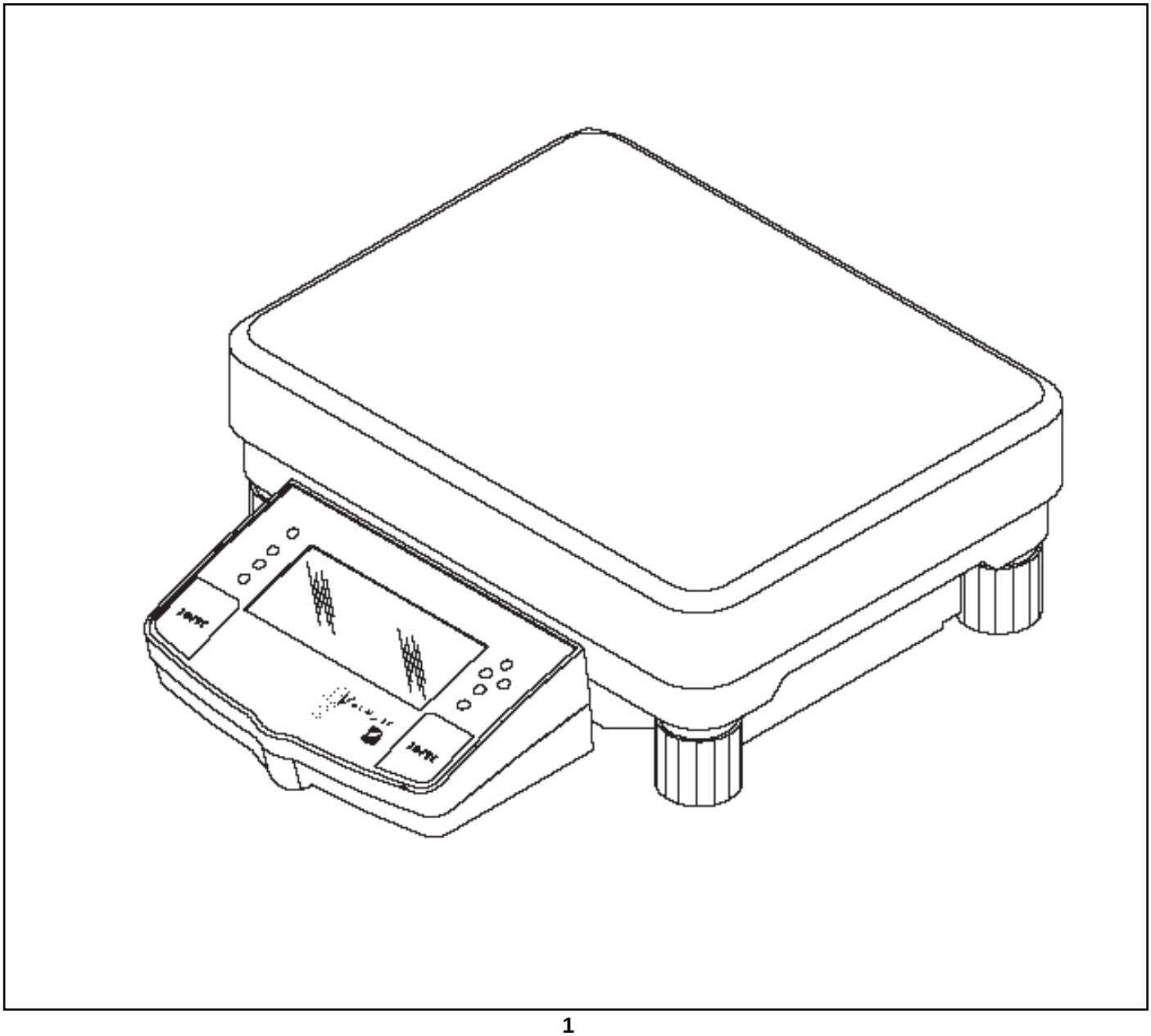
Ohaus Corporation
29 Hanover Road
Florham Park, NJ
07932-0900

INSTRUCTION MANUAL

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 Nostras, 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	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	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
CE 96 122 M T2914		EU 90/384 NAWI EU 90/384 FNSW EU 90/384 BFNA EU 90/384 PBNA EU 90.384 BFNA	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 fornice 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

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 selbstund 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 Güitigkeitsdauer der Eichung beschränkt ist, ist der Betreiber einer soichen 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.

NOTE: THIS EQUIPMENT HAS BEEN TESTED AND FOUND TO COMPLY WITH THE LIMITS FOR A CLASS A DIGITAL DEVICE, PURSUANT TO PART 15 OF THE FCC RULES.

THESE LIMITS ARE DESIGNED TO PROVIDE REASONABLE PROTECTION AGAINST HARMFUL INTERFERENCE WHEN THE EQUIPMENT IS OPERATED IN A COMMERCIAL ENVIRONMENT. THIS EQUIPMENT GENERATES, USES, AND CAN RADIATE RADIO FREQUENCY ENERGY AND, IF NOT INSTALLED AND USED IN ACCORDANCE WITH THE INSTRUCTION MANUAL, MAY CAUSE HARMFUL INTERFERENCE TO RADIO COMMUNICATIONS. OPERATION OF THIS EQUIPMENT IN A RESIDENTIAL AREA IS LIKELY TO CAUSE HARMFUL INTERFERENCE IN WHICH CASE THE USER WILL BE REQUIRED TO CORRECT THE INTERFERENCE AT HIS OWN EXPENSE.

THIS DIGITAL APPARATUS DOES NOT EXCEED THE CLASS A LIMITS FOR RADIO NOISE EMISSIONS FROM DIGITAL APPARATUS AS SET OUT IN THE INTERFERENCE-CAUSING EQUIPMENT STANDARD ENTITLED “DIGITAL APPARATUS”, ICES-003 OF THE DEPARTMENT OF COMMUNICATIONS.

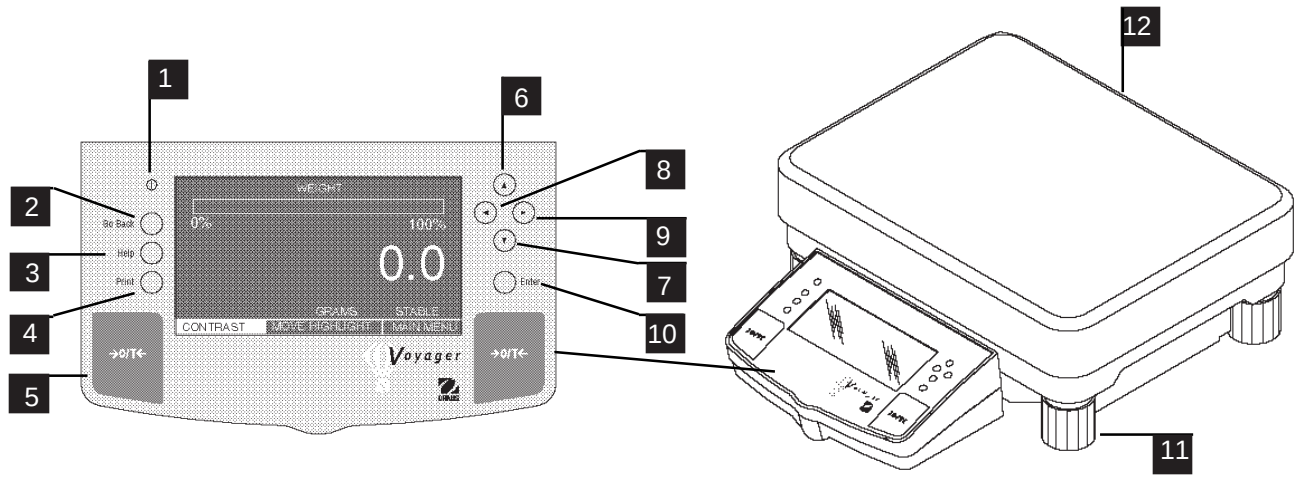
CET APPAREIL NUMERIQUE RESPECTE LES LIMITES DE BRUITS RADIOELECTRIQUES APPLICABLES AUX APPAREILS NUMERIQUES DE CLASSE A PRESCRITES DANS LA NORME SUR LE MATERIEL BROUILLEUR : “APPAREILS NUMERIQUES”, NMB-003 EDICTEE PAR LE MINISTRE DES COMMUNICATIONS.

Unauthorized changes or modifications to this equipment are not permitted.

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont.)

OVERVIEW OF CONTROLS



No.	Designation	Function
1	⏻	LCD display on off button.
2	Go Back button	Permits going back in menus.
3	Help button	Provides additional information on subject displayed in the current menu.
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 alpha numeric 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 (located at rear of balance).

1. GETTING TO KNOW YOUR BALANCE

Please read through this section carefully, as it contains important information for safe and economical operation of your Voyager Balance.

1.1 Introduction

Thank you for deciding to purchase a Voyager Balance from Ohaus. Thanks to a new modular design, your Voyager Balance lets you adapt the balance to your changing needs. Remote displays, upgraded displays which can be table, wall or tower mounted are available as accessories. It offers a high level of operating convenience and useful functions to make accurate measurements. A new, large, graphic LCD panel with a 240 x 128 pixel resolution is a Back lighted, Cold Cathode Fluorescent (CCFL) type. Pop up displays makes operation of the balance extremely simple. The use of the up/down, left/right arrow panel buttons enable selections from the menus. The Enter button on the front panel when pressed permits any highlighted menu item to be enabled. A Go Back button permits going back up to three levels in any menu. A Help button provides assistance when required. Panel controls are clearly marked as to their function with large Tare buttons on either side of the front panel. Operation and setup of the balance is straightforward and easy.

Behind your instrument stands OHAUS, a leading manufacturer of scales, balances and analytical measuring instruments. Our Aftermarket Department is staffed with trained instrument technicians and is dedicated to provide you, the customer, 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, we advise you to read through these operating instructions very carefully.

2. INSTALLATION

2.1 Unpacking and Checking the Standard Equipment

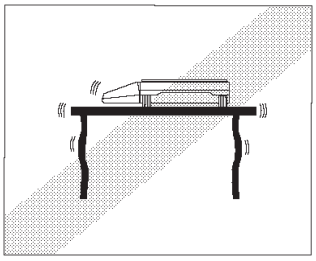
Open the package and remove the instrument and the accessories. Check the completeness of the delivery. The following accessories are part of the standard equipment of your new Voyager balance.

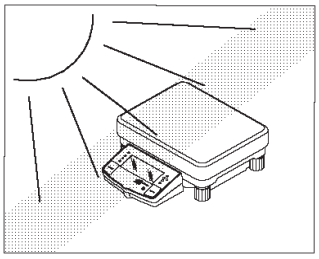
Equipment	12,000g	22,000g	32,000g
• **AC Power Adapter**	✓	✓	✓
• **Instruction Manual**	✓	✓	✓
• **Warranty Card**	✓	✓	✓
• **Weigh Below Hook**	✓	✓	✓

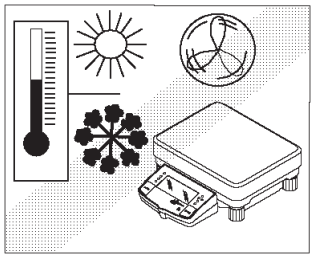
- Remove packing material from the instrument.
- Check the instrument for transport damage. Immediately inform your Ohaus dealer if you have complaints or parts are missing.
- Store all parts of the packaging. This packaging guarantees the best possible protection for the transport of your instrument.

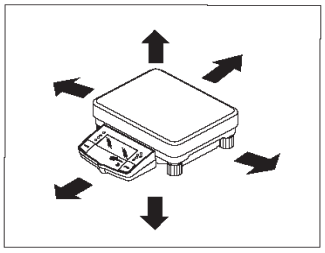
2.2 Selecting the Location

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.







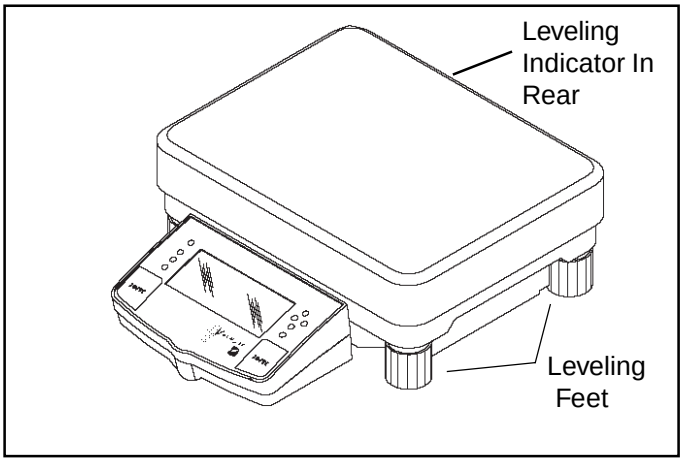


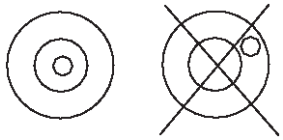
DO NOT install the balance:

- 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.
- Allow sufficient space around the instrument for ease of operation and keep away from radiating heat sources.

2.3 Setting Up and Leveling the Balance

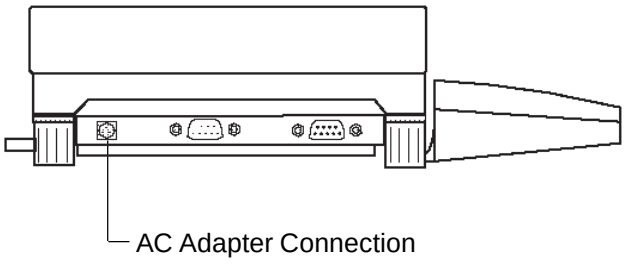
Exact horizontal positioning and stable installation are prerequisites for repeatable results. To compensate small irregularites or inclinations at the location, the instrument can be leveled.





Leveling Indicator

2.4 Connecting Power



Left Side of Balance

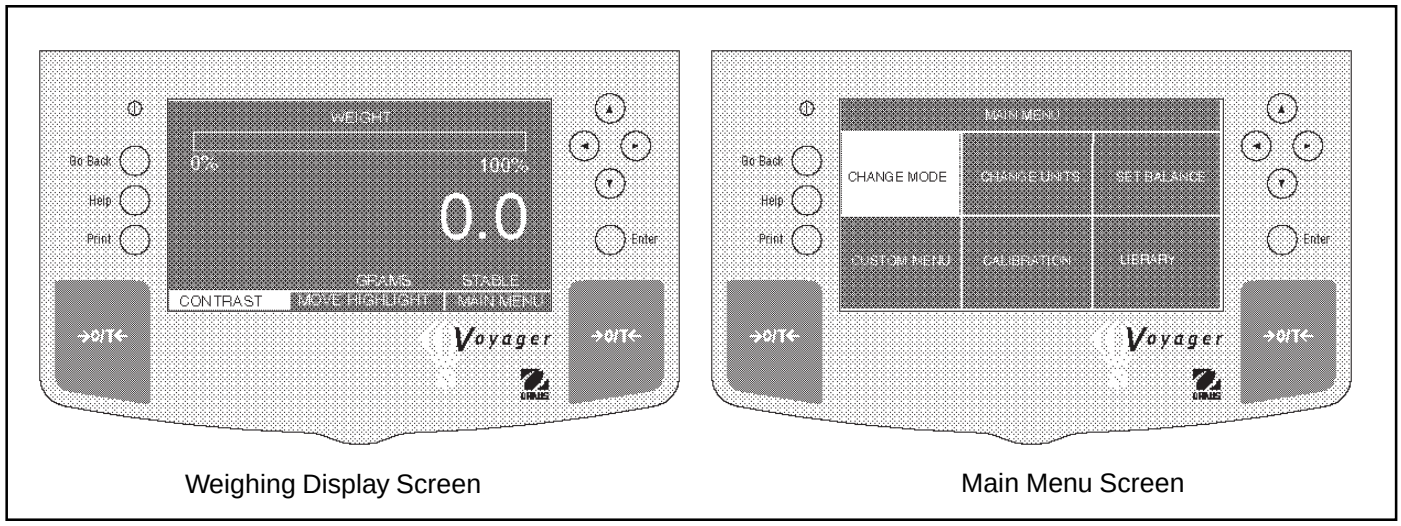
Connect the AC Adapter supplied to the three pin connector located at the left side of the balance.

The balance is now ready for operation.

3. OPERATING YOUR BALANCE

3.1 Main Menu

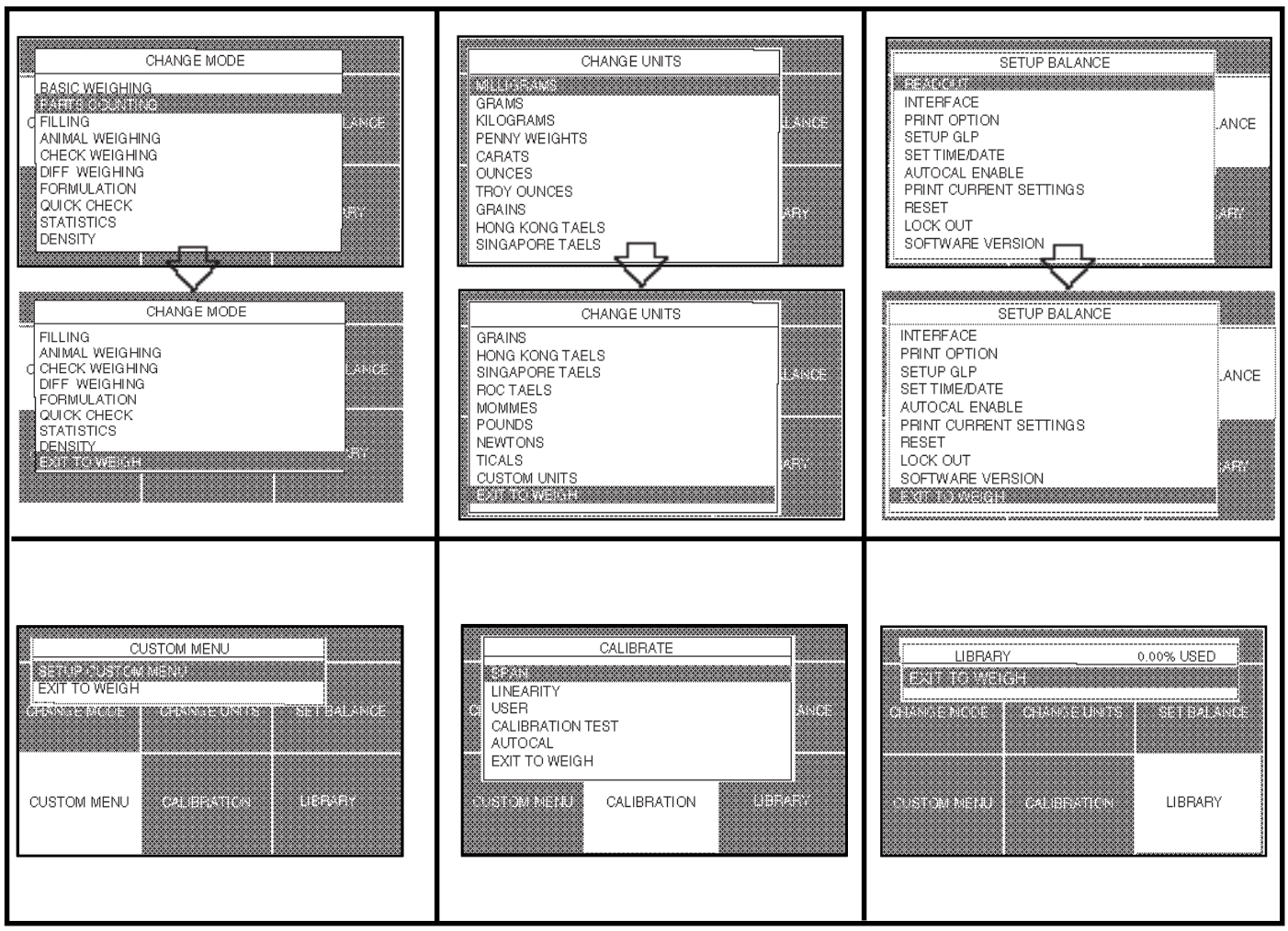
The Voyager balance has one main menu from which all selections are made. Shown below is the normal weighing display screen and the main menu screen.



Weighing Display Screen | Main Menu Screen

MENU SELECTION

The menus shown below are selected from the main menu screen by using the arrow buttons and pressing **ENTER**. The screens shown are all of the primary selections that can be made. By using the arrow buttons, further selections can be made in each menu to set parameters.



3.2 Turning On the Balance

The Voyager balance is ready to operate after the the installation procedures are performed. When the balance is first turned on and it completes its checks, and is calibrated, it can be used to weigh or tare materials without setting the menus. The balance is preset at the factory to weigh in grams

It is recommended that you read this manual carefully and set the balance to operate for your specific applications using the procedures in Chapter 4 Setting up Your Balance and calibrate the balance before using.

LCD Display On/Off

To turn the balance LCD display ON, press the ON/OFF button (circled button with an I inside) located at the upper left-hand corner of the panel once. To turn OFF, press button again.

Stabilization

Before initially using the balance, allow time for it to adjust to its new environment. The balance only requires to be plugged in to warm up. Recommended warm up period is twenty (20) minutes. The internal circuits of the balance are powered whenever it is plugged into a power source.

3.3 Calibration

Voyager balances offer a choice of five calibration methods: Automatic Calibration (AutoCal™), Span Calibration, User Calibration, Linearity Calibration, and Calibration Test.

- ***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.
- ***Calibration Test*** - Calibration test allows the stored calibration data to be tested against the current mass being used for the test.
- ***AutoCal™*** Automatic calibration (AutoCal™) of the balance is accomplished by an internal mass.

Calibration Menu Protection

NOTES:

• Calibration may be locked out to prevent unauthorized personnel from changing calibration. 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 the section 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 adjacent table.

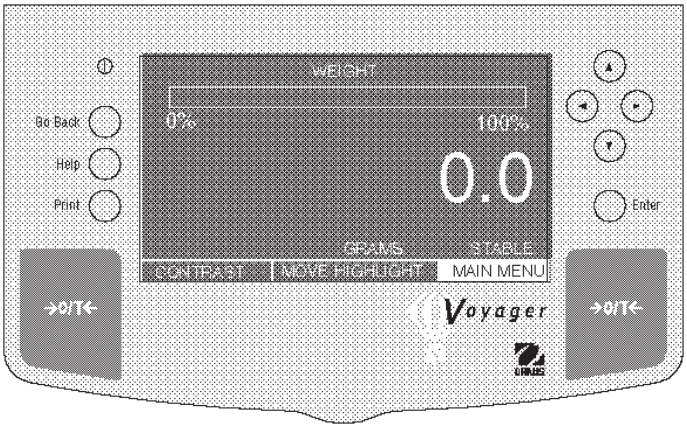
CALIBRATION MASSES

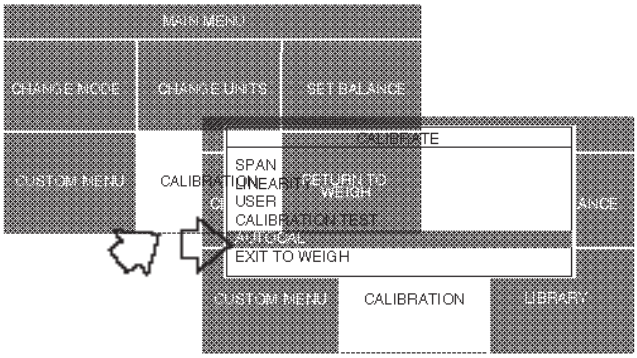
CAPACITY	LINEARITY MASSES	SPAN ONLY MASSES
12000g	5000g/10000g	10000g
22000g	10000g/20000g	20000g
32000g	15000g/30000g	30000g

It is recommended that masses must meet or exceed ASTM Class 1 Tolerance. Calibration masses are available as accessories.

3.3.1 Auto Calibration (AutoCal™)

On Voyager 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.

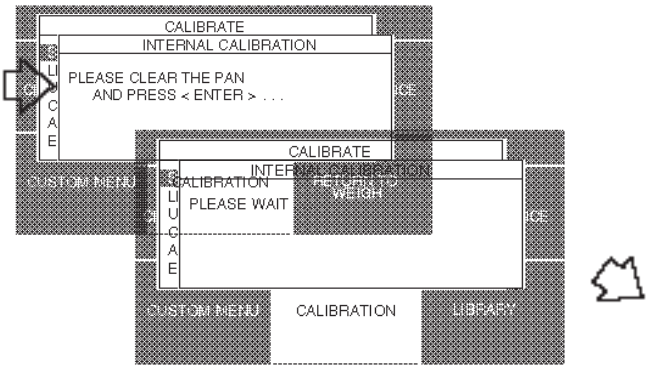


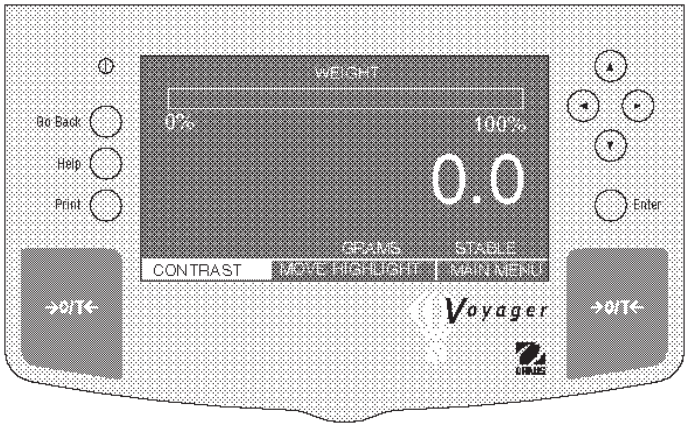


PROCEDURE

- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select CALIBRATION.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select AUTOCAL.
- Clear the pan.
- Press **Enter** button, screen displays PLEASE WAIT, the balance is automatically calibrated and then returns to a weighing mode.

