Cole-Parmer®
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MB-200-40 Moisture Analyzer

(P.N. 3076611320, Revision B, July 2022)

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1.0 CONTENTS

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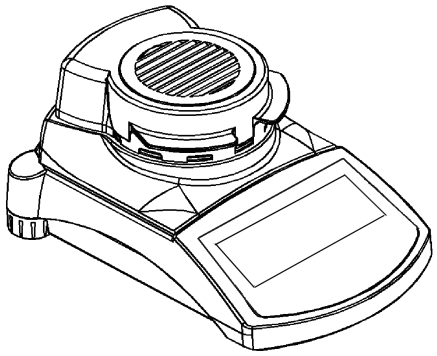
2.0 INTRODUCTION

This Instruction Manual will familiarize you with the installation, accessories, trouble-shooting, after sales service information, general maintenance of the analyzer, etc. and will guide you through the various applications.
Please read this Manual thoroughly before starting the operation. If you need any clarifications, feel free to contact your supplier.

PRODUCT OVERVIEW



FEATURES:

- Large easy to read LCD display with backlight
- Bi-directional RS-232 interface
- Can be configured to print a GLP-compliant report after each calibration to include the time, date, analyzer number and a verification of the calibration
- 400 watt Halogen Heater
- Date and time
- Easy to use, sealed keypad
- Password protection
- Security locking point
- Multiple languages for display and printing

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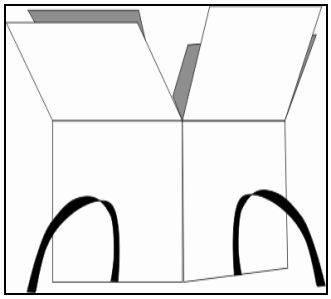
3.0 SET UP

3.1 UNPACKING AND SETTING UP YOUR ANALYZER

Remove the balance from the packing by carefully lifting it out of the box. Inside the box you will find everything needed to start using the analyzer-



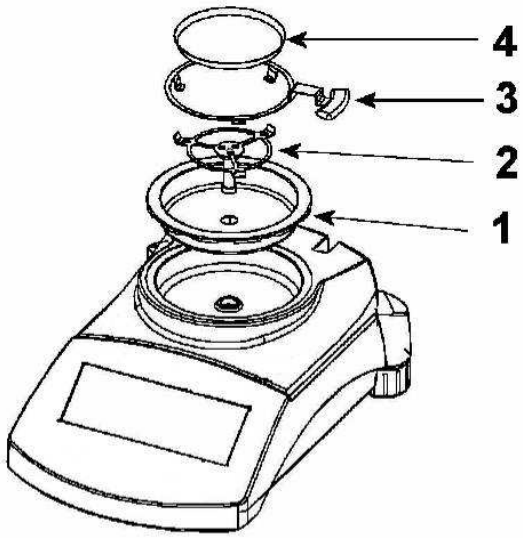
- ✓ AC power cable
- ✓ Pan Support
- ✓ Stainless Steel Lower Chamber Insert
- ✓ Sample Pan Lifter
- ✓ Sample Pans (Qty 10)
- ✓ Spare Fuse 5A, Time Lag, High capacity
- ✓ This User Manual

IMPORTANT:
Before applying power make sure the balance is configured for the power in your area. The analyzer will have a label on the rear panel showing the voltage required: 115VAC (±10%) or 230VAC (±10%). If the label does not match your power do not attempt to use the analyzer, damage to the balance could result.

The balance should be positioned to allow easy access to the power connection on the rear panel. Ensure the power cable is fully engaged to ensure safe operation.

3.2 ASSEMBLING THE ANALYZER

For best performance, let the analyzer warm up for 30 minutes before using.



