         FINAL WT:
                   0.000
PUT INITIAL SAMPLE #1 ON PAN STABLE
START/SAMPLE │  EDIT  │  SETUP
```

Put first unprocessed sample on the pan. When the weight has stabilized, press **Enter** button with START/SAMPLE highlighted on the display. This advances to the next sample. Continue adding samples and pressing the **Enter** button for each sample until all samples have been weighed. When the last sample has been weighed, the display indicates the initial weight of all samples.

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TAREWT	INIT WT	TARE WT	FINAL \VT
N/A	7.705	NA	0.000
N/A	7.702	N/A	0.000
N/A	7.701	N/A	0.000

CONTINUE	SAVE	RESAMPLE	DELETE

This sample display indicates 3 samples taken with no tare.
Four options are available at the bottom of the display. CONTINUE permits continuing with the procedure. SAVE permits saving the data and returns the

balance to a weighing mode. RESAMPLE allows going back to resample a selected entry. DELETE permits deleting a selected entry.

To return to your final weighing, find and select the Library name of your test.
The balance then returns to where you left off in your sampling procedure for final weighing.

Enter

```
        DIFF WEIGHING
[                            ]
TARE WT:          TARE WT:
IN IT WT:         FINAL WT:
                     7.299
PUT INITIAL SAMPLE #1 ON PAN STABLE
START/SAMPLE    EDIT       SETUP
```

No Tare - Final weighing
After pressing the **Enter** button, the display returns to final weighing. Put first processed sample on the pan. When the weight has stabilized, press **Enter** button with START/SAMPLE highlighted on the display. This advances to the next sample. Continue adding samples and pressing the **Enter** button for each sample until all final samples have been weighed. When the last sample has been weighed, the display indicates the final weight of all samples.

Enter

TAREWT	INITWT	TARE WT	FINAL \VT
N/A	7.705	NA	7.299
N/A	7.702	N/A	7.299
N/A	7.701	N/A	7.299

CONTINUE	SAVE	RESAMPLE	DELETE

With CONTINUE highlighted, press **Enter** button to review final display.

SAMPLE #	INIT WT	FINAL WT	WT DIFF
N/A	7.705	7.220	-0.407
N/A	7.702	7.299	-0.403
N/A	7.701	7.299	-0.402
TOTAL	23.109	21.896	-1.212

PRESS <ENTER> FOR MENU

Final display.

Enter

```
     DIFF WEIGHING SETUP
LIBRARY NAME
TARE SETUP
AUTO SAMPLE       OFF
DIFF RESULT       WEIGHT
NUMBER OF SAMPLES
VIEW RESULTS
CLEAR ALL DATA
RUN
```

Single Tare - Initial weighing (one container)
This procedure is used when one container is used with the initial and final samples. After pressing the **Enter** button, the display indicates PUT INITIAL CONTAINER #1 ON PAN.

```
        DIFF WEIGHING
[                            ]
TARE WT:          TARE WT:
IN IT WT:         FINAL WT:
                     0.000
PUT INITIAL SAMPLE #1 ON PAN STABLE
START/SAMPLE    EDIT       SETUP
```

Put container #1 on the pan. When the weight has stabilized, press **Enter** button with START/SAMPLE highlighted on the display. This advances to the next container. Continue adding containers and pressing the **Enter** button for each container until all containers have been weighed. When the last container has been weighed, the display indicates the initial weight of all containers.

TAREWT	INIT WT	TARE WT	FINAL \VT
8.739	0.000	N/A	0.000
8.744	0.000	N/A	0.000
8.738	0.000	N/A	0.000
CONTINUE	SAVE	RESAMPLE	DELETE

This sample display indicates 3 containers weighed. Four options are available at the bottom of the display. CONTINUE permits continuing with the procedure. SAVE permits saving the data and returns the balance to a weighing mode. RESAMPLE allows going back to resample a selected entry. DELETE permits deleting a selected entry.

Enter

```
        DIFF WEIGHING
[                          ]
TARE WT:        TARE WT:
IN IT WT: 20.006   FINAL WT:
                   20.006
PUT INITIAL SAMPLE #1 ON PAN STABLE
START/SAMPLE │  EDIT  │  SETUP
```

Select CONTINUE. Display changes to PUT INITIAL SAMPLE #1 ON PAN. Place sample # 1 on the pan, press **Enter** button. Repeat steps and place each sample on the pan.

TAREWT	INIT WT	TARE WT	FINAL \VT
8.739	20.006	N/A	0.000
8.744	20.096	N/A	0.000
8.738	20.096	N/A	0.000
SAMPLE #1			
CONTINUE	SAVE	RESAMPLE	DELETE

When the last sample is placed on the pan and entered, the display indicates the tare weight of the containers and the initial weight of the samples.

```
        DIFF WEIGHING
[                          ]
TARE WT:        TARE WT:
IN IT WT:       FINAL WT:16.144
                   16.144
PUT FINAL SAMPLE #1 ON PAN   STABLE
START/SAMPLE │  EDIT  │  SETUP
```

Single Tare - Final weighing (one container)

After pressing the **Enter** button, the display returns to final weighing. Put first processed sample with the container on the pan. When the weight has stabilized, press **Enter** button with START/SAMPLE highlighted on the display. This advances to the next sample. Continue adding samples and pressing the **Enter** button for each sample until all final samples have been weighed. When the last sample has been weighed, the display indicates the final weight of all samples.

Enter

TARE WT	INIT WT	TARE WT	FINAL \VT
8.739	20.006	N/A	16.143
8.744	20.096	N/A	16.598
8.738	20.096	N/A	16.685
SAMPLE #1			
CONTINUE	SAVE	RESAMPLE	DELETE

With CONTINUE highlighted, press **Enter** button to review final display.

SAMPLE #	INIT WT	FINAL WT	WT DIFF
1	11.267	7.404	-3.863
2	11.352	7.854	-3.498
3	11.358	6.947	-4.411
TOTAL	33.977	22.205	-11.772
	PRESS <ENTER> FOR MENU		

Final display.

Enter

```
        DIFF WEIGHING SETUP
LIBRARY NAME
TARE SETUP
AUTO SAMPLE        OFF
DIFF RESULT        WEIGHT
NUMBER OF SAMPLES
VIEW RESULTS
CLEAR ALL DATA
RUN
```
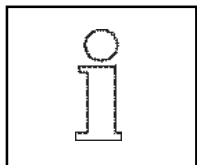
Dual Tare - Initial weighing (two containers)

This procedure is used when separate containers are used at the start of a process and the end of a process. After pressing the **Enter** button, the display indicates to PUT INITIAL CONTAINER #1 ON PAN.

```
          DIFF WEIGHING

TARE WT: 8.738         TARE Wf:
IN IT WT:              FINALWT:8.738

                8.738
PUT INITIAL CONTAINER  #1 ON PAN STABLE
START/SAMPLE    EDIT       SETUP
```

Put container #1 on the pan. When the weight has stabilized, press **Enter** button with START/SAMPLE highlighted on the display. This advances to the next container. Continue adding containers and pressing the **Enter** button for each container until all containers have been weighed. When the last container has been weighed, the display indicates the initial weight of all containers.

TAREWT	INIT WT	TARE WT	FINAL \VT
8.738	0.000	N/A	0.000
8.738	0.000	N/A	0.000
8.738	0.000	N/A	0.000
CONTINUE	SAVE	RESAMPLE	DELETE

This sample display indicates 3 containers weighed. Four options are available at the bottom of the display. CONTINUE permits continuing with the procedure. SAVE permits saving the data and returns the balance to a weighing mode. RESAMPLE allows going back to resample a selected entry. DELETE permits deleting a selected entry.

Enter

```
          DIFF WEIGHING
┌─────────────────────────────┐
└─────────────────────────────┘
TARE WT:              TARE WT:
IN IT WT: 23.076      FINAL WT:

               23.076
PUT INITIAL SAMPLE #1 ON PAN STABLE
START/SAMPLE    EDIT       SETUP
```

Select CONTINUE. Display changes to PUT INITIAL SAMPLE #1 ON PAN. Place sample # 1 on the pan, press **Enter** button. Repeat steps and place each sample on the pan.

TAREWT	INIT WT	TARE WT	FINAL \VT
8.738	23.989	N/A	0.000
8.738	23.994	N/A	0.000
8.738	24.064	N/A	0.000
SAMPLE #1			
CONTINUE	SAVE	RESAMPLE	DELETE

When the last sample is placed on the pan and entered, the display indicates the tare weight of the containers and the initial weight of the samples.

```
          DIFF WEIGHING
┌─────────────────────────────┐
└─────────────────────────────┘
TARE WT:              TARE WT:
IN IT WT:             FINAL WT:8.738

                8.738
PUT FINAL CONTAINER #1 ON PAN   STABLE
START/SAMPLE    EDIT       SETUP
```

Dual Tare - Final weighing (two containers)

After pressing the **Enter** button, the display returns to final weighing. Put final container #1 on the pan. Repeat process for all containers.

Enter

TARE WT	INIT WT	TARE WT	FINAL \VT
8.738	23.989	8.738	19.647
8.738	23.994	8.741	20.580
8.738	24.064	8.738	20.102
SAMPLE #1			
CONTINUE	SAVE	RESAMPLE	DELETE

Put first processed sample with the container on the pan. When the weight has stabilized, press **Enter** button with START/SAMPLE highlighted on the display. This advances to the next sample. Continue adding samples and pressing the **Enter** button for each sample until all final samples have been weighed. When the last sample has been weighed, the display indicates the final weight of all samples. With CONTINUE highlighted, press **Enter** button to review final display.

SAMPLE #	INIT WT	FINAL WT	WT DIFF
1	15.251	10.909	.342
2	15.256	1.839	-3.417
3	15.326	11.364	-3.962
TOTAL	45.833	34.112	-11.721
PRESS <ENTER> FOR MENU			

Final display.

6.6 Formulation

Formulations can be named and have from 2 to 10 components specified. Names are limited to 8 characters. Once named, they may be recalled and used at any time. Each component of a given formulation can be specified as to its weight or percentage. Each element of a formulation is shown on a dual bar graph as a percentage and displays the desired weight. Thus, each component may be placed on the pan until 100% is indicated.

CHANGE MODE
FORMULATION

From main menu

Enter CHANGE MODE. Select FORMULATION, display advances to LIBRARY NAME.
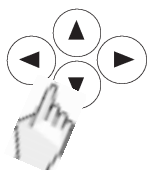
FORMULATION SETUP
LIBRARY NAME

Library name

Enter a library name, up to 8 characters and press **Enter** button. Display advances to FORMULATION SETUP with WEIGH TYPE highlighted. If a previous name was entered and selected, the balance displays the parameters which were set.

Enter

FORMULATION SETUP	
LIBRARY NAME	FORM2
WEIGH TYPE	WEIGHT
NUMBER OF ITEMS	
SETUP	
RUN	

Enter

WEIGH TYPE
WEIGHT
PERCENT
RETURN

Weigh type

Enter the weigh type. You can select the components to be specified by weight or percentage. Display returns to FORMULATION SETUP.

FORMULATION SETUP	
LIBRARY NAME	FORM 2
WEIGH TYPE	WEIGHT
NUMBER OF ITEMS	
SETUP	
RUN	

Number of items

Select NUMBER OF ITEMS.
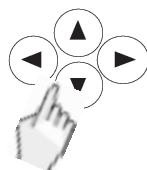
FORMULATION SETUP
NUMBER OF ITEMS

Specify the number of items (components) in the formulation. After specifying the number of items, the display returns to FORMULATION SETUP with SETUP highlighted.

41

Enter

```
    FORMULATION SETUP
LIBRARY NAME      FORM2
WEIGH TYPE        WEIGHT
NUMBER OF ITEMS
SETUP
RUN
```

Enter SETUP in the FORMULATION SETUP. Display advances to a split screen.
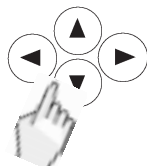
```
    FORMULATION SETUP
1  ██████████    0.000
2                0.000
```

Specifying component names

Specify the name for the first component of the formula, then press **Enter** button. Display advances to right of screen which is either weight or percentage (whichever was previously selected).
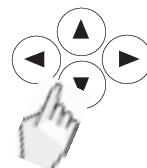
```
    FORMULATION SETUP
1            ██0.000██
2
```

Specifying weight or percentage values

Specify either weight value or percentage value which you had previously selected for the first component. Repeat these two steps for all components in your formula. After you enter all component names and values, the display advances to FORMULATION SETUP with RUN highlighted.

```
    FORMULATION SETUP
LIBRARY NAME      FORM2
WEIGH TYPE        WEIGHT
NUMBER OF ITEMS
SETUP
RUN
```

Select RUN. A dual bar display appears indicating the weight or percentage to be placed on the pan.

Enter

```
        FORMULATION
████████████████████████
0%                    90%
████████████
90%                  110%
            200.044
A1=200.000       DIFF WT: 0.044
    GRAMS              STABLE
```

Adding first component

Add the first component on the pan. The bar graph is used as a guide to precisely add 100% of the first component. NEXT appears highlighted at the bottom of the display. Press **Enter** button to add next component. Sample indicates 200.044 grams. Leave the first component on the pan. Repeat this procedure for all additional components.

Enter

```
        FORMULATION
████████████████████████

████████████
90%                  110%
            200.021
A1=200.000       DIFF WT: 0.021
    GRAMS              STABLE
```

Adding remaining components

Add all remaining components one at a time, pressing the **Enter** button after each component is placed on the pan.

Enter

	TARGET	RESULT	DIFF
AI	200.000	200.044	0.044
A2	200.000	200.021	0.021
TOTAL	400.000	400.065	0.065

PRESS <ENTER> FOR MENU

Final results

After the last component is placed on the pan, the final result is indicated on the display.

6.7 Quick check weighing

Quick check weighing permits placing a reference sample on the balance pan which is used as a reference weight to measure against similar samples. A single bar display indicates up to 100% of the capacity of the balance. The difference in percentage is also shown along with the reference weight. The large numeric display indicates the weight of the sample.

```
         CHANGE MODE



QUICK CHECK
```

From main menu

Enter CHANGE MODE. Select QUICK CHECK, display advances to QUICK CHECK.

```
         QUICK CHECK

DIFF: 0.000        REF WT: 14.798
DIFF%: 0.020

PUT REF WT ON PAN    14.800
WAIT            GRAMS   STABLE
NEW REF WT  |  MODE  |  MAIN MENU
```

Setting reference weight

Tare the balance. The display indicates PUT REF WT ON PAN. Place the reference weight on the pan. WAIT is momentarily displayed as the balance accepts the reference weight.

```
         QUICK CHECK

DIFF: 0.030        REF WT: 14.798
DIFF%: 0.020

               14.768
               GRAMS   STABLE
NEW REF WT  |  MODE  |  MAIN MENU
```

Adding samples

After the balance accepts the weight, remove the reference weight and place the first sample on the pan. The display indicates the difference in weight and

percentage of the sample against the reference weight. You may continue to weigh additional samples.