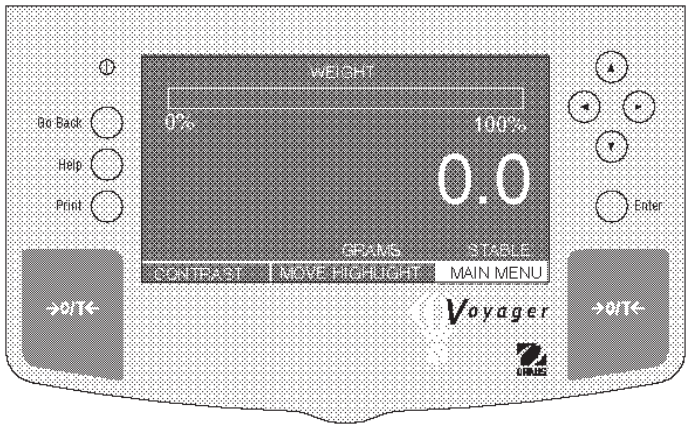
NOTE:
AutoCal™ calibration uses an internal mass in the balance for calibration and is done automatically when selected.

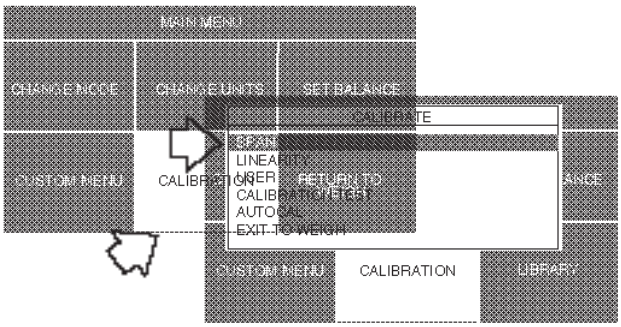


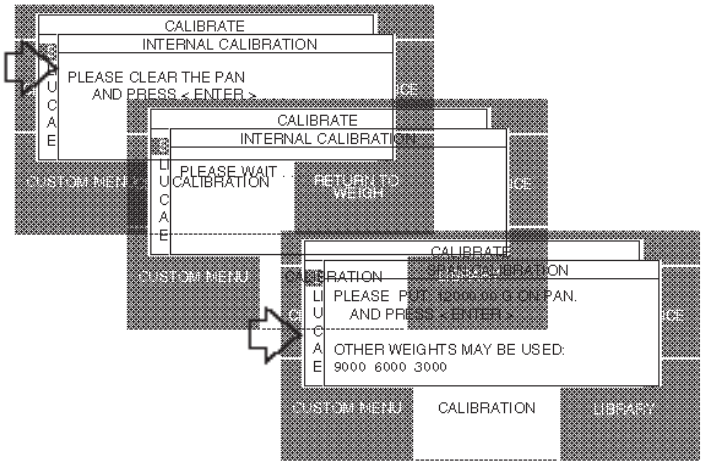


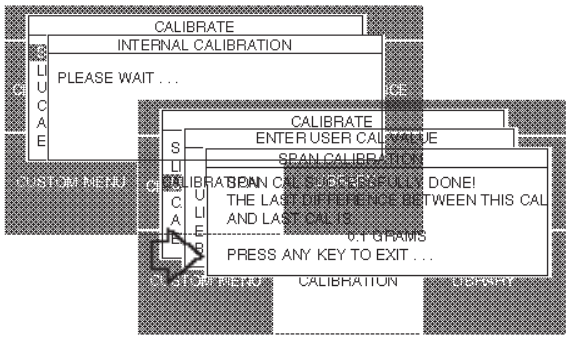
3.3.2 Span Calibration

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.





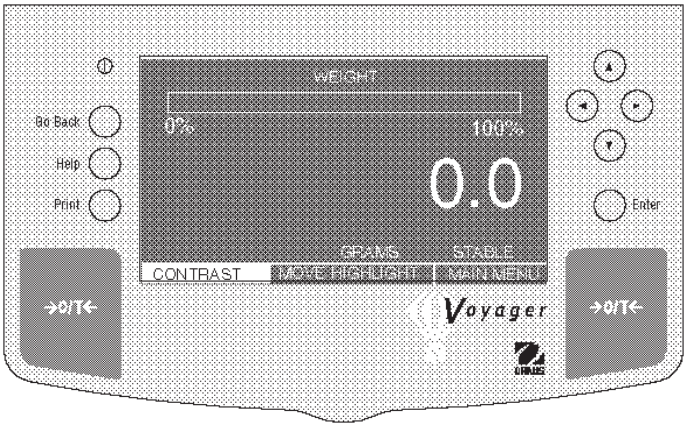




PROCEDURE

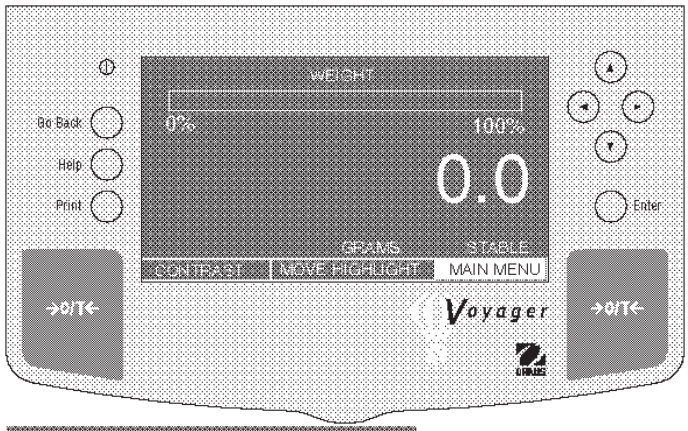
- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select CALIBRATION.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select SPAN.
- Press **Enter** button.
- Clear the pan and press **Enter** button.
- Place indicated mass value on pan and press **Enter** button.
- Display indicates if calibration was successful and the difference between the last calibration.
- Press any button, balance returns to weighing mode.
- Remove masses from the pan.

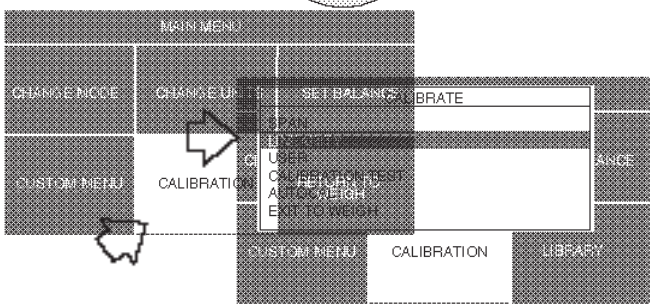
NOTE: The samples shown on the displays were for an 12kg balance.

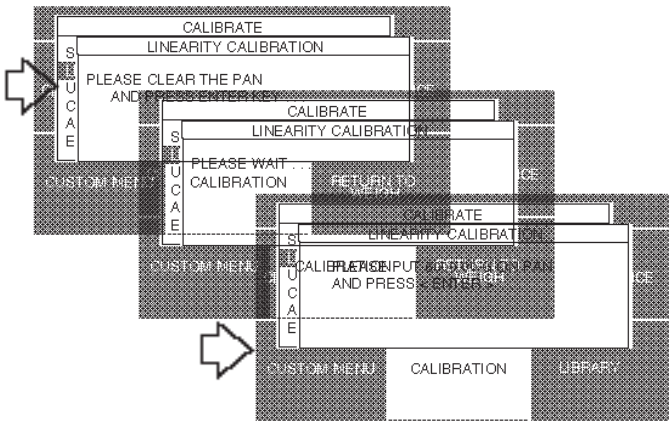


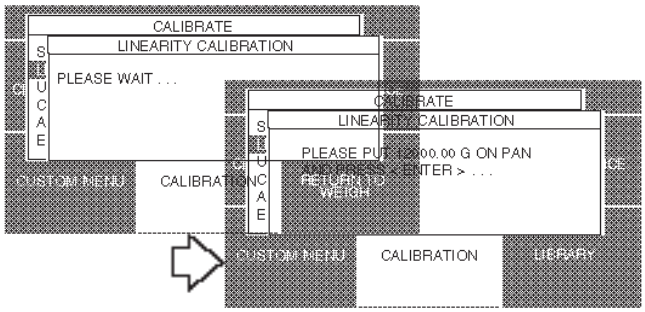
3.3.3 Linearity Calibration

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.









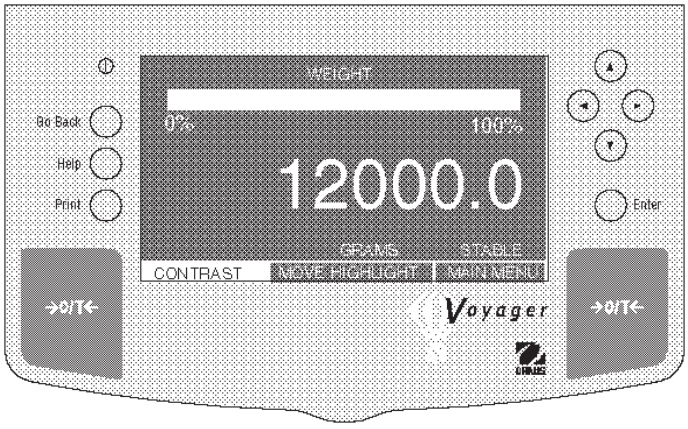
PROCEDURE

- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select CALIBRATION.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select LINEARITY.
- Press **Enter** button, LINEARITY CALIBRATION is displayed.
- Clear pan and press **Enter** button.
- Place indicated mass value on pan. This will be one half of the total capacity of the balance, then press **Enter** button.
- Place indicated mass value on pan. This will be the total capacity of the balance, then press **Enter** button.

PLEASE WAIT is displayed followed by the actual weight value placed on the pan which is the maximum capacity of the balance.

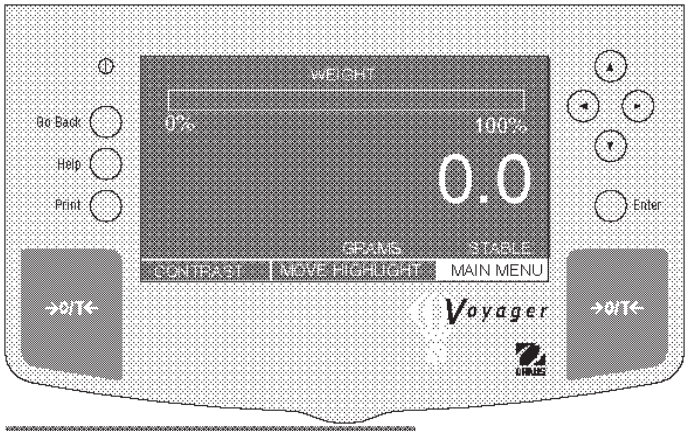
- Remove the masses from the pan. The balance is now calibrated.

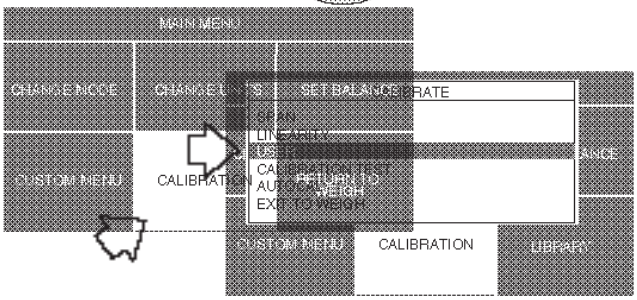
NOTE: The samples shown on the displays were for an 12kg balance.

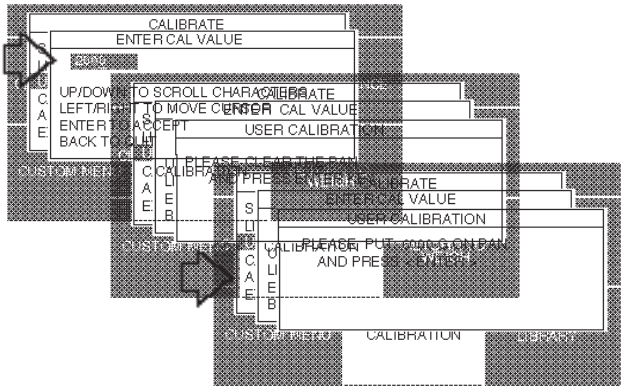


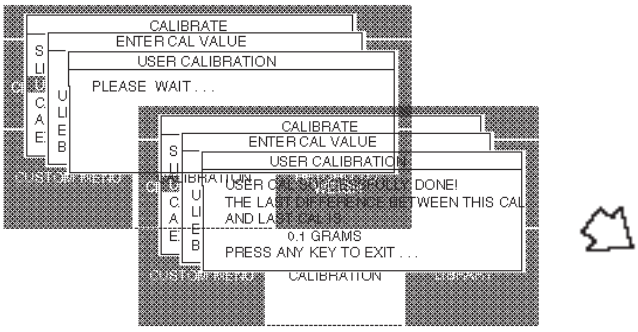
3.3.4 User Calibration

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:



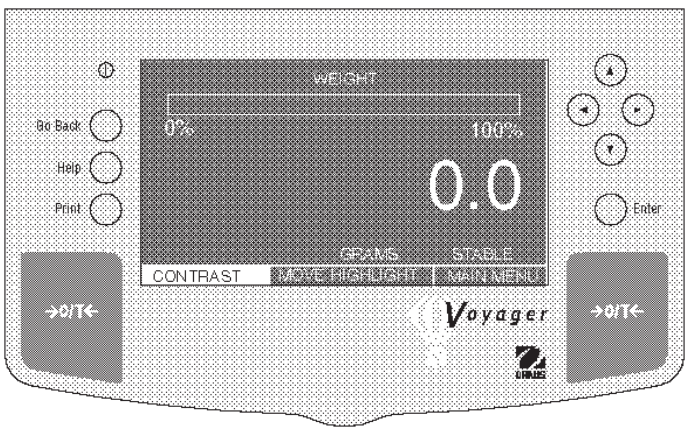






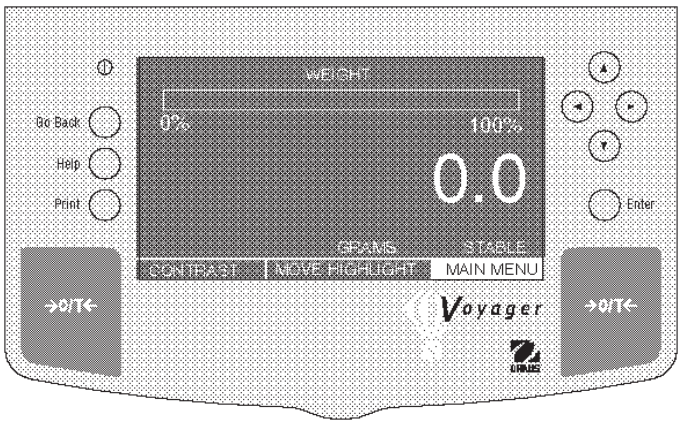
PROCEDURE

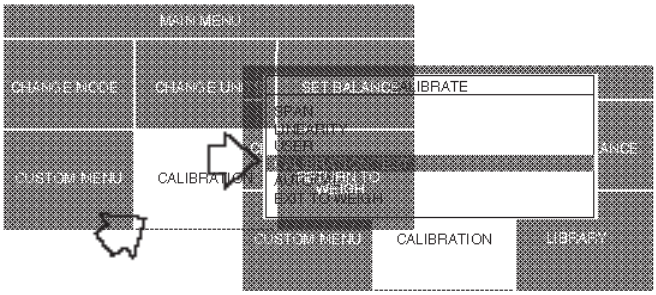
- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select CALIBRATION.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select USER.
- Press **Enter** button, USER CALIBRATION is displayed.
- Using the arrow buttons, enter a value which is at least 25% of the full span value, press **Enter** button. The sample displays shown used a 6kg mass on an 12kg balance.
- Clear the pan and press **Enter** button.
- Place the selected mass value on the pan and press **Enter** button.
- Display indicates if calibration was successful and the difference between the last calibration.
- Press any button, balance returns to weighing mode.

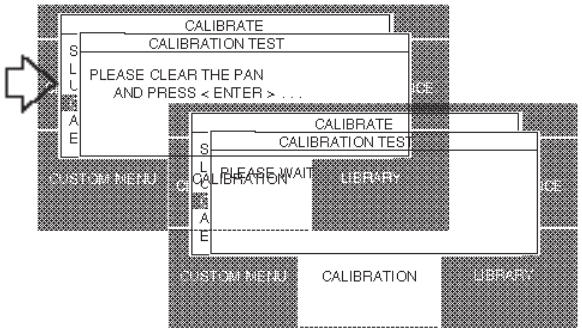


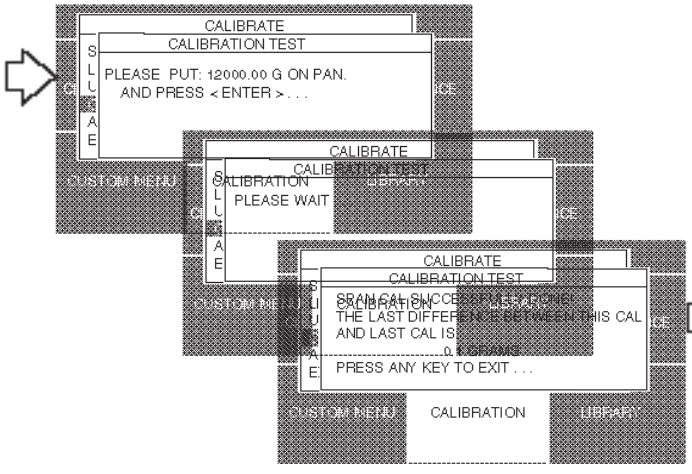
3.3.5 Calibration Test

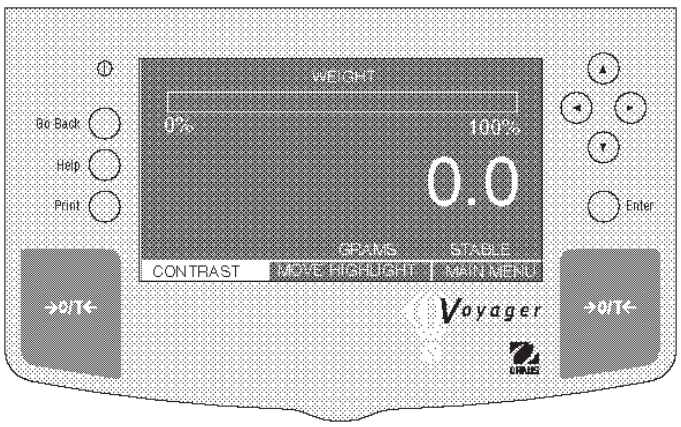
Calibration test feature allows a check of a known calibration mass against the last stored calibration information in the balance. The sample displays shown are for a 12 kilogram balance.









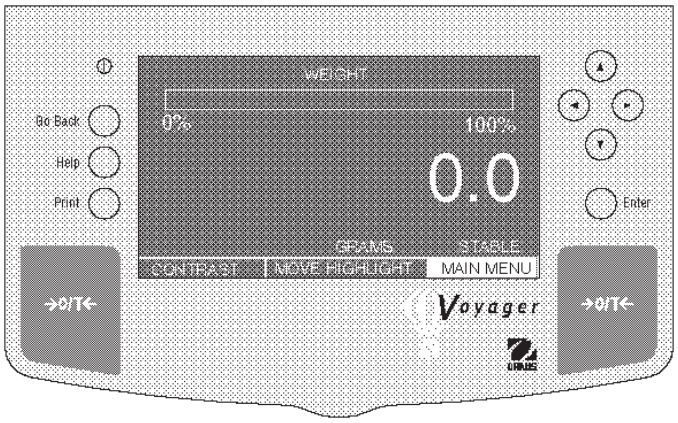


PROCEDURE

- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select CALIBRATION.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select CALIBRATION TEST.
- Press **Enter** button.
- Clear the pan and press **Enter** button.
- Place the indicated mass value on the pan and press **Enter** button.
- Display indicates if calibration was successful and the difference between the last calibration.
- Remove masses from the pan.
- Press any button, balance returns to weighing mode.

3.4 Setting Measuring Unit

Before using the balance for the first time, the desired measuring unit should be set first. The following measuring units are available: GRAMS, KILOGRAMS, PENNY WEIGHTS, CARATS, OUNCES, TROY OUNCES, MOMMES, GRAINS, HONG KONG TAELS, SINGAPORE TAELS, ROC TAELS, NEWTONS, TICALS and CUSTOM UNITS.



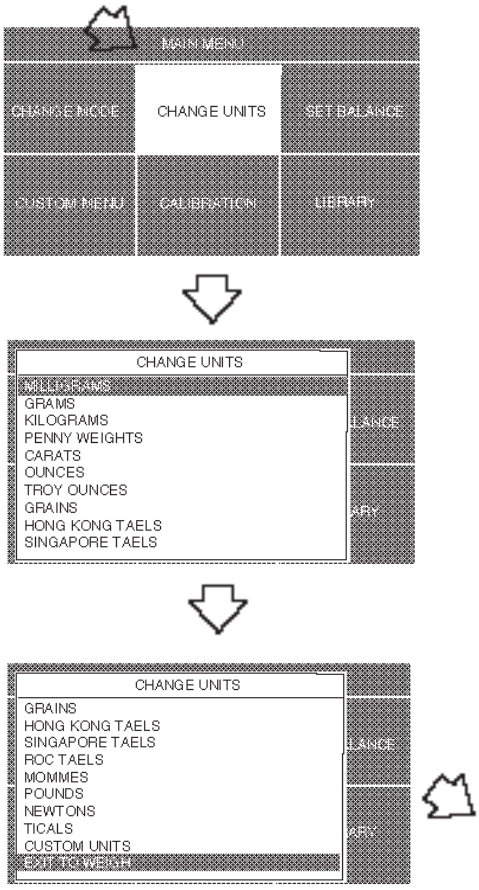
Procedure

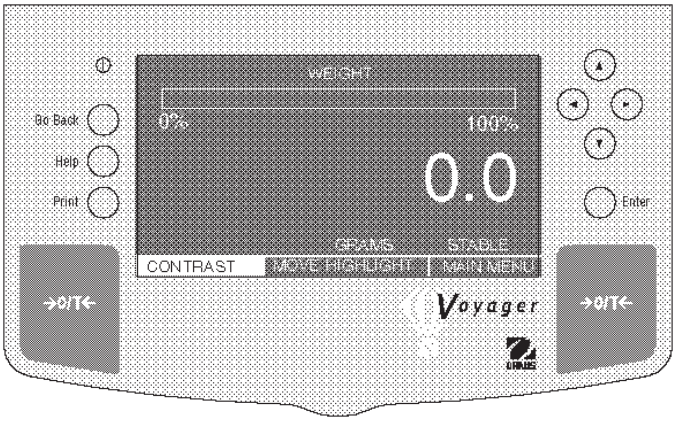
To select a measuring unit, proceed as follows:

- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select CHANGE UNITS.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select the desired measuring unit. (Grams is shown).
- Press **Enter** button to save setting. The balance will now weigh in the selected measuring unit.

NOTE: Depending upon the balance model/capacity, some measuring units may not be available when selected.

When CUSTOM UNITS is selected, refer to paragraph 3.4.1 for operation.





3.4.1 Custom Unit

Custom Unit is enabled when Custom Units is selected under the Change Units menu. This feature can be used to create your own custom weighing unit. It permits entering a conversion factor which the balance will use to convert grams to the desired unit of measure.

