

DENVER INSTRUMENT COMPANY

AC SERIES

Top Loading Electronic Balances

Operating Instructions

600482.1

SPECIFICATIONS

Denver Instrument AC Series

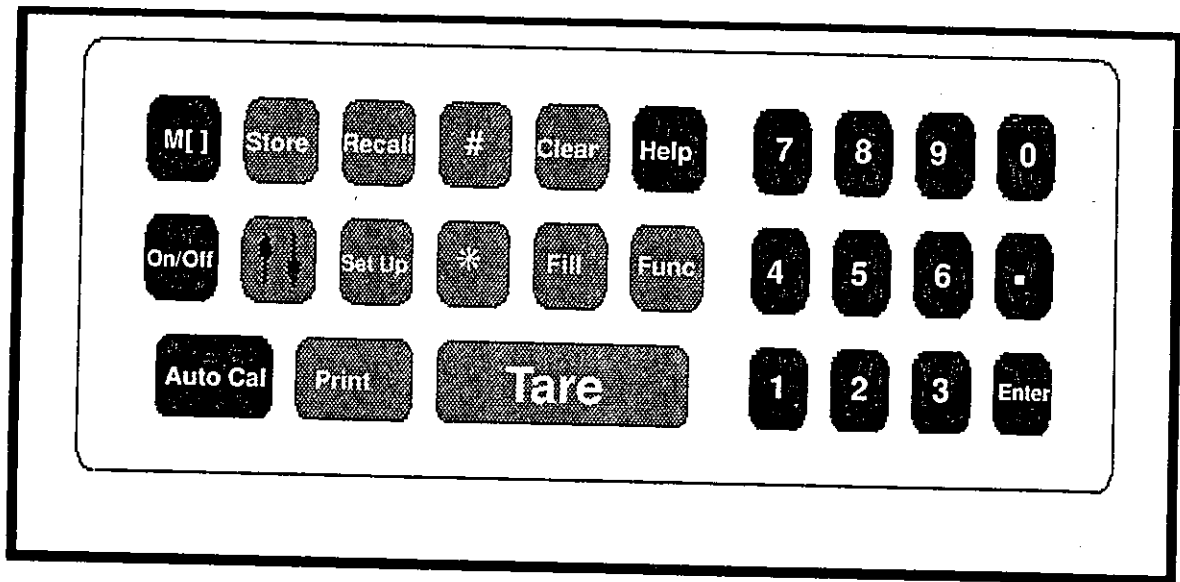
<u>MODEL</u>	<u>CAPACITY</u>	<u>SENSITIVITY</u>	<u>PAN SIZE</u>
ACA-100	100 g	0.0001 g	3 1/4" (8.3cm)
AC-400	400 g	0.001 g	4" (10.2 cm)
AC-800	800 g	0.01 g	5 1/2" (14 cm)
AC-2200	2200 g	0.01 g	5 1/2" (14 cm)
AC-4K	4000 g	0.01 g	8x9" (20x23 cm)
AC-5K	5000 g	0.1 g	8x9" (20x23 cm)
AC-8K	8000 g	0.1 g	8x9" (20x23 cm)
AC-12K	12000 g	0.1 g	8x9" (20x23 cm)
AC-400D	400/100 g	0.01/0.001 g	4" (10.2 cm)
AC-1200D	1200/120 g	0.01/0.001 g	5 1/2" (14 cm)
AC-2KD	2000/200 g	0.01/0.001 g	5 1/2" (14 cm)
AC-4KD	4000/400 g	0.1/0.01 g	8x9" (20x23 cm)
AC-8KD	8000/800 g	0.1/0.01 g	8x9" (20x23 cm)

Common Specifications and Features For All AC Series Models

Electrical Requirements 115/230 vac 50/60 Hz*
 Response Time Variable, 2-5 seconds
 Controls Silicone Rubber Keyboard, 26 Keys plus Tare
 Display, Numeric5" Vacuum Fluorescent, seven segment character
 Display, Message25" Vacuum Fluorescent, 14 segment, 10 characters
 Multiple Functions
 Statistical Analysis
 RS-232 Bi-directional Interface, 5 different formats
 Automatic Calibration
 Counting

* Models **ACA-100** and **AC-2KD** use an external transformer.

AC Keyboard



Function Keypad

Numeric Keypad

Keyboard Description

The keys are used individually and in combination with other keys to perform the various balance operations.

The function keys are used to set your balance parameters or to activate certain balance operations. See the appropriate section of your manual for the necessary key strokes.

The numeric keypad is used to enter data and to recall stored values.

Use the **Help** key to obtain balance information.
(See page 18 for additional directions.)