```
         QUICK CHECK

DIFF: 0.030        REF WT: 14.798
DIFF%: 0.020

                0.0000
               GRAMS   STABLE
NEW REF WT  |  MODE  |  MAIN MENU
```

Enter

Setting new reference weight

Clear the pan and tare the balance. With NEW REF WT highlighted at the bottom of the display, press **Enter** button. The display indicates PUT REF WT ON PAN. You may now place a new reference weight on the pan and repeat the above procedure for new samples using a new reference weight.
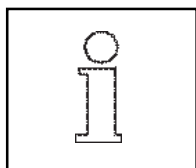
When you exit quick check weighing and use other balance functions and return to quick check weighing, the previous reference weight appears in the display. Disregard display readings. When you place a new reference weight on the pan, the balance resets to the new weight.

6.8 Statistics/Function link

Statistics are used when it is desired to compare a number of samples and examine the relative deviation of the samples along with other statistical data. A minimum of three samples is required in this program. Statistics contains menu options which include standard deviation, mean, sum, maximum, minimum, difference, relative deviation, auto sample and sample size. Most of these can be set ON or OFF except sample size which can be set for a particular number. When a printer or computer is connected to the balance, all statistical information can be observed and printed. FUNCTION LINK offers a choice of three functions; CHECK WEIGHING, FILLING and ANIMAL WEIGHING which can be linked directly to statistical data. Statistics can be enabled either through the CHANGE MODE menu or the LIBRARY. The library method will automatically run the link. Changes can be made through the CHANGE MODE menu setup.

Enter

MAIN MENU
CHANGE MODE

From main menu

Enter CHANGE MODE and select STATISTICS, display advances to LIBRARY NAME.
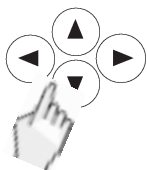
STATISTICS SETUP
LIBRARY NAME

Library name

Enter a library name, up to 8 characters and press **Enter** button. Display advances to STATISTICS SETUP with STD DEV highlighted. If a previous name was entered and selected, the balance uses the parameters which were previously set.

STATISTICS SETUP	
LIBRARY NAME	STATS1
STD DEV	ON
MEAN	ON
SUM	ON
MAXIMUM	ON
MINIMUM	ON
DIFFERENCE	ON
RELATIVE DEV	ON

Turning statistics on or off

Select each option under the STATISTICS SETUP and turn either ON or OFF. When you reach FUNCTION LINK, you have a choice of linking the statistical data to either CHECK WEIGHING, FILLING or ANIMAL WEIGHING or not linking and leave the FUNCTION LINK OFF.

FUNCTION LINK
OFF
FILLING
CHECK WEIGHING
ANIMAL WEIGHING
RETURN TO SETUP

Selecting a function link

Selecting FUNCTION LINK offers a choice of either FILLING, CHECK WEIGHING, or ANIMAL WEIGHING functions to have statistics available on printouts. Select the desired function and press **Enter** button.

STATISTICS SETUP	
DIFFERENCE	ON
RELATIVE DEV	ON
AUTO SAMPLE	OFF
AUTO PRINT	OFF
SAMPLE SIZE	3
FUNCTION LINK	OFF
RUN	

Running the program

Select RUN and press **Enter** button. If statistics was selected to link with any function, the display for that function will indicate STATS ON at the top of the display.

STATISTICS RESULT
NUMBER OF SAMPLES: 3
UNIT: GRAMS
MEAN: 203.571
MAXIMUM: 203.929
MINIMUM: 203.283
STD DEVIATION: 0.310
RELATIVE DEV: 0.064
SUM: 610.713
DIFFERENCE:0.546

Statistical result display

When a program has been run, a typical display as shown appears.
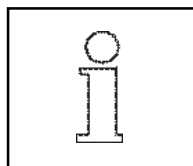
Function links when set up to a particular function such as FILLING, CHECK WEIGHING, or ANIMAL WEIGHING can be run directly from the Library listing. Scrolling through the Library will reveal which item(s) are linked to statistics.

6.9 Density

Four methods of density determinations can be made with the Voyager balance. These are: solids more dense than water, solids less dense than water, porous material (impregnated with oil), and liquid density. A Density Determination Kit Part Number 470007-010 is specifically designed to be used with Ohaus® Analytical Voyager balances. Illustrations in this procedure refer to the density kit, however, you may use whatever lab apparatus that will suit the requirements for density measurements. A built in reference density table for water at temperatures between 10ºC and 30ºC is included in the balance software. When making density measurements, the material should weigh at least 10.0 mg on an analytical balance and 100 mg on a precision balance.

6.9.1 Balance preparation with density kit

Allow the balance to warm up sufficiently before making measurements.

Support

Equalizing   Weigh   Bracket
Washer   Below Hook

Kit Components

Pan
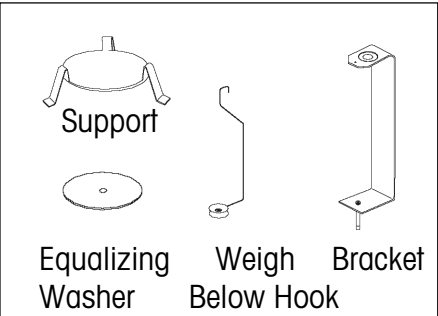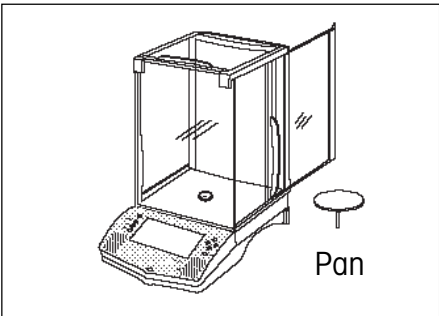
Balance preparation
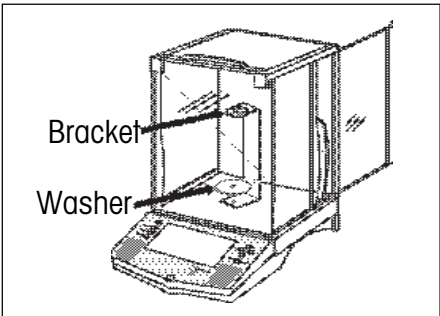
Bracket

Washer

Bracket and Washer Mounting

Open either the left or right side door of the balance and remove the Pan as shown. Insert the Bracket into the balance where the Pan was removed.

On balances which are rated over 400g, place the Equalizing Washer on top of the Bracket as shown in the illustration.
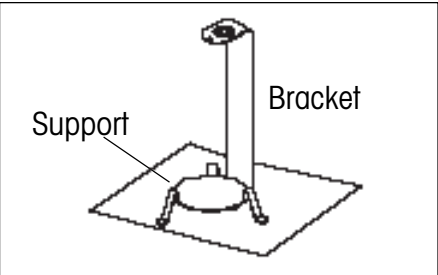
Bracket

Support

Support Mounting

Place the Support into position over the bracket making sure the Support **does not** make contact with the Bracket as shown in illustration.
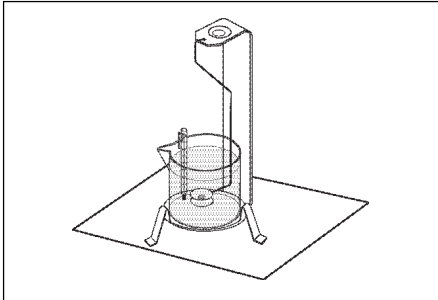
Beaker Installation

Install beaker on support as shown.

NOTE: Beaker and thermometer are not supplied as part of the density kit.

6.9.2 Solid density determinations for items more dense than water

The density Q is the quotient of the mass m and the volume V.

$$Q = \frac{m}{V}$$

Density determinations are performed by using **Archimedes' principle**. This principle states that every solid body immersed in a fluid loses weight by an amount equal to that of the fluid it displaces. The density table for water is included in the Voyager balance software.

The density of a solid is determined with the aid of a liquid whose **density, Qo,** is known (water is used as an auxiliary liquid). The solid is weighed in air (**A**) and then in the auxiliary liquid (**B**). The density **Q** can be calculated from the two weighings as follows:

$$Q = \frac{A}{A - B} \cdot Q_0$$

The balance allows direct determination of the buoyancy P *(P = A - B)* and consequently the above formula can be simplified:

$$Q = \frac{A}{P} \cdot Q_0$$

Q = Density of the solid

A = Weight of the solid in air

B = Weight of the solid in the auxiliary liquid

Q_0 = Density of the auxiliary liquid at a given temperature (this value depends on the temperature). The density table for water is included in Voyager balances.

P = Buoyancy of the solid in the auxiliary liquid (corresponds to *A -B*).

In the event that a different liquid is to be used, provisions are made to enter the density of the desired liquid and enter its name into a library. The following procedure uses water.

Enter

```
           MAIN MENU
 CHANGE MODE
```

From main menu

Enter CHANGE MODE. Select DENSITY, display advances to LIBRARY NAME.

```
          DENSITY SETUP

        LIBRARY NAME
 ███████
```

Library name

Enter a library name, up to 8 characters and press **Enter** button. Display advances to DENSITY SETUP with SOLID DENSITY highlighted. If a previous name was entered and selected, the balance uses the parameters which were previously set.

After you select SOLID DENSITY, display advances to AUX LIQ & MODE with H2O highlighted.

Enter

```
         DENSITY SETUP
 LIBRARY NAME     D2
 SOLID DENSITY    <-SELECTED
 LIQUID DENSITY
 AUTO SAMPLE      OFF
 AUTO PRINT       OFF
 RUN
```

Enter

```
        AUX LIQ & MODE
H20                 <-SELECTED
OTHER
POROUS MATERIAL     OFF
DRY WEIGHT          0.000
DENSITY OF OIL      0.0000
RETURN TO SETUP
```

Selecting water as auxiliary liquid

Select H2O, and perform the next step. If you are using a different liquid, skip the next step and continue.
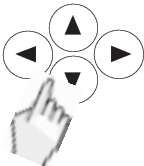
```
        AUX LIQ & MODE


ENTER TEMPERATURE CELSIUS
■■■■■■■
```

Specify temperature

Enter the temperature of the water and press **Enter** button. Display advances to AUX LIQ & MODE with POROUS MATERIAL highlighted. Skip the next two steps.

Enter

```
        AUX LIQ & MODE
H20                 <-SELECTED
OTHER
POROUS MATERIAL     OFF
DRY WEIGHT          0.000
DENSITY OF OIL      0.0000
RETURN TO SETUP
```

Selecting an auxiliary liquid

Select OTHER, and perform the next step.
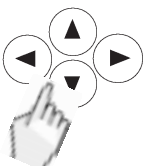
```
        AUX LIQ & MODE


ENTER LIQUID DENSITY IN CC
■■■■■■■
```

Specify auxiliary liquid density

Enter the density of the auxiliary liquid and press **Enter** button. Display advances to AUX LIQ & MODE with POROUS MATERIAL highlighted.

Enter

```
        AUX LIQ & MODE
H20                 <-SELECTED
OTHER
POROUS MATERIAL     OFF
DRY WEIGHT          0.000
DENSITY OF OIL      0.0000
RETURN TO SETUP
```

Return to setup

Select RETURN TO SETUP. Disregard POROUS MATERIAL in menu as this is explained in Appendix A-2. Display returns to DENSITY SETUP with AUTO SAMPLE highlighted.

Enter

```
        DENSITY SETUP
LIBRARY NAME     D2
SOLID DENSITY    <-SELECTED
LIQUID DENSITY
AUTO SAMPLE      OFF
AUTO PRINT       OFF
RUN
```

Auto sample

Select AUTO SAMPLE and turn it ON or OFF. A setting of ON allows samples to be sequentially sampled without pressing the **Enter** button for each sample.

Enter

```
        DENSITY SETUP
LIBRARY NAME     D2
SOLID DENSITY    <-SELECTED
LIQUID DENSITY
AUTO SAMPLE      OFF
AUTO PRINT       OFF
RUN
```

Auto print

At this point you can select AUTO PRINT. To turn on, press the **Enter** button and select ON. If you do not want automatic printing, select OFF.

Enter

```
        DENSITY SETUP
LIBRARY NAME     D2
SOLID DENSITY    <-SELECTED
LIQUID DENSITY
AUTO SAMPLE      OFF
AUTO PRINT       OFF
RUN
```

Testing the sample

Select RUN and press the **Enter** button. The display advances to DENSITY and requests WEIGH IN AIR shown at the bottom of the screen.