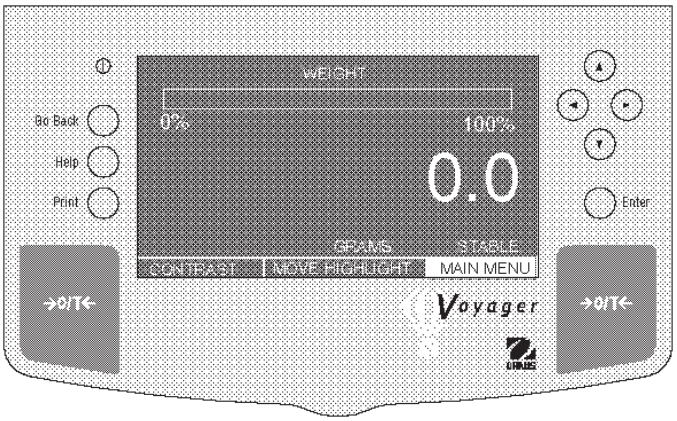
Conversion Factor x *Weight in grams* = *Weight in custom unit*

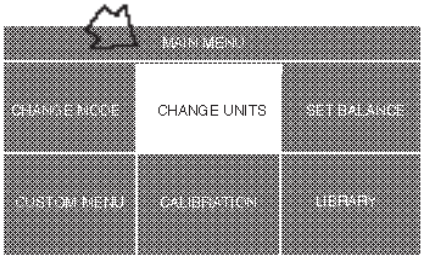
Conversion factors are expressed in scientific notation and entered into the balance in three parts:

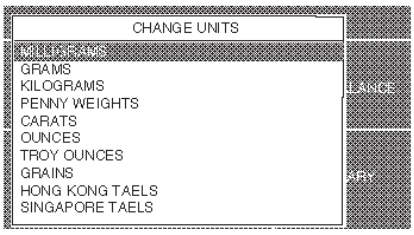
- a number between 0.1 and 1.999999 called the mantissa
- a power of 10 called the exponent
- a least significant digit (LSD)

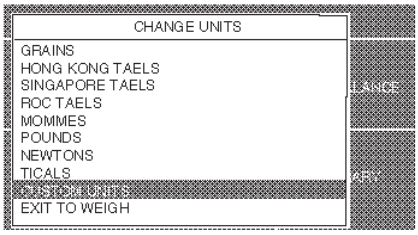
SCIENTIFIC NOTATION						
Conv. Factor		Number Between 0.1 and 1.999999		Power of 10	Man-tissa	Exp.
123.4	=	.1234	x	1000	= .1234 x	10^3
12.34	=	.1234	x	100	= .1234 x	10^2
1.234	=	.1234	x	10	= .1234 x	10^1
.1234	=	.1234	x	1	= .1234 x	10^0
.01234	=	.1234	x	.1	= .1234 x	10^{-1}
.001234	=	.1234	x	.01	= .1234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







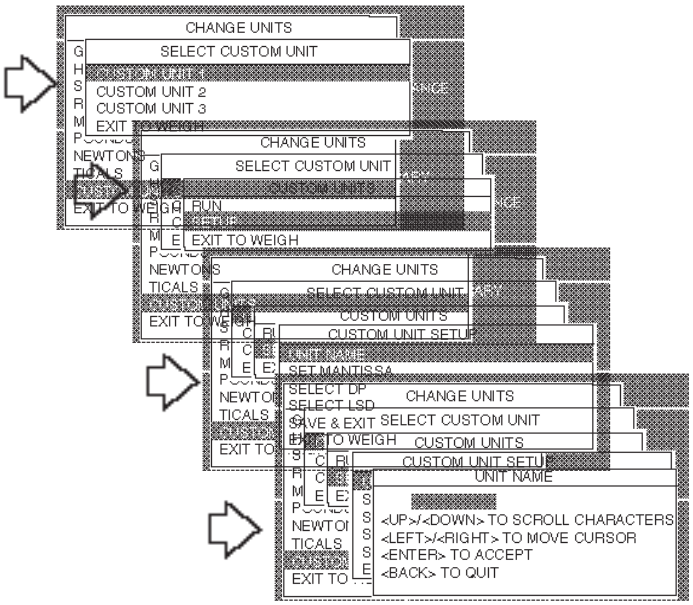


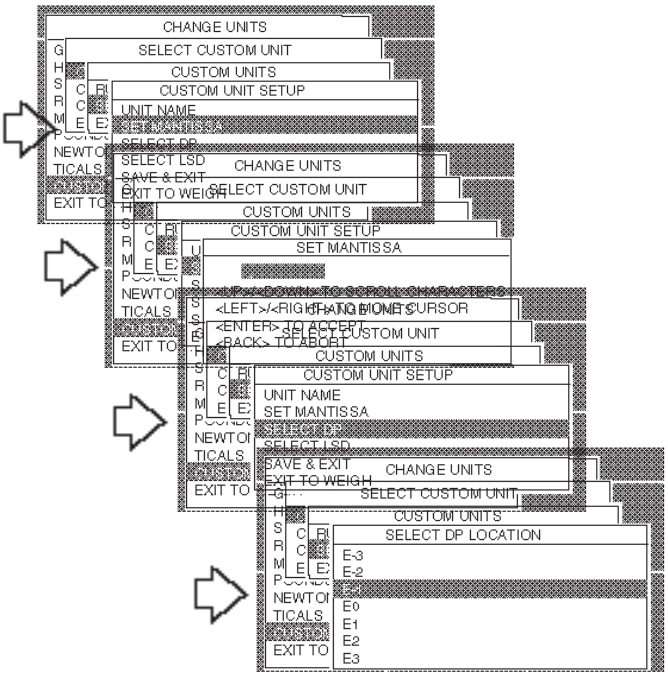
Procedure

To select CUSTOM UNIT unit, proceed as follows:

- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select CHANGE UNITS.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select CUSTOM UNITS.
- Press **Enter** button. The display indicates SELECT CUSTOM UNIT. You can enter values for up to three different custom units if desired.

3.4.1 Custom Unit (Cont.)

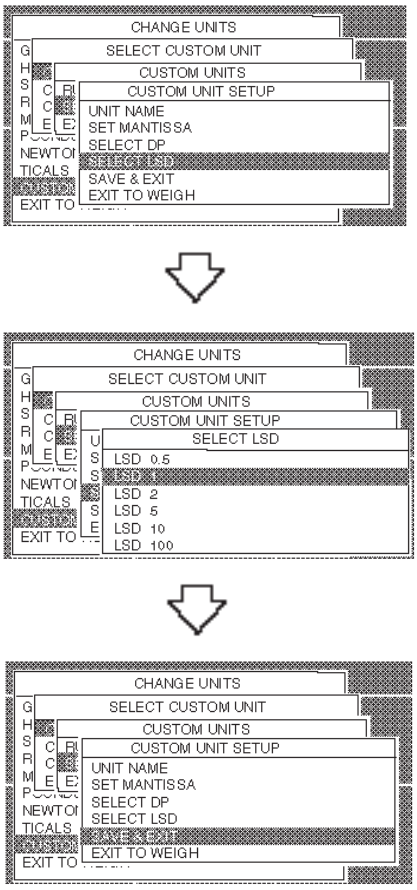




Procedure (Cont.)

- Press ▲ or ▼ arrow button and select CUSTOM UNIT 1.
- Press **Enter** button. The display indicates CUSTOM UNITS. You now have a choice of running the program if you have entered data before, setting up the custom unit or exiting to weigh mode. This procedure continues with setting up the custom unit.
- Press ▲ or ▼ arrow button and select SETUP.
- Press **Enter** button, CUSTOM UNIT SETUP is displayed.
- Press ▲ or ▼ arrow button and select UNIT NAME.
- Press **Enter** button, UNIT NAME is displayed.
- Using arrow buttons, enter unit name, press **Enter**.
- Press ▲ or ▼ arrow button and select SET MANTISSA.
- Press **Enter** button, SET MANTISSA is displayed. The mantissa of the current conversion factor is displayed. This is a number between 0.1 and 1.999999 with the first digit flashing. For conversion factors outside of this range, the exponent will be used to move the decimal point.
- Using arrow buttons, enter conversion factor, press **Enter**, CUSTOM UNIT SETUP is displayed.
- Press ▲ or ▼ arrow button and select SELECT DP.
- Press **Enter** button, SELECT DP LOCATION is displayed.
- Press ▲ or ▼ button and select exponent value either E-3, E-2, E-1, E0, E1, E2, or E3.
- Press **Enter** button, CUSTOM UNIT SETUP is displayed.

3.4.1 Custom Unit (Cont.)

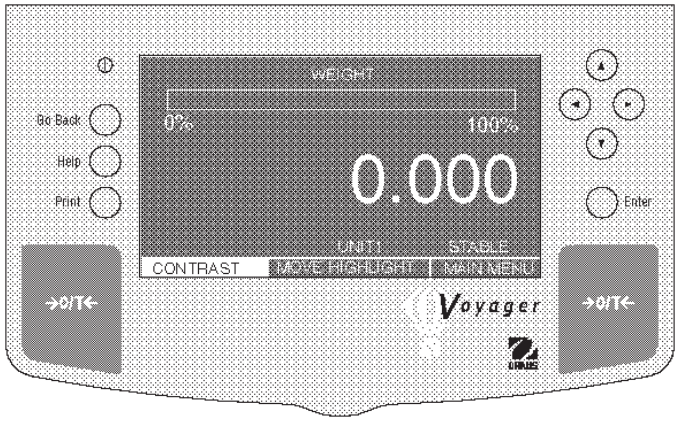


Procedure (Cont.)

- Press ▲ or ▼ arrow button and select LSD.
- Press **Enter** button,SELECT LSD is displayed. There are 6 LSD (least significant digit) settings you can choose from (see table).

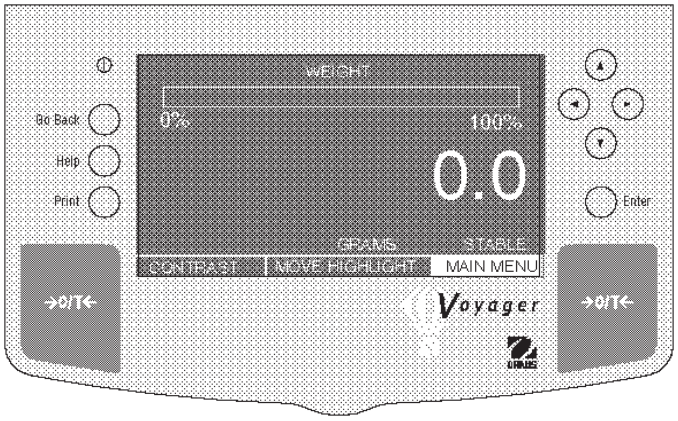
LSD's	
LSD 0.5	Adds one decimal place display counts by 5's.
LSD 1	**Display counts by 1's.**
LSD 2	Display counts by 2's.
LSD 5	Display counts by 5's.
LSD 10	Display counts by 10's.
LSD 100	Display counts by 100's.

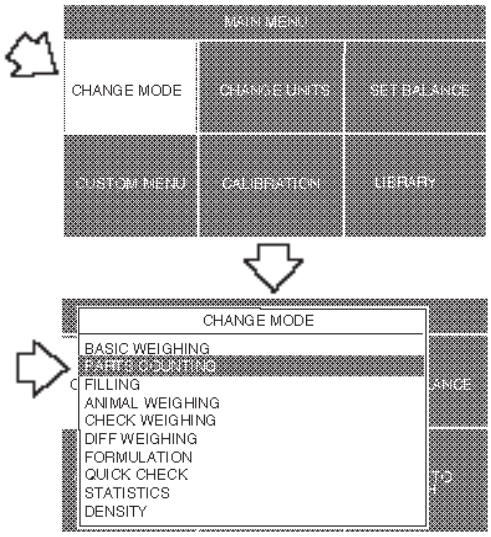
- Press ▲ or ▼ button and select LSD value either 0.5, 1, 2, 5, 10 or 100.
- Press **Enter** button, CUSTOM UNIT SETUP is displayed.
- Press ▲ or ▼ button and select SAVE & EXIT.
- Press **Enter** button, balance returns to the weighing mode with the custom unit activated. The sample display below indicates that UNIT1 is the custom unit.



3.5 Basic Weighing

Voyager balances are shipped with grams enabled. When the balance is to be used with other Type Approved/Legal for Trade units of measure, the desired unit must be enabled. For weigh below applications, refer to section on Density measurements.





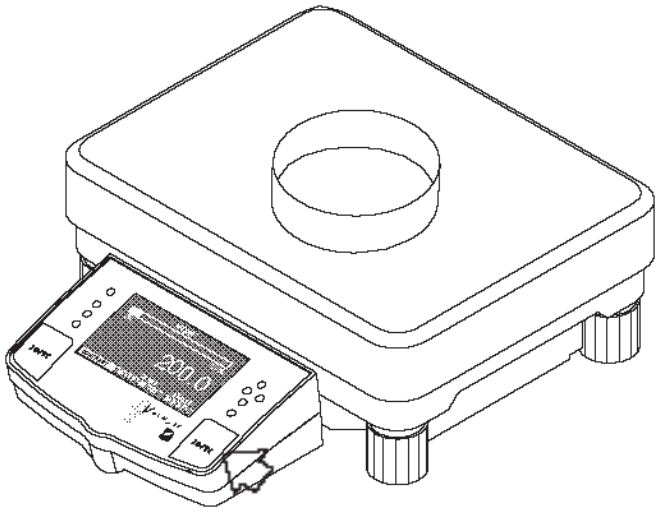
Procedure

- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select CHANGE MODE.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select BASIC WEIGHING.

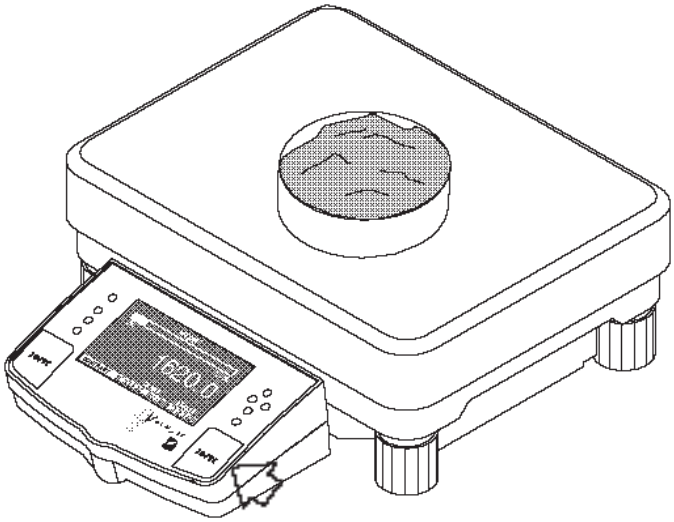
Zero/Tare

When weighing material or objects that must be held in a container, taring stores the container weight in the balance's memory, separate from the weight of the material in the container.

- Press →0/T← with no load on the pan to set the balance to zero.
- Place an empty container on the pan. Its weight is displayed. (200 gram container is shown).
- Press →0/T← the display blanks until stable weight readings are received, then indicates zero. The container's weight is stored in memory.
- Add material to the container. As material is added, its net weight is displayed. (Example is 1620 grams).
- Removing the container and material from the platform will cause the balance to display the container's weight as a negative number. The tared weight will remain in memory until →0/T← is pressed again or the balance is turned off.
- Pressing →0/T← resets the balance to zero.



(*Example* Container 200g)



(*Example* Material 1620g)

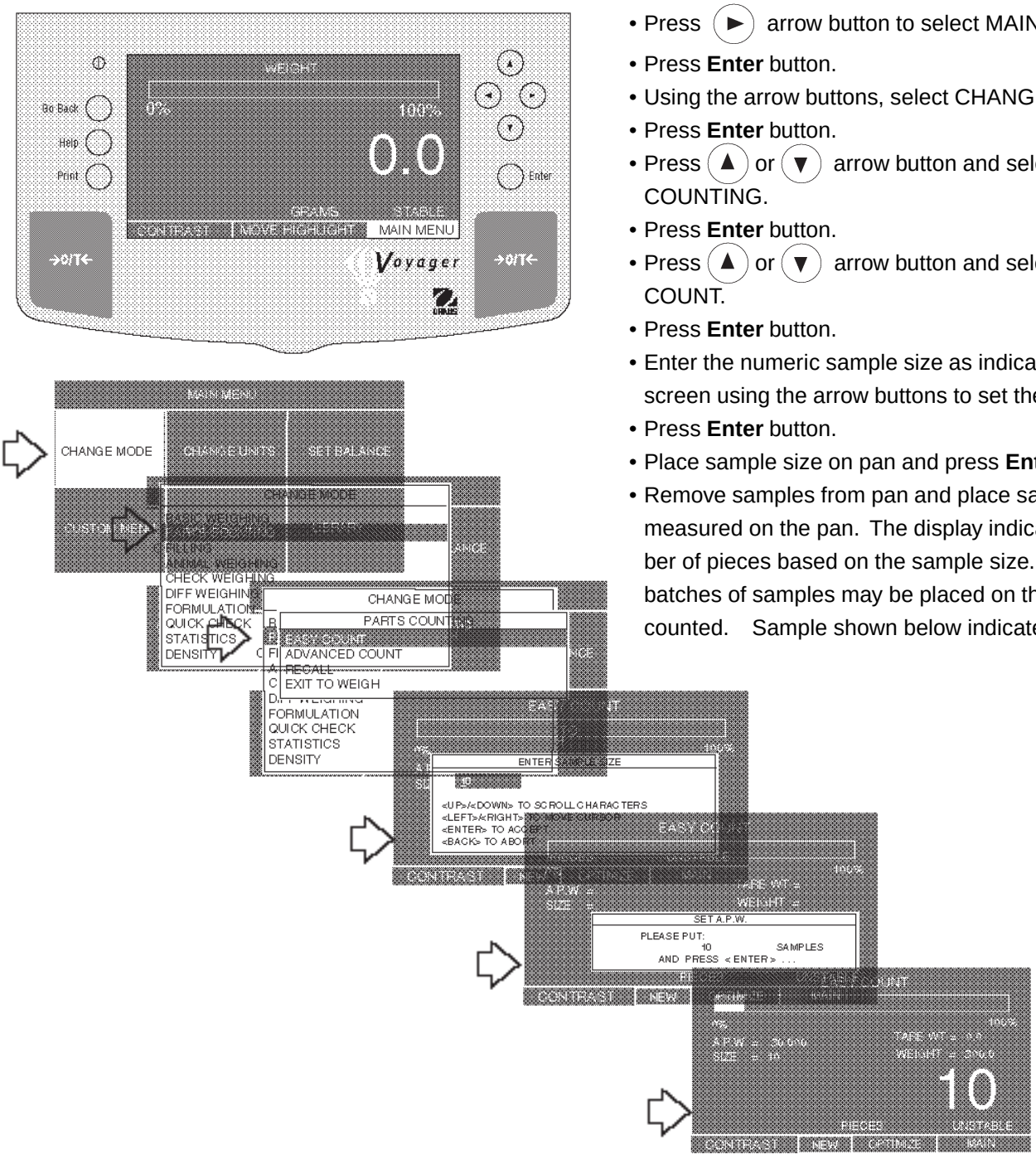
3.6 Parts Counting

The Voyager balance can be set to either an Easy Count or Advanced Count parts counting method.

Easy Count setting enables a simplified method for counting parts. When selected, Easy Count displays a screen which requires that the number of sample parts be entered. After this entry, putting a quantity of samples on the pan, the balance will display the actual number of samples. Since the balance determines the quantity based on the average weight of a single part, all parts must be reasonably uniform in weight.

Advanced Count setting contains a number of entry screens which include assigning a library name, filling and sorting applications and statisical information which can be printed.

3.6.1 Easy Count



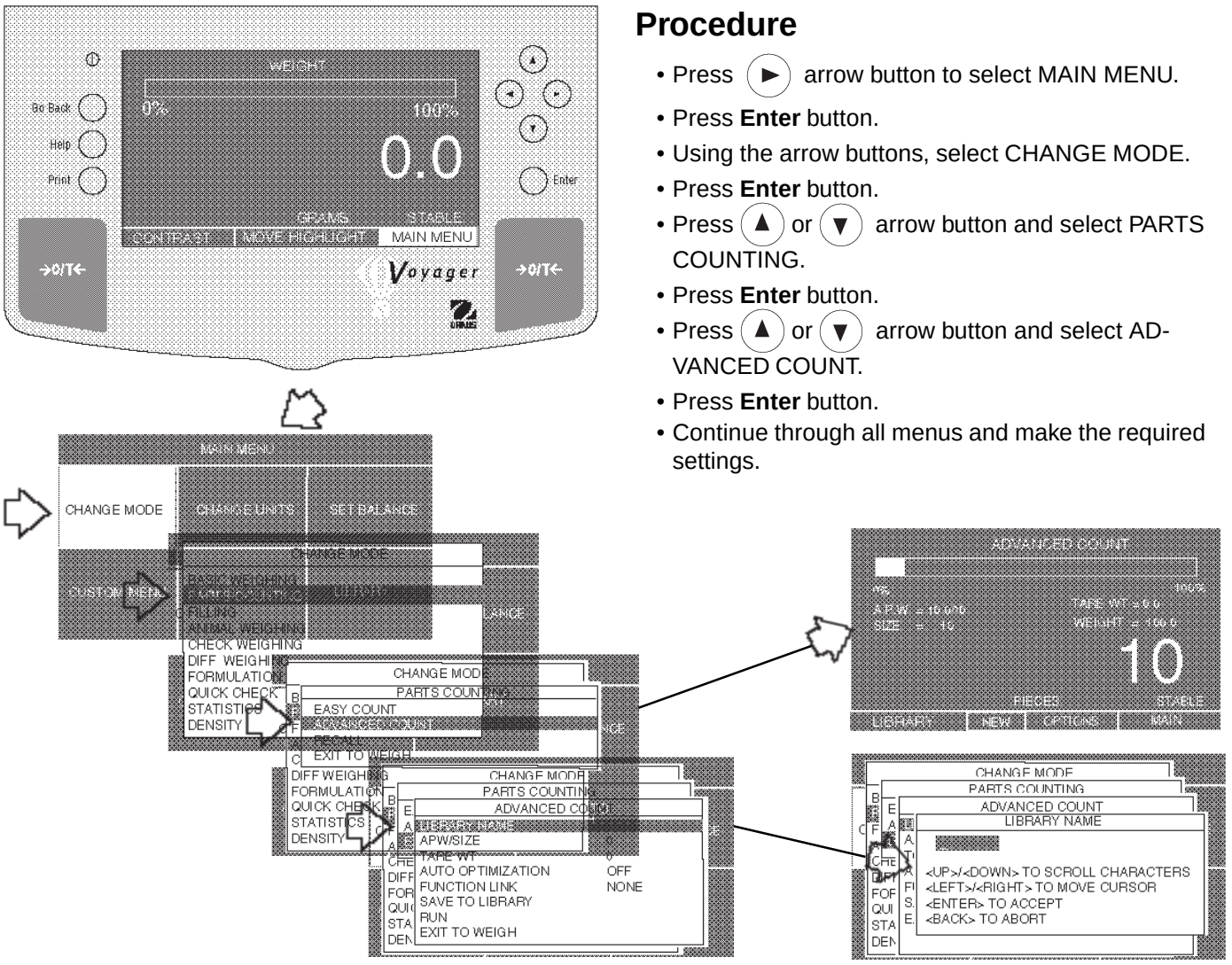
Procedure

- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select CHANGE MODE.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select PARTS COUNTING.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select EASY COUNT.
- Press **Enter** button.
- Enter the numeric sample size as indicated on the screen using the arrow buttons to set the value.
- Press **Enter** button.
- Place sample size on pan and press **Enter** button.
- Remove samples from pan and place samples to be measured on the pan. The display indicates the number of pieces based on the sample size. Repeated batches of samples may be placed on the pan and counted. Sample shown below indicates 10 pieces.

3.6.2 Advanced Counting

Advanced Count setting contains a number of entry screens which include assigning a library name, filling and sorting applications and statisical information which can be printed. Refer to screen 4 below which contains the following entries:

LIBRARY NAME - A name up to 10 characters can be entered and stored to identify the item to be counted.
A.P.W. - This average piece weight, when selected, either a sample size or actual piece weight can be entered.
TARE WEIGHT - This is the tare weight of the container holding the samples.
AUTO OPTIMIZATION - An ON or OFF function. When set ON, optimizes the accuracy based on sample size.
FUNCTION LINK - Various pop-up screens permit the entry of four options, NONE, FILLING, CHECK WEIGHING and STATISTIC. 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 pop-up display has entries for nominal pieces, over pieces, under pieces, display type, library name and save 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, population or sample, with Mean, Sum, High, Low and Difference readings available. Each can be individually set ON or OFF.
SAVE TO LIBRARY - When selected, saves all settings to the library.
RUN - When selected, starts program.

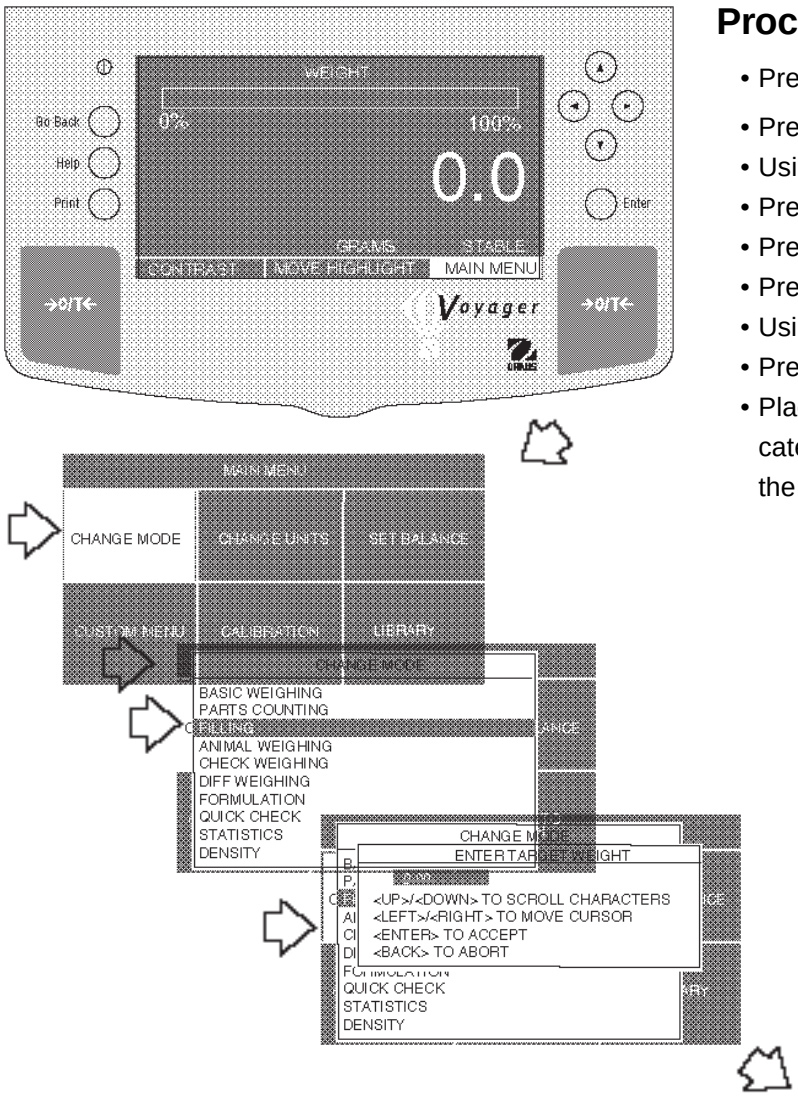


Procedure

- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select CHANGE MODE.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select PARTS COUNTING.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select ADVANCED COUNT.
- Press **Enter** button.
- Continue through all menus and make the required settings.