Use the **Tare** key to zero the display before weighing or to exit any menu during Set Up. (See page 19.)

Auto Cal

All balances are calibrated at the factory prior to shipment. However, you should calibrate your balance before using it for the first time and you should periodically check calibration to ensure accuracy. We recommend that you check the calibration once a week or whenever the balance has been moved or excessive temperature variations have occurred. Use only calibrated weights. Calibrated weights may be purchased from your **Denver Instrument** representative.

The Auto Cal allows you to permanently change the scale factor adjustment without making a potentiometer adjustment or using other equipment. Use only permissible weights for calibration. To view permissible weights for your model, press the **Help** key and then the **Auto Cal** key. The Message Display then shows the permissible weights.

Calibration is **not** possible if the balance is **not** stable. In addition, the balance displays *NO CAL* and does **not** complete calibration if weights being used are out of range or the balance capacity is exceeded.

PROCEDURE

1. Press the **Tare** key.
2. Place calibration weight on pan.
3. When the unstable indicator disappears, press the **Auto Cal** key.
4. When calibration is complete, remove weight.

MESSAGE DISPLAY SHOWS

TARING

CAL

CAL -value-

It is possible to use other standards for calibration when a standard permissible weight is not available. (See Example 3 in Appendix C.)

Using Your Balance For Basic Weighing Applications

If you have properly installed your balance, have allowed adequate warm-up time, and have checked the calibration, you are now able to do any basic weighing application without further adjustments. The factory settings (see page 12) are automatically activated when the balance initially is powered up.

- ✓ Use the **Func** key to advance to one of the pre-set weighing modes - Gram or Ounce.
- ✓ Press the **Tare** key to zero the Numeric Display.
- ✓ Place your sample on the weighing pan and wait for the unstable indicator (*U*) to disappear on the Message Display.
- ✓ Record the results shown on the Numeric Display.
- ✓ Continue by placing another sample on the weighing pan.

Doing a simple weighing task

Help Key

The **Help** key assists you by giving a description of a selected key or function and how it is used. The information scrolls across the Message Display for easy reading.

PROCEDURE

1. Press the **Help** key.
- 2a. Press the key in question.
or
- 2b. While in a function, press the **Help** key for information on how to continue.
A programmed message scrolls across the Message Display.
3. To stop the scrolling Help message, press the **Tare** key. The message stops and the balance returns to normal operation.

Using the Help Key



Tare Key

Press the **Tare** key during a weighing operation to zero the balance. Tare (zero) the balance before beginning any weighing operation.

Using the Tare Key

Press the **Tare** key during a Set Up procedure to exit that operation.

Taring (Zeroing)

Balances have tare capabilities up to their total weight capacity. (Check your balance capacity with the specifications for your model on page 2.)

If you Tare the balance while it is unstable, the Displays show



until the balance becomes stable. To weigh a sample in its container with the Numeric Display showing the actual weight of the sample, use the following Tare Procedure:

PROCEDURE

1. Place sample container on pan, wait for the unstable indicator (U) to disappear, and then press the **Tare** key.
2. Now place sample in its container on the pan.
3. When the balance is stable, the Numeric Display shows the weight of the sample.

(See Example 2a in Appendix C.)

Read all instructions prior to operating your balance! Remember, this is a precision weighing instrument and should be handled with care.

NOTICE

Strict compliance with all warranty stipulations must be maintained or warranty service will be voided. Repair or internal adjustments performed by unauthorized personnel may cause serious damage and will void the warranty.

For your reference and protection, record:

Model Number _____

Serial Number _____

Purchase Date _____



TABLE OF CONTENTS

<p>Introduction 1</p> <p>Specifications 2</p> <p>Preparation 4</p> <p>Installation 5</p> <p>General Information</p> <p style="padding-left: 20px;">Dual Display 7</p> <p style="padding-left: 20px;">Unstable Indicator 9</p> <p style="padding-left: 20px;">Beeper 9</p> <p style="padding-left: 20px;">Keyboard 10</p> <p style="padding-left: 20px;">Factory Settings 12</p> <p style="padding-left: 20px;">Dual Range Models 13</p> <p>Operating Your Balance 15</p> <p style="padding-left: 20px;">Automatic Calibration 16</p> <p style="padding-left: 20px;">Basic Weighing 17</p> <p style="padding-left: 20px;">Using The Help Key 18</p> <p style="padding-left: 20px;">Using The Tare Key 19</p> <p style="padding-left: 20px;">Taring The Balance 19</p> <p style="padding-left: 20px;">Changing The Weigh Modes 20</p> <p style="padding-left: 20px;">Counting 22</p> <p style="padding-left: 20px;">Percent Calculation 23</p> <p>Balance Configuration 25</p> <p style="padding-left: 20px;">Set Up-Display 26</p> <p style="padding-left: 40px;">(Default Values, Filter, Auto-Zero, Beeper, Range)</p> <p style="padding-left: 20px;">Set Up (Print Menu) 33</p> <p style="padding-left: 40px;">(Print, Baud, Format, Zero Print, Parity, Interval)</p>	<p>Current Values 44</p> <p>Balance Identification Number 45</p> <p>Statistical Analysis 47</p> <p style="padding-left: 20px;">Storing Values 50</p> <p style="padding-left: 20px;">Recalling Values 51</p> <p style="padding-left: 20px;">Sample Value Recall 52</p> <p>Fill Guide 53</p> <p style="padding-left: 20px;">Setting Low and High Limits 54</p> <p style="padding-left: 20px;">Setting Target Weight and Tolerance Level 56</p> <p style="padding-left: 20px;">Setting Bar Graph Indicators 58</p> <p>Multiple Tare Values 60</p> <p style="padding-left: 20px;">Storing Tare Values 61</p> <p style="padding-left: 20px;">Recalling Stored Tare Values 62</p> <p>Math Function 63</p> <p>Keyboard Lock 65</p> <p>Displays On/Off 65</p> <p>Interface Applications 67</p> <p>I/O Commands 71</p> <p>Appendices</p> <p style="padding-left: 20px;">Appendix A (List of Balance Options) A-1</p> <p style="padding-left: 20px;">Appendix B (Trouble Shooting) B-1</p> <p style="padding-left: 20px;">Appendix C (Examples) C-1</p> <p style="padding-left: 20px;">Appendix D (Glossary Of Terms) D-1</p> <p style="padding-left: 20px;">Appendix E (Initialization and Linearity Correction) E-1</p> <p style="padding-left: 20px;">Appendix F (AC Warranty) F-1</p>
--	--

Congratulations on choosing a **Denver Instrument AC Balance**. Your **AC Balance** is a precision unit designed and engineered to the most rigorous standards in order to give you years of weighing service.

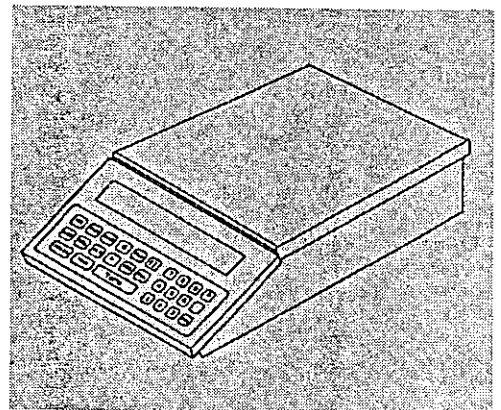
- ✓ First, check the contents of the shipping carton. You should find the following:

- AC Manual
- AC Balance
- Weighing Pan
- Power Cord
- (Power Transformer for AC-2K and ACA-100)

- ✓ Next, follow the instructions for installing your balance. (See pages 4 - 5.)

- ✓ Now you're ready to begin using your **AC Balance**. To take advantage of its many features, carefully read your operating manual. It contains step-by-step procedures, examples, and other vital information.

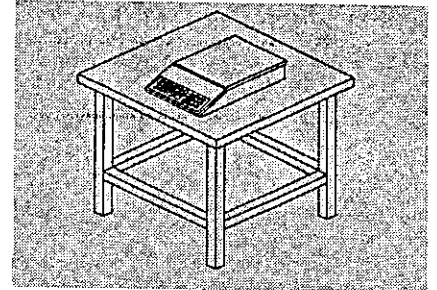
- ✓ Finally, remember to return your completed warranty card within ten days and to record all purchase information in the space provided inside the front cover of your manual.



PREPARATION

Select a suitable work area.

- ✓ Work area should be relatively free from drafts and vibrations.
- ✓ Work surface should be level and rigid.
- ✓ Line voltage to the balance should be reasonably constant and free from fluctuations. It is **not** advisable to use an outlet that is shared with fluorescent fixtures or other electrical equipment that draws voltage in an inconsistent manner.
- ✓ Do **not** locate near magnetic materials or equipment/instruments which use magnets in their design.
- ✓ Avoid areas which have variations in room temperatures or have excessive room temperatures. Room temperatures above 105°F/40°C or below 60°F/15°C could affect balance operation and accuracy.



Choose your work site carefully to obtain the best weighing results.