```
        DENSITY  - - D2

WEIGH IN AIR:  0.000    TEMP:25.0
WEIGH IN LIQ:          AUX D= 9.971
                       VOLUME:

WEIGH IN AIR      0.000

START/SAMPLE   SETUP   MAIN MENU
```

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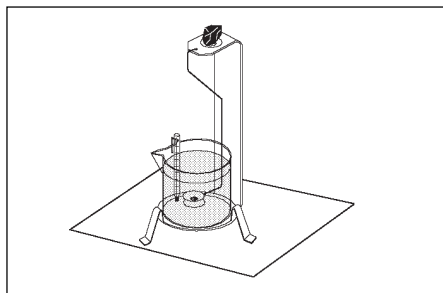
Sample Weighing in Air

START/SAMPLE is highlighted.

Make sure a beaker with liquid is in position on the stand in the balance. Press the **>O/T<** button to zero the balance reading.

Place solid on top of the bracket as shown and close the draft shield doors. Weigh the solid (weight *A)* and press the **Enter** button. The display now requests WEIGH IN LIQUID.
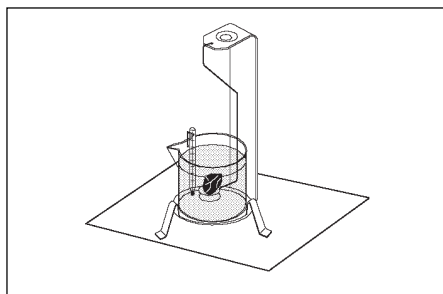
Sample Weighing in Liquid

Open the draft shield of the balance and place the solid in the Weighing Pan on the Weigh Below Hook in the liquid as shown. Ensure that there are no air bubbles on the solid to be weighed.

Close the draft shield doors and weigh the solid (buoyancy P) by pressing the **Enter** button. The display indicates the density in grams/cc.

Successive samples may be taken simply by pressing **Enter** with the START SAMPLE bar highlighted. If AUTO SAMPLE was selected previously, samples can be taken as per the indication on the display.
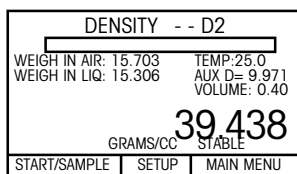
A typical final display is shown which indicates all of the parameters and values.

6.9.3 Solid density determinations for items less dense than water

For density determination of solids with a density less than 1 g/CM^3, the bottom of the Weigh Below Hook for solids must be used as it holds the solid body below the surface of the auxiliary liquid. If the buoyancy of the solid is greater than the weight of the Weigh Below Hook, the Weigh Below Hook must be weighted by placing an additional mass on the submerged part of the Weigh Below Hook as shown.
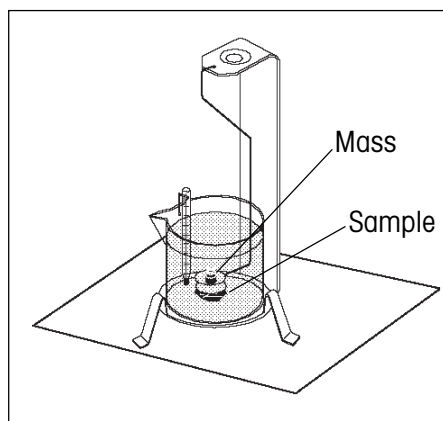
Buoyancy Sample Weighing

Weigh the sample in air first as explained in the previous procedure.

After loading the additional mass, tare the balance and start the weighing again. Wait until the balance has reached stability and note the displayed weight **P** (buoyancy of the solid).

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6.9.4 Improving the accuracy of the result of solid density

The following tips should help you improve the accuracy of the results in the density determination of solids.

Temperature

Solids are generally so insensitive to temperature fluctuations that the corresponding density changes are of no consequence. However, as work is performed with an auxiliary liquid in the density determination of solids, their temperature must be taken into account as the temperature has a greater effect with liquids and causes density changes in the order of magnitude 0.l to 1% per °C. This effect is already apparent in the third decimal place of the result.

To obtain accurate results, we recommend that you always take the temperature of the auxiliary liquid into account on all density determinations.

Air buoyancy

1 CM^3 of air weighs approximately 1.2 mg (depending on the physical condition). As a consequence, in the weighing in air, each solid experiences a buoyancy of this magnitude (the so-called "air buoyancy") per cm^3 of its volume.

However, the air buoyancy must be taken into account only when a result is required with an accuracy of 3 to 4 decimal places. To correct for this, the air buoyancy (0.0012 g per cm^3 volume of the body) is added to the calculated result:

Calculated density **+ 0.0012 g/cm³ air buoyancy** = effective density

Surface tension of the auxiliary liquid

Adhesion of the liquid to the Weigh Below Hook causes an apparent weight increase of up 3 mg.

As the Weigh Below Hook is immersed in the auxiliary liquid in both weighings of the solid (in air and in the auxiliary liquid), the influence of the apparent weight increase can be neglected because the balance is tared before every measurement.

To reduce the effect of air bubbles and to ensure the greatest possible accuracy, use a few drops of a wetting agent (not supplied) and add them to the auxiliary liquid.

6.9.5 Liquid density determinations

The density of a liquid can be made using a sinker of known volume. The sinker is weighed in air and then in the liquid whose density is to be determined, The density, **Q,** can be determined from the two weighings as follows:

Q = Density of the liquid

A = Weight of the sinker in air

$$Q = \frac{A - B}{V}$$

B = Weight of the sinker in liquid

V = Volume of the sinker

P = Buoyancy of the sinker in the liquid ($P = A\text{-}B$)

```
        DENSITY  SETUP
LIBRARY NAME     D2
SOLID DENSITY    <-SELECTED
LIQUID DENSITY
AUTO SAMPLEOFF
AUTO PRINT       OFF
RUN
```

Select liquid density

The balance is prepared in the same manner. Follow the same procedure for solid density determination except select LIQUID DENSITY under the DENSITY SETUP display. Press the **Enter** button. The display advances to ENTER SINKER VOLUME IN CC.
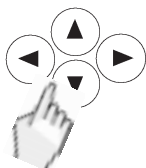
```
        DENSITY SETUP
ENTER SINKER VOLUME IN CC

 30.000
```

Enter sinker volume

Enter the sinker volume in CC's. The display starts with 30 cc. Continue with the instructions on the displays and select RUN.

```
        DENSITY - - D3

WEIGH IN AIR: 211.395
WE GH iN LIQ: 200.043  SKRVOL:30.000
                    0.378
            GRAMS/CC STABLE
START/SAMPLE  SETUP   MAIN MENU
```

After weighing the sinker in air and then weighing the sinker immersed in liquid, the balance calculates the density of the liquid and is displayed in grams/cc. See illustrations below for placement of the sinker. When the sinker is immersed in the liquid, it **must not** come into contact with the bottom of the beaker.
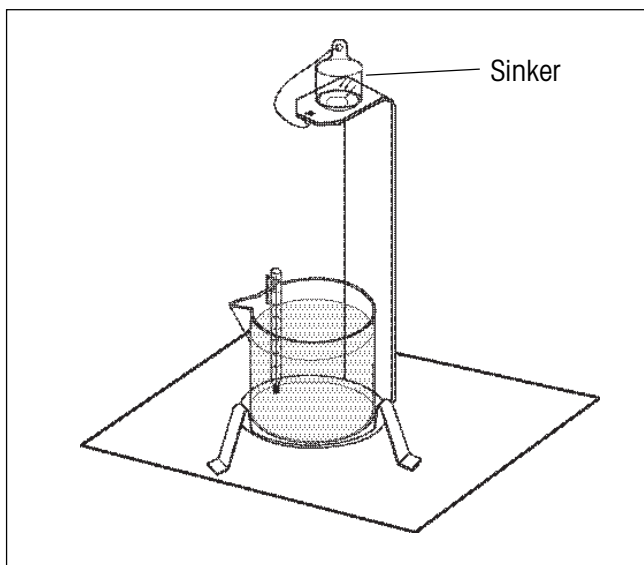
Sinker

Sinker

Sinker In Air

Sinker In Liquid

50
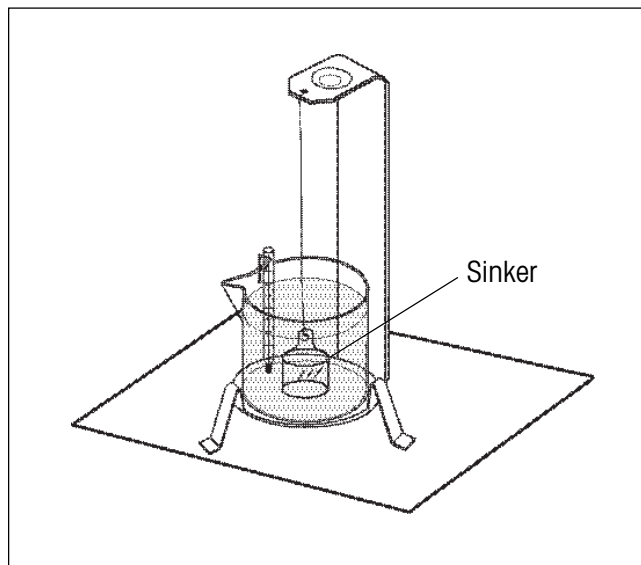
6.10 Statistical quality control (SQC)

The Statistical Quality Control (SQC) feature is extremely useful during various types of process filling operations when it is desired to monitor and control the process to eliminate under and over filling. Provisions are made in the balance to accommodate the weight of various packaging methods. During operation, parameters of the packaged product are set into the balance such as packaging weight, acceptable weight limits and non-acceptable weight limits of the product. These weight limits are identified as +TI, +T2, NOMINAL and -TI, -T2. As samples are weighed and stored in the balance, a trend analysis is developed and displayed on the balance. Up to 25 samples in a batch with up to ten batches are visible on a trend screen for quality control purposes. Each batch of samples is shown on the display which indicates the maximum/minimum standard deviation and mean values for each batch. An on going examination of the relative deviation of the samples along with other statistical data can be viewed and is stored. By observing the results of the TREND ANALYSIS screen, you can effectively monitor the filling process operation. Setup parameters can be stored in the library and up to 5 products with statistical history can be stored in memory. All SQC information can be printed.

Enter

CHANGE MODE
SQC

From main menu

Enter CHANGE MODE and select SQC, display advances to LIBRARY NAME.
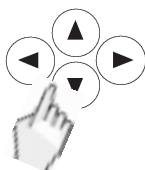
SQC SETUP
LIBRARY NAME

Library name

Enter a Library Name, up to 8 characters and press **Enter** button. Display advances to SQC SETUP with TOLERANCE highlighted. If a previous name was entered and selected, the balance uses the parameters which were previously set.

Enter

SQC SETUP	
LIBRARY NAME	SQC1
TOLERANCE	
TARE	NO TARE
MEAN TARE VALUE	OFF
AUTO SAMPLEOFF	I
AUTO PRINT OFF	
NUMBER OF SAMPLES	I
BATCH NAME	

Tolerance

Enter TOLERANCE. Display advances to DEFINE TOLERANCE with +T2 highlighted.
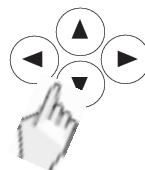
DEFINE TOLERANCE	
+T2	0.000
+T1	0.000
NOMINAL WEIGHT	0.000
-Ti	0.000
-T2	0.000
RETURN TO SETUP	

Defining tolerances

Define the tolerances for your product. Start with +T2, continue with +TI, NOMINAL WEIGHT, then -TI, finish with -T2. After entering values, press **Enter** button. Display advances to RETURN TO SETUP, press **Enter** button.

SQC SETUP	
LIBRARY NAME	SQC1
TOLERANCE	
TARE	NO TARE
MEAN TARE VALUE	OFF
AUTO SAMPLEOFF	I
AUTO PRINT OFF	
NUMBER OF SAMPLES	I
BATCH NAME	

Selecting tare

Select TARE and press **Enter** button. Display advances to TARE SELECTION with NO TARE highlighted.
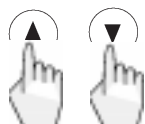
```
        TARE SELECTION
  NO TARE
  MEAN TARE
  INDIVIDUAL TARE
  ADD. WITH MT
  RETURN TO SETUP
```

Selecting type of tare

Four types of taring are available. NO TARE is self explanatory, MEAN TARE is used to subtract the packaging weight automatically, INDIVIDUAL TARE is for each sample with display prompts, ADD with MT is additive weighing with

mean tare. After selecting tare type, press **Enter** button.

```
          SQC SETUP
  LIBRARY NAME        SQC1
  TOLERANCE
  TARE                NO TARE
  MEAN TARE VALUE     OFF
  AUTO SAMPLE         OFF
  AUTO PRINT          OFF
  NUMBER OF SAMPLES   I
  BATCH NAME
```

Selecting auto sample/auto print

AUTO SAMPLE and AUTO PRINT are ON/OFF selectable functions. When AUTO SAMPLE is turned ON, samples can be taken without pressing any buttons. When AUTO PRINT is set ON, automatic printing of results are made. Select functions and press **Enter** button.
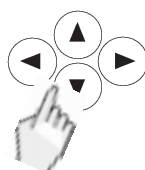
```
          SQC SETUP
  LIBRARY NAME        SQC1
  TOLERANCE
  TARE                NO TARE
  MEAN TARE VALUE     OFF
  AUTO SAMPLE         OFF
  AUTO PRINT          OFF
  NUMBER OF SAMPLES   3
  BATCH NAME
```

Specifying sample size

Enter NUMBER OF SAMPLES. Specify the number of samples to be measured. After specifying sample size, display advances to SQC SETUP with BATCH NAME highlighted. Press **Enter** button.
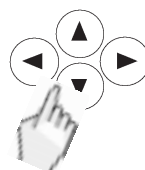
```
          SQC SETUP
  LIBRARY NAME        SQC1
  TOLERANCE
  TARE                NO TARE
  MEAN TARE VALUE     OFF
  AUTO SAMPLE         OFF
  AUTO PRINT          OFF
  NUMBER OF SAMPLES   3
  BATCH NAME
```

Specifying batch name

Enter BATCH NAME. Specify the name of the batch and press **Enter** button. After specifying the batch name, the display advances to SQC SETUP with RUN highlighted. You are now ready to take samples.

```
          SQC SETUP
  AUTO SAMPLE         OFF
  AUTO PRINT          OFF
  NUMBER OF SAMPLES   3
  BATCH NAME          0
  V IEW MEAN VALUE TRACE
  VIEW BATCH HISTORY
  RUN
```

Taking samples

The balance has a total limit of 5 history files which can include other functions such as Differential Weighing and Formulation. If more than five sets are entered, one or more data files will have to be removed. If when saving, a message appears FAILED TO SAVE, the library is full.

```
      SQC - - SQC2
  [                    ]
  0%                100%
  PUT SAMPLE #1 ON PAN
                   0.000
  START/SAMPLE  SETUP  MAIN MENU
```

Sample # 1

With the SQC SETUP displayed and RUN highlighted, press **Enter** button, display indicates the previously entered data Library name at the right hand top of the display and instructs: PUT SAMPLE #1 ON PAN.

```
      SQC - - SQC2
  [                    ]
  0%                100%
  PUT SAMPLE #1 ON PAN
                  11.905
  START/SAMPLE  SETUP  MAIN MENU
```

Place your first sample on the balance pan, then press **Enter** button. When the balance stabilizes, it will record the weight you have placed on the pan and will automatically advance to sample number 2.

52

```
         SQC - - SQC2
┌──────────────────────────┐
│                          │
0%                      100%
PUT SAMPLE #2 ON PAN
                    12.305
────────────────────────────
START/SAMPLE │ SETUP │ MAIN MENU
```
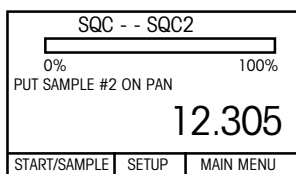
Sample # 2

Remove the first sample from the pan and place the second sample on the pan. When the balance stabilizes, press the **Enter** button. When AUTO SAMPLE is ON, you do not have to press **Enter**.

```
         SQC - - SQC2
┌──────────────────────────┐
│                          │
0%                      100%
PUT SAMPLE #3 ON PAN
                    12.710
────────────────────────────
START/SAMPLE │ SETUP │ MAIN MENU
```
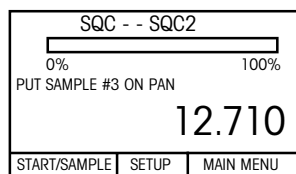
Remaining samples

Continue this procedure until all of your samples have been entered. When all samples have been entered, a History screen is displayed which indicates the parameters of the first batch.