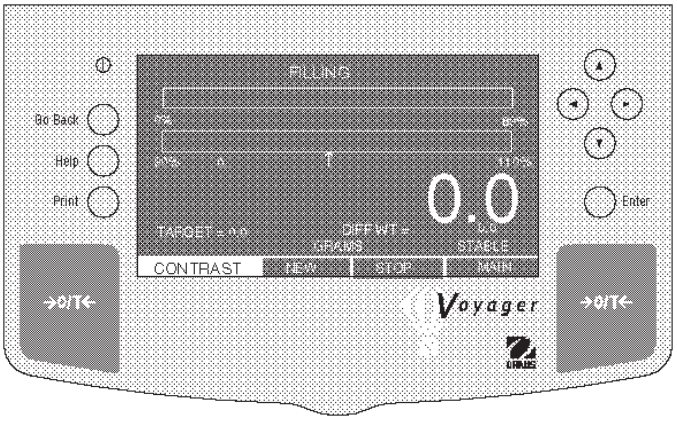
3.7 Filling

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



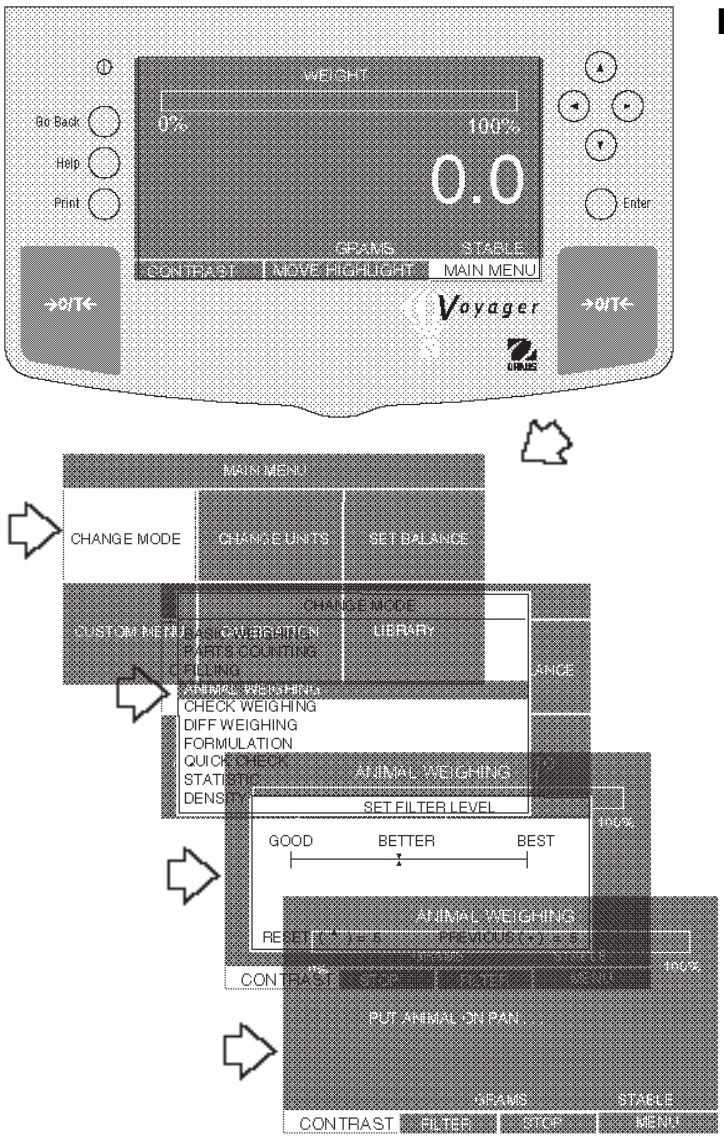
Procedure

- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select CHANGE MODE.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select FILLING.
- Press **Enter** button.
- Using the arrow buttons, enter the target weight.
- Press **Enter** button.
- Place the load on the balance pan, the display indicates on the bar graph as a percentage and displays the actual load weight numerically .



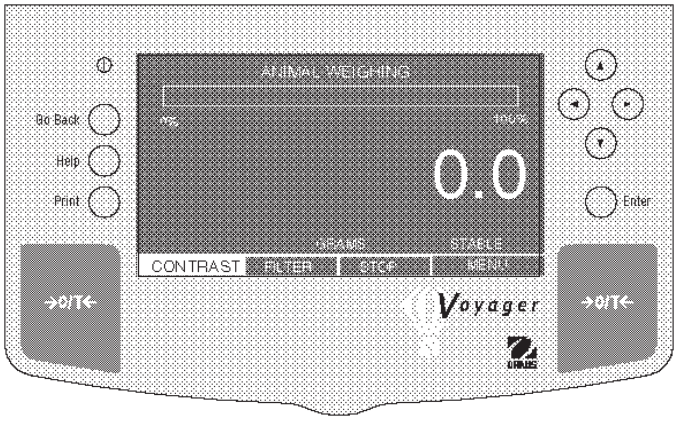
3.8 Animal Weighing

Animal weighing permits you to weigh small animals directly on the balance. To compensate for active subjects, a setup menu permits you to enter a smoothing filter labeled Good, Better and Best which averages the subjects movements and displays an accurate weight. A single bar display indicates up to 100% of the capacity of the balance. The large numeric display indicates the weight of the subject.



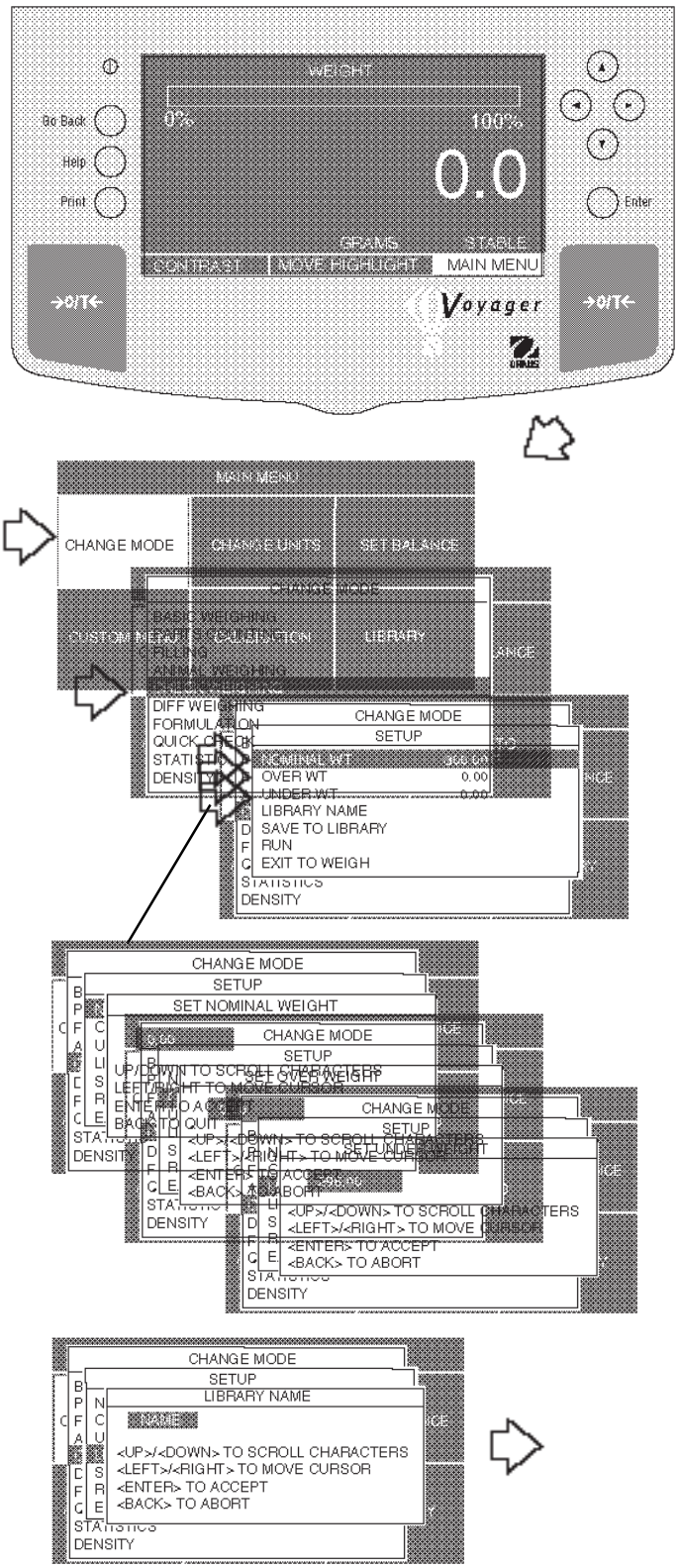
Procedure

- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select CHANGE MODE.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select ANIMAL WEIGHING.
- Press **Enter** button.
- Press ◄ or ► buttons to set the AW Filter, then press **Enter** button. PUT ANIMAL ON PAN . . . is displayed.
- Place the subject on the balance pan, a countdown appears on the display which allows the balance to accurately indicate the weight of the subject. The bar graph indicates the percentage of weight relative to the capacity of the balance.
- Remove the subject from the balance pan, PUT ANIMAL ON PAN... is displayed again. You may continue to weigh subjects in this manner simply by removing and placing subjects on the pan.
- To exit, use arrow buttons and select STOP or MAIN and press **Enter**.



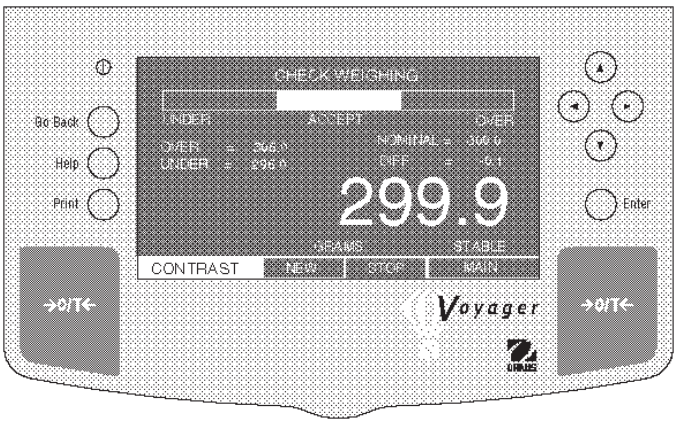
3.9 Check Weighing

Check weighing mode permits you to weigh an item, set balance parmeters such as the nominal weight, over weight, under weight and assign a library name. This can then be recalled later eliminating the need to enter weighing parameters again. This type of weighing is where individual items must be checked against preset parameters. Since many displays are repetitive, not all will be shown in the following procedure



Procedure

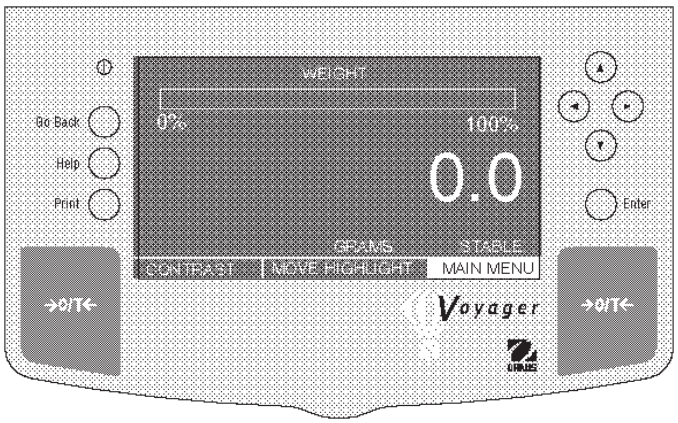
- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select CHANGE MODE.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select CHECK WEIGHING.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and start with NOMINAL WT.
- Press **Enter** button.
- Using the arrow buttons, enter the NOMINAL WT value, then, press **Enter** button.
- Repeat steps and enter parameters for OVER WT, and UNDER WT.
- Enter a library name for the object of measurement and press **Enter button**.
- Press ▼ arrow button and select SAVE TO LIBRARY and press **Enter button**.
- Press ▼ arrow button and select RUN.
- Press **Enter** button.
- Place item to be checked on the balance pan, the normal display indicates the weight of the item. The bar graph indicates whether the item is under , acceptable or over in weight based on the settings made in the balance. Display below illustrates a 300 gram sample weight.
- Items may be repetitively weighed if using the same parameters.
- To exit, use arrow buttons and select STOP or MAIN and press **Enter**.

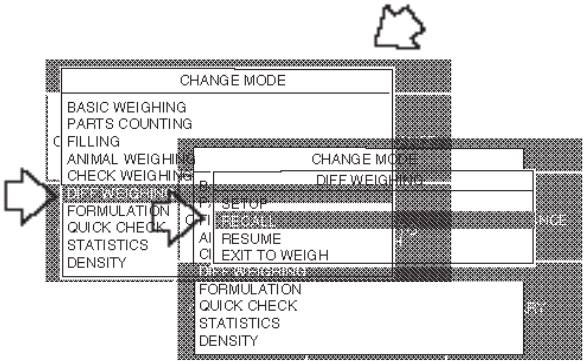


3.10 Differential Weighing

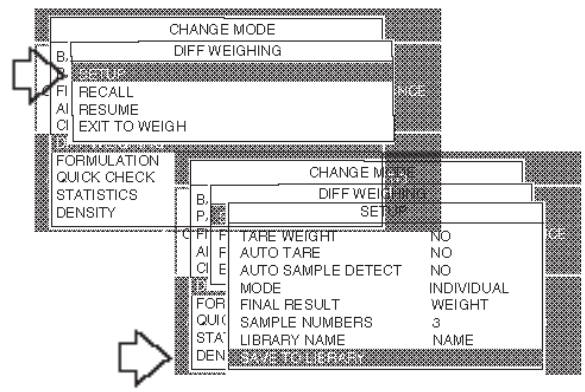
Differential weighing stores tare and weight values so a sample can be dried and the difference calculated at a later time. Up to 5 batches with up to 80 samples per batch can be stored. Samples can be added to the applications library. Batch and individual samples can be accommodated. The features in the Voyager balance for differential weighing include:

RECALL - When selected, brings up previously stored library names associated with each sample.
LIBRARY NAME - A name up to 10 characters can be entered and stored to identify the sample item.
TARE WEIGHT - This is the tare weight of the container holding the samples, can be set to NO or YES.
AUTO TARE - Used when it is desired to automatically tare the storing container's weight, can be set to NO or YES.
AUTO SAMPLE DETECT - This feature is used for repetitive sample weighing, can be set NO or YES.
MODE - Can be set to INDIVIDUAL or BATCH.
FINAL RESULT - Can be set to show results in PERCENTAGE or WEIGHT.
SAMPLE NUMBERS - Desired number of samples can be entered.
SAVE TO LIBRARY - Permits all entries to be saved to the Library.
EXIT TO WEIGH - When selected, will exit to standard weighing mode.



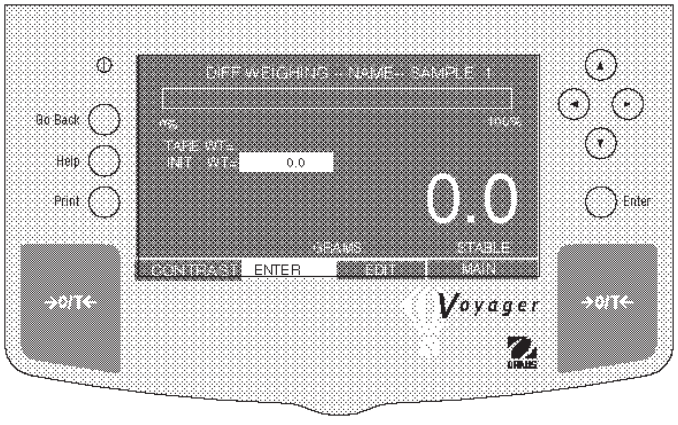


or



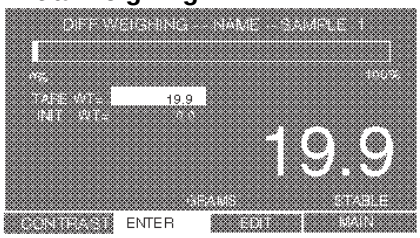
Procedure

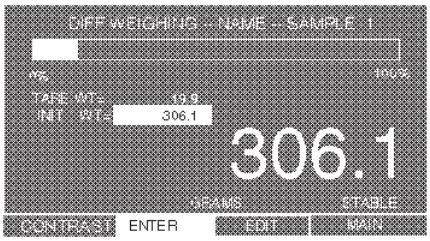
- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select CHANGE MODE.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select DIFF-WEIGHING.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select RECALL, SETUP or EXIT TO WEIGH.
- Press **Enter** button. If RECALL was selected, you can scan the library and select the desired item.
- If SETUP is selected, continue by pressing **Enter** button.
- On the SETUP MENU, using the arrow buttons and **Enter** button, select YES or NO for each of the following items on the menu: TARE WEIGHT, AUTO TARE, AUTO SAMPLE DETECT; for MODE, select either INDIVIDUAL or BATCH; for FINAL RESULT, select either WEIGHT or PERCENT; for SAMPLE NUMBERS, enter the desired number of samples to be weighed; enter a name for LIBRARY NAME; scroll down using the arrow button and select SAVE TO LIBRARY by pressing **Enter** button.
- Scroll to RUN, press **Enter** button. DIFF WEIGHING-SAMPLE 1 is displayed as shown below.



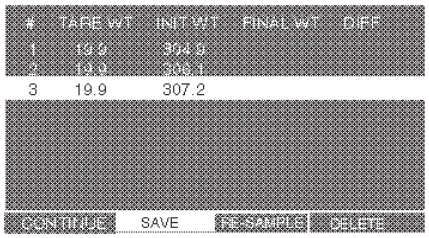
3.10 Differential Weighing (Cont.)

Initial Weighing

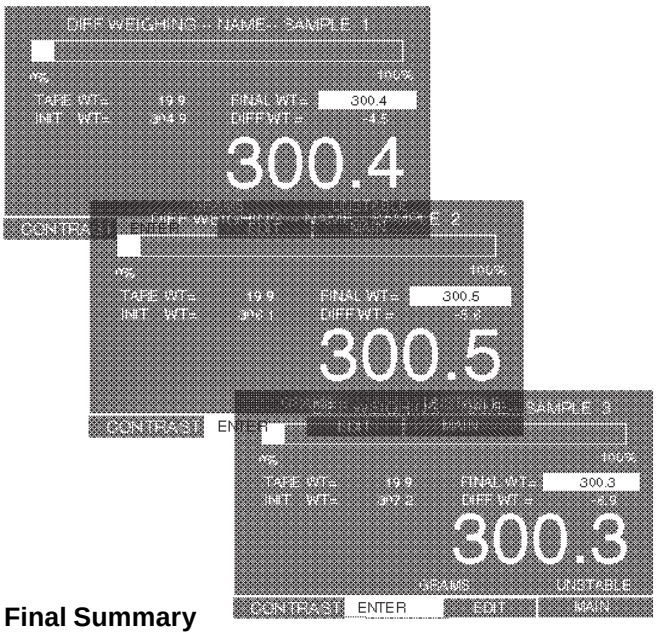




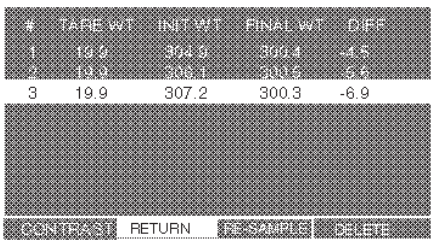
Summary Page



Final Weighing



Final Summary



Procedure (Cont.)

First, the container is tared and stored, then the product is intially weighed in the container and stored for each sample. A name is given to the samples which is stored in the balance. After all samples have been weighed and entered, a summary table indicates the weight of the containers and each sample.

After the samples have undergone a process such as heating or cooling, the entire procedure is repeated starting with sample number 1 and continued until all samples have been completed. The balance then displays a new table which indicates the tare weight of the container, the initial weight of the product, the final weight of the product and the difference weight. To enter samples, proceed as follows:

Initial Weighing

- Press >O/T< button.
- Place container on pan, wait for stable indication, then press **Enter** button. The display indicates the container weight.
- Place the first sample in the container on the pan. The display indicates the initial weight of the first sample.
- Press **Enter** button, display changes to sample 2.
- Remove first sample and container from pan.
- Place container on pan for sample two, press **Enter** button. The display indicates the container weight.
- Place the second sample in the container on the pan. The display indicates the initial weight of the second sample.
- Press **Enter** button, display changes to sample 3.
- Remove second sample and container from pan.
- Repeat the above procedure for all samples. The example shown at left is for one sample.

When the last sample is placed on the balance, a summary display indicates the TARE WT and INITIAL WT.

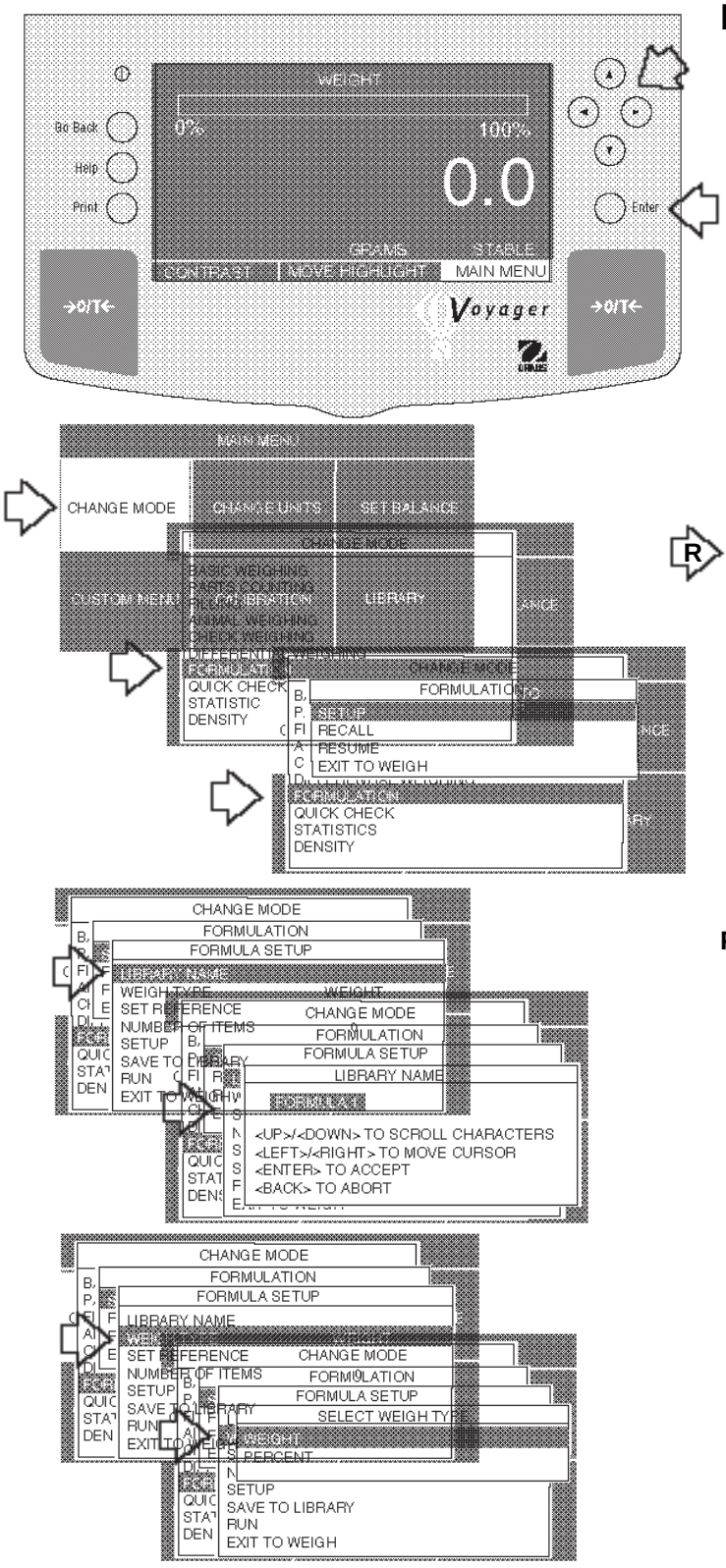
- Using the arrow buttons, select CONTINUE or SAVE, then enter Data File Name.

Final Weighing

When all of the samples have been removed and processed externally, reenter Differential Weighing and select RESUME. The final samples are weighed with their containers one after another. When the last sample is weighed on the balance, a final summary display is shown. See example at bottom of the page. The final summary indicates the TARE WT, INIT WT, FINAL WT and DIFF (difference weight). This can be printed. The RE-SAMPLE and EDIT selections on the displays allow corrections to be made.

3.11 Formulation

The Voyager balance can store between 200 minimum and 500 formulations limited only by the memory capacity of the resident library. Each formulation can be named and have up to 10 components specified and identified by name. Once the formulations are stored in the balance library, they may be recalled and used at any time. Each component of a given formulation can be specified as to its weight or percentage. The balance will display each element of a formulation on a dual bar graph as a percentage and also displays the desired weight. Thus, each product may be placed on the pan until 100% is indicated. Names are limited to 10 characters.