- Locate the balance on a solid surface, free from vibration with good ventilation around it.
- Place the lower reflector (1) into the base of the weighing chamber
- Gently place the pan support (2) into the access hole. Rotate to position.
- Place the sample pan lifter (3) into the weighing chamber, rotate so the tangs on the lifter do not interfere with the pan supports and the handle exits the chamber using one of the gaps in the cover.
- Place an empty aluminium weighing tray (4) on the pan support
- Level the balance using the adjustable feet and spirit level

For some applications it is desirable to run the analyzer in a dummy run to warm up the weighing chamber and the surrounding area before doing the actual test. See section 14 for other ideas to help ensure accurate test results.

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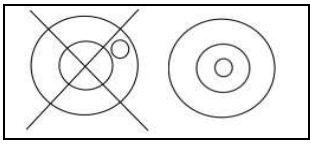
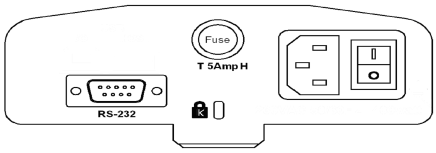
3.3 LEVELING THE ANALYZER

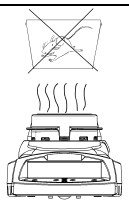
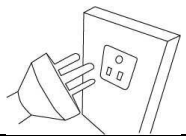
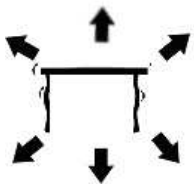
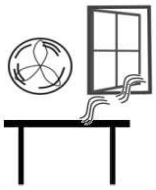
	After placing the balance in a suitable location, level it by using the spirit level on the rear of the analyzer. To level the balance turn the two adjustable feet at the rear of the analyzer until the bubble in the spirit level is centered.

3.4 WARM-UP TIME

	Attach the power supply cable to the connector on the rear of the analyzer. The master power switch is on the rear panel, next to the power cable. Turn the power on. The display will indicate the serial number and the software revision number followed by the capacity. Next the analyzer will run a self-test by displaying all segments. The display will then show zero weight accompanied by the **→0←** symbol.
Before you start weighing, wait for the analyzer to achieve a stable internal temperature. In addition it may be necessary for some material test to preheat the weighing chamber so that the delay to reach operating temperature is minimized.	
	A stable sign **~** is shown when the balance is in stable condition. It will turn off if the reading is not stable. Exact zero is shown when the **"→0←"** symbol is on to the left of the display area.

3.5 LOCATING AND PROTECTING YOUR ANALYZER

In order to keep your analyzer functioning at its best we suggest that you do the following:

	Avoid extremes of temperature. Do not place in direct sunlight or near air conditioning vents.
	Make sure there are no heat sensitive or flammable materials above the analyzer. The exhaust from the weighing chamber can be very hot.
	Make sure the analyzer is located on a strong table and free from vibration.
	Avoid unstable power sources. Do not use near large users of electricity such as welding equipment or large motors.
	Keep free from vibration. Do not place near heavy or vibrating machinery.
	Avoid high humidity that might cause condensation. Keep away from direct contact with water. Do not spray or immerse the analyzers in water.
	Do not place near open windows, air-conditioning vents or fans that may cause a draft and unstable readings.

Keep the analyzer clean. Clean up spills in the weighing chamber before they become baked on.

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3.6 SAFETY

This Moisture Analyzer complies with the European Council Directives and international standards for electromagnetic compatibility, and safety requirements.

Improper use or handling can result in damage or injury.

To prevent damage to the equipment, read these operating instructions thoroughly. Keep these instructions in a safe place.

For safe and dependable operation please follow these instructions.

- The Moisture Analyzer is used for determination of the moisture in samples. Do not use it for any other purpose. Improper use is dangerous and can cause injury or damage to other property.

- The Moisture Analyzer must be operated as described in this manual. The environment must be controlled so that hazardous materials or conditions are not present.

- The Moisture Analyzer must be operated only by trained personnel who are familiar with the properties of the samples used and with the operation of the instrument. Do not leave the analyzer unattended when running a test.

- Make sure before getting started that the voltage printed on the rear panel is identical to your local voltage.

- Your Moisture Analyzer is supplied with a 3-pin power cable with a grounding conductor. Use cables that meet the safety standards for your location and include the earth ground conductor.