```
SAMPLES 3 BATCH NAME: NOI
UNIT GRAMS
NOMINAL WT: 12.181
MEAN  12.307
MAXIMUM  12.710
MINIMUM  11.906
STD DEVIATION:  0.402
RELATIVE DEVIATION:  0.108
>+T2 0.00%          0
>+T1 0.00%          0
TI>N>-TI 100.00%, 3
<-T10.00%,          0
<-T20.00%           0
```
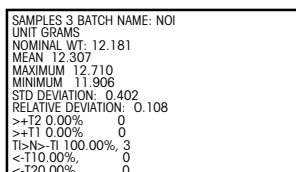
Batch history result

The sample history result at the left represents a batch of three samples. To run additional batches of samples, press the **Enter** button, the display will return to PUT SAMPLE #1 ON PAN. Remember that only ten batches will be displayed, however, if more batches are run, data is still recorded.

Go Back
```
          SQC SETUP
AUTO SAMPLE          OFF
AUTO PRINT           OFF
NUMBER OF SAMPLES    3
VIEW MEAN VALUE TRACE
VIEW BATCH HISTORY
RUN
```
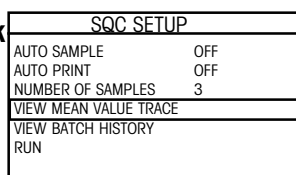
Analyzing data

Press the **Go Back** button until SQC SETUP is displayed. Select VIEW MEAN VALUE TRACE. Press the **Enter** button and the Trace Value screen appears. This screen indicates the limits you have set for your samples and the amount of deviation per batch.
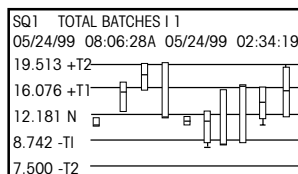
```
SQ1   TOTAL BATCHES I 1
05/24/99  08:06:28A  05/24/99  02:34:19
19.513 +T2
16.076 +T1
12.181 N
8.742 -TI
7.500 -T2
```
Sample Value Trace

Viewing mean value trace

After you have taken the required number of data samples, you can view the sample value trace and/or the sample batch history. Screen indicates 11 batches were processed with the last 10 displayed.
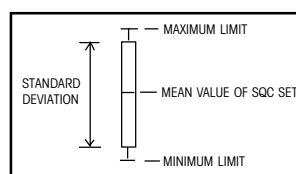
```
        ─ MAXIMUM LIMIT
STANDARD
DEVIATION   ─ MEAN VALUE OF SQC SET

        ─ MINIMUM LIMIT
```
Symbol definitions

Symbol   Definitions

The sample illustration at the left describes the symbols used on the Mean Value Trace screen and their definitions.

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Go Back

```
          SQC SETUP
AUTO SAMPLE          OFF
AUTO PRINT           OFF
NUMBER OF SAMPLES    3
VIEW MEAN VALUE TRACE
VIEW BATCH HISTORY
RUN
```

Selecting batch history

To select the batch history, press the **Go Back** button to enter the SQC SETUP screen and scroll down to VIEW BATCH HISTORY. Press the **Enter** button.

```
START SAMPLING: 05/24/99 08:26:28A
TOTAL BATCHES:11
TOTAL SAMPLES: 33
MEAN: 14.314
MAXIMUM: 20.523
MINIMUM: 8.745
STD DEVIATION: 2.226
>+T2: 9.09%          3
>+T1: 24.24%         8
T1>N>-T1: 66%, 22
<-T1:0.00%,          0
<-T2:0.00%,          0
LAST SAMPLE: 05/24/99  02:34:19P
```

Viewing batch history

Eleven batches of samples with three samples per batch were taken as an example. The sample illustration at the left indicates the parameters taken during the last 33 samples.

6.10.1   Resuming a particular SQC setup

SQC has a resume feature which enables you to recall any SQC procedure which has been named and stored in the library. The Setup procedure enabled you to designate the product parameters and assign a basic name. To use a stored product parameter with a new set of samples, you recall the procedure by name.

Enter

```
        CHANGE MODE
SQC
```

From main menu

Enter CHANGE MODE and select SQC, display advances to LIBRARY NAME.

```
      STATISTICS SETUP

      LIBRARY NAME
  ▂▂▂▂▂▂▂▂
```

Enter library name

Enter the library name of the previous SQC procedure you want to resume. Press **Enter** button. Display advances to SQC STARTUP with RESUME highlighted. The balance uses the parameters which were previously set.
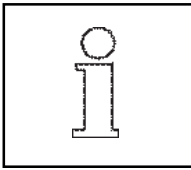
In the next step, you cannot use the **Go Back** to exit the menu. If you decide to exit, you must enter RESUME first, then back out.

Enter

```
          SQC SETUP
RESUME
NEW SETUP
PREVIOUS SETUP/REDO BATCH
PREVIOUS SETUP/CLEAR ALL DATA!
```

Select resume

When RESUME is selected, the display returns to the SQC SETUP with RUN highlighted.

Enter

```
        SQC SETUP
AUTO SAMPLE          OFF
AUTO PRINT           OFF
NUMBER OF SAMPLES    3
BATCH NAME           0
VIEW MEAN VALUE TRACE
VIEW BATCH HISTORY
RUN
```

Select run

With RUN selected, press **Enter** button.

```
        SQC - - SQI
[                        ]
PUT SAMPLE # 1 ON PAN

              0.000

START/SAMPLE   SETUP   MAIN MENU
```

Adding additional samples

Display returns to the name of the SQC identified and is ready to run sample # 1. You may now run additional samples with the parameters previously set. These samples will be added to the original sample set. The last ten samples are displayed on the MEAN VALUE TRACE.

6.10.2 Specifying new SQC setup

There are two methods of entering SQC for a new setup. One is to start at the beginning of the SQC procedure. The second method is to enter the SQC STARTUP menu. The second method is specified.
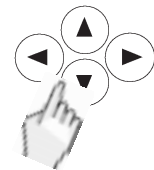
Enter

```
       CHANGE MODE
SQC
```

From main menu

Enter CHANGE MODE and select SQC, display advances to LIBRARY NAME.

```
      STATISTICS SETUP

       LIBRARY NAME
     ████████
```
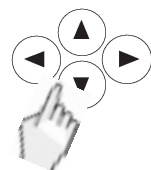
Enter library name

If you have selected an existing library name you can still change the setup in the next step. Press the **Enter** button. Display advances to SQC STARTUP with RESUME highlighted.

Enter

```
       SQC STARTUP
RESUME
NEW SETUP
PREVIOUS SETUP/REDO BATCH
PREVIOUS SETUP/CLEAR ALL DATA!
```

Select new setup

When NEW SETUP is selected, the display returns to the SQC SETUP with TOLERANCE highlighted.

Enter

```
        SQC SETUP
LIBRARY NAME         SQC 1
TOLERANCE
TARE                 NO TARE
MEAN TARE VALUE      OFF
AUTO SAMPLE          OFF
AUTO PRINT           OFF
N NUMBER OF SAMPLES  1
BATCH NAME
```

Completing new setup

Refer back to section 6.10 and enter all information required for a new setup.

6.10.3 Redoing or correcting a batch

If during the course of taking samples, an error has occurred and you want to rerun the set of samples you are currently working with, this procedure will allow you to start a new set without recording data from the set containing errors.

Go Back

```
          SQC SETUP
LIBRARY NAME
TOLERANCE
TARE
MEAN TARE VALUE
AUTO SAMPLE
AUTO PRINT
N NUMBER OF SAMPLES
BATCH NAME
```

Exiting a sample set containing an error

When the current sample you are working with is incorrect, you can exit by pressing the **Go Back** button. The display returns back to SQC SETUP with LIBRARY NAME highlighted. Press the **Enter** button.
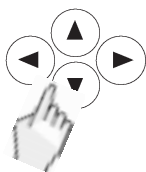
```
       STATISTICS SETUP


       LIBRARY NAME


```

Entering current library name

The current name you assigned should be displayed. Press the **Enter** button. Display advances to SQC STARTUP with RESUME highlighted.

Enter

```
        SQC STARTUP
RESUME
NEW SETUP
PREVIOUS SETUP/REDO BATCH
PREVIOUS SETUP/CLEAR ALL DATA!

```

Select previous setup

Select PREVIOUS SETUP/REDO BATCH and press **Enter** button. The display returns to SQC SETUP with VIEW BATCH HISTORY highlighted.

Enter

```
          SQC SETUP
MEAN TARE VALUE    OFF
AUTO SAMPLE            OFF
AUTO PRINT             OFF
NUMBER OF SAMPLES  3
BATCH NAME           NO1
VIEW MEAN VALUE TRACE
VIEW BATCH HISTORY
RUN
```

Select run

Scroll to RUN. With RUN selected, press the **Enter** button. The balance returns to the sample set interrupted and you may continue to take samples.
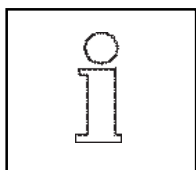
Clearing previous data set

When you are in the SQC STARTUP menu, you can elect to remove all data if desired by selecting PREVIOUS SETUP/CLEAR ALL DATA and pressing **Enter** button.

6.11 Pipette calibration

Pipette calibration checks the accuracy and precision values of pipettes by weight analysis. An analytical balance is recommended for maximum accuracy. The balance is capable of recording data from 3 to 30 samples of each pipette tested. Each test run is stored in the application library. The number of tests which can be stored will depend on the number of samples per test. The density table for water is included. If other liquids are used for pipette calibration, you must enter the liquid's density in g/cc at current room temperature. Since all calculations are made within the balance, it is also required that you know the atmospheric pressure which has to be entered. A printout can be made which specifies all parameters of the test made.

Enter

CHANGE MODE
PIPETTE

From main menu

Enter CHANGE MODE and select PIPETTE, display advances to LIBRARY NAME.
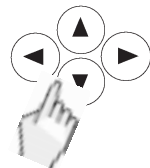
PIPETTE SETUP
LIBRARY NAME
▮

Library name

Enter a Library Name, up to 8 characters and press **Enter** button. Display advances to PIPETTE SETUP with TEST LIQUID G/CC highlighted. If a previous name was entered and selected, the balance uses the parameters which were previously set.

Enter

PIPETTE SETUP	
LIBRARY NAME	P2
TEST LIQUID(G/CC)	0.9971
BARO PRESSURE	1.0ATM
AUTO SAMPLE	OFF
AUTO PRINT	OFF
NUMBER OF SAMPLES	10
PIPETTE NAME	

Test liquid

Press **Enter** button. Display advances to SELECT TEST LIQUID with H2O highlighted.

Enter

SELECT TEST LIQUID
H2O
OTHER
RETURN TO SETUP

Selecting water as the test liquid

If you are using water as the test liquid, press the **Enter** button. If you are using a liquid other than water, skip the next step and continue.
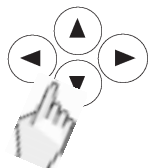
ENTER TEMPERATURE CELSIUS
25.000 25.000

Enter temperature of water

Measure the temperature of water you will be using for Pipette measurements in Celsius. A standard room temperature of 25 degrees Celsius has been pre-entered in the balance. Enter the correct value.

SELECT TEST LIQUID
H2O
OTHER
RETURN TO SETUP

Selecting other test liquid

If you are using a liquid other than water as the test liquid, scroll to OTHER and press the **Enter** button. The display advances to ENTER LIQUID DENSITY IN CC.

Enter density of test liquid
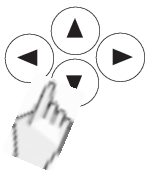
ENTER LIQUID DENSITY IN CC
0.9971   0.9971

Enter the density value for the test liquid. The standard density for water has been pre-entered. Enter the correct value for the liquid you are using, and press **Enter** button. Display advances to RETURN TO SETUP.

Return to setup

SELECT TEST LIQUID
H2O
OTHER
RETURN TO SETUP

Enter

Press the **Enter** button. Display advances to PIPETTE SETUP with BARO PRESSURE highlighted.

Enter barometric pressure

Enter

PIPETTE SETUP	
LIBRARY NAME	P2
TEST LIQUID(G/CC)	0.9971
BARO PRESSURE	1.0ATM
AUTO SAMPLE	OFF
AUTO PRINT	OFF
NUMBER OF SAMPLES	10
PIPETTE NAME	

Press the **Enter** button. The display advances to BAROMETRIC PRESSURE with ATM highlighted.

Select unit of atmospheric pressure measurement

BAROMETRIC PRES-
ATM SURE
PSIG
MMHG
MBAR
HPA
INHG

Select unit, press **Enter** button. The display advances to BAROMETRIC PRESSURE.

Specify barometric pressure
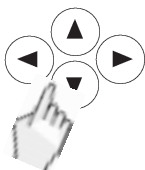
BAROMETRIC PRESSURE
1.0000   1.000

Enter the barometric pressure of the test area, then press the **Enter** button. Display advances to PIPETTE SETUP with AUTO SAMPLE OFF highlighted.   If you do not want auto sampling, skip next two steps and select AUTO PRINT.
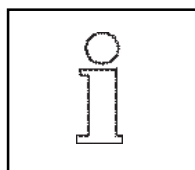
It should be noted that in the next step you can select AUTO SAMPLE either ON or OFF. When AUTO SAMPLE is turned ON, it is a real time saver as the balance controls do not have to be touched during sampling.

Select auto sampling

Enter

PIPETTE SETUP	
LIBRARY NAME	P2
TEST LIQUID(G/CC)	0.9971
BARO PRESSURE	1.0ATM
AUTO SAMPLE	OFF
AUTO PRINT	OFF
NUMBER OF SAMPLES	10
PIPETTE NAME	

If you want auto sampling, press **Enter** button. Display advances AUTO SAMPLE with ON highlighted. Press the **Enter** button.

Select auto print on

Enter

PIPETTE SETUP	
LIBRARY NAME	P2
TEST LIQUID(G/CC)	0.9971
BARO PRESSURE	1.0ATM
AUTO SAMPLE	OFF
AUTO PRINT	OFF
NUMBER OF SAMPLES	10
PIPETTE NAME	

Press the **Enter** button. The display advances to PIPETTE SETUP with AUTO PRINT OFF highlighted.

Enter

```
         AUTO PRINT
ON
OFF
```

Set auto print on

When set ON, results are automatically printed. Press the **Enter** button.
Display advances to PIPETTE SETUP with NUMBER OF SAMPLES highlighted.

Enter

```
        PIPETTE SETUP
LIBRARY NAME          P2
TEST LIQUID(G/CC)     0.9971
BARO PRESSURE         1.0ATM
AUTO SAMPLE           OFF
AUTO PRINT            OFF
NUMBER OF SAMPLES     10
PIPETTE NAME
```

Select number of samples

Press the **Enter** button. The display advances to NUMBER OF SAMPLES.
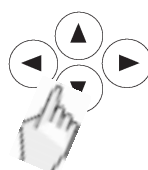
```
      NUMBER OF SAMPLES

  10         10
```

Enter sample size

Enter the number of samples.   Press **Enter** button. The display advances to
PIPETTE SETUP with PIPETTE NAME highlighted.

Enter