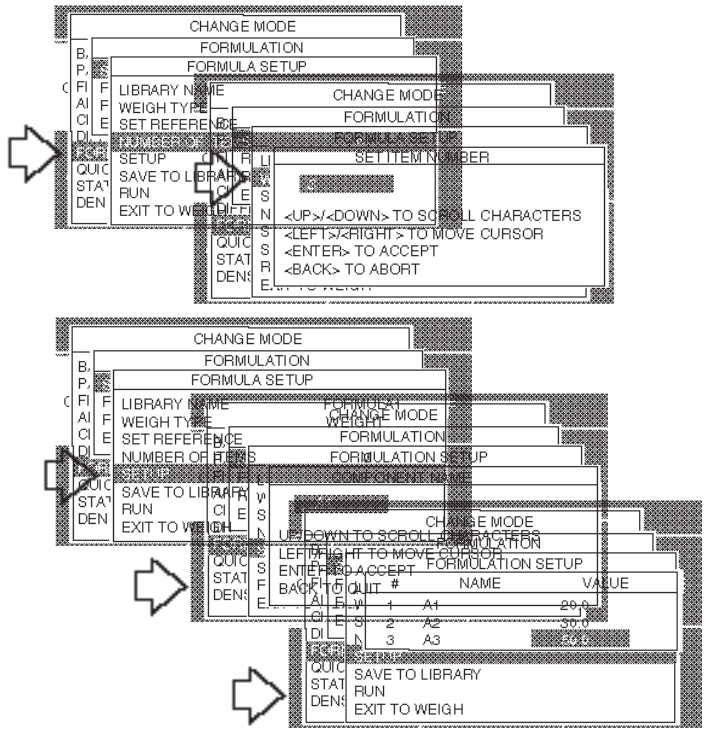
Procedure

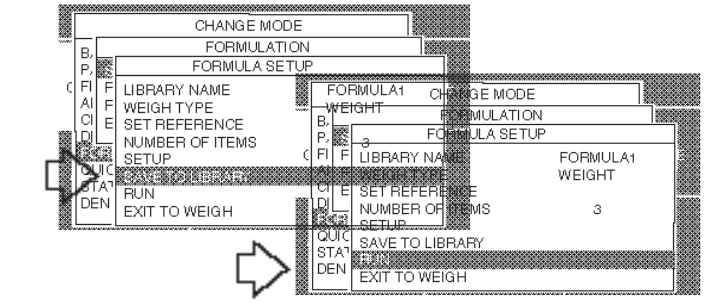
- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select CHANGE MODE.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select FORMULATION.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select SETUP.
- Press **Enter** button, FORMULA SETUP is displayed.
- Press ▲ or ▼ arrow button and select LIBRARY NAME.
- Press **Enter** button.
- Enter a library name for the 1st formula using the arrow buttons.
- Press **Enter** button when name is completed, FORMULA SETUP is displayed again.
- Press ▼ arrow button and select WEIGH TYPE.
- Press **Enter** button, a new screen with WEIGHT and PERCENT is displayed. WEIGHT allows components of the formula to be specified by weight. PERCENT allows components to be specified by percentage.

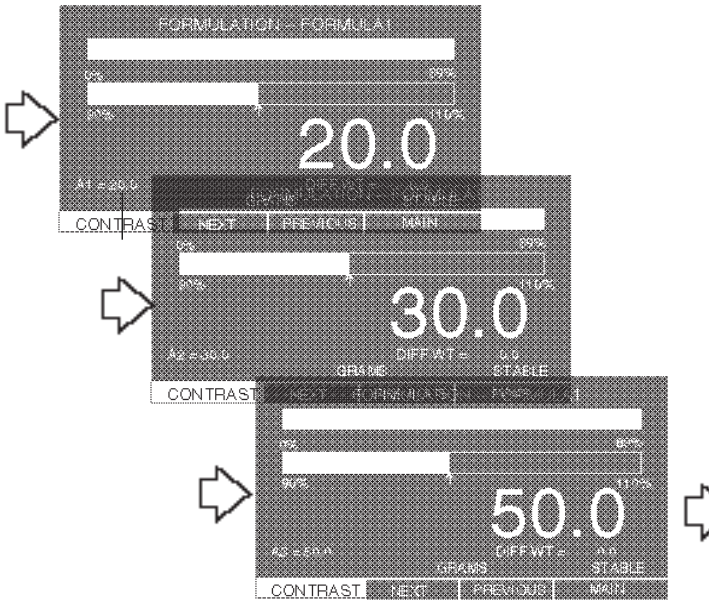
FORMULATIONS BY WEIGHT

- Press ▲ or ▼ arrow button and select WEIGHT.
- Press **Enter** button.
- Using ▼ arrow button, scroll to ITEM NUMBER.
- Press **Enter** button. A new screen, SET ITEM NUMBER appears.
- Press ▲ or ▼ arrow button and enter the number of components in the formula.
- Press **Enter** button, FORMULA SETUP is displayed.
- Press ▲ or ▼ arrow button and select SETUP.
- Press **Enter** button, NAME menu is displayed with the number of items you entered for the first formula.
- Press ▲ or ▼ arrow button and select item 1.
- Press **Enter** button, COMPONENT NAME display appears.
- Using arrow buttons, enter the component name for item 1 in the formula.

3.11 Formulation (Cont.)





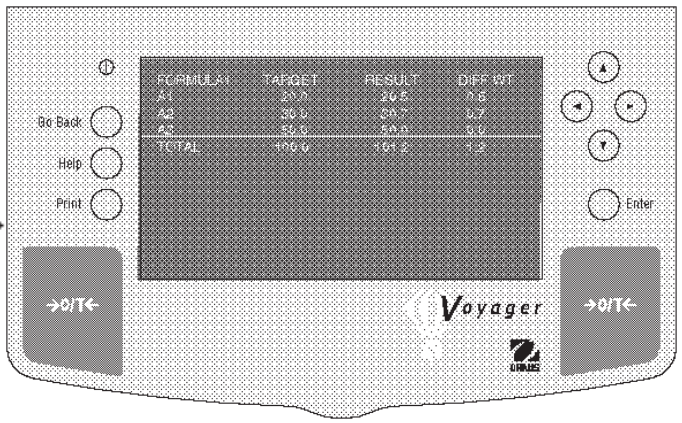


Example using a total of 100 grams in the formulation.

Procedure (Cont.)

FORMULATIONS BY WEIGHT (cont.)

- Press **Enter** button, a NAME menu appears with the value shaded.
- Press **Enter** button, ENTER COMPONENT WEIGHT menu is displayed.
- Using the arrow buttons, enter the component weight for item 1 in the formula.
- Press **Enter** button when desired weight is entered. The NAME menu appears again. Repeat steps (identified with arrow **R** on previous page) and enter the component names and weight values for the first formula. Samples shown at left.
- When all of the entries have been made, select SAVE TO LIBRARY in the FORMULATION SETUP menu, and then select RUN, press **Enter** button. The balance displays the first component of the formula and the required weight.
- Place a container on the pan and tare by pressing >O/T< button.
- Add the required amount to the container until the balance indicates 100% on the bar graph and the proper weight.
- Using the arrow buttons, select NEXT shown at the bottom of the screen and press **Enter** button. The second component of the formula is displayed. Add the required weight. Select NEXT and repeat the procedure for all items in the formula.
- When you have completed weighing all items in the formula, select NEXT again and a display appears which indicates the Target Weight, Result and Difference Weight for the formula. See display below.
- To select previously stored formulations, select FORMULATION menu and select RECALL. This will bring up the library of formulations.



3.11 Formulation (Cont.)

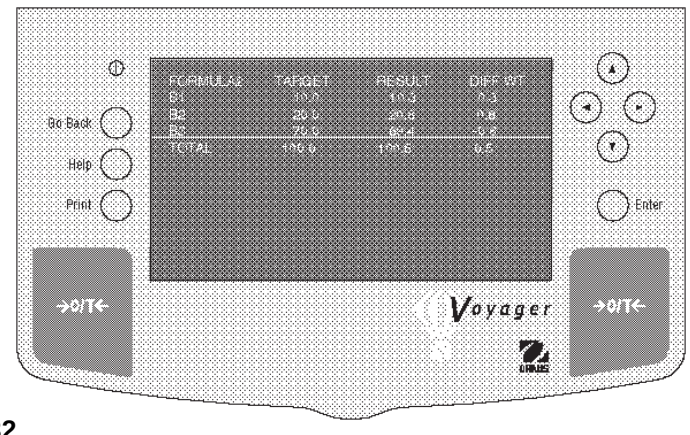
Procedure

FORMULATIONS BY PERCENTAGE

Formulations can be done by using percentages instead of weight values. See page 21 and repeat procedure up to where screen choice for WEIGH TYPE is displayed, Then continue as follows:

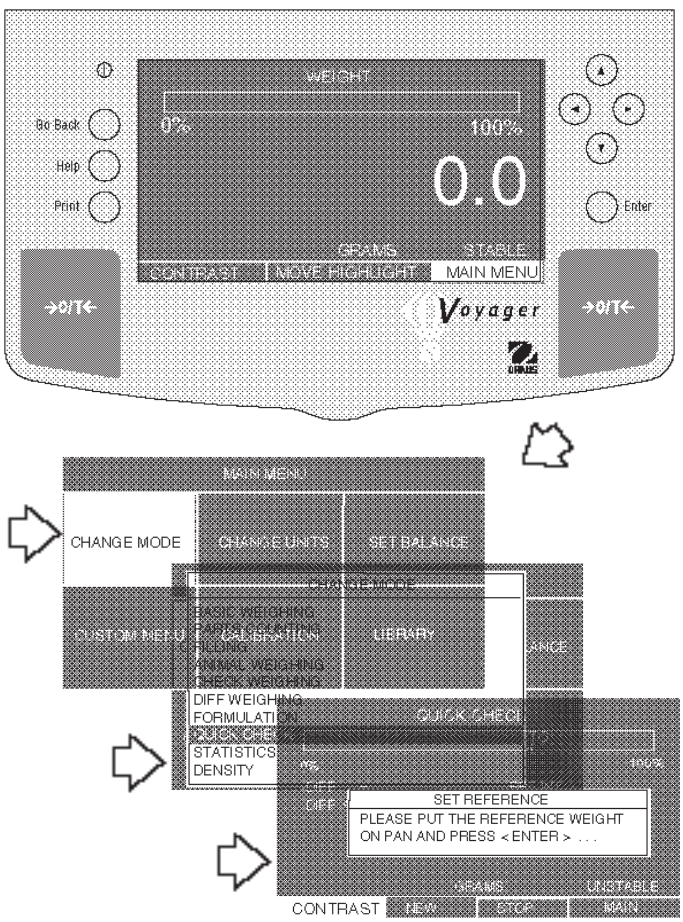
- Press ▼ arrow button and select WEIGH TYPE.
- Press **Enter** button, a new screen with WEIGHT and PERCENT is displayed. PERCENT allows components to be specified by percentage.
- Press ▲ or ▼ arrow button and select PERCENT.
- Press **Enter** button.
- Using ▼ arrow button, scroll to SET REFERENCE.
- Press **Enter** button. A new screen, ENTER TARGET WEIGHT appears.
- Using arrow buttons, enter target weight.
- Press **Enter** button, FORMULA SETUP is displayed.
- Using ▼ arrow button, scroll to NUMBER OF ITEMS .
- Press **Enter** button. A new screen, SET ITEM NUMBER appears.
- Press ▲ or ▼ arrow button and enter the number of components in the formula.
- Press **Enter** button, FORMULA SETUP is displayed.
- Press ▲ or ▼ arrow button and select SETUP.
- Press **Enter** button, NAME menu is displayed with the number of items you entered for the first formula.
- Press ▲ or ▼ arrow button and select item 1.
- Press **Enter** button, COMPONENT NAME display appears.
- Using arrow buttons, enter the component name for item 1 in the formula.
- Press **Enter** button, a NAME menu appears with the value shaded.
- Press **Enter** button, ENTER COMPONENT % menu is displayed.
- Using the arrow buttons, enter the component percentage for item 1 in the formula.
- Press **Enter** button when desired weight is entered. The NAME menu appears again. Repeat steps and enter the component names and percent values for the first formula.
- When all of the entries have been made, select SAVE TO LIBRARY in the FORMULATION SETUP menu, and then select RUN, press **Enter** button. The balance displays the first component of the formula and the required weight.
- Place a container on the pan and tare by pressing >O/T< button.
- Add the required amount to the container until the balance indicates 100% on the bar graph and the proper percentage.
- Using the arrow buttons and select NEXT shown at the bottom of the screen and press **Enter** button. The second component of the formula is displayed. Add the required weight. Select NEXT and repeat the procedure for all items in the formula.

- When you have completed weighing all items in the formula, select NEXT again and a display appears which indicates the Target Weight, Result and Difference Weight for the formula. See display below.



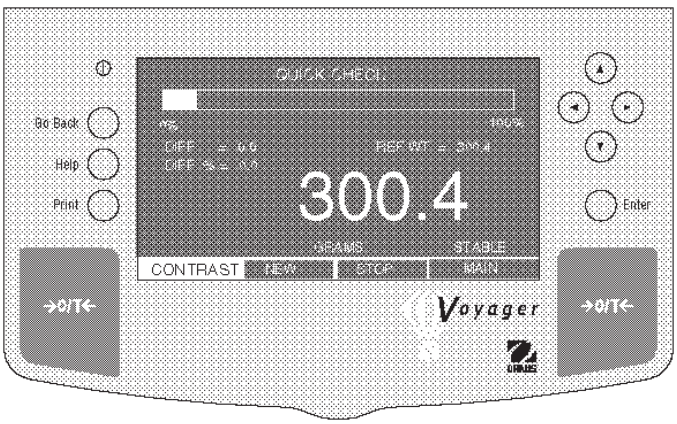
3.12 Quick Check Weighing

Quick check weighing permits you to place a reference sample or a sample weight 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 weight between the original sample and suceeding samples is displayed. The difference in percentage is also shown along with the reference weight. The large numeric display indicates the weight of the subject.



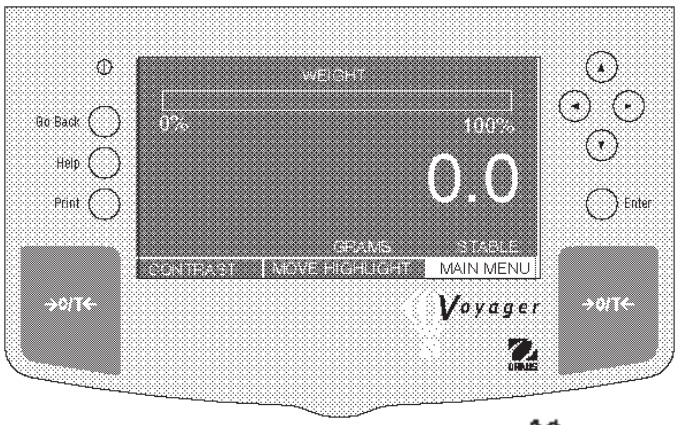
Procedure

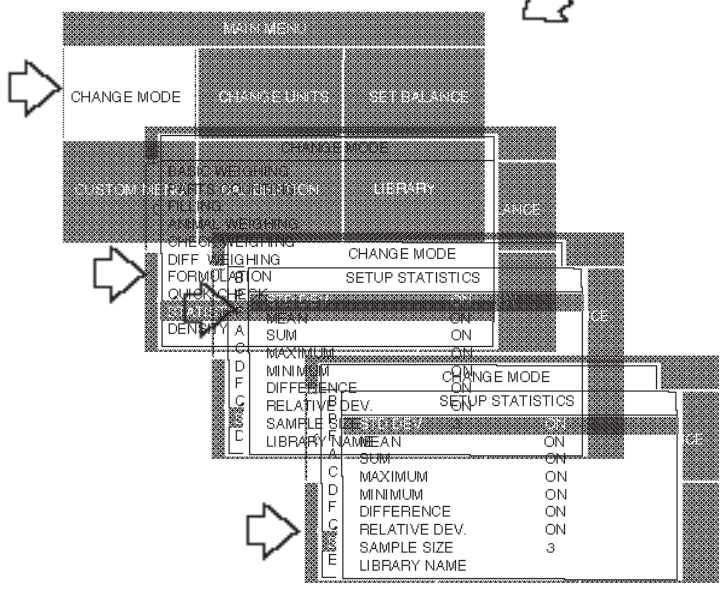
- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select CHANGE MODE.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select QUICK CHECK.
- Press **Enter** button.
- Place the reference weight on the pan and press the **Enter** button.
- Remove reference weight from the pan and place sample to be compared against the reference weight on the pan.
- The balance displays the difference of the sample weight against the reference weight in a measuring unit and percentage. The bar graph indicates the percentage of weight of the capacity of the balance.
- To enter a new reference weight, select NEW at the bottom of the display using the ► arrow button and press the **Enter** button and repeat procedure.

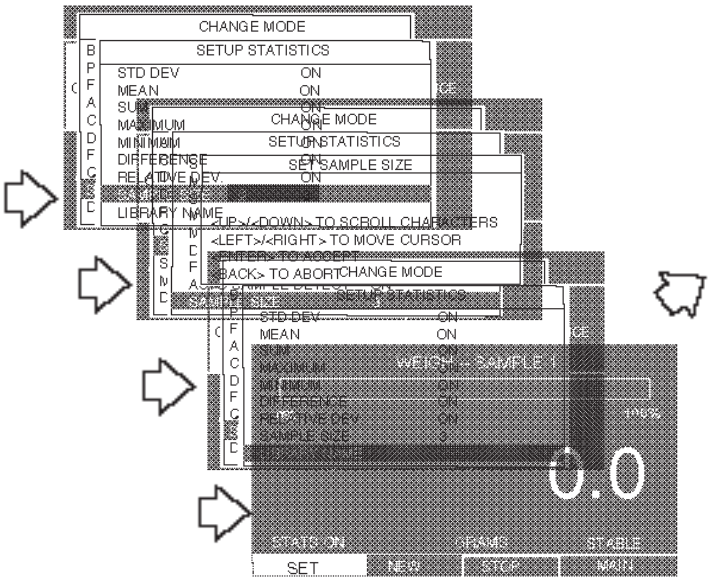


3.13 Statistics

Statistics is used when it is desired to compare a number of samples and examine the relative deviation of the samples along with other statistical data such as mean, sum, maximum and minimum and difference. A minimum of three samples is required in this program. Statistics contains a number of pop-up menus which include standard deviation, mean, sum, maximum, minimum, difference, relative deviation, auto sample detect and sample size. All 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







Procedure

- Press (►) arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select CHANGE MODE.
- Press **Enter** button.
- Press (▲) or (▼) arrow button and select STATISTICS.
- Press **Enter** button.
- Press (▲) or (▼) arrow button and select STD DEV.
- Press **Enter** button.
- Press (▲) or (▼) arrow button and select either ON or OFF.
- Continue through all menus and set each of the items ON or OFF.
- Press **Enter** button.
- Press (▲) or (▼) arrow button and select SAMPLE SIZE, three is the minimum.
- Press **Enter** button.
- Using the arrow buttons, enter the sample size.
- Press **Enter** button.
  - Press (▼) button and select LIBRARY NAME. Enter a library name, press **Enter**.
  - Press (▼) button and select SAVE TO LIBRARY.
  - Press (▼) button and select RUN, press **Enter**.

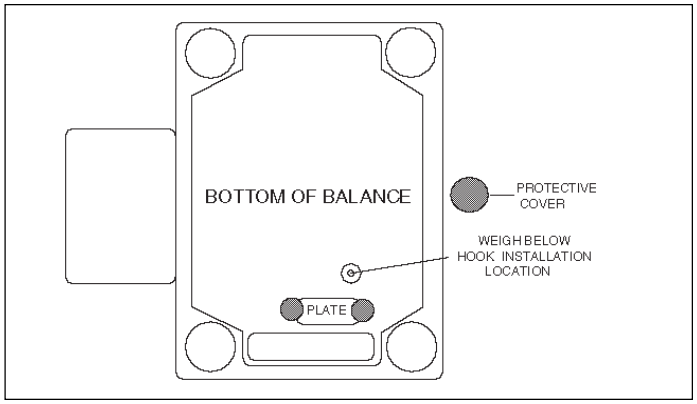
A new screen appears . Place a sample on the pan and wait for STABLE to appear, press **Enter** button, then remove the 1st sample and place the second, press **Enter** button. Continue to do this until all samples have been weighed. The final screen will automatically appear when the last sample is entered as shown below.

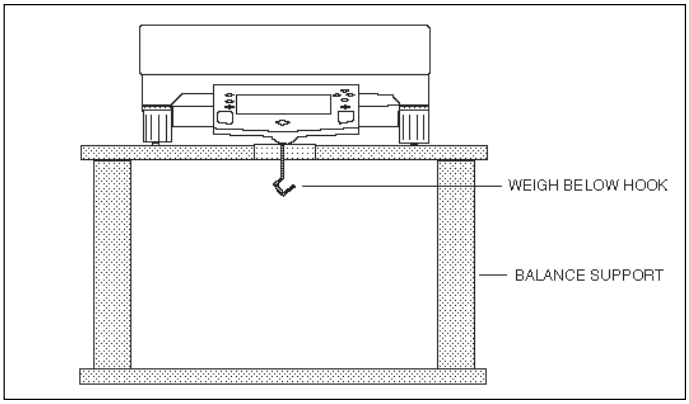
3.14 Density

Density determinations of solids and liquids can be made with the Voyager balance. The Voyager balance contains built in reference density tables for water and ethanol at temperatures between 10° C and 30° C. It is not necessary to refer to any external tables to calculate density.

3.14.1 Balance Preparation for Density Measurements

The Voyager balance is equipped with a weigh below hook which can be attached to the bottom of the balance. When making density measurements, it is necessary to support the balance on both sides allowing enough clearance to for a beaker to fit under the balance, a platform or laboratory jacks can be used. Remove the protective adhesive cap from the bottom of the balance as shown in the figure below. Screw the weigh below hook into the bottom of the balance.





3.14.2 Solid Density Determinations

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 princple states that every solid body immersed in a fluid loses weight by an amount equal to that of the fluid it displaces.
The density of a solid is determined with the aid of a liquid whose **density Q_0** is known (water or ethanol are usually used as auxiliary liquids). 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:

$$Q \frac{A}{A - B} \bullet Q_0$$

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

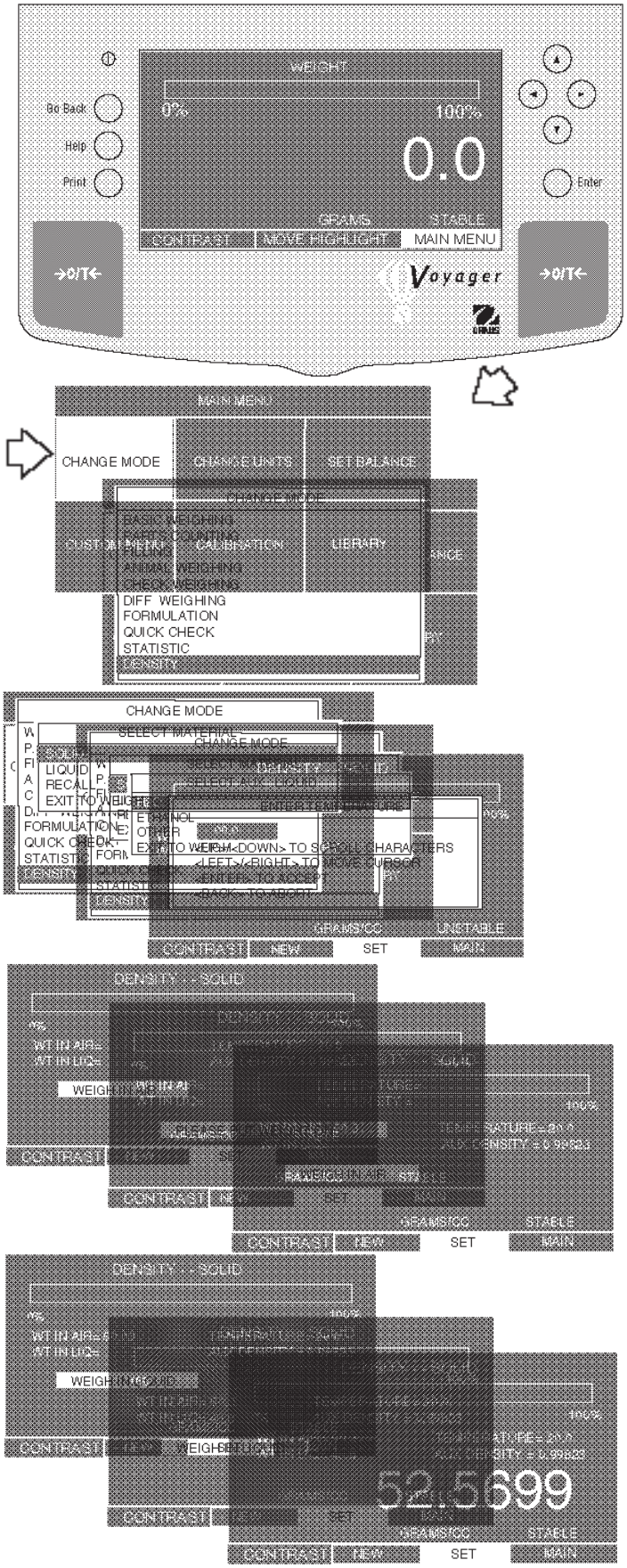
$$Q = \frac{A}{P} \bullet Q_0$$

Q = Density of the solid
A = Weight of the solid in air
B = Weight of the solid in the auxilary liquid
Q_0 = Density of the auxiliary liquid at a given temperature (this value depends on the temperature. The density table is included in Voyager balances).
P = Buoyancy of the solid in the auxiliary liquid (corresponds to *A - B*).

As previously mentioned, the balance contains built in density tables for water and and ethanol. In the 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 as an example.

3.14 Density (Cont.)

3.14.2 Solid Density Determinations (Cont.)



Procedure

- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select CHANGE MODE.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select DENSITY.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select SOLID.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select H2O.