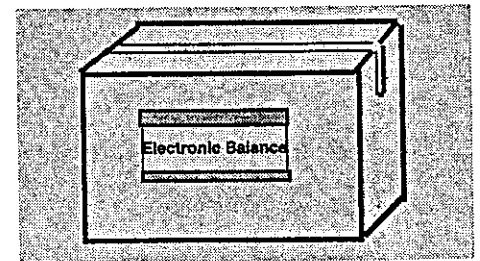


INSTALLATION

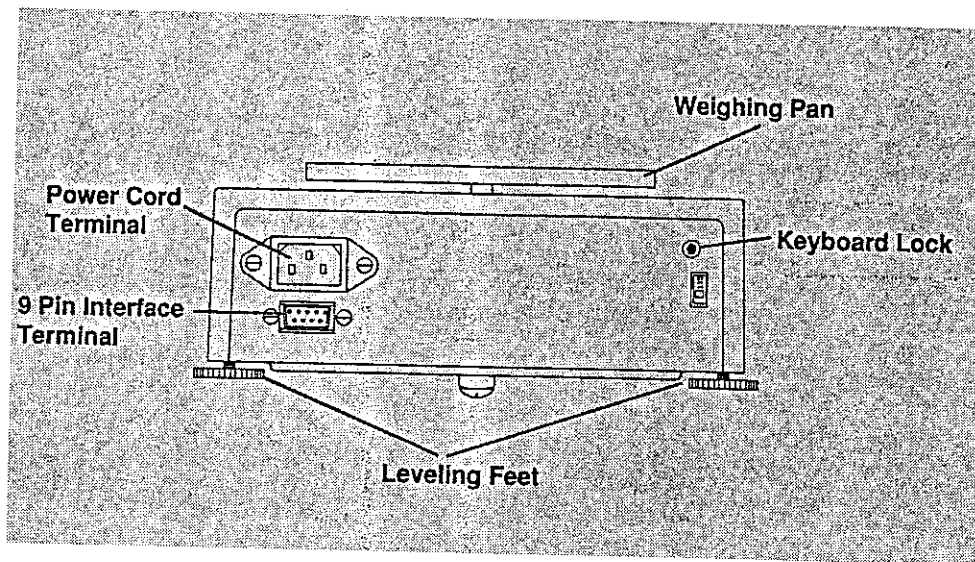
Set up your balance by following these steps:

(See illustration on page 6.)

- ✓ Remove balance and all accessories from the carton. There are no internal packing or tie downs inside the balance.
- ✓ Level the balance by using the level bubble and the leveling feet located underneath the base.
- ✓ Place the weighing pan on the balance.
- ✓ Insert power cord into the receptacle located on the rear panel of the unit. Firmly push in the plug. (Models AC-2KD and ACA-100 use a power transformer.)
- ✓ Balance model designation is displayed during start-up message.
- ✓ Allow a 60 minute warm up period.
- ✓ Do not unplug your balance. Denver Instrument Electronic Balances are designed to be continuously plugged in with power supplied to the unit at all times.
- ✓ When the unit is not in use, press the **On/Off** key to turn the displays OFF.



This is a precision electronic instrument. Handle with care to ensure years of trouble-free use.



Follow instructions on page 5 for properly installing your AC Balance.



GENERAL INFORMATION

Dual Display

Your balance features two displays (a Numeric Display and a Message Display) to give you complete weighing information.

Numeric Display

The Numeric Display continuously shows your weighing results.

The number of decimal places displayed depends on the balance model and the selected weigh mode.

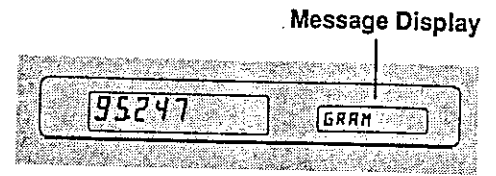
Numeric Display



Message Display

The Message Display combines text and numerals to clearly provide other weighing information. While a weigh mode is being used, the Message Display (in most operations) continues to show that mode. The Message Display shows text prompts during the following applications:

- Help Key Information
- Set Up Menus
- Fill Guide Settings
- Fill Guide Use

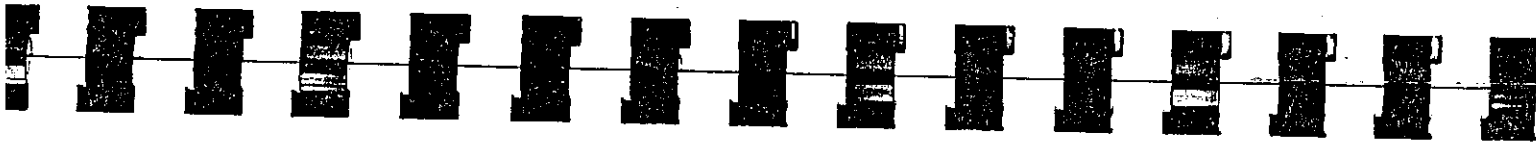


The Message Display shows numerals during the following applications:

- Fill Guide Values
- Statistical Analysis Calculations
- Multiple Tare Values
- Math Function Values

When you set the Fill Guide for use with bar indicators, the Message Display shows the Bar Graph when you turn ON the Fill Guide.