```
        PIPETTE SETUP
LIBRARY NAME          P2
TEST LIQUID(G/CC)     0.9971
BARO PRESSURE         1.0ATM
AUTO SAMPLE           OFF
AUTO PRINT            OFF
NUMBER OF SAMPLES     10
PIPETTE NAME
```

Select pipette name

Press **Enter** button. Display advances to new screen PIPETTE NAME.
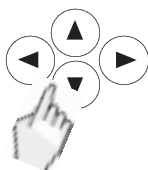
```
      PIPETTE  NAME
  WHEAT
```

Enter pipette name

Enter the name of the pipette. Press **Enter** button. Display advances to
PIPETTE NUMBER. Press **Enter** button.
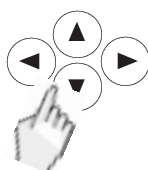
```
     PIPETTE  NUMBER
  345
```

Enter pipette number

Enter the number of the pipette. Press the **Enter** button. The display ad-
vances to PIPETTE SETUP with NOMINAL highlighted.

Enter

```
        PIPETTE SETUP
BARO PRESSURE         1.0ATM
AUTO SAMPLE           OFF
AUTO PRINT            OFF
NUMBER OF SAMPLES     10
PIPETTE NAME          WHEAT
PIPETTE NUMBER        345
NOMINAL               0.00ML
```

Select nominal

Press the **Enter** button. The display advances to NOMINAL VALUE UNITS with
ML highlighted.

or
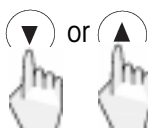
```
     NOMINAL VALUE UNITS
ML
UL
RETURN TO SETUP
```

Select nominal value unit

Select either ML (milliliters) or UL (microliters). Press the **Enter** button.
Display advances to NOMINAL.

Enter nominal value

Enter the nominal value. Press the **Enter** button. The display advances to PIPETTE SETUP with INACCURACY highlighted.

NOMINAL
0.0000   0.0000

Enter

PIPETTE SETUP	
AUTO SAMPLE	OFF
AUTO PRINT	OFF
NUMBER OF SAMPLES	10
PIPETTE NAME	WHEAT
PIPETTE NUMBER	345
NOMINAL	3.45ML
INACCURACY	2.00%

Select inaccuracy

Select INACCURACY. Press **Enter** button. The display advances to INACCU-RACY.
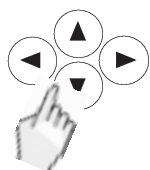
INACCURACY
2.000   2.000

Enter inaccuracy value

Enter the percentage of acceptable inaccuracy. This indicates the deviation of all pipette samples (mean error). Press **Enter** button. The default setting is 2 percent. Display advances to IMPRECISION.

Enter

PIPETTE SETUP	
AUTO PRINT	OFF
NUMBER OF SAMPLES	10
PIPETTE NAME	WHEAT
PIPETTE NUMBER	345
NOMINAL	3.45ML
INACCURACY	2.00%
IMPRECISION	2.00%

Select imprecision

Select IMPRECISION. Press the **Enter** button. Display advances to IMPRECI-SION.
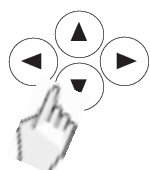
IMPRECISION
2.000   2.000

Enter imprecision value

Enter the imprecision value. This indicates the variation of all pipette samples from the mean value (Coefficient of Variation). Press the **Enter** button. The default setting is 2 percent. The display advances to RUN.
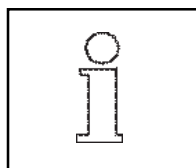
When placing samples in the vessel during pipette calibration, make sure to continue the calibration to the end without significant pauses in between each sample. If a significant amount of time has elapsed (30 seconds or more) between samples, re-tare the balance before adding the next sample. This is to eliminate errors introduced by evaporation.
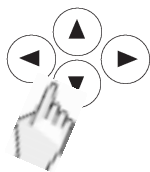

Enter

PIPETTE SETUP	
PIPETTE NUMBER	345
NOMINAL	3.45ML
INACCURACY	2.00%
IMPRECISION	2.00%
VIEW RESULTS	
CLEAR ALL DATA	
RUN	

Taking samples

With RUN highlighted, press the **Enter** button. The display advances to a screen requesting to PUT SAMPLE #1 ON PAN.

PIPETTE - - P2

0%   100%
PUT SAMPLE #1 ON PAN

0.000
AUTO SAMPLE ON   GRAMS   STABLE
START/SAMPLE | SETUP | MAIN MENU

Press **Enter**, the display indicates PIPETTE -- NAME of test at the top of the screen.

START/SAMPLE is at the bottom of the screen. Pressing **Enter** starts the testing. If you are using water, use distilled water only.

Place empty vessel on the balance, fill the vessel with a small amount of liquid, and then tare the balance.
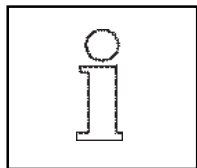
When AUTO SAMPLE has been selected, it is not necessary to press the **Enter** button for each sample. If the balance fails to advance to the next sample, press the **Enter** button.

Place the first sample from the pipette into the vessel and press **Enter**. The display indicates SAMPLE #1. Place the second sample from the pipette into the vessel and press **Enter**.

```
P1                        STATUS PASS
05/26/99   03:11:03P   INACCURACY: 0.30%
NOMINAL: 3.45ML          IMPRECISION:0.97%
3.525   2S
3.492   S
3.458   M
3.425   S
3.391   2S
```
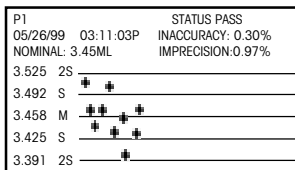
Repeat the above steps until all samples have been run. When the last sample is placed on the balance and the **Enter** button is pressed, the panel display indicates the results of the test which includes the Date, Time, Status, Nominal value, Inaccuracy and Imprecision. The graph on the display indicates the mean value in the center with standard deviation and   2 times standard deviation above and below shown as lines across the screen. Each sample is shown as a diamond shaped mark on the graph. A ten sample set is shown.
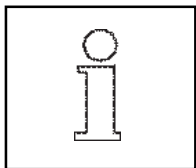
If AUTO PRINT was selected during the setup, the results are automatically printed. Printout contains numerical results and all statistics.

For manual printing of test results, press the **Print** button on the balance.

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7. Balance settings

7.1 Reset to factory settings

In this menu option you can reset selected functions or all menu settings to factory settings.

Enter

CHANGE MODE
SET BALANCE

From main menu

Select SET BALANCE, display advances to SET BALANCE.

▼

SET BALANCE
READOUT
INTERFACE
PRINT OPTION
SETUP GLP
SET TIME/DATE
AUTOCAL ENABLE
PRINT CURRENT SETTINGS
RESET

Select RESET, press **Enter** button. Display advances to RESET TO FACTORY SETTINGS.

▲ or ▼
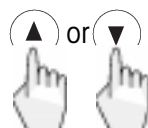
SET BALANCE
RESET TO FACTORY SETTINGS
RESET READOUTS
RESET RS232
RESET PRINT OPTION
RESET GLP
RESET ALL
EXIT TO WEIGH

Enter

Reset to factory settings

The RESET TO FACTORY SETTINGS has several reset functions. To reset a function, select the function using the arrow buttons and press **Enter** button. To reset all functions, select RESET ALL using arrow buttons and press **Enter** button.
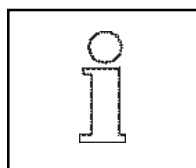
RESET ALL when selected, will return the balance to factory default settings.

7.2 Setting contrast and brightness of display

When the balance is first turned on, you may want to adjust the balance's LCD display contrast and brightness to suit your needs.

Enter

MAIN MENU
CHANGE MODE
CHANGE UNITS
SET BALANCE
CUSTOM MENU
LIBRARY
CALIBRATION
CONTRAST

Enter the MAIN MENU and select CONTRAST and press **Enter** button. Display advances to LCD CONTRAST / BRIGHTNESS ADJUST.

▲ or ▼

MAIN MENU
LCD CONTRAST/BRIGHTNESS
CONTRAST   BRIGHTNESS

Using arrow buttons, adjust contrast as needed.

▶

MAIN MENU
LCD CONTRAST/BRIGHTNESS
CONTRAST   BRIGHTNESS

Press arrow buttons and adjust brightness as needed. Press **Enter** or **Go Back** button to return to MAIN MENU.

7.3 Setting the readout

This menu option enables you to set the balance averaging level, stability level, auto zero, and legal for trade (LFT).

Enter

```
    SET BALANCE
  READOUT
```

From main menu

Select SET BALANCE and press the **Enter** button. Display advances to SET BALANCE with READOUT highlighted. Press the **Enter** button, display advances to READOUT SETUP.

◄ or ►
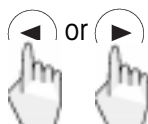
```
    READOUT SETUP
  AVERAGING LEVEL FILTER

GOOD         ■       BEST
         5
```

Setting averaging level

Press **Enter** button, AVERAGING LEVEL FILTER is displayed. Averaging level filter compensates for vibration or excessive air currents. A zero setting (GOOD) corresponds to minimum filtering with fastest stabilization time. A setting of (BEST)10 is maximum filtering with the slowest stabilization time. Adjust to desired setting and press **Enter** button.

◄ or ►
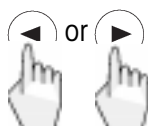
```
    READOUT SETUP
  STABILITY LEVEL FILTER

GOOD      ■          BEST
         5
```

Setting stability level

Scroll to STABILITY LEVEL and press **Enter** button, STABILITY LEVEL FILTER is displayed. Stability level filter determines the variation range in divisions for a given reading depending upon the filter setting. A setting of zero (GOOD) permits the balance to respond to variations of .5 divisions. A setting of (BEST) 10 sets the threshold to 3 divisions. Adjust to desired setting and press **Enter** button.

▲ or ▼
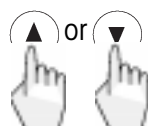
```
    READOUT SETUP
        AZT
  OFF
  0.5
  1
  3
```

Setting auto-zero

Scroll to AUTO ZERO and press **Enter** button, AZT is displayed. Auto zero minimizes the effects of temperature changes and shift on the zero reading. There are 4 settings, OFF, 0.5, 1, and 3. The numbers represent display divisions. The balance maintains the zero display until the set threshold is exceeded. Select the desired setting and press **Enter** button.

▲ or ▼
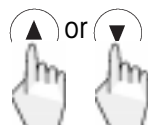
```
    READOUT SETUP
  AVERAGING LEVEL    5
  STABILITY LEVEL    5
  AUTO ZERO        0.5
  LEGAL FOR TRADE  OFF
  EXIT TO WEIGH
```

Setting legal for trade

Scroll to LEGAL FOR TRADE and press **Enter** button. Legal for trade can be set ON or OFF. When set ON, only the functions allowed by the national weights and measures legislation are available. Press Enter button after making your selection.

7.4 Setting the interface

This menu option enables you to set the balance communication parameters for the RS232 interface which include: baud rate, data bits, parity and stop bit.

Enter

SET BALANCE
INTERACE

From main menu

Select SET BALANCE and press the **Enter** button. Display advances to SET BALANCE with READOUT highlighted. Scroll to INTERFACE and press the **Enter** button, display advances to INTERFACE.

▲ or ▼

INTERFACE
BAUD RATE
300
1200
2400
4800
9600
RETURN

Setting baud rate

Baud rates of 300, 1200, 2400, 4800 and 9600 are available for communications. Select the appropriate rate. Default setting is 2400 baud. Press **Enter** button.

▲ or ▼

INTERFACE
DATA BITS
7
8
RETURN

Setting data bits

Data bits of 7 or 8 are selectable. Select appropriate bit rate. Default setting is 7. Press **Enter** button.

▲ or ▼

INTERFACE
PARITY
NONE
EVEN
ODD
0
1
RETURN

Setting parity

Select appropriate parity setting of either NONE, EVEN, ODD, 0, or 1. Default setting is NONE. Press **Enter** button.

▲ or ▼

INTERFACE
STOP BITS
1
2
RETURN

Setting stop bits

Select appropriate stop bits setting of either 1 or 2. Default setting is 2. Press **Enter** button.

7.5 Setting print option

This menu option enables you to set various print features ON or OFF and include Auto Print, Data, Numeric Data, Print Date, Print Time and Print Reference.

Enter

| SET BALANCE |
| --- |
| PRINT OPTION |

From main menu

Select SET BALANCE and press the **Enter** button. Display advances to SET BALANCE with READOUT highlighted. Scroll to PRINT OPTION and press the **Enter** button, display advances PRINT OPTION with AUTO PRINT OFF highlighted.

▲ or ▼

AUTO PRINT
OFF
CONTINUOUS
STABLE
INTERVAL

Setting auto print

Enter AUTO PRINT. AUTO PRINT can be set to output display data in one of three ways: CONTINUOUS, STABLE or INTERVAL at user specified interval (seconds). When Interval is selected, you will have to specify number of seconds. Select desired mode and press **Enter** button.

▲ or ▼

PRINT OPTION	
STABLE DATA	OFF
NUMERIC DATA	OFF
PRINT DATE	OFF
PRINT TIME	OFF
PRINT REFERENCE	OFF

Setting stable data, numeric data, print date, print time, print reference

All of these features can be set ON or OFF. STABLE DATA, when set ON, prints only when the reading is stable. NUMERIC DATA, when set ON, prints numerical data. PRINT DATE, when set ON, prints current date. PRINT TIME, when set ON, prints current time. PRINT REFERENCE, when set ON, prints the value of the weight used as a reference to the printer.

▲ or ▼

STABLE DATA
ON
OFF

Setting functions on or off

Select each of the above functions and select either ON or OFF.

Enter

7.6 Setting GLP print options

This menu **GLP** (Good Laboratory Practices) options allows the entering of a Project Name, User Name, and GLP Print Options which include: Date & Time, Balance ID, Project Name, User Name and Calibration all of which can be set ON or OFF.
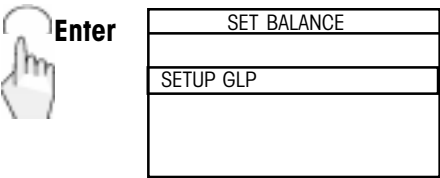
Enter

SET BALANCE
SETUP GLP

From main menu

Select SET BALANCE and press the **Enter** button. Display advances to SET BALANCE with READOUT highlighted. Scroll to SETUP GLP and press the **Enter** button, display advances SETUP GLP with PROJECT NAME highlighted.

Enter

SETUP GLP
PROJECT NAME
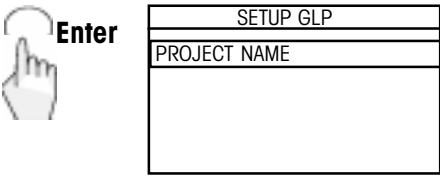
Enter project name

Enter PROJECT NAME, the display advances to permit entering project name.

SETUP GLP
PROJECT NAME
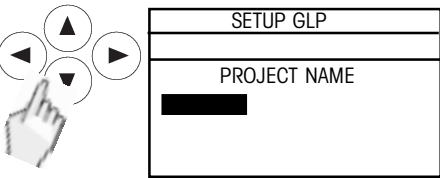
Specify the project name

Specify the project name. The name can have any combination of alpha numeric characters not to exceed 8 characters. After specifing the project name, the display advances to USER NAME.

Enter

SETUP GLP
USER NAME

Select user name

SETUP GLP
USER NAME
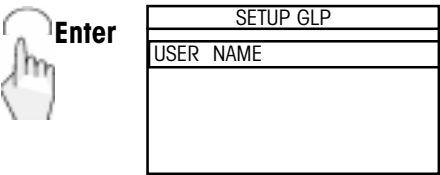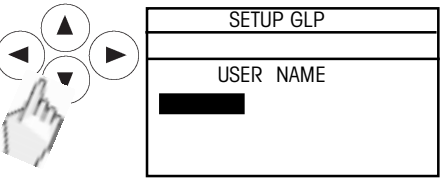
Specify the user name

Specify the user name, and press **Enter** button. The display advances to GLP PRINT OPTIONS. Press **Enter**, the display advances to GLP PRINT OPTIONS with DATE & TIME highlighted.

▲ or ▼

GLP PRINT OPTIONS	
DATE & TIME	OFF
BALANCE ID	OFF
PROJECT NAME	OFF
USER NAME	OFF
CALIBRATION	OFF
RETURN	
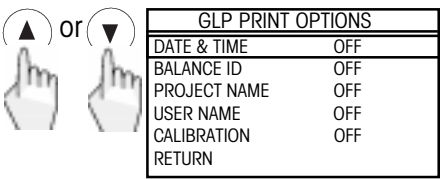
Setting GLP print options

GLP PRINT OPTIONS permit DATE & TIME, BALANCE ID, PROJECT NAME, USER NAME, and CALIBRATION DATA to be turned ON or OFF for printing.
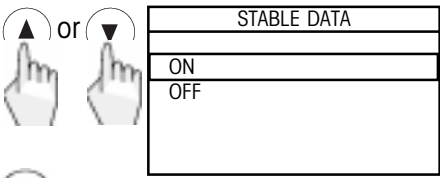
▲ or ▼

STABLE DATA
ON
OFF

Setting functions on or off

Select each of the above functions and select either ON or OFF.

Enter

7.7   Setting time and date

This menu permits entering time and date. A battery backup is used for the memory. The battery has a life of 5 years.

Enter

SET BALANCE
SET TIME/DATE

From main menu

Select SET BALANCE and press the **Enter** button. Display advances to SET BALANCE with READOUT highlighted. Scroll to SET TIME/DATE and press the **Enter** button.

Enter

SETUP   DATE/TIME
DATE TYPE   MM/DD/YY

Setting date type

This option offers 6 arrangements of date styles to suit your needs. They are: MM/DD/YY, DD/MM/YY, YY/MM/DD, MM/YY/DD, DD/YY/MM, YY/DD/MM. Enter the date type option and press the **Enter** button. The display advances to SET DATE.

Enter

SETUP   DATE/TIME
SET DATE

Setting date

This option permits entering the current date. Enter the SET DATE option. The display advances to a new SET DATE display.
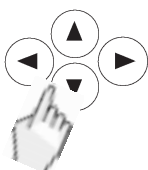
SETUP DATE/TIME
SET DATE
▬▬▬

Enter the date in the format you have chosen above.   After entering the date, press the **Enter** button. The display advances to SETUP DATE/TIME with TIME TYPE highlighted.

Enter

SETUP   DATE/TIME
TIME TYPE

Setting time type

This option permits entering either a 12 hour or 24 hour display for time. Enter the TIME TYPE option. The display advances to SELECT TIME TYPE.

▲ or ▼
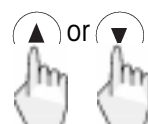
SELECT TIME TYPE
24 HOUR
12 HOUR
RETURN

Select either 24 hour or 12 hours. This will be displayed on printouts which have time and date turned on. After selecting time type, press the **Enter** button. The display advances to SET TIME.

Enter

67

Enter