NOTE: At this point you could also select either ethanol or a different auxiliary liquid. When a different auxiliary liquid is selected, you must enter its density and name it for the library.

- Place a beaker underneath the balance (not supplied) and suspend a precision calibrated thermometer 0° C to 30° C on the edge of the beaker.
- Tare the balance.
- Press **Enter** button, ENTER TEMPERATURE is displayed.
- Using the arrow buttons, enter the temperature of the liquid in the beaker.
- Press **Enter** button, the display DENSITY SOLID requests item to weighed, press the **>O/T<** button.
- Weigh the solid (weight *A*) by pressing the **Enter** button. The display now requests the weight in liquid.
- Suspend the sample from the Weigh Below Hook into the beaker. Use a fine wire or thread.
- Fill the beaker with auxiliary liquid (liquid of known density Q_0' usually distilled water or ethanol). Insure that the liquid will cover the sample by at least 1 cm after immersion.
- Ensure that no air bubbles adhere to the immersed part of the supporting wire. Remove air bubbles by moving the wire or by means of a fine brush.
- Weigh the solid (buoyancy *P*) by pressing the **Enter** button. The display indicates the density in grams/cc.
- Successive samples may be taken by pressing **Enter** button with SET highlighted on the bottom of the display screen.

3.14 Density (Cont.)

3.14.3 Improving the Accuracy of the Result of Solid Density Determinations

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 0.1 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 of all density determinations.

Air Buoyancy

1 cm^3 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/cm^3 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) and the balance is tared before every measurement, the influence of the apparent weight increase can be neglected.

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.

3.14.4 Liquid Density Determinations

The density of a liquid can be made using either a sinker of known **volume** or a Pycnometer. When using the sinker, 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:

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

Q = Density of the liquid
A = Weight of the sinker in air
B = Weight of the sinker in liquid
V = Volume of the sinker
P = Buoyancy of the sinker in the liquid (*P*= *A*-*B*)

When the Pycnometer is used, it is filled with a known volume of a liquid. The density is arrived at as follows:

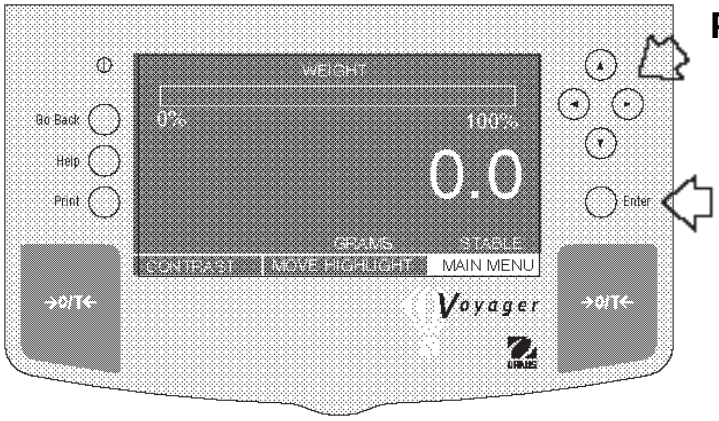
$$\text{Density} = \frac{\text{Weight of full pycnometer - Weight of pycnometer}}{\text{Volume of pycnometer}} + \{\text{Air density}\}$$

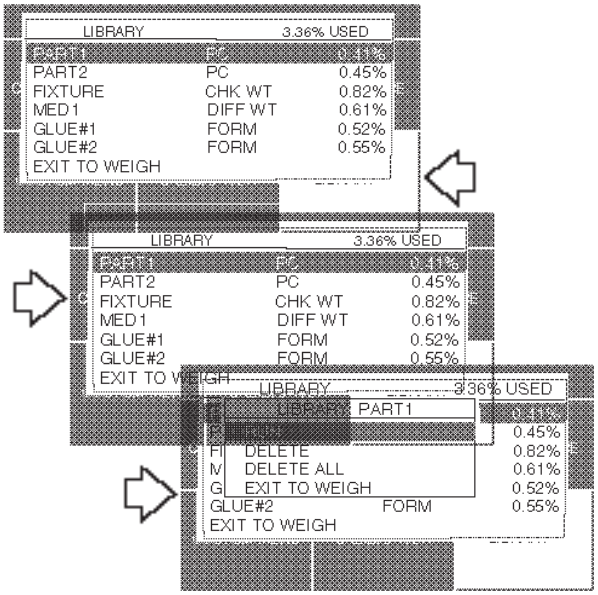
NOTE: pycnometer may be obtained at laboratory supply firms.

- Follow the same procedure for solid density determination except select LIQUID under the Select material display. The balance is prepared in the same manner.

3.15 Library

The Voyager balance can store approximately 200 names in the library. Six functions in the balance have provisions for storing a library name, they are: Advanced Counting, Check Weighing, Differential Weighing, Formulation, Density and SQC. When a library name is selected, the associated function is also displayed along with the percentage of memory used for the entry. A Library menu is provided which allows the selected library name and function to be run or deleted. If you have accessed the library and do not want to run or delete a name an exit to weighing selection can be made which does not affect the library.



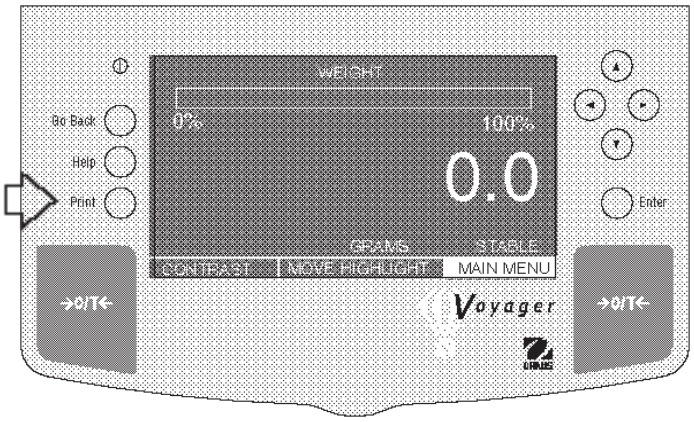


Procedure

- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select LIBRARY.
- Press **Enter** button. The LIBRARY menu is displayed with all of the previously entered names and their corresponding functions.
- Using the arrow buttons, select the name and function you want to access.
- Press **Enter** button, a LIBRARY menu is displayed.
- Using the arrow buttons, select either RUN, DELETE, DELETE ALL or EXIT TO WEIGH. When RUN is selected, that particular balance operation is enabled and can be run again. When a particular name is selected and the DELETE selection is made, that particular name and function is removed from the library. DELETE ALL when selected removes the entire contents of the library.
- Press **Enter** button.

3.16 Printing Data

Printing data to an external computer or printer requires that the communications parameters be set first. Refer to Section 4, Setting up Your Balance.



Procedure

- Press the **Print** button. Printing to an external printer or computer will occur each time the Print button is pressed unless 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.
- This section defines the various printing setups with printing samples.

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.

The sample shown, indicates the status in the menus.

SAMPLE PRINTOUTS

```
TYPE= MM/DD/YY
TYPE= 24 HOUR
7/01/97   16:26:12
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
```

3.16 Printing Data (Cont.)

SAMPLE PRINTOUTS

Span Calibration Printout

When performing a Span calibration, a printout is automatically made after the calibration mass is placed on the pan and the **Print** button is pressed.

```
- - - - - SPAN CAL - - - - - -
7/01/97      1:00:00 PM
Bal Id  1234
Cal:              4000.0g
Old:              4000.0g
Dif:                 0.0g
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 and the **Print** button is pressed.

```
- - - - - LIN CAL - - - - - -
7/01/97      1:00:00 PM
Bal Id  1234
Cal:              4000.0g
Old:              3999.4g
Dif:                 0.6g
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 available. When the display indicates the mass value to be placed on the pan, the balance the automatically displays the calibration weight required and the **Print** button is pressed.

```
- - - - - CAL TEST - - - - - -
7/01/97      1:00:00 PM
Bal Id  1234
Cal:              4000.0g
Act:              4000.4g
Dif:                 0.4g
Wt. Ref.....
USER NO 2056853
PROJ NO 100012
Name.....

- - - - - END - - - - -
```

4. SETTING UP YOUR BALANCE

The Voyager balance has ten menus under SET BALANCE which are listed as follows:

READOUT - User menu is used to adapt the balance to environmental conditions.

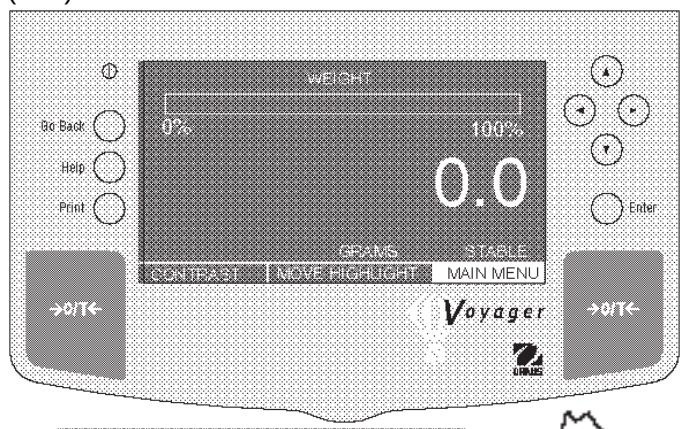
INTERFACE - Interface is used to set the balance up for communications.

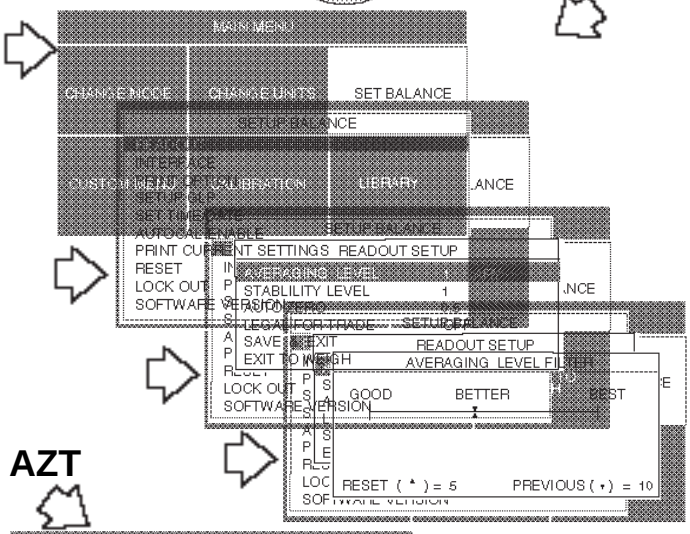
PRINT OPTION - Allows the setting of various print options.

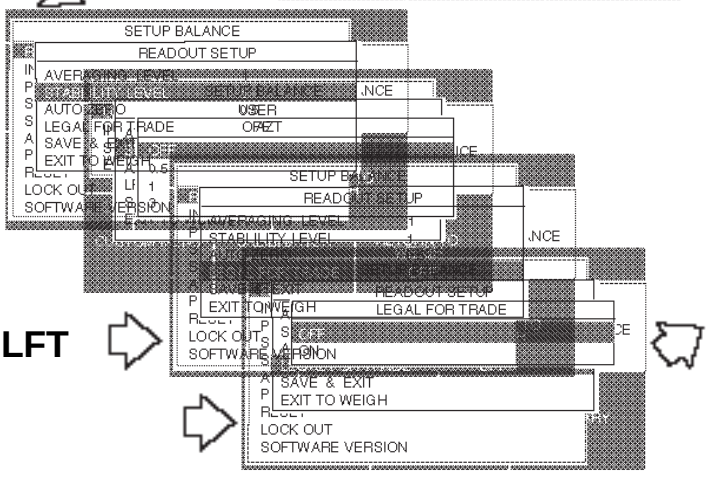
SET TIME/DATE - Permits setting time and date.

4.1 Readout

The Readout menu enables you to set the balance averaging level, stability level (good, better, best) automatic zero tracking (AZT) settings and legal for trade (LFT) ON or OFF.







AUTOCAL - Function can be set ON or OFF.

PRINT CURRENT SETTINGS - When selected, print data to external printer or computer.

RESET - Allows the resetting of Readouts, RS232, Print Option and GLP Print Option.

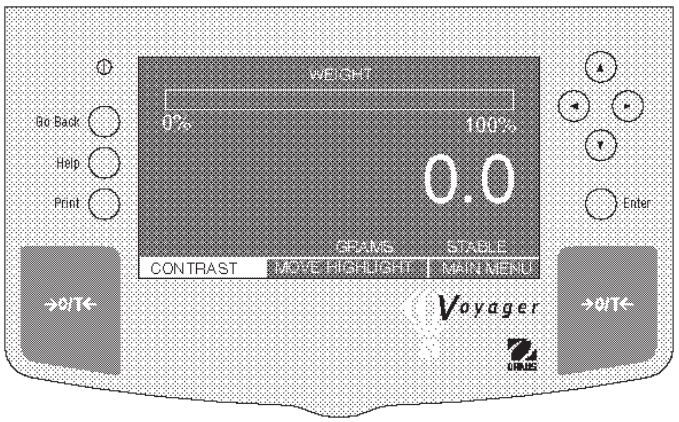
SETUP GLP - GLP stands for Good Laboratory Practices. This series of menus permits setting of time, date, GLP print options, balance I.D., project I.D. and user I.D.

LOCK OUT - Legal for Trade only, Unit, Calibration and balance Functions can be individually set On or Off.

SOFTWARE VERSION - Indicates software version and date.

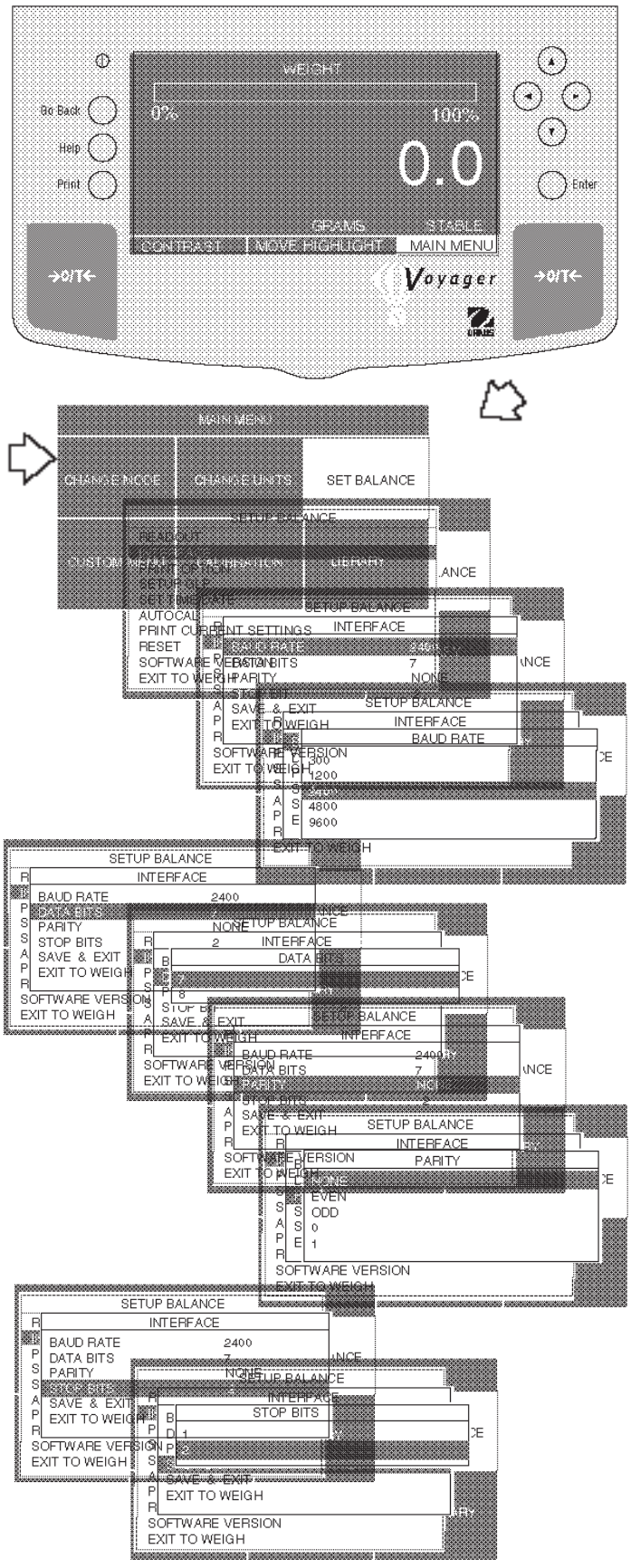
Procedure

- Press ► arrow button to select MAIN MENU, press **Enter** button.
- Using the arrow buttons, select SET BALANCE, press **Enter** button.
- Press ▲ or ▼ arrow button and select READOUT, press **Enter** button.
- Press ▲ or ▼ arrow button and select AVERAGING LEVEL, press **Enter** button.
- Press ◄ or ► arrow button and set the filter level, press **Enter** button.
- Repeat the same procedure for STABILITY LEVEL.
- Press ▲ or ▼ arrow button and select AUTO ZERO, press **Enter** button.
- Press ▲ or ▼ arrow button and select either OFF, 0.5, 1 or 3, press **Enter** button.
- Press ▲ or ▼ arrow button and select LEGAL FOR TRADE, press **Enter** button.
- Press ▲ or ▼ arrow button and select ON or OFF, press **Enter** button.
- Press ▲ or ▼ arrow button and select SAVE & EXIT, press **Enter** button.



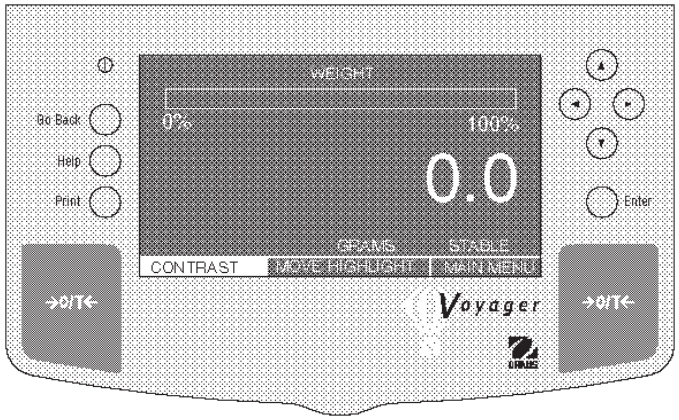
4.2 Interface

The Interface menu enables you to set the balance communication parameters for an RS 232 interface. The baud rate, data bits, parity and stop bits can be set to match the communication requirements of external printers or computers.



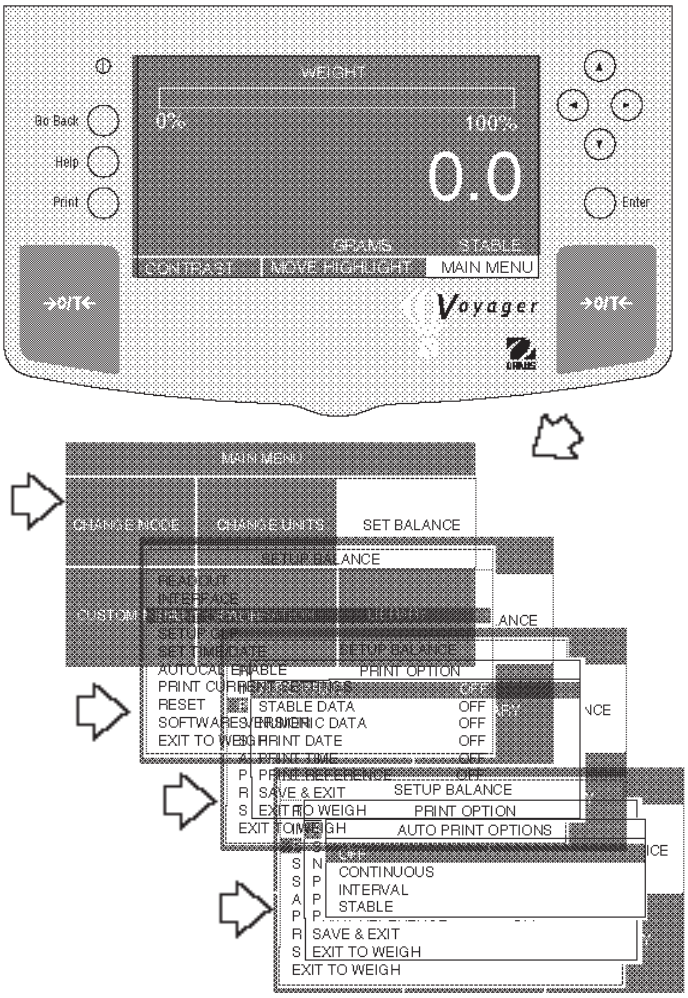
Procedure

- Press ► arrow button to select MAIN MENU, press **Enter** button.
- Using the arrow buttons, select SET BALANCE, press **Enter** button.
- Press ▲ or ▼ arrow button and select INTERFACE, press **Enter** button.
- Press ▲ or ▼ arrow button and select BAUD RATE, press **Enter** button.
- Press ▲ or ▼ arrow button and select either 300, 1200, 2400, 4800, or 9600. (2400 is normal), press **Enter** button.
- Press ▲ or ▼ arrow button and select DATA BITS, press **Enter** button.
- Press ▲ or ▼ arrow button and select 7 or 8, (7 is normal), press **Enter** button.
- Press ▲ or ▼ arrow button and select PARITY, press **Enter** button.
- Press ▲ or ▼ arrow button and select either NONE. EVEN, ODD , 0 or 1, (NONE is normal), press **Enter** button.
- Press ▲ or ▼ arrow button and select STOP BITS, press **Enter** button.
- Press ▲ or ▼ arrow button and select 1 or 2, (2 is normal), press **Enter** button.
- Press ▲ or ▼ arrow button and select SAVE and EXIT, press **Enter** button.



4.3 Print Option

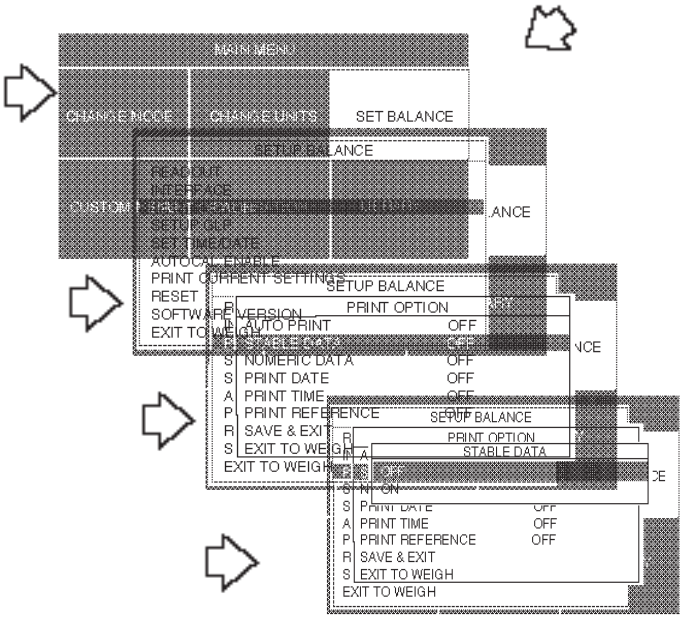
The Print Option menu contains various print features which can be set ON or OFF and include Auto Print, Stable Data only, Numeric Data only, Date, Time and Reference data.



Procedure
Auto Print

When enabled, Auto Print causes the balance to automatically output display data in one of three ways: continuously, at user specified time intervals, or upon stability. Auto print can also be set off.

- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select SET BALANCE,
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select PRINT OPTION.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select AUTO PRINT.
- Press **Enter** button, AUTO PRINT OPTIONS is displayed.
- Press ▲ or ▼ arrow button and select either OFF, CONTINUOUS, INTERVAL or STABLE.
- Press **Enter** button, display returns to PRINT OPTION.

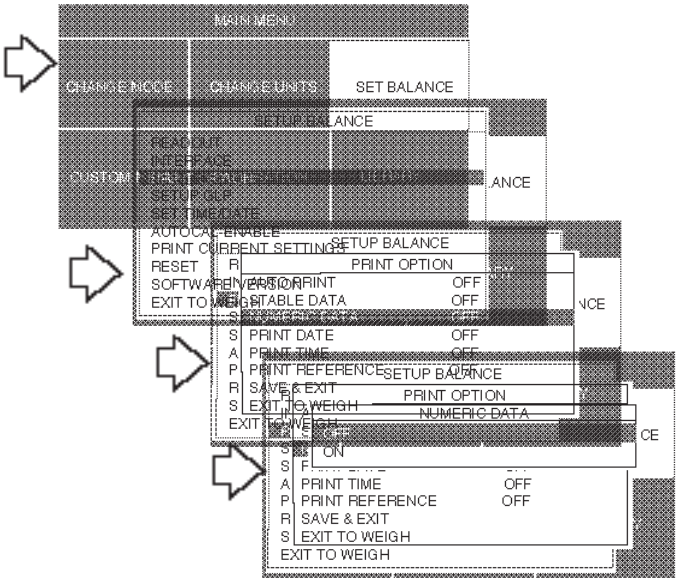


Procedure
Print Stable Data

When selected, permits only stable display data to be output.

- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select SET BALANCE,
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select PRINT OPTION.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select STABLE DATA.
- Press **Enter** button, STABLE DATA is displayed.
- Press ▲ or ▼ arrow button and select either OFF or ON.
- Press **Enter** button, display returns to PRINT OPTION.