- DO NOT disconnect the earth ground connection.

- The power cable should not touch the enclosure where it can be heated during the test.

- Remove the power cable if the Moisture Analyzer is serviced.

- Protect the Moisture Analyzer from external liquids. Clean any spills immediately.

- If there is any visible damage to the Moisture Analyzer or the power cable, stop using the instrument immediately. Unplug the power and isolate the analyzer. Do not use until the faults have been repaired.

- All repairs must be done by a trained technician. There are no user serviceable parts in the enclosure.

HOT SURFACES

- During test the cover of the heating chamber can become very hot, especially near the top vent. Keep all material away from the vent area. Do not touch hot surfaces.

- Leave 20 cm (about 8 inches) around the moisture analyzer and 1 m (3 ft.) above.

- Samples will be hot after a test. Do not use bare fingers to pick up any samples pans or touch the materials. The internal surfaces of the weighing chamber may be hot for some time after a test.

MATERIALS

- The Moisture Analyzer is not suitable for all materials. During the drying process samples will be heated to high temperatures. Materials that are flammable or explosive should not be tested.

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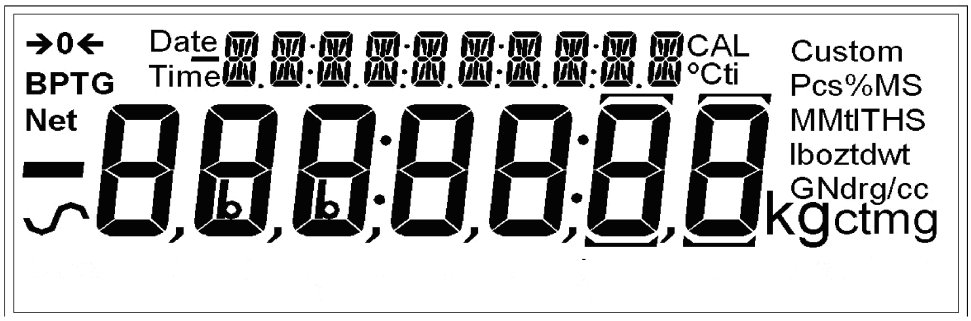
- Materials that emit toxic, caustic or noxious fumes should only be tested in suitable fume hoods or with other ventilation.
- Materials that will have a film on the surface during drying may cause high internal pressures to be present. These materials should not be tested using this method.
- Materials that emit aggressive or corrosive fumes (such as acids) should be tested using small quantities of material in an area with good ventilation.
- See Section 14 for further information on sample preparation.

The user shall be liable and responsible for any damage that arises in connection with this moisture analyzer.

4.0 DISPLAY AND KEYPAD

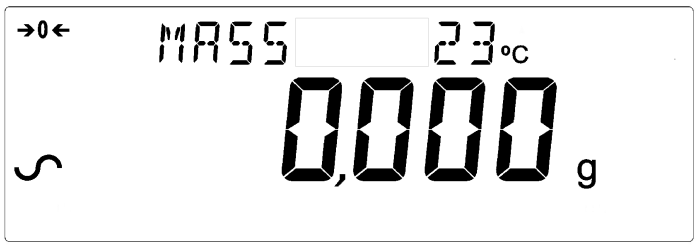
The LCD has unique symbols to indicate the following:



→0←	Zero
	Stable
Net	Net weight

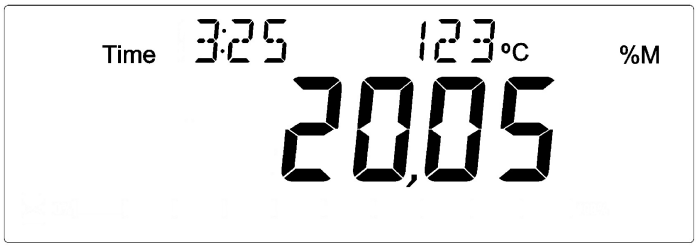
Note: Some symbols shown on the display are not used in the analyzers. During the moisture test the main display will show the percent moisture. It can be switched to other values using the **[Dspl/↑]** key, for example, current mass.
The secondary display will show the elapsed time and temperature during a test.
Typical Displays that would be used are:

Weighing:



Showing no weight on the pan, stable and at zero point.