```
SETUP  DATE/TIME

SET TIME      11:23:21AM
```

Enter set time

Enter the SET TIME option. The previously entered time appears in the display. Press the **Enter** button.
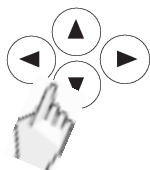
```
SETUP DATE/TIME
SET TIME


████████
```

Setting the time

Enter the time in the format you have chosen above.   After entering the time, the display advances to SELECT AM/PM display only if 12 hour time type was selected.
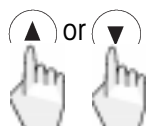
▲ or ▼

```
SETUP   DATE/TIME
AM
PM
```

Setting am/pm

Select AM or PM as required. The display returns to the DATE TYPE. Press the **Go Back** button to return to SET BALANCE menu, SET TIME/DATE is displayed.

7.8   Setting auto calibration

Automatic calibration of the balance can be accomplished when equipped with this option. When this function is turned ON, the balance automatically calibrates itself due to a temperature change.

Enter

```
SET  BALANCE


AUTOCAL ENABLE
```

From main menu

Select SET BALANCE and press the **Enter** button. Display advances to SET BALANCE with READOUT highlighted. Scroll to AUTOCAL ENABLE and press the **Enter** button.
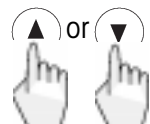
▲ or ▼

```
AUTOCAL ENABLE

ON
OFF
```

Select either ON or OFF and press the **Enter** button. The display returns to AUTOCAL ENABLE.

7.9 Print current settings

When this option is selected, you may view all settings made in your balance on an external printer.

Enter

```
SET  BALANCE


PRINT CURRENT SETTINGS
```

From main menu

Enter SET BALANCE and select PRINT CURRENT SETTINGS. Press the **Enter** button. The balance wil print current settings out to a printer. If a printer is not connected or improperly connected, the balance will display PRINT FAILED after displaying PRINTING.

7.10 Lock out

This software option works in conjunction with a hardware Lockswitch and LFT software. It permits various measure-ment units, calibration methods and balance functions to be selected and either turned ON or OFF.

Before using this sofware function, check the status of the hardware lock switch and Legal for Trade software (see section 7.14). If the hardware switch is ON, and the Legal for Trade software is set ON (locked), you cannot access the LFT LOCK software.

Enter

```
       SET  BALANCE



 LOCK OUT
```

From main menu

Enter the SET BALANCE menu and scroll to LOCK OUT.

▲ or ▼

```
          LFT LOCK

 TURN UNITS <ON> OR <OFF>
 TURN CALIBRATION <ON> OR <OFF>
 TURN FUNCTIONS <ON> OR <OFF>
```
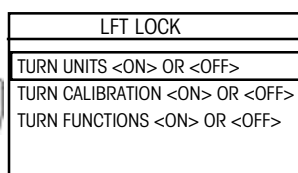
Select any one of the available options and press **Enter** button.

Enter

Depending on what you have selected, an entire list of all Units, Calibration methods and balance Functions are displayed. Every item in each list can be individually turned ON or OFF. These items when turned OFF will not be available for balance operation and are locked out.
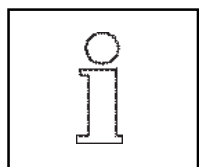
All selected items which have been turned OFF will still function. Menu lock out is accomplished with the setting of a physical switch located under the pan. Paragraph 7.14 describes how to lock out the selected menus. The balance can then be sealed if required.

7.11 Software version

This option allows you to view the software version number, date installed and main board version number. These numbers are very important for servicing. To view software version, proceed as follows;

Enter

SET BALANCE
SOFTWARE VERSION

From main menu

Enter SET BALANCE. Select SOFTWARE VERSION, press the **Enter** button, the software version is indicated on the display. Keep a written record of this information in the event servicing is required and the display does not work. Software Version_____.

7.12 Setting custom menu

This option allows you to enter specific balance functions.   These functions can be selected conveniently from this menu to operate the balance in a RUN mode. There are 18 items which can be selected and are listed with the associated paragraphs in the following table.

Enter

CUSTOM MENU
RUN
SETUP CUSTOM MENU

From main menu

Enter the CUSTOM MENU and select SETUP CUSTOM MENU.   Review list on menu shown in table.

▲ or **▼**

STABLE DATA
ON
OFF

Enter

Setting functions on or off

Select any of the functions and set either ON or OFF.

LIST OF CUSTOM MENU ITEMS	
FILLING	SQC
CHECK WEIGHING	PIPETTE
ANIMAL WEIGHING	READOUT
PARTS COUNTING	INTERFACE
DIFF WEIGHING	PRINT OPTION
QUICK CHECK	SETUP GLP
FORMULATION	SET TIME/DATE
STATISTICS	AUTOCAL ENABLE
DENSITY	PRINT CURRENT SETTINGS

Enter

CUSTOM MENU
RUN
SETUP CUSTOM MENU

To run a particular function, select RUN and press the **Enter** button..

7.13 Legal for trade (LFT)

LFT is a software controlled option which can be set to Legal For Trade ON or OFF. When set ON, certain items in the CALIBRATION and SET BALANCE menus are automatically preset and locked to permit the balance to operate in a legal for trade application and works in conjunction with a Lock Out switch (see section 7.14). Default setting is OFF. The READOUT menu enables you to set the balance legal for trade (LFT) ON or OFF. See default table.

Enter

SET BALANCE
READOUT

From main menu

Enter SET BALANCE and select READOUT. The READOUT SETUP menu is displayed.

▼

READOUT SETUP
LEGAL FOR TRADE

Select LEGAL FOR TRADE, press **Enter** button .

Legal for trade default settings

The following table indicates the menus and options which are locked and unlocked when LFT is set ON.

LFT DEFAULT TABLE

LFT and Lockswitch	Default Value
Set Balance Menu	
Readout	
Averaging Level	Unlocked
Stability Level	**Locked to 1**
Auto Zero	**Limited to OFF & 0.5**
Interface	Unlocked
Print Option	
Auto Print	Unlocked
Stable Data	**Locked ON**
Numeric Data	Unlocked
Print Data	Unlocked
Print Time	Unlocked
Print Reference	Unlocked
Setup GLP	Unlocked
Set Time and Date	Unlocked
Autocal Enable	**Locked**
Print Current Settings	Unlocked
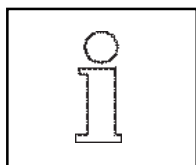
When LFT is turned ON, the last digit on the weight display has a white colored block behind it. This signifies that the balance is in a legal for trade operational mode and that the last digit should be ignored. The CENTER OF ZERO is displayed only for LFT operation.

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7.14 Menu lockout protection

Access to the various menus can be disabled by setting the Lock switch located on the PC board inside the balance to ON position. The Lock switch locks out certain menus when Legal For Trade is turned ON. The default setting for the Lock switch is OFF.

Type Approved/Legal for Trade Balance Sealing

All Voyager balances may be sealed for type approved/legal for trade applications. Type Approved balances include a lead seal with wire and security screw as shown in the illustration.

For type approved balances consult local Weights and Measures officials to determine sealing method requirements.

After the balance has been set up properly and LFT is set ON, proceed to sealing the balance.

Sealing the balance

— Turn the display off and unplug the power cord.

— On balances with a draft shield, slide the door open and remove the pan and cover plate.

Higher capacity balances with a 6" or 8" pan do not have a cover plate.

— On balances without a draft shield, remove the pan and cover plate.

— Remove the protective cover seal.

— The Lock switch is located to the left of the pan support hole.

— Select the desired position on the Lock switch, seal and reassemble the balance.
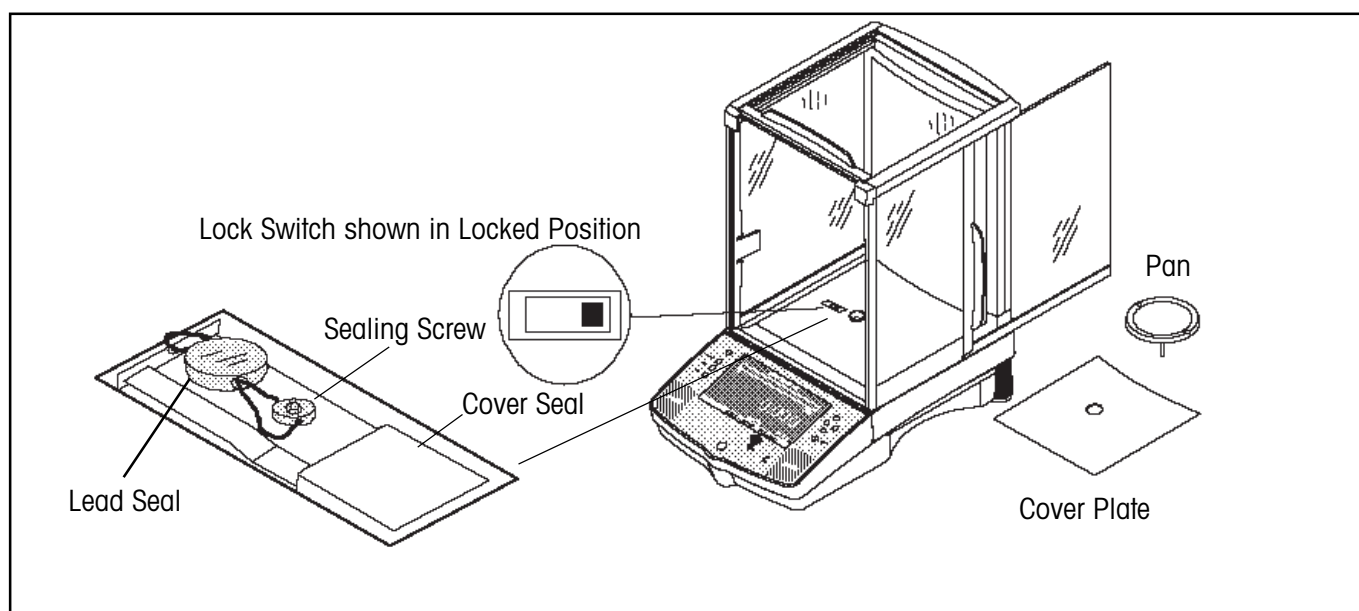
Example of Sealing Method

8. RS232 interface/printing data

8.1 RS232 interface

The balance is equipped with a bi-directional RS232 compatible interface for communication with printers and computers. When the balance is connected directly to a printer, displayed data can be output at any time by simply pressing PRINT.

The balance can be operated from a computer, as well as receive data such as displayed weight, weighing mode, stability status, etc. The following sections describe the hardware and software provided with the balance

RS232 Connection
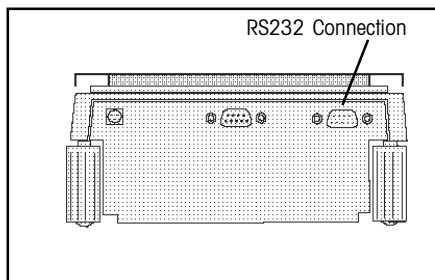
Hardware

On the rear of the balance, the right-hand, 9-pin male subminiature "D" connector is provided for interfacing to other devices.

1	N/C
2	Data Out (TXD)
3	Data In (RXD)
4*	Tare (External signal)
5	Clear To Send (CTS)
6	Data Terminal Ready (DTR)
7	Ground
8	Request To Send (RTS)
9*	Print (External signal)

* External PRINT and/or TARE switches may be installed as shown in the diagram. Momentary contact switches must be used.

Output Formats

Data output can be initiated in one of three ways: 1) By pressing PRINT; 2) Using the Auto Print feature; 3) Sending a print command ("P") from a computer.

RS232 Commands

All communication is accomplished using standard ASCII format. Only the characters shown in the following table are acknowledged by the balance. Invalid command response "ES" error indicates the balance has not recognized the command. Commands sent to the balance must be terminated with a carriage return (CR) or carriage return-line line feed (CRLF). For example, a tare command should appear as shown in the adjacent diagram. Data output by the balance is always terminated with a carriage return - line feed (CRLF).

RS232 COMMAND TABLE

Command Character	Description	
?	Print current mode	Field: Mode(5) Stab(1) CR(1) LF(1) — blank if stable / "?" if unstable; Units: mg, g, kg, dwt, ct, oz, oz t / GN, tael, tael, tael, momme, lb / N, tical, custm, Pcs, %
nnnn	Set Auto Print feature to "nnnn" (see table)	nnn = 0 Turns feature OFF; nnn = S Output on stability; nnn = C Output is continuous; nnnn = 1-3600 Sets Auto Print Interval
xD	Set 1 second print delay (set x = 0 for OFF, or x = 1 for ON)	
F	Print current function.	
xI	Set Averaging Filter Level to "x", where x = 0 to 9 (see table). If LFT, level 0 to 2.	0 = minimum level; 1 =; 2 =; 3 =; 4 =; 5 =; 6 =; 7 =; 8 =; 9 = maximum level
xM	Places balance in mode "x", where x = 1 to 17 (see table). If unit or mode is not already enabled, command will be ignored.	1 = milligrams; 2 = grams; 3 = kilo grams; 4 = dwt; 5 = Carats; 6 = Ounces; 7 = Ounces troy; 8 = Grains; 9 = Taels Hong Kong; 10 = Taels Singapore; 11 = Taels Taiwan; 12 = Mommes; 13 = Decimal Pounds; 14 = Pounds-Ounces combined; 15 = Newton's; 16 = tical; 17 = Custom Units
P	Print display data	Field Length: Number field Variable 3-9	Units 6 characters	Stab CR LF — blank if stable / "?" if unstable; Units: mg, g, kg, dwt, ct, oz, oz t / GN, tael, tael, tael, momme, lb / N, tical, custm, Pcs, %

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RS232 COMMAND TABLE (Cont.)

Command Character	Description
T	Same effect as pressing O/T button.
V	Print EPROM version
Esc V	Print balance ID (13 characters).
xZ	Set Auto Zero to "x",where x = 0 to 3). 0=Off, 1=0.5d, 2=1d, 3=5d.If LFT, programs Auto zero level from 0 to 1.
Esc R	Resets Setup and Print menus to factory defaults. CAUTION: This will reset RS232 configuration.
ON	Turns balance on.
OFF	Turns balance off.
?	Print current weigh mode.
#	Print current Parts Count Reference Weigh.
%	Print current Percent Reference Weigh.
xA	Set Auto Print feature, action CA - continuous printing, SA - print on stability, OA - turns all selections off.
ID	Print Current ID String.
XID	Program User ID String, 1-8 characters.
SN	Show Serial Number.
xS	Print Stable Only. Where x =0 Off and x=1 On.
TIME	Print Current Time. Note, a ? mark will follow if date or time has not been set.
SETDATE	Set Date Command and remove Invalid Indicator
SETTIME	Set Time Command and Remove Invalid Time Indicator
DATE	Prints Current Date. Note, a ? mark will follow the year if date or time has not been set.

8.2 Printing data

Printing data to an external computer or printer requires that the communications parameters be set first.

Printing to an external printer or computer will occur each time the **Print** button is pressed unless the autoprint feature is turned on, in which case, printing can occur in a continuous fashion at specified intervals or each time a stable reading is achieved. When an external printer or computer is properly connected and the communication parameters are set correctly, the display indicates PRINTING... If the external printer or computer is improperly connected or the communication parameters are set incorrectly, PRINT FAILED is displayed. To clear the screen, press the **Go back** button. Check computer/printer settings and connections.

This section defines the various printing setups with printing samples.

The sample shown, indicates the status in the menus.

<div style="float:left">

SAMPLE PRINTOUTS