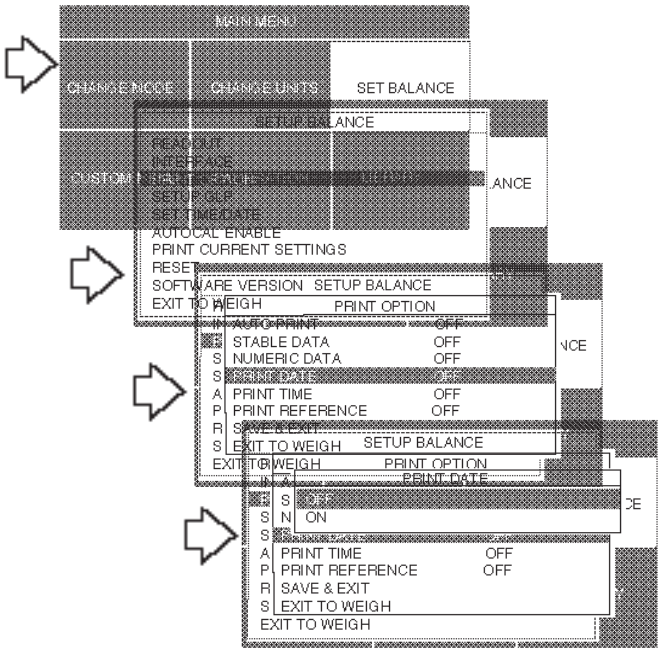
4.3 Print Option (Cont.)



Procedure
Numeric Data

When set ON, only numeric data will be output.

- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select SET BALANCE,
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select PRINT OPTION.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select NUMERIC DATA.
- Press **Enter** button, NUMERIC DATA is displayed.
- Press ▲ or ▼ arrow button and select either OFF or ON.
- Press **Enter** button, display returns to PRINT OPTION.

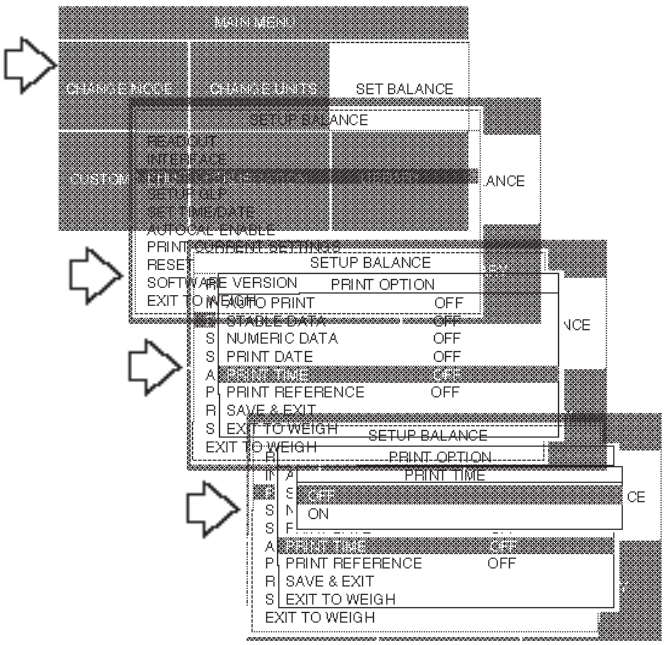


Procedure
Print Date

When the Date function is set ON, allows the balance to output the current date to the printer.

- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select SET BALANCE,
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select PRINT OPTION.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select PRINT DATE.
- Press **Enter** button, PRINT DATE is displayed.
- Press ▲ or ▼ arrow button and select either OFF or ON.
- Press **Enter** button, display returns to PRINT OPTION.

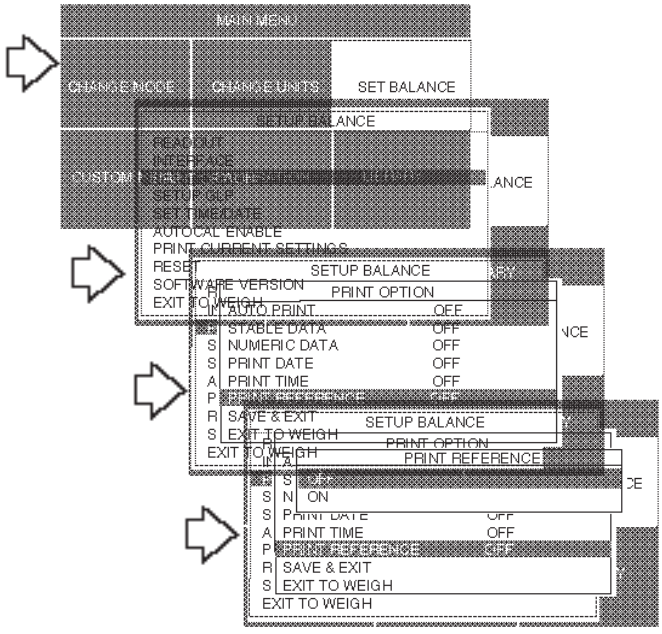
4.3 Print Option (Cont.)



Procedure
Print Time

When Print Time is turned ON, current time will be output to the printer.

- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select SET BALANCE,
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select PRINT OPTION.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select PRINT TIME.
- Press **Enter** button, PRINT TIME is displayed.
- Press ▲ or ▼ arrow button and select either OFF or ON.
- Press **Enter** button, display returns to PRINT OPTION.

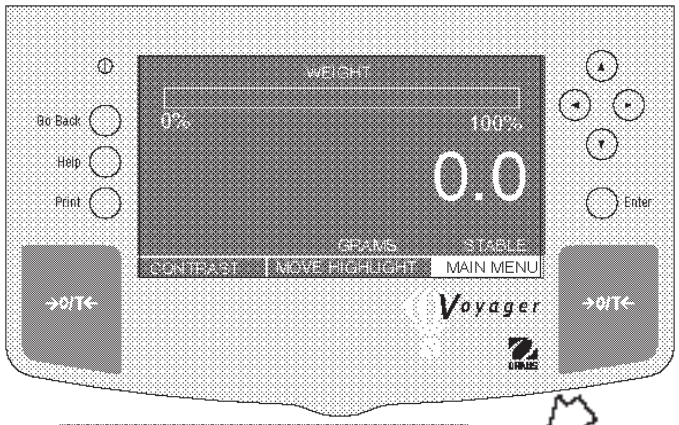


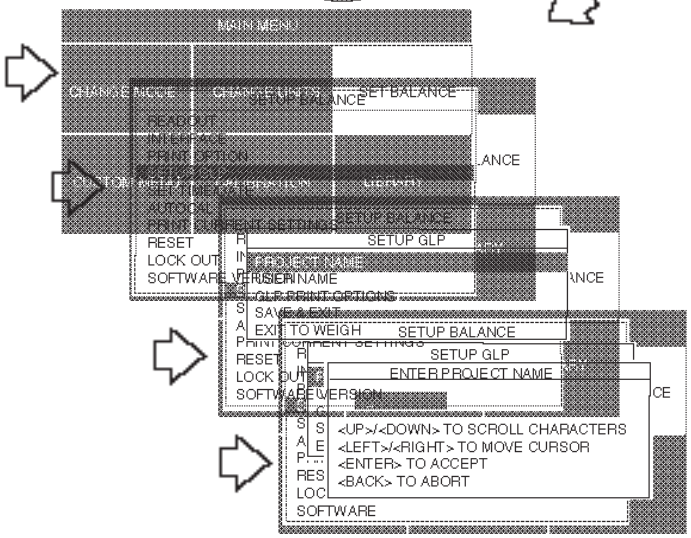
Procedure
Print Reference

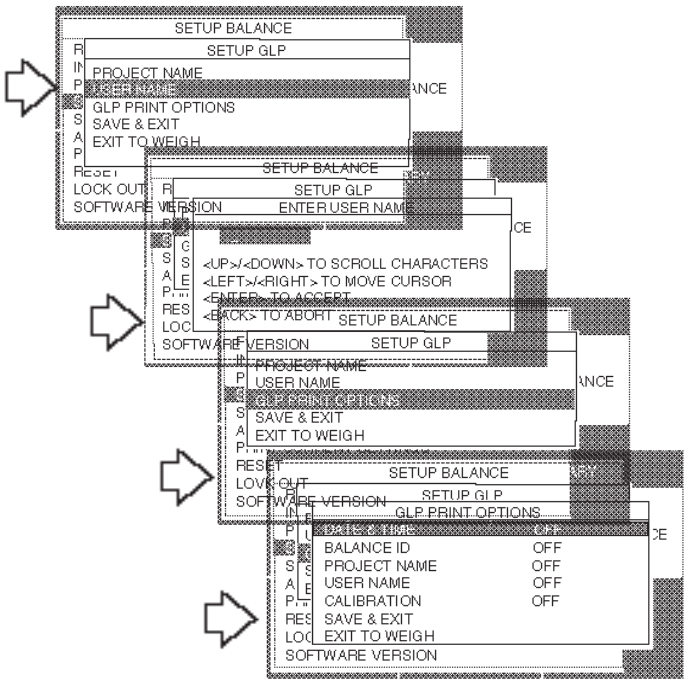
When the Print Reference function is set ON, print the value of weight used as a reference to the printer.

- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select SET BALANCE,
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select PRINT OPTION.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select PRINT DATE.
- Press **Enter** button, PRINT DATE is displayed.
- Press ▲ or ▼ arrow button and select either OFF or ON.
- Press **Enter** button, display returns to PRINT OPTION.
- After making all selections in Print Option, press ▼ arrow button and select SAVE & EXIT.
- Press **Enter** button, display returns to WEIGHT display.

4.4 Setup GLP



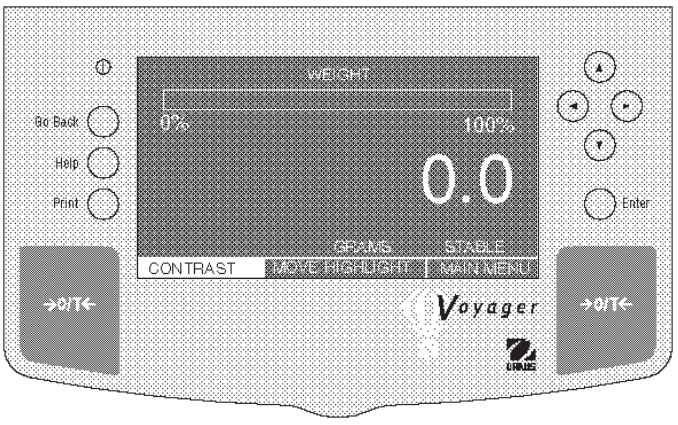




Setup GLP (Good Laboratory Practices) menu allows the selection of Time & Date, Balance Identification Number, Project Name, User Name and Calibration data to be printed. The purpose of this menu is to permit the printing of the above selected items. These items are not displayed. The default setting is off. When an external printer is used, and all items are set ON and the balance is calibrated, the printer will print out calibration data for audit trail purposes and will indicate date, and time. Since there are many displays used in this procedure, not all are shown.

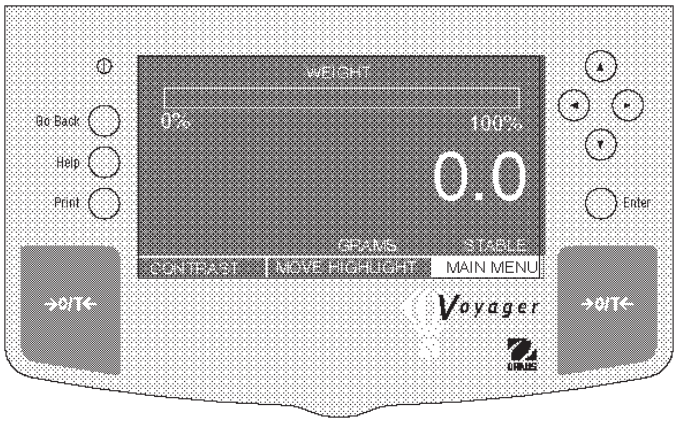
Procedure

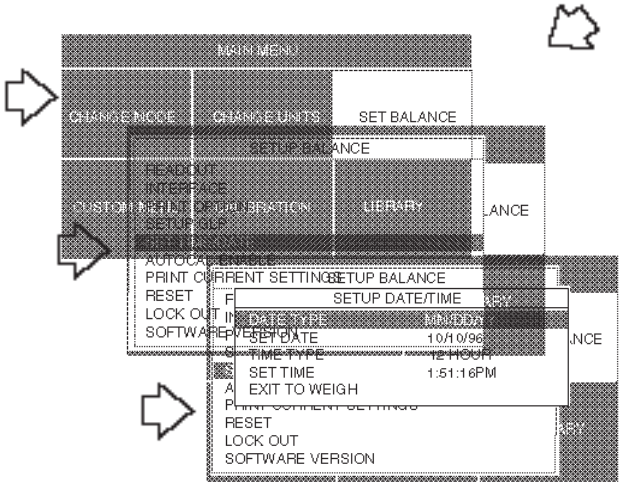
- Press (►) arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select SET BALANCE.
- Press **Enter** button.
- Press (▲) or (▼) arrow button and select SETUP GLP.
- Press **Enter** button.
- Press (▲) or (▼) arrow button and select PROJECT NAME.
- Press **Enter** button.
- Continue in the menu and enter the User Name, GLP Print Options (these are limited to 10 characters each) and then save. The GLP Print Options can be set ON or OFF.
- After making all selections in Setup GLP, press (▼) arrow button and select SAVE & EXIT.
- Press **Enter** button, display returns to WEIGHT display.

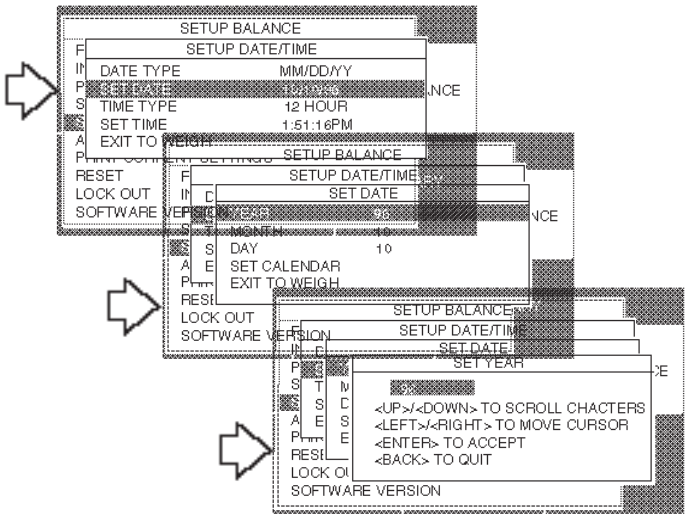


4.5 Set Time/Date

Permits entering time and date into the balance. A battery backup is used for the memory, time and date information. The life of the battery is up to five years. Time and date information appears on printed data and to an external computer when connected to the balance.

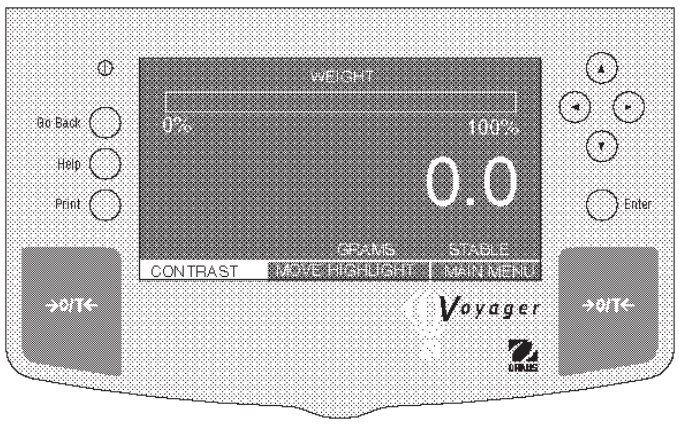






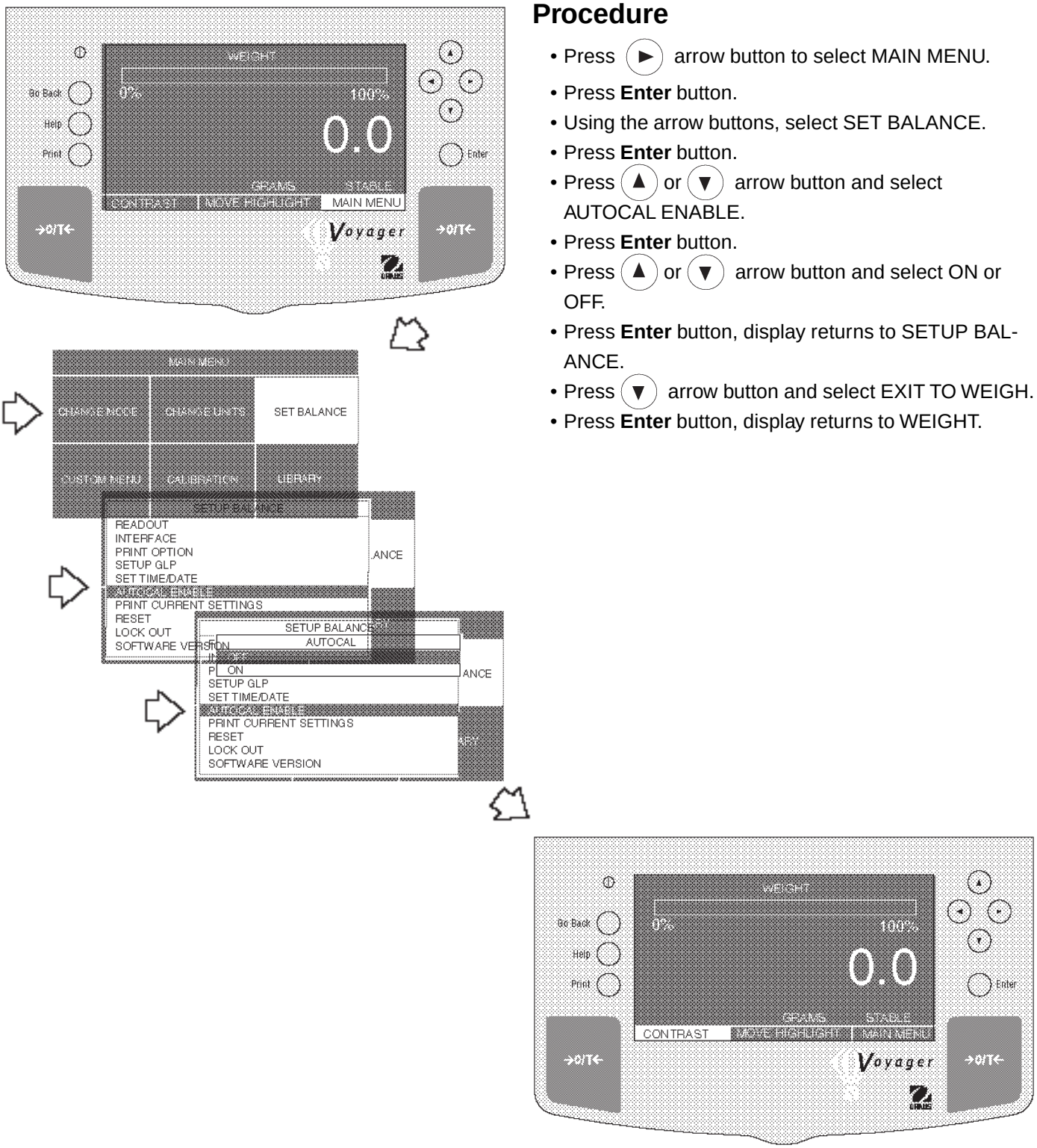
Procedure

- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select SET BALANCE.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select SET TIME/DATE.
- Press **Enter** button, SETUP DATE/TIME is displayed.
- Press ▲ or ▼ arrow button and select DATE TYPE.
- Press **Enter** button, SELECT DATE TYPE is displayed. Six formats are shown.
- Press ▲ or ▼ arrow button and select format for date.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select SET DATE.
- Press **Enter** button, SET DATE is displayed with the YEAR, MONTH, DAY, SET CALENDAR and EXIT TO WEIGH.
- Press ▲ or ▼ arrow button and select YEAR.
- Press **Enter** button, SET YEAR is displayed.
- Using the arrow buttons enter the year.
- Press **Enter** button.
- Repeat the above procedure for the month, day and time. The displays are not shown here.
- When the year, month and day have been entered, scroll to SET CALENDAR and press **Enter** button.



4.6 Auto Calibration

Automatic calibration of the balance can be accomplished when equipped with this option. On balances which do not contain AutoCal™, the automatic calibration function is inoperative. On balances equipped with AutoCal™, a second screen permits turning this function ON or OFF.

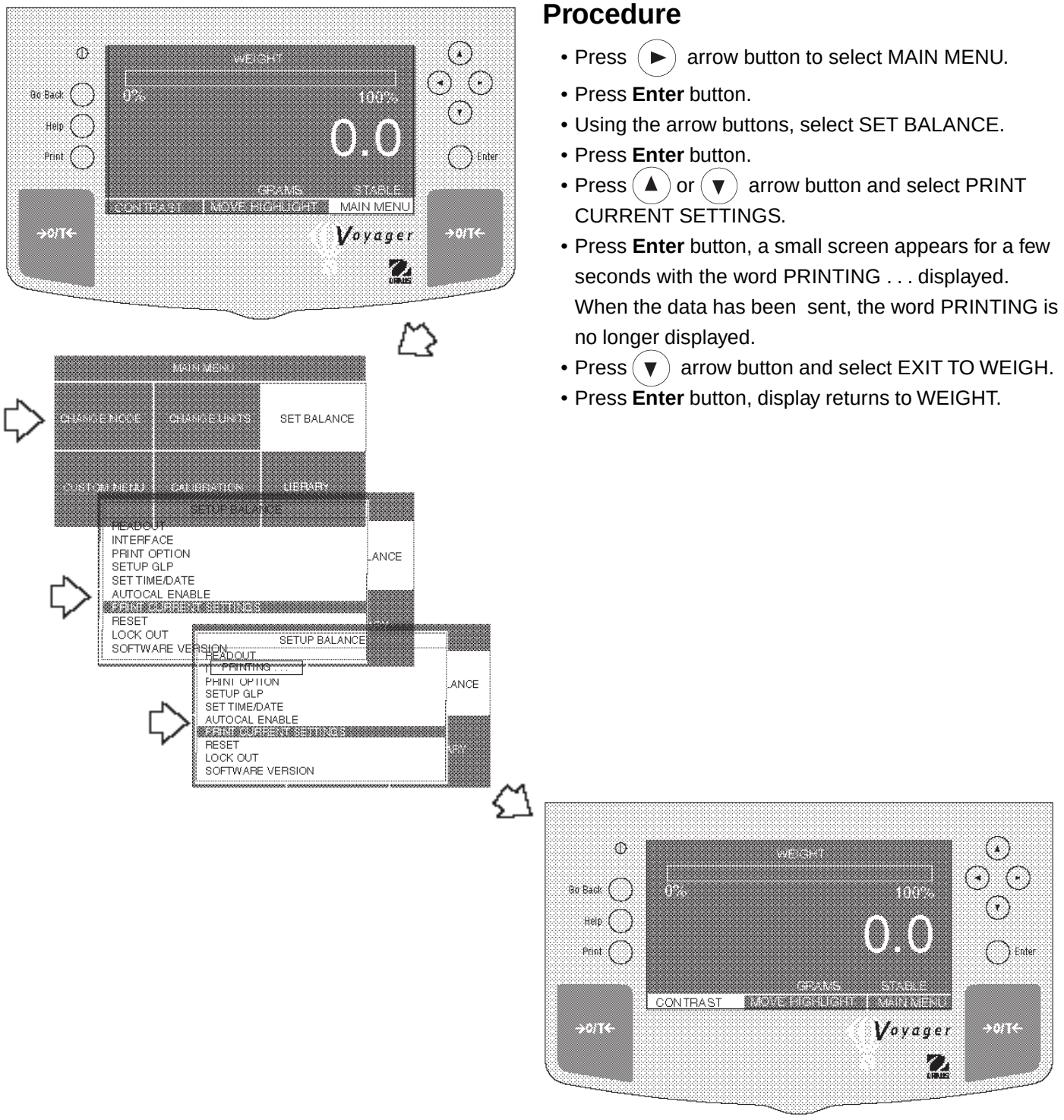


Procedure

- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select SET BALANCE.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select AUTOCAL ENABLE.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select ON or OFF.
- Press **Enter** button, display returns to SETUP BALANCE.
- Press ▼ arrow button and select EXIT TO WEIGH.
- Press **Enter** button, display returns to WEIGHT.

4.7 Print Current Settings

When this function is selected, and the **Enter** button is pressed, all settings which were made in the balance are sent to an external printer or computer. This is a quick method of checking the balance settings.