During a typical Moisture test:



Showing a test in progress for 3:25 minutes, with a current temperature of 123ºC and 20.05% moisture, the test is still running.

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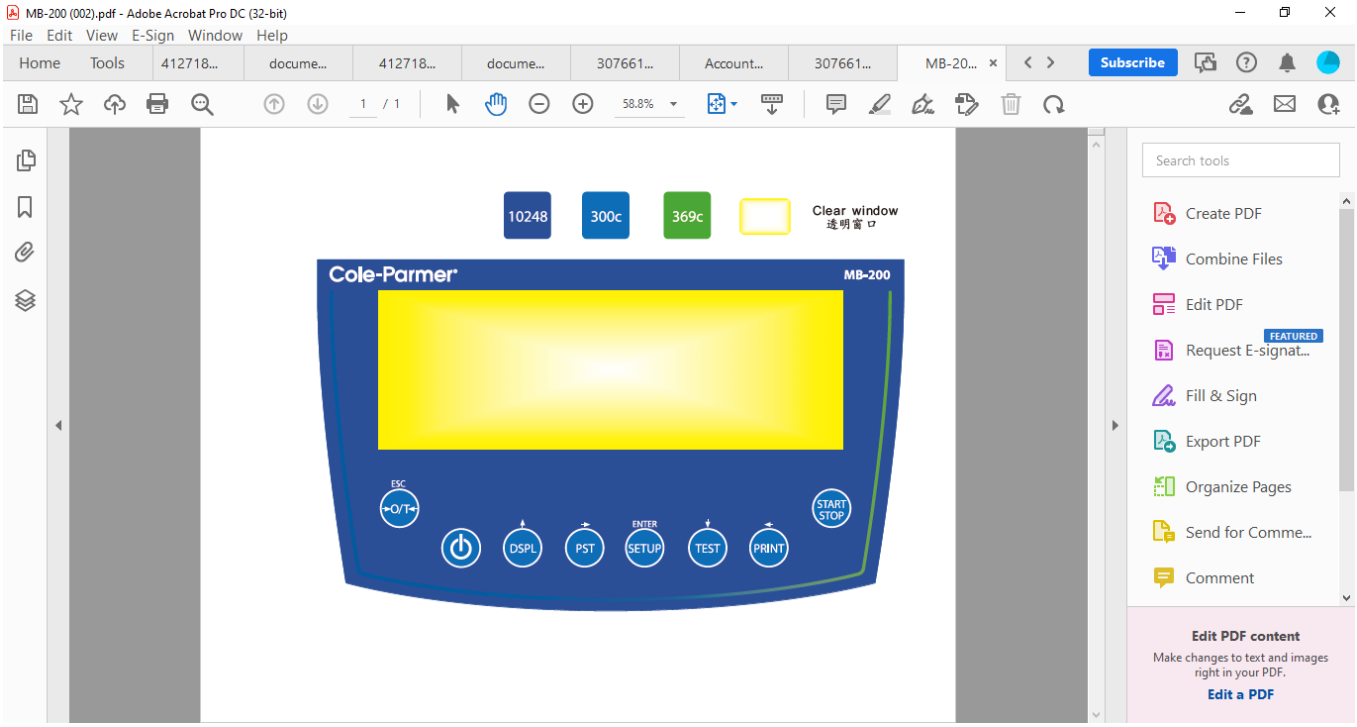

The keypad has dual purpose function keys to allow a selected menu item or value to be incremented or changed. Right/left shift to change the active digit and up/down to increment or decrement a value.

The keypad has the following keys to operate the analyzer.