```
TYPE= MM/DD/YY
TYPE= 24 HOUR
12/01/99   16:00:00
READOUT
        STABILITY LEVEL FILTER = 0.5d
        AVERAGING LEVEL FILTER = 1
        AZT LEVEL = 0.5d
GLP PRINT OPTIONS
        DATE & TIME = OFF
        BALANCE ID = OFF
        PROJECT NAME = OFF
        USER NAME = OFF
        DIFFERENCE = OFF
PRINT OPTION
        AUTO PRINT =  OFF
        INTERVAL=  0
        STABLE PRINT =  OFF
        NUMERIC DATA =  OFF
        DATE=  OFF
        TIME=  OFF
        PRINT REFERENCE =  OFF
RS232 = 2400: NONE: 7 : 2
```

</div>

Time and date

When time and date are entered in the balance with both Time and Date options set to ON, each printout starts with the date and time on the first line.

```
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
    - - - - - SPAN CAL - - - - - -
12/01/99    1:00:00 PM
Bal Id  1234
Cal:       400.000g
Old:       400.000g
Dif:         0.000g
Wt. Ref.....................................
USER NO 2056853
PROJ NO 100012
Name.....................................

      - - - - - END - - - - -
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
```

Span calibration printout

When performing a Span calibration with GLP turned ON, a printout is automatically made after the calibration mass is placed on the pan.

```
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
    - - - - - LIN CAL - - - - - -
12/01/99    1:00:00 PM
Bal Id  1234
Cal:       400.000g
Old:       399.094g
Dif:         0.006g
Wt. Ref.....................................
USER NO 2056853
PROJ NO 100012
Name.....................................

      - - - - - END - - - - -
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
```

Linearity calibration printout

When performing a Linearity calibration with GLP turned on, a printout is automatically made after the calibration mass is placed on the pan.

```
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
    - - - - - CAL TEST - - - - - -
12/01/99    1:00:00 PM
Bal Id  1234
Cal:       400.000g
Act:       400.004g
Dif:         0.004g
Wt. Ref.....................................
USER NO 2056853
PROJ NO 100012
Name.....................................
      - - - - - END - - - - -
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
```

Calibration test printout

When performing a Calibration Test with GLP turned on, a printout is automatically made after the calibration mass is placed on the pan.

77

```
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Pipette Results


Pipette Name:  WHEATON
Pipette Number:  832
Water Temp<C>:  25.0
Test Liquid Density<g/cc:  0.9971
Barometric Pressure: 1.00PSIA
Nominal Value:  3.448ml
INACCURACY
E%:  0.31%
E% Limit:  2.00%
Mean Value:  3.459ml
IMPRECISION
CV:  0.88%
CV Limit:  2.00%
Standard Deviation:  0.031ml


Status: PASS
07/01/99
     -----Sample Data ml----
3.488
3.485
3.487
3.435
3.458
3.430
3.470
3.510
3.446
3.456