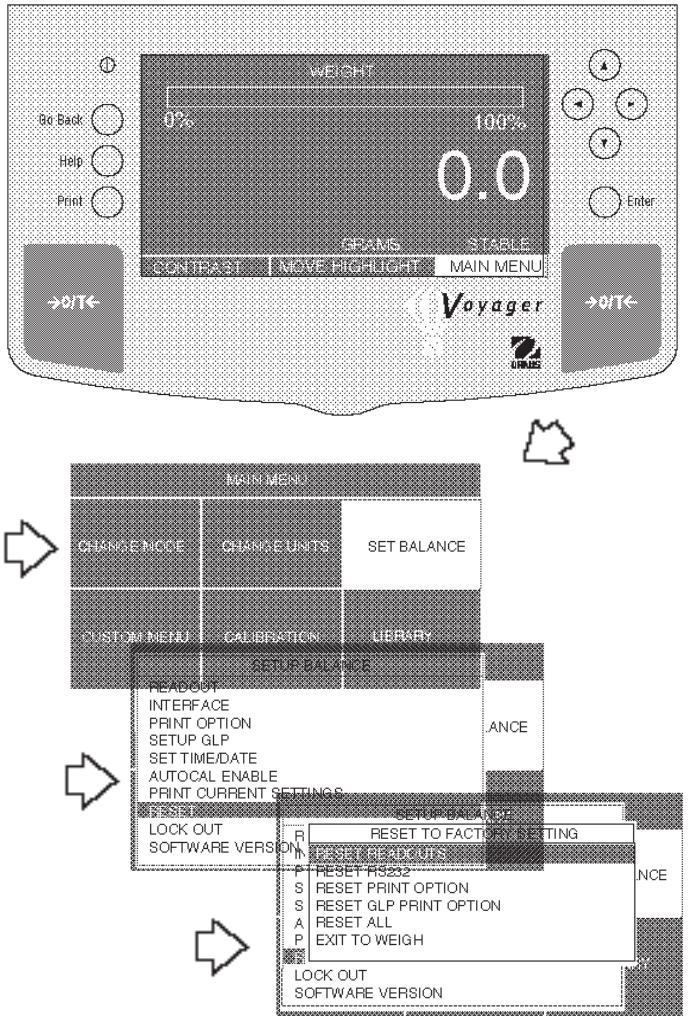


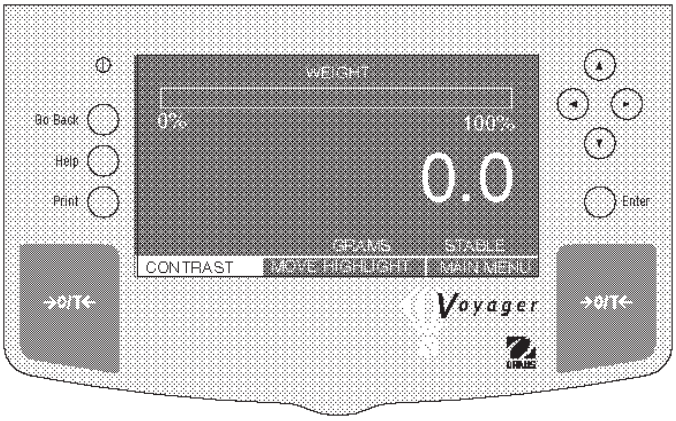
Procedure

- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select SET BALANCE.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select PRINT CURRENT SETTINGS.
- Press **Enter** button, a small screen appears for a few seconds with the word PRINTING . . . displayed. When the data has been sent, the word PRINTING is no longer displayed.
- Press ▼ arrow button and select EXIT TO WEIGH.
- Press **Enter** button, display returns to WEIGHT.

4.8 Reset

When this function is selected, and the **Enter** button is pressed, settings which were made in Readouts, RS232, Print Option and GLP Print Option can be reset to factory settings. See table below for factory settings.





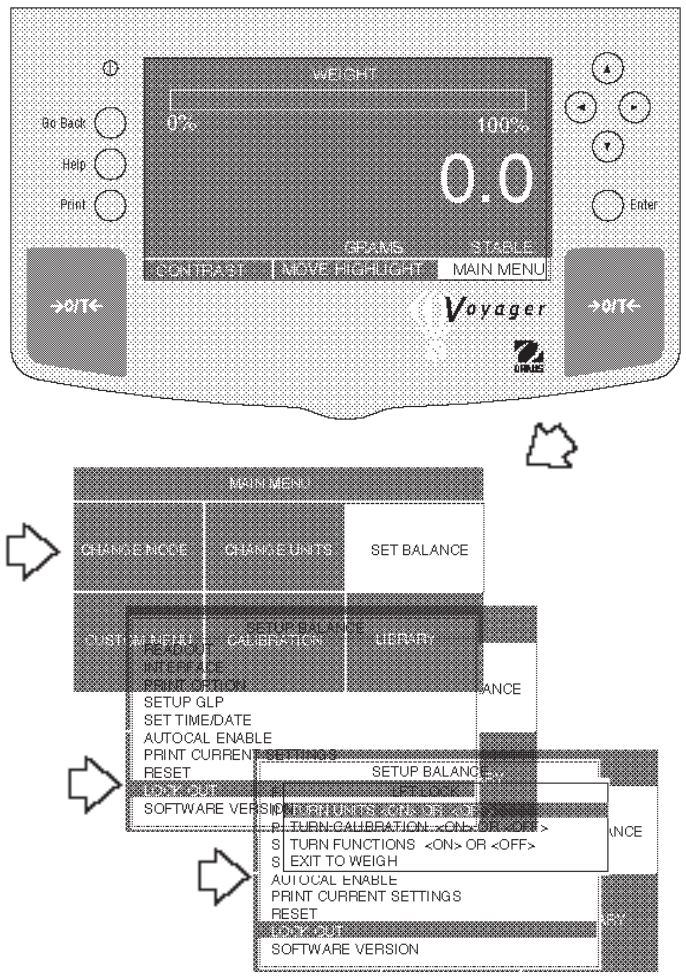
Procedure

- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select SET BALANCE.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select RESET.
- Press **Enter** button, RESET TO FACTORY SETTING is displayed.
- Press ▼ arrow button and select either RESET READOUTS, RESET RS232, RESET PRINT OPTION, RESET GLP PRINT OPTION or RESET ALL. Selecting any of these items will reset that function to the factory setting. RESET ALL when selected, sets all items to factory settings.
- Press **Enter** button, display returns to SETUP BALANCE.
- Press ▼ arrow button and select EXIT TO WEIGH.
- Press **Enter** button, display returns to WEIGHT.

READOUTS FACTORY SETTINGS	
Averaging Level	1
Stability Level	1
Auto Zero	0.5
Legal for Trade	OFF
RS232 FACTORY SETTINGS	
Baud Rate	2400
Data Bits	7
Parity	None
Stop Bits	2
PRINT OPTIONS FACTORY SETTINGS	
Auto Print	OFF
Stable Data	OFF
Numeric Data	OFF
Print Date	OFF
Print Time	OFF
Print Reference	OFF
GLP PRINT OPTIONS FACTORY SETTINGS	
Date & Time	OFF
Balance ID	OFF
Project Name	OFF
User Name	OFF
Calibration	OFF
RESET ALL	
Sets all items shown above to factory settings.	

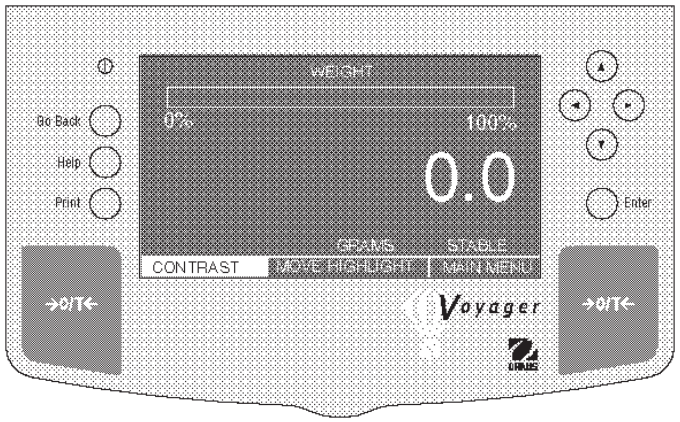
4.9 Lock Out

Lock Out when selected, permits measurement units, calibration methods, and balance functions to be turned on or off. When the balance is set for Legal For Trade operation (LFT ON), and the Lockswitch is set ON underneath the balance and sealed in accordance with paragraph 4.11, all selections made become locked and cannot be changed. Refer to paragraph 4.12 for legal for trade operation and default settings.



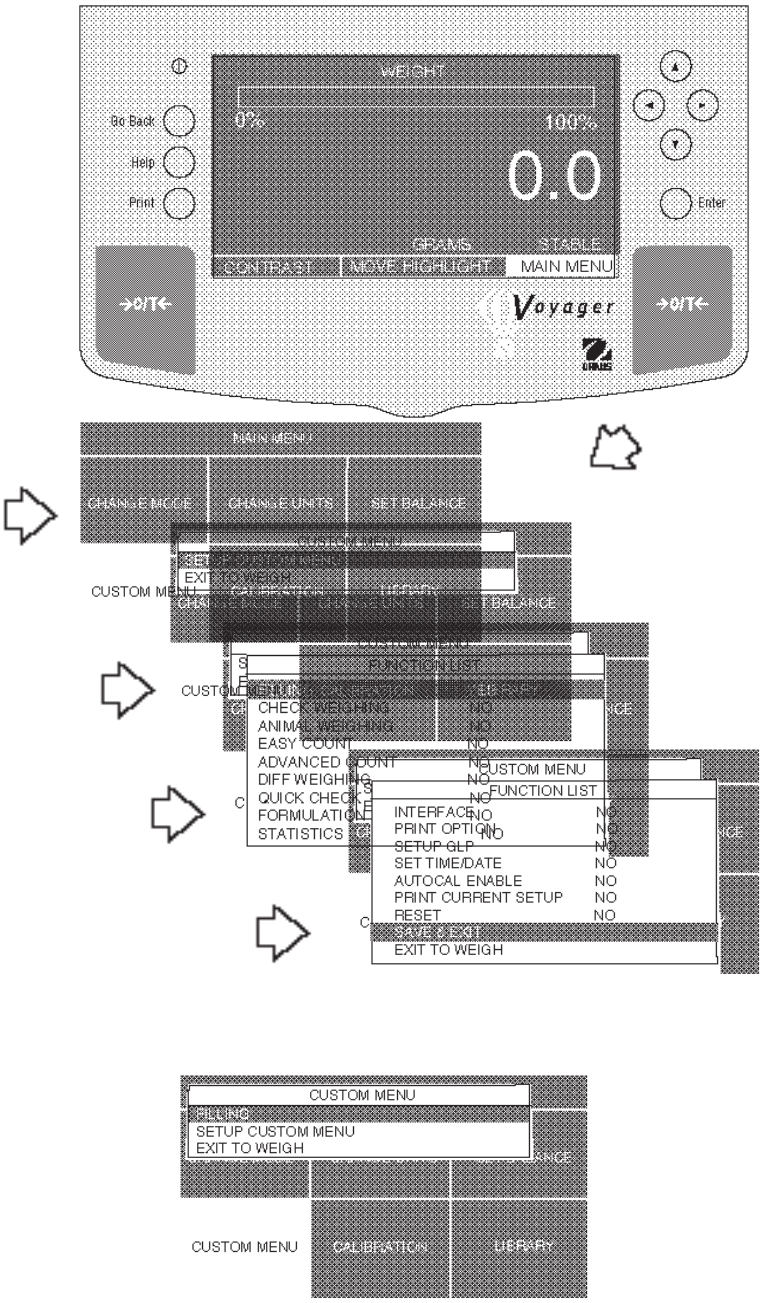
Procedure

- Press ► arrow button to select MAIN MENU, press **Enter** button.
- Using the arrow buttons, select SET BALANCE, press **Enter** button.
- Press ▲ or ▼ arrow button and select LOCK OUT.
- Press **Enter** button, LFT LOCK screen is displayed.
- Press ▼ arrow button and select either TURN UNITS <ON> or <OFF>, TURN CALIBRATION <ON> or <OFF> or TURN FUNCTIONS <ON> or <OFF>.
- Depending on which category was selected, you may select either ON or OFF using the arrow buttons and press **Enter** button.
- When you have finished selecting items to be either ON or OFF, use the arrow buttons and scroll to SAVE & EXIT, press **Enter** button, display returns to WEIGHT.



4.10 Custom Menu

Custom menu provides a convenient way of selecting one or more balance functions. By entering the Custom menu, you can quickly select your most used function and operate the balance. The FUNCTION LIST menu parallels the menus in the CHANGE MODE and SET BALANCE menus and is listed with the associated paragraphs in the manual at the bottom of the page.



Example of Filling Entered into Custom Menu

Procedure

- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select CUSTOM MENU.
- Press **Enter** button, CUSTOM MENU is displayed.
- Press ▲ or ▼ arrow button and select SETUP CUSTOM MENU.
- Press **Enter** button, FUNCTION LIST is displayed. This list contains the various functions available in the balance.
- Press ▲ or ▼ arrow button and select desired functions.
- Press **Enter** button, FUNCTION SELECT with a YES or NO choice is displayed.
  Press ▲ or ▼ arrow button and select either YES or NO, then press the **Enter** button. When YES is selected, that function is available under the Custom menu for operation.
- Repeat the above steps for all functions to be included in the Custom menu.
- When you entered all of the selected functions,using the ▼ arrow button, scroll down to SAVE & EXIT.
- Press **Enter** button. The selections you have made are stored and can be accessed when the Custom menu is selected.

Paragraph References

EASY COUNT -	Paragraph 3.61
ADVANCED COUNTING -	Paragraph 3.62
FILLING -	Paragraph 3.7
ANIMAL WEIGHING -	Paragraph 3.8
CHECK WEIGHING -	Paragraph 3.9
DIFFERENTIAL WEIGHING -	Paragraph 3.10
FORMULATION -	Paragraph 3.11
QUICK CHECK WEIGHING -	Paragraph 3.12
STATISTICS -	Paragraph 3.13
DENSITY -	Paragraph 3.14
READOUT -	Paragraph 4.1
INTERFACE -	Paragraph 4.2
PRINT OPTION -	Paragraph 4.3
SETUP GLP -	Paragraph 4.4
SET TIME/DATE -	Paragraph 4.5
AUTO CALIBRATION -	Paragraph 4.6
PRINT CURRENT SETTINGS-	Paragraph 4.7
LEGAL FOR TRADE (LFT) -	Paragraph 4.12

4.11 Menu Lock-Out Protection

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

Procedure

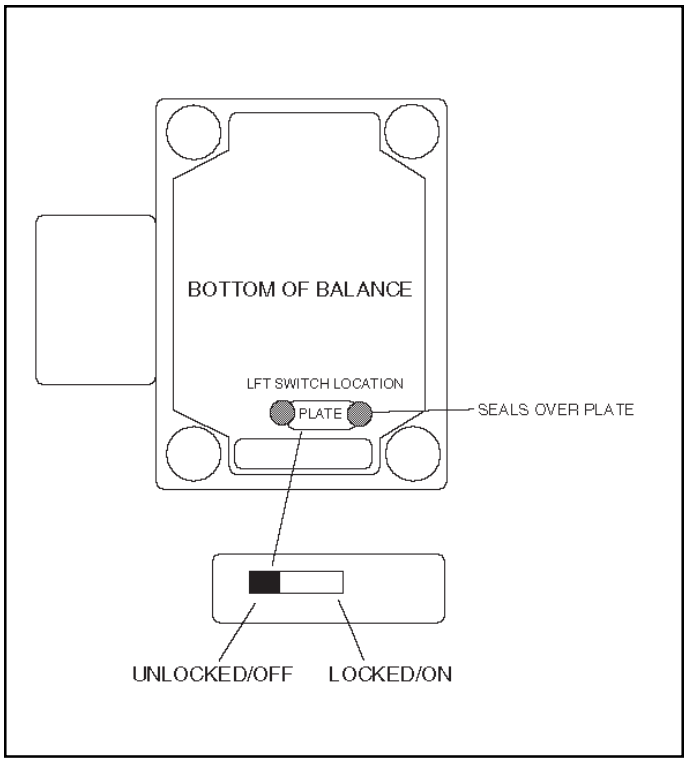
- Turn the display off and unplug the power cord.
- Turn the balance over, make sure the pan does not fall off.
- The Lockswitch can be accessed through the hole nearest the front panel as shown in the illustration below.
- Remove the plastic cover from the hole nearest the front panel.
- Select the desired position on the Lockswitch and reassemble the balance. Use a small screwdriver to reach the switch.
- Replace the plastic cover in the switch access hole.
- Turn the balance over and plug in the power cord.

Type Approved/Legal for Trade Balance Sealing

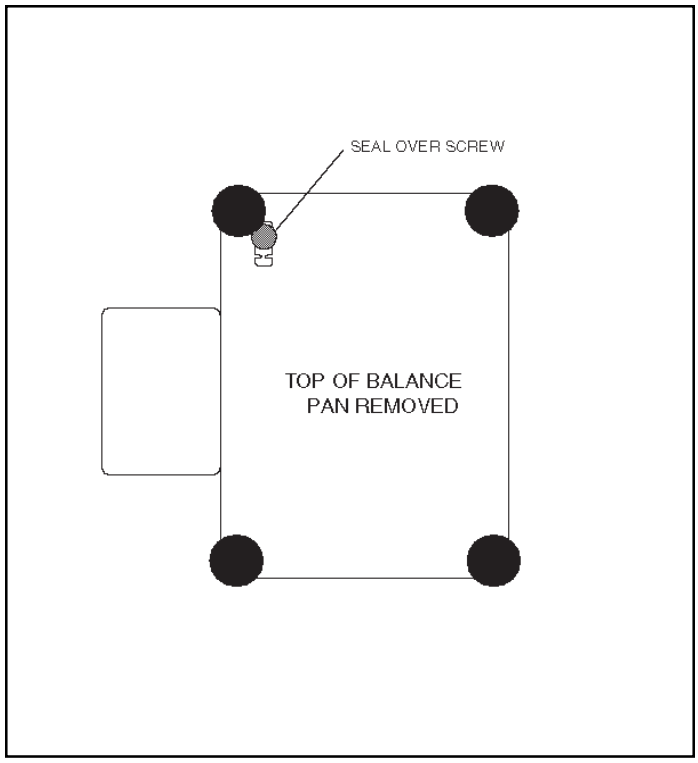
AlL Voyager balances may be sealed for type approved/ legal for trade applications. Type Approved balances are sealed as shown in the figures.

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 seal the balance as shown below.



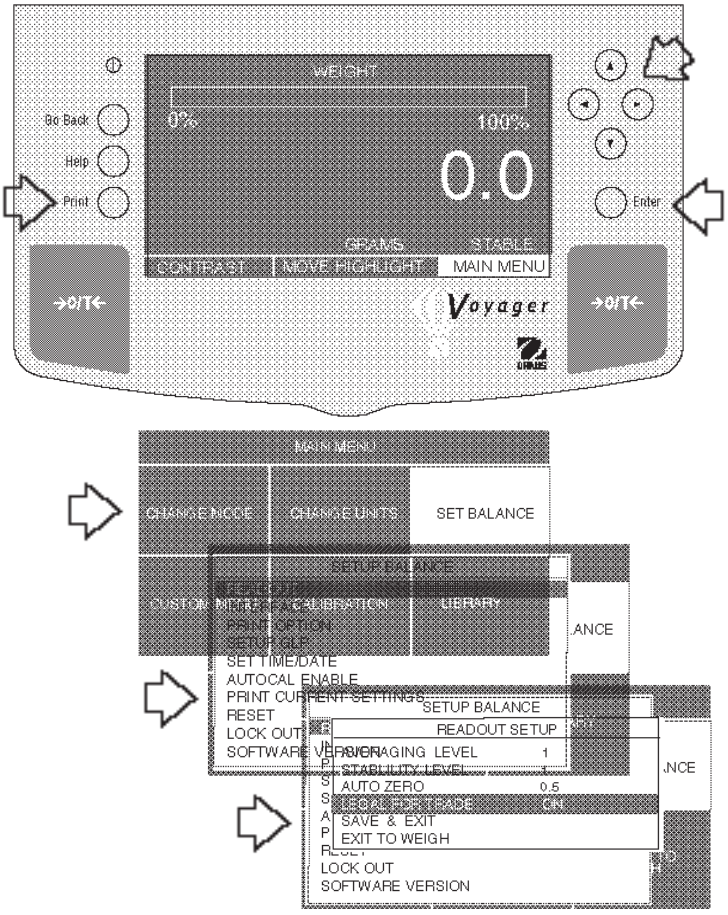
LFT Switch Location and Sealing Method



Top Sealing Location and Method

4.12 Legal for Trade (LFT)

Legal for trade (LFT) is a software controlled option which can be set 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. Default setting is OFF. The Readout menu enables you to set the balance legal for trade (LFT) ON or OFF. See default table.



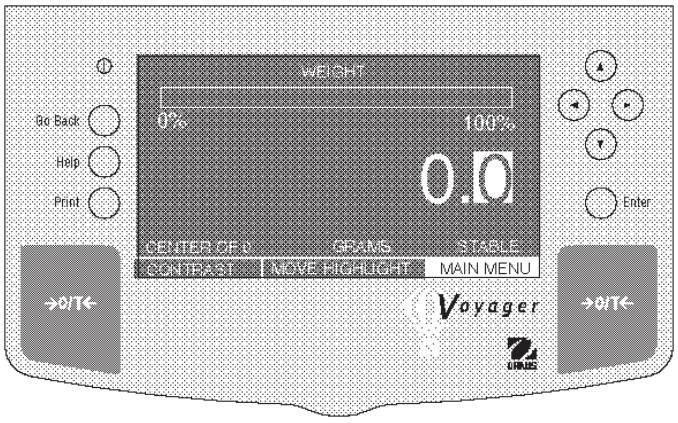
Procedure

- Press ► arrow button to select MAIN MENU.
- Press **Enter** button.
- Using the arrow buttons, select SET BALANCE.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select READ-OUT.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select LEGAL FOR TRADE.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select ON.
- Press **Enter** button.
- Press ▲ or ▼ arrow button and select SAVE & EXIT.
- Press **Enter** button.

NOTE:
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.

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



5. 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.

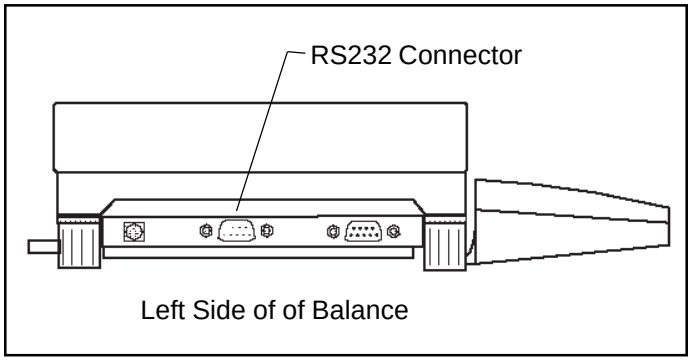
5.1 Troubleshooting

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. Balance not properly calibrated.	Press →0/T← with no weight on the pan, then weigh item. 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. Cable connections.	Verify interface settings in RS232 menu correspond to those of peripheral device. 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 Vibration on table surface.	Check environmental condition. Place balance on a stable surface or change averaging level.
Error message display.	———————	See Error Codes list.

5.2 RS232 Interface

Voyager balances are 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.

Connecting the balance to a computer enables you to operate the balance from the 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



Hardware

On the left side of the balance, the center, 9-pin male subminiature “D” connector is provided for interfacing to other devices. The pinout and pin connections are shown in the adjacent illustration.
The balance will not output any data unless pin 5 (CTS) is held in an ON state (+3 to +15 V dc). Interfaces not utilizing the CTS handshake may tie pin 5 to pin 6 to defeat it.

Output Formats

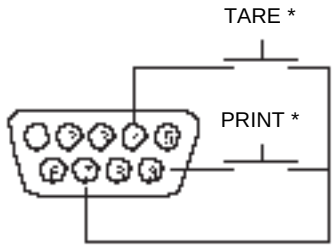
Data output can be initiated in one of three ways: 1) By pressing PRINT; 2) Using the Auto Print feature; 3) Sending a print command (“P”) from a computer.

The output format is illustrated in the RS232 command table which follows.

.

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 regonized 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).



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)

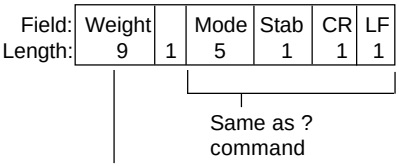
* External PRINT and/or TARE switches may be installed as shown in the diagram. Momentary contact switches must be used.

RS232 COMMAND TABLE

Command Character	Description	
?	Print current mode	Field: Mode | Stab | CR | LF Length: 5 | 1 | 1 | 1 blank if stable “ ? ” if unstable mg, g, kg, dwt, ct, oz, oz t GN, tael, tael, tael, momme, lb N, tical, custm, Pcs, %
nnnnA	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

5.2 RS232 Interface (Cont.)

RS232 COMMAND TABLE (Cont.)

Command Character	Description
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 When "numeric only"data is selected for output in the RS232 menu, the Mode field is not output.  Displayed weight sent right justified w/ lead zero blanking. Nine characters include: decimal point (1) weight (7 max) polarity (1): blank if positive "-" if negative
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.

RS232 COMMAND TABLE (Cont.)

Command Character	Description
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, 0A - 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.

5.3 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.

5.4 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.

5.5 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.

5.6 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

5.7 Accessories

Description	Ohaus Part No.
Calibration Masses - ASTM Class 1 Tolerance:	
1 kg	49016-11
2 kg	49026-11
4 kg	49046-11
In-Use Display Cover Kit	470003-010
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.

5.8 Specifications

Capacity (g)	12,000	22,000	32,0000
Readability (g)	0.1		
Weighing modes	g, lbs, kg, oz , oz t, ct, dwt, taels (3), mommes, gn, ti, N, custom unit		
Functions	Parts counting, differential weighing, quick check, statistics, formulation, filling, animal weighing, percent formulation, 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, help text		
Repeatability (Std. dev.) (g)	0.1		
Linearity (g) (±)	0.4		
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 V ac, 50/60 Hz Plug configuration for US, Euro, UK, Japan & Australia		
Display (in/cm)	0.6/1.5		
Pan size (in/cm)	11 x 1 3/4 x 13/27.9 x 4.4 x 33		
Dimensions (WxHxD) (in/cm)	14 x 5 1/4 x 16/35.5 x 13.3 x 40.6		

NOTE: Not all weighing modes apply depending upon capacity and resolution of the balance.

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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