Keys	Primary function	Secondary function
⏻	To turn the analyzer to ON or Standby	
[➔0/T➔ / Esc]	A combined zero and tare function	To escape from setup functions and modes
[Start]	To begin the moisture test after all settings and sample preparation have been completed. During a test, used to stop the test.	
[Test/🡻]	Selects moisture test parameters such as temperature, method, results.	Scrolls through menu options to decrement or change a displayed value

Keys	Primary function	Secondary function
[PST/➔]	Store or Recall pre-stored test parameters.	To advance a flashing digit by one position to the right. To go back by one step during setup functions
[Print/🡐]	Instructs the analyzer to print data	To advance a flashing digit by one position to the left
[Dspl/🡑]	Changes the display to read other data during a moisture test.	To increase or change a displayed value or scroll through options forward
[Setup/Enter] ↵	Enters the Setup parameters (Supervisor Menus)	Enters a function or saves a value while manually entering unit weight or check weighing limits

4.1 NUMERIC ENTRY METHOD

To set a value when required, use the keys as given below:

- **[Dspl/🡑]** and **[Test/🡓]** keys to increase or decrease the flashing digit
- **[Print/🡐]** and **[PST/➔]** keys to advance or move back the digit
- **[Setup/Enter]** key to accept the value

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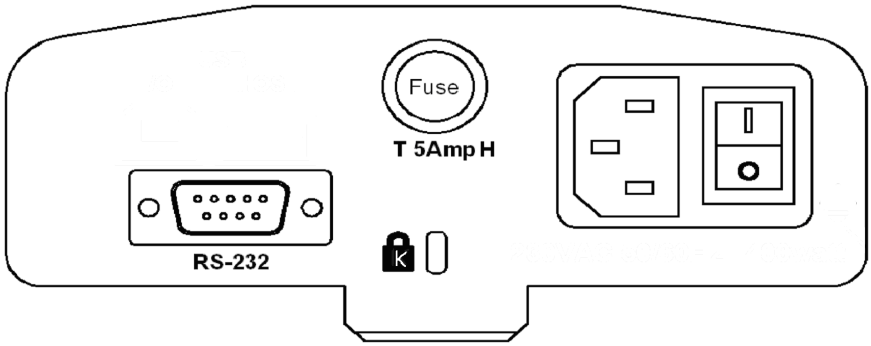
5.0 REAR PANEL INTERFACES



The rear panel has connectors for the data interface, fuse holder, security lock location and power supply input.

5.1 POWER

Make certain your balance is compatible with the power supply in your area. If the voltage is not the same the analyzer can be damaged. Contact your supplier if you require assistance.

The power connection uses a standard IEC C13 socket on the cable with a plug suitable for the location. Do not use adaptors if the plug does not match your power supply.

The fuse should only be replaced with a time lag type fuse with high breaking capacity, 5Amp current rating. The fuse is a standard 5 x 20mm size. To replace the fuse remove all power from the analyzer, unscrew the fuse holder cover to extract the old fuse, replace with a new fuse. If the fuse should blow again, the analyzer must be serviced by a qualified service representative. There are no user serviceable parts inside. Contact your supplier.

5.2 DATA INTERFACE

The RS-232 interface is a general purpose serial interface for communications with the analyzer, using a DE-9P type connector. Refer to section 11.0 for details of the interface.

5.3 SECURITY LOCK

The center of the rear panel has a location to mount a Kensington type security lock. Refer to the instructions that come with the lock for details.

6.0 BASIC OPERATION

When first turned on the balance will act as a basic balance showing grams weight on the display.

If a passcode has been set to limit access to the weighing functions of the analyzer the display will show “PASSCODES”. The display will change to show 7 digits set to zero with the rightmost digit flashing. Use the numeric entry method (see section 4.1) to enter the code. Make sure to enter the correct passcode to continue. See the Section 10.1.4 for details.

While in the weighing mode the test conditions for a drying test can be set.

6.1 SETUP OF METHOD

- The balance is set to perform a drying test using a method determined by the user. The drying method can be input by using the keyboard or entered from a PC using the RS-232 interface.