Operator:----------------------
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
```

Pipette test printout

When performing a Pipette Test with GLP turned on, a printout is available. The following sample printout is shown.

9. Care and maintenance

To keep the balance operating properly, the housing and platform should be kept clean and free from foreign material. If necessary, a cloth dampened with a mild detergent may be used. Keep calibration masses in a safe dry place.

9.1 Troubleshooting

SYMPTOM	PROBABLE CAUSE(S)	REMEDY
Unit will not turn on.	Power cord not plugged in or properly connected to balance.	Check power cord connections.
Incorrect weight reading.	Balance was not re-zeroed before weighing.	Press **>0/T<** with no weight on the pan, then weigh item.
	Balance not properly calibrated.	Recalibrate correctly.
Cannot display weight in desired unit or cannot access desired weighing mode.	Desired unit not selected.	Check setting.
Unable to store menu settings/ changes.	Exit was not selected.	You MUST use SAVE & Exit to leave menus and save settings.
RS232 interface not working.	Print menu settings not properly set up.	Verify interface settings in RS232 menu correspond to those of the peripheral device.
	Cable connections.	Check cable connections.
Random segments displayed or display locks up.	Microprocessor locks up.	Turn power off, then turn on again. If condition persists, unit must be serviced.
Unable to change settings.	Lock set ON. (LFT set ON)	Set Lock switch to OFF.
Unstable readings.	Excessive air current	Check environmental condition.
	Vibration on table surface.	Place balance on a stable surface or change averaging level.
Error message display.	_____	See Error Codes list.

9.2 Error codes list

Error Codes List

The following list describes the various error codes and which can appear on the display and the suggested remedy.

Data Errors
1.0 Transient error (hardware error, probably static discharge). If error persists, the balance must be serviced.
1.1 Balance temperature transducer hardware error.
1.2 No data from main board.

Tare Errors
2.0 Balance is unable to stabilize within time limit after taring. Environment is too hostile or balance needs recalibration.

Calibration Errors
3.0 Incorrect or no calibration mass used for calibration. Recalibrate with correct masses.

RS232 Errors
4.4 RS232 buffer is full.

User Errors
7.0 User entry out of bounds.
7.2 Number outside of display capacity.

Over-Under Load Errors
8.0 Hardware error causing an internal weight signal which is too low. Check if pan is off. If not, the balance must be serviced.
8.1 Hardware error caused by an internal weight signal which is too high. Check load on the pan which may be excessive. If error persists, the balance must be serviced.
8.2 Power-on load out of specification (LFT only)
8.3 Rated capacity exceeded. Remove excessive weight from pan.
8.4 Underload condition on balance. Check that the proper pan is installed.
8.5 AutoCal™ weight internal sensor indicated its weight on the pan.

CheckSum Errors
9.1 Bad factory checksum. If error persists, have the balance serviced.
9.2 Bad factory checksum. If error persists, have the balance serviced.
9.3 Bad factory checksum. If error persists, have the balance serviced.
9.4 AutoCal™ data failed checksum. This failure will disable access to the autocal feature (if installed).
9.5 Factory calibration data   failed checksum.
9.6 Bad program checksum.
9.7 Bad CMOS checksum.
9.8 User calibration data failed checksum.
9.9 Temperature compensation data failed checksum.

9.3 Information messages

Informational messages and error messages appear on the display either when an action is required on the users part or a malfunction has occurred in the balance due to hardware, software errors or misapplication. A typical message is shown below.

SCALE UNSTABLE -Balance was unable to acquire stable data during calibration. The balance will try again.

9.4 Service information

If the Troubleshooting section does not resolve or describe your problem, you will need to contact an authorized Ohaus Service Agent. For Service assistance in the United States, please call Aftermarket, Ohaus Corporation toll-free at (800) 526-0659. An Ohaus Product Service Specialist will be available to help you.

9.5 Replacement parts

Description	Ohaus Part No.
Power Pack, 100/120 V ac US Plug (Cord set part of power pack)	490202-01
Power Pack, (Cord set required for UK, European and Australian)	490203-01
Cord Set, 230 V ac, UK Plug	76448-00
Cord Set, 230 V ac, European Plug	76212-00
Cord Set, 230 V ac, Australian plug	76199-01

9.6 Accessories

Description	Ohaus Part No.
Calibration Masses - ASTM Class 1 Tolerance:	
20 g	49024-11
50 g	49054-11
100 g	49015-11
200 g	49025-11
500 g	49055-11
1 kg	49016-11
2 kg	49026-11
4 kg	49046-11
In-Use Display Cover Kit	470003-010
Security Device	470004-010
Draftshield Kit	470006-010
Density Determination Kit	470007-010
Auxilliary Display Kit	
(Table Mount)	470009-040
(Wall Mount)	470009-050
(Tower Mount)	470009-060
Remote Display Kit	
(Table Mount)	470010-010
(Wall Mount)	470010-020
(Tower Mount)	470010-030
RS232 Interface Cable, Blunt end (user defined)	AS017-01
RS232 Interface Cable, IBM® - PC 25 Pin	AS017-02
RS232 Interface Cable, (connects impact printer)	AS017-06
RS232 Interface Cable, IBM® - PC 9 Pin	AS017-09
RS232 Interface Cable, Apple® IIGS/Macintosh	AS017-10
Printer	AS142
Battery, Memory - 3 Volt Lithium (Use BR2325, Ray O Vac or Panasonic)	-----

----

   NOTE: When the Memory Battery is replaced, all stored data in the balance will be lost.

9.7 Specifications

Analyticals

Capacity (g)	62	110	210	100/210 *
Readability (mg)	0.1			0.1/1
Weighing modes	mg, g, kg, dwt, ct, oz, oz t, gn, taels (3), mommes, lbs, N, ti, custom unit			
Functions	Parts counting, differential weighing, quick check, statistics, formulation, filling, animal weighing, percent weighing, check weighing, density determination, SQC & pipette calibration.			
Performance enhancing features	Program-Link™, GLP protocol, contrast and brightness control, custom menu, pop-up windows, application library, go-back key			
Repeatability (Std. dev.) (mg)	0.1			0.1/0.5
Linearity (mg) (±)	0.2			0.2/0.5
Tare range	Full capacity by subtraction			
Safe overload capacity	150% of capacity			
Stabilization time	≤4 seconds			
Sensitivity drift PPM/°C (10°C - 30°C)	3			
Operating temperature range: w/internal calibration w/o internal calibration	10° to 40°C/ 50° to 104°F 10° to 30°C/ 50° to 86°F			
Calibration	InCAL™ calibration			
Power requirements	External Adapter, 100 -120 V ac, 220 - 240 V ac, 50/60 Hz Plug configuration for US, Euro, UK, Japan & Australia			
Draft shield (in/cm) (free height above platform)	10.2/25.9			
Display (in/cm)	0.6/1.5			
Pan size (in/cm)	3.5/9 diameter			
Dimensions (WxHxD) (in/cm)	9 x 15.25 x14/22.8 x 38.7 x 35.5			

Precision Top Loaders

Capacity (g)	210	410	100/410*	610	2100	4100	1000/4100¹	4100**	6100**	8100**
Readability (g)	0.001		0.001/0.01	0.01			0.01/0.1	0.1		
Weighing modes	mg, g, kg, dwt, ct, oz, oz t, gn, taels (3), mommes, lbs, N, ti, custom unit									
Functions	Parts counting, differential weighing, quick check, statistics, formulation, filling, animal weighing, percent weighing, check weighing, density determination, SQC & pipette calibration.									
Performance enhancing features	Program-Link™, GLP protocol, contrast and brightness control, custom menu, pop-up windows, application library, go-back key									
Repeatability (Std. dev.) (g)	0.0005		0.0005/0.005	0.005			0.01/0.05	0.05		
Linearity (g) (±)	0.002		0.002/0.005	0.02			0.02/0.05	0.1		
Tare range	Full capacity by subtraction									
Stabilization time	≤3 seconds									
Sensitivity drift PPM/°C (10°C - 30°C)	4	3	4	3	4	3	4	3		
Operating temperature range: w/internal calibration w/o internal calibration	10° to 40°C/ 50° to 104°F 10° to 30°C/ 50° to 86°F									
Calibration	InCAL™ calibration									
Power requirements	External Adapter, 100 -120 V ac, 220 - 240 V ac, 50/60 Hz Plug configuration for US, Euro, UK, Japan & Australia									
Draft shield (in/cm) (free height above platform)	10.2/25.9									
Display (in/cm)	0.6/1.5									
Pan size (in/cm)	4.7/12 Dia.			6.8 x 6.8/17.2 x 17.2 w/windshield				8 x 8/ 20.3 x 20.3		
Dimensions (WxHxD) (in/cm)	9 x 15.25 x14/22.8 x 38.7 x 35.			8.25 x 4 x 14/20.9x 10.1 x 35.5						

* Moveable FineRange ™   ** Balances with internal calibration are equipped with a 6" x 6" Pan and Windshield.
NOTE: Not all weighing modes apply depending upon capacity and resolution of the balance.

A-1 Sieve analysis

During most sieving operations, it is necessary to record the initial weight of each sieve before beginning as the weights of the sieves may change due to particles being retained from the previous operation. In this procedure, the *basic sample is weighed first with it's container weight tared*. This sample weight is entered into the balance manually and stored during the procedure. Then, each sieve is weighed in sequence and the weights are stored. After the screening process, each sieve along with its retained sample, is weighed in sequence. The balance stores the weight values and automatically subtracts the weight of each sieve and displays the retained amount in a table as percent retension. Up to 80 sieve weights can be stored.
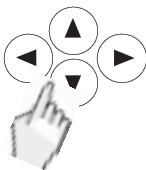
Enter

CHANGE MODE
DIFF WEIGHING

From main menu
Enter CHANGE MODE and select DIFF WEIGHING, display advances to DIFF WEIGHING SETUP with LIBRARY NAME highlighted.

DIFF WEIGHING SETUP
LIBRARY NAME
DIFF4

Specify the library name
Specify the library name. The name can have any combination of alpha numeric characters not to exceed 8 characters. After specifing the library name, the display advances to DIFF STARTUP with SETUP highlighted. Press the **Enter** button. The display advances to DIFF WEIGHING SETUP with TARE SETUP highlighted.

Enter

DIFF WEIGHING SETUP	
LIBRARY NAME	DIFF4
TARE SETUP	NO TARE
AUTO SAMPLE	OFF
DIFF RESULT	WEIGH
NUMBER OF SAMPLES	1
VIEW RESULTS	
CLEAR ALL DATA	
RUN	

Tare setup
Press the **Enter** button, the display indicates a choice of NO TARE, SINGLE TARE, DUAL TARE and RETURN. Select type of tare and press **Enter** button. Then scroll to RETURN and press **Enter** button.

Enter

DIFF WEIGHING SETUP	
LIBRARY NAME	DIFF4
TARE SETUP	NO TARE
AUTO SAMPLE	OFF
DIFF RESULT	WEIGH
NUMBER OF SAMPLES	1
VIEW RESULTS	
CLEAR ALL DATA	
RUN	

Auto sample
Press the **Enter** button, the display indicates a choice of ON or OFF, then press **Enter** button. AUTO SAMPLE permits one sieve after another to be weighed without pressing the **Enter** button. Display returns to DIFF RESULT highlighted.

Enter

DIFF WEIGHING SETUP	
LIBRARY NAME	DIFF4
TARE SETUP	NO TARE
AUTO SAMPLE	OFF
DIFF RESULT	% RETENSION
NUMBER OF SAMPLES	1
VIEW RESULTS	
CLEAR ALL DATA	
RUN	

Diff result
Press the **Enter** button, the display indicates a choice of WEIGHT, PERCENT, % RETENSION and RETURN. Select % RETENSION, then press **Enter** button. Display indicates to ENTER TOTAL SAMPLE WEIGHT.
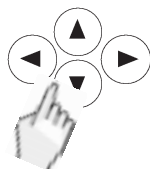
ENTER TOTAL SAMPLE WEIGHT

200.025

Enter total sample weight

Enter the total sample weight. This is the weight of the actual sample. Press **Enter** button.   Display advances to RETURN.

Enter

DIFF RESULT

WEIGHT
PERCENT
% RETENSION <-SELECTED
RETURN

With RETURN highlighted, press the **Enter** button.
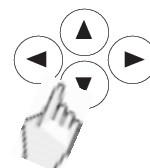
Enter

DIFF WEIGHING SETUP	
LIBRARY NAME	DIFF4
TARE SETUP	NO TARE
AUTO SAMPLE	OFF
DIFF RESULT	% RETENSION
NUMBER OF SAMPLES	1
VIEW RESULTS	
CLEAR ALL DATA	
RUN	

Enter number of samples

Enter the number of samples, press the **Enter** button.,

NUMBER OF SAMPLES

3

Specify the number of samples

Specify the number of samples and press **Enter** button. Display advances to DIFF WEIGHING SETUP with RUN highlighted.

Enter

DIFF WEIGHING SETUP	
LIBRARY NAME	SIEVE 2
TARE SETUP	OFF
AUTO SAMPLE	ON
DIFF RESULT	% RETENTION
NUMBER OF SAMPLES	3
VIEW RESULTS	
CLEAR ALL DATA	
RUN	

Initial weighing of sieves

Press the **Enter** button, the display indicates to PUT EMPTY SIEVE #1 ON PAN.

Enter

DIFF WEIGHING

TARE WT:	TARE WT:3.426
IN IT WT:	FINAL WT:
	3.426
PUT EMPTY SIEVE # 1 ON PAN	STABLE
START/SAMPLE	EDIT	SETUP

Place empty sieve #1 on the pan and press **Enter** button. When AUTO SAMPLE is set ON, display advances to the next sieve. Continue adding sieves until all sieves have been weighed pressing the **Enter** button after each sieve. When the last sieve has been weighed, the display indicates the tare weight of all sieves. Press the **Enter** button.

TAREWT	INIT WT	TARE WT	FINAL \VT
N/A	NA	3.426	0.000
N/A	N/A	3.969	0.000
N/A	N/A	3.962	0.000
SAMPLE #1			
CONTINUE	SAVE	RESAMPLE	DELETE

This sample display indicates 3 sieves were weighed. With CONTINUE highlighted at the bottom of the display, press **Enter** button. The display advances and indicates PUT FULL SIEVE #1 ON PAN.

```
       DIFF WEIGHING
┌─────────────────────────────┐
└─────────────────────────────┘
TARE WT:         TARE WT:
INIT WT:         FINAL WT:3.841
                 3.841
PUT FULL SIEVE #1 ON PAN  STABLE
START/SAMPLE │  EDIT  │  SETUP
```

Final weighing of sieves

After pressing **Enter** button, the display returns to final weighing. Place first full sieve on the pan and press **Enter** button. Repeat weighing with remaining sieves pressing the **Enter** button after each sieve. When the last sieve has been weighed, the display indicates the final weight of all samples.

Enter

TAREWT	INIT WT	TARE WT	FINAL \VT
N/A	NA	3.426	3.839
N/A	N/A	3.969	4.388
N/A	N/A	3.962	4.377
SAMPLE #1			
CONTINUE	SAVE	RESAMPLE	DELETE

With CONTINUE highlighted, press **Enter** button to review final display.

SAMPLE #	INIT WT	FINAL WT	% RETENSION
1	200.025	0.413	0.206
2	200.025	0.419	0.209
3	200.025	0.415	0.207
TOTAL		1.247	0.623
PRESS <ENTER> FOR MENU			

Final display indicates the initial weight, final weight of all sieves and the total weight and total amount of retention in percent.
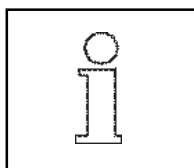
The above illustration represents 3 sieves which weighed between 3.4 and 3.9 grams each. TARE SETUP was set OFF, AUTO SAMPLE was set OFF and % RETENTION was selected. The sample weight retained in each different sieve weighed between 3.839 and 4.377 grams. The total amount of retention is shown in percent on the last display which was 0.623 for three sieves. Initial sample was 200.25 grams.
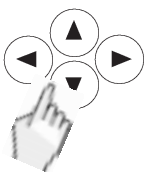
A-2   Porous material density determinations

The density of a porous (oil impregnated part) can be made with the balance. Weigh the part (dry) prior to oil impregnation and *record its weight*. You must also know the density value of the oil to be used in immersing the part before starting. In this procedure, you will follow the method for solid density measurements using water.

Enter

MAIN MENU
CHANGE MODE

From main menu

Enter CHANGE MODE. Select DENSITY, display advances to LIBRARY NAME.

DENSITY SETUP
LIBRARY NAME
▇

Library name

Enter a library name, up to 8 characters and press **Enter** button. Display advances to DENSITY SETUP with SOLID DENSITY highlighted. If a previous name was entered and selected, the balance uses the parameters which were previously set.

Enter

DENSITY SETUP	
LIBRARY NAME	D2
SOLID DENSITY	<-SELECTED
LIQUID DENSITY	
AUTO SAMPLE	OFF
AUTO PRINT	OFF
RUN	

Select SOLID DENSITY, display advances to AUX LIQ & MODE with H2O highlighted.

Enter

AUX LIQ & MODE	
H2O	<-SELECTED
OTHER	
POROUS MATERIAL	OFF
DRY WEIGHT	0.000
DENSITY OF OIL	0.0000
RETURN TO SETUP	

Selecting water as auxiliary liquid

Select H2O, display advances to AUX LIQ & MODE with ENTER TEMPERA-TURE CELSIUS highlighted.
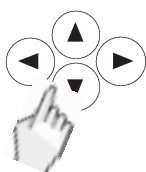
AUX LIQ & MODE
ENTER TEMPERATURE CELSIUS
▇

Specify temperature

Enter the temperature of the water and press **Enter** button. Display advances to AUX LIQ & MODE with POROUS MATERIAL highlighted.

Enter

AUX LIQ & MODE	
H2O	<-SELECTED
OTHER	
POROUS MATERIAL	OFF
DRY WEIGHT	0.000
DENSITY OF OIL	0.0000
RETURN TO SETUP	

Specify porous material

Select Porous Material and press **Enter** button. Display advances to POROUS MATERIAL ON/OFF. Select ON and press **Enter** button.

AUX LIQ & MODE	
H2O	<-SELECTED
OTHER	
POROUS MATERIAL	ON
DRY WEIGHT	200.040
DENSITY OF OIL	0.0000
RETURN TO SETUP	

Enter dry weight

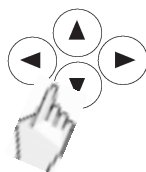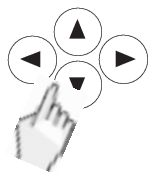Enter the dry weight of the part as previously measured. Press **Enter** button. Display advances to DENSITY OF OIL highlighted.

```
        AUX LIQ & MODE
H20                  <-SELECTED
OTHER
POROUS MATERIAL  ON
    DRY WEIGHT       200.040
    DENSITY OF OIL   0.4000
RETURN TO SETUP
```

Enter oil density

Enter the density of the oil being used to impregnate the part. Press **Enter** button. Display advances to RETURN TO SETUP highlighted. Press **Enter** button. Display returns to DENSITY SETUP with AUTO SAMPLE highlighted.

Enter

```
         DENSITY SETUP
LIBRARY NAME      D2
SOLID DENSITY     <-SELECTED
LIQUID DENSITY
AUTO SAMPLE       OFF
AUTO PRINT        OFF
RUN
```

Auto sample

Select AUTO SAMPLE and turn it ON or OFF. A setting of ON allows samples to be sequentially sampled without pressing the **Enter** button for each sample.

Enter

```
         DENSITY SETUP
LIBRARY NAME      D2
SOLID DENSITY     <-SELECTED
LIQUID DENSITY
AUTO SAMPLE       OFF
AUTO PRINT        OFF
RUN
```

Auto print

At this point you can select automatic printing. To turn on, press the **Enter** button and select ON. If you do not want automatic printing, select OFF.

Enter

```
         DENSITY SETUP
LIBRARY NAME      D2
SOLID DENSITY     <-SELECTED
LIQUID DENSITY
AUTO SAMPLE       OFF
AUTO PRINT        OFF
RUN
```

Testing the sample

Select RUN and press **Enter** button. Display advances to final DENSITY display and requests to weigh the sample in air.

```
         DENSITY - - D7
WEIGH IN AIR: 207.457    TEMP: 25.0
WEIGH IN LIQ: 204.005    AUX: D:0.9971
DRY WEIGHT:   200.040    VOLUME: 3.59
               57.779
WEIGH IN AIR    P1: 535.58%
             GRAMS/CC       STABLE
START/SAMPLE  SETUP   MAIN MENU
```

Now follow balance prompts to weigh sample in air and water. After weighing in air, weigh the sample in water. The balance will calculate Dry Density and Oil Content by Volume (P1).

To determine wet density

Wet density of the sample can be calculated by following the normal Solid Density procedure using the oil impregnated part. When in AUX LIQ MODE menu, turn OFF POROUS MATERIAL, then follow previous solid density measuring procedure.

LIMITED WARRANTY

Ohaus products are warranted against defects in materials and workmanship from the date of delivery through the duration of the warranty period. During the warranty period Ohaus will repair, or, at its option, replace any component(s) that proves to be defective at no charge, provided that the product is returned, freight prepaid, to Ohaus.

This warranty does not apply if the product has been damaged by accident or misuse, exposed to radioactive or corrosive materials, has foreign material penetrating to the inside of the product, or as a result of service or modification by other than Ohaus. In lieu of a properly returned warranty registration card, the warranty period shall begin on the date of shipment to the authorized dealer. No other express or implied warranty is given by Ohaus Corporation. Ohaus Corporation shall not be liable for any consequential damages.

As warranty legislation differs from state to state and country to country, please contact Ohaus or your local Ohaus dealer for further details.

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