The Message Display shows the Unstable Indicator (*U*) when the balance is not stable.



Unstable Indicator

Always make sure your balance is stable before and after each step of your weighing operation.

The letter *U* appears on the far right side of the Message Display whenever the balance is not stable. It disappears when the balance becomes stable.



Unstable Indicator

Beeper

An audible Beep is emitted whenever a function is activated. This signal ensures you that the key you pressed is working. If you press a key and a BEEP is not heard, press the key again until the BEEP is heard. However, some keys are disabled in some functions and therefore will not BEEP.

To turn the BEEPER OFF or adjust its length, see the **Set Up-Display** Section.

Factory Settings

Your balance is pre-set at the factory to correspond to the most common user requirements. Listed below are the factory settings that are activated when the balance initially is turned on.

<u>Options</u>	<u>Setting</u>
Weigh Mode	Gram On Ounce On
Deviation Formula	Standard Deviation
Filter	Filter Normal
Auto-Zero	Auto- Zero On
Beeper	Beeper Short
Range	Automatic Range
Print	Single
Baud	Baud 300
Print Format	Type 1
Zero Print	Zero Print On
Parity	Parity Off
Interval	No Interval

Additional settings are listed in the **Weigh Mode** and **Set Up** sections of this manual. You can easily change the factory settings to any of these options by following the procedure outlined in that section. For a complete list of all the settings available on your **AC Balance**, see **Appendix A**.

Dual Range

Five **AC** Models are designed as dual range balances:

AC-400D

AC-1200D

AC-2KD


AC-4KD

AC-8KD

These models provide a fine range to increase readability by a factor of 10. In the Set Up Menu (See page 26), you can program the dual range models for Automatic Range Change or Manual Range Change.

AUTO R (Automatic Range) allows the balance to change from fine range to coarse range when the fine range is exceeded.

MANUAL R (Manual Range) keeps the balance in the fine range.

Press the  key to change range. However, when changing to the fine range, make sure the weighing pan is empty and the samples to be weighed do not exceed the fine range capacity.

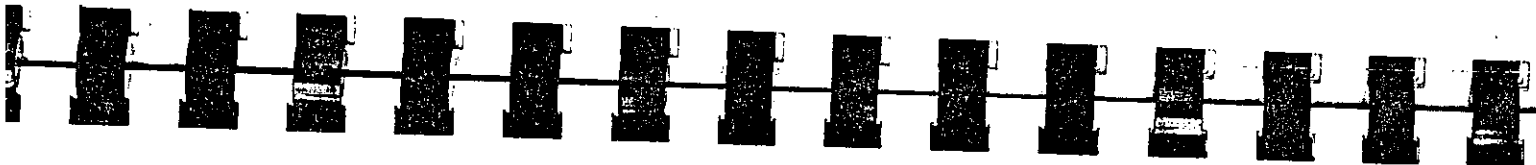
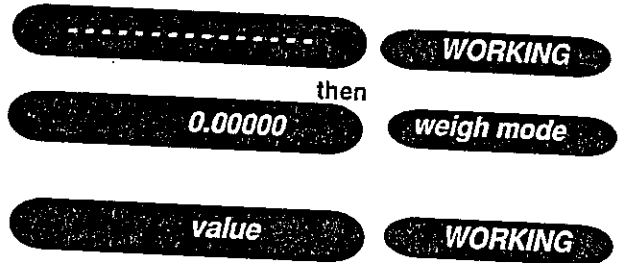
Dual Range cont.

The position of the decimal point on the Numeric Display identifies the weighing range. One decimal place is added when weighing in the fine range.

When your balance is changing range, the displays show when the balance is unstable

or

when the balance is stable.



OPERATING YOUR AC BALANCE

Automatic Calibration.....16
 Basic Weighing.....17
 Using The Help Key.....18
 Using The Tare Key.....19

Taring the Balance..... 19
 Changing Weigh Modes..... 20
 Counting..... 22
 Percent Calculation..... 23