Regardless of the method used it will be necessary to program the analyzer with the following:

Type of test:

- % moisture =100 * ((initial mass - dry mass)/initial mass)
- % solid =100 * (dry mass/initial mass)
- % moisture vs. dry weight =100 * ((initial mass - dry mass)/dry mass)
  Also called ATRO Moisture
- % solid vs. dry weight = 100 * (Initial mass/dry mass)
  Also called ATRO Solid

ATRO Moisture or Solid test are special applications specific to some industries. %Moisture and %Solid are the more common calculations.

Heat Control

- Single temperature, heat to a set temperature (50-160ºC).

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Interval
Set the time interval at which the results are computed and printed. Range is 1 to 99 seconds.

End Point Determination (manual stop active in all tests)
The analyzer ends a test when the results are stable within a value set by the user. The test will stop when the weight changes less than a preset amount in a preset time. The default setting is 0.002g in 15 seconds. The user can set other values depending upon model.

Start Criteria

- Start Manually when the **[Start]** key is pressed
- Start Automatically when cover lowered.
  Delays 5 seconds after cover is down before beginning.

Print settings
To set if the analyzer should print and store results and when printing if the compete test results or only the summary is printed and stored in the analyzer's internal memory.

Default settings
% Moisture
Single Temperature = 110ºC
Rapid = Off
Interval Time = 5 seconds
End Point Determination = Time and stable result
Time 60 minutes, and
Stable = 0.002g/15 seconds
Start Criteria = manual start
Print Test = on
Print Format = Complete

6.1.1 MANUALLY SETTING TEST PROCEDURES

Press the **[Test/🡻]** key to set the test procedure. During the process use the numeric entry procedure described in section 4.1 to enter or change a setting.

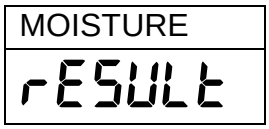
Pressing **[Print/🡸]** at any time during this procedure will print a list of the current settings. See 6.1.2

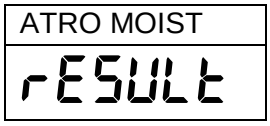
Pressing **[➔0/T🡸 / Esc]** will always escape back to normal weighing without a change to the parameter being displayed. Any parameter changed before this time will be accepted.

PROCEDURE

Press **[Test/🡻]** to show “rESULt” with the current setting displayed,
Options are “Moisture”, “Solid”, “ATRO Moist”, “ATRO Solid”

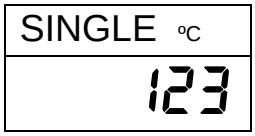
Use arrow keys, **[Dspl/🡹]** and **[Test/🡻]**, to change and press **[Setup/Enter]** to continue.





“Single” Selected

Show “Single” “123 C” with the left digit flashing. The user can use the **[PST/➔]** key to select another digit or the **[Dspl/🡹]** and **[Test/🡻]** to set the temperature, Range is 050 C to 160 C



Interval Setting

The next setting will be to set the time interval the analyzer uses to determine results and to print the current result. The analyzer will compute the percent

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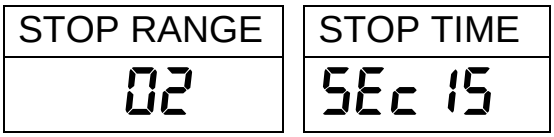
moisture or solid at the time interval desired. The new result will be displayed and printed as described below.

Display “Interval” “Sec XX” The user can change the value using the arrow keys. Range is 01 to 99 Seconds. Typical results will be computed every 5-15 seconds.

Enter the conditions to be used to determine if the results are stable. The amount of weight change to be used to determine if the test is finished, followed by the time to be used for the weight to change. For example 0.006g in 15 seconds would be a typical setting. Longer times or smaller weight changes could be used to ensure better stability or shorter times or larger weight changes to ensure a faster determination. For example 0.006g in 5 seconds will end a test quicker (but possibly less accurately) than 0.002g in 15 seconds. The user sets the weight first, then the time.

Display shows “ STAB RANGE” “ XXX”. Set the range for the weight change. Set from 0.001 to 0.099.

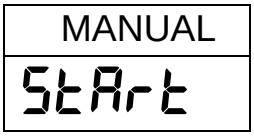


Start Method

The last setting is the Start method. The analyzer will either start a test automatically whenever the cover is lowered (after a 5 second delay to allow stability), or manually when the **[Start]** key is pressed.

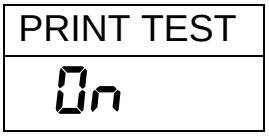
Display will show “START”

Options are “Manual” or “Auto”



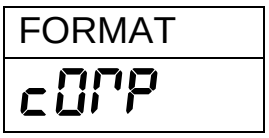
Print Control
The analyzer can print the results during the test. If the print is set to ON, the analyzer will also store the results to memory using the filename given by the user. See Section 8.0

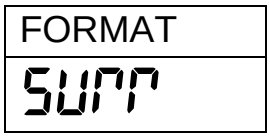
Display will show



Options are "On" or "Off"

The display then changes to the format of the print test.





Options are "Complete" or "Summary " test results. See section 11.4

After setting the last parameter press **[→0/T← / Esc]** to return to normal weighing and ready to begin a new test.

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6.1.2 PRINT CURRENT SETTINGS

When setting the test parameters the **[Print/🡐]** key will cause the current parameters to be printed as shown below. However if the display is awaiting a numeric entry the **[Print/🡐]** key will move the flashing digit to the left.

For example (English language version shown) :

CURRENT TEST SETTINGS	
DATE: 08/01/2009 TIME: 14:44:49	From the Real Time Clock
SER NO:AE00001234	Analyzer Serial number
USER NO:1234567	User ID number
Preset: PST 01 ABCD-01234	If Preset test is used, blank if not from a preset test.
Result %MOISTURE Heating: Single 157 C	Current test settings for heating
Interval: 05 Sec Stop: STABLE 0.002 g 15 Sec	Printing interval Stop Criteria
Start: MANUAL	Start Criteria

6.2 STORE TEST SETTINGS

It will be possible to store up to 49 test procedures/settings. There is also a factory default that is permanently stored as PST 00. See section 6.1

To Store the current settings press the **[PST/🡒]** key. The display will give the user the option to store, recall or delete a Preset Test. The display will show “PST STORE” or “PST RECALL” or “PST DELETE”. Use the up/down arrow keys, **[Dspl/🡑]** and **[Test/🡓]**, to select either store or recall.

PST STORE

If Store is selected the display will then show “PST STORE XX” with the number showing the ID for the next empty location. For example if PST 01, 02, & 03 are already stored the next number is PST 04. If the user wishes to overwrite a previously stored value they can change the number and continue. Using the up/down arrow keys, **[Dspl/↑]** and **[Test/↓]**. If the user has stored positions 1,2, and 4 then when this process begins the first blank location is PST 03, so that is the value to be displayed. Then the next time PST 05 would be shown.

PST STORE
05

Press **[Setup/Enter]** to select the PST number shown. If this number already has a test method stored, then ask if the test should be overwritten. To continue the user must press **[Setup/Enter]** to overwrite the old results and store new ones.

OVERWRITE?

Pressing the **[→0/T← / Esc]** key will escape without clearing the old result.

When storing a test procedure the user has the option of adding a text or numeric name to the test. The top display will show “PST NAME” then show “- - - - - - - - - “. To enter a name, use the **[Dspl/↑]** or **[Test/↓]** keys to cycle through numbers and letters. Use the **[PST/→]** or **[Print/←]** key to move the flashing digit to the left or right.

— . / 0 1 2 3 4 5 6 7 8 9 A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

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Up to 10 characters can be used to describe the test. Press **[Setup/Enter]** at any time to finish the description. If no name is added the field will be shown as blanks when the name is shown during the recalling process.

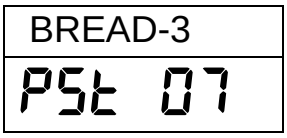
PST NAME

BREAD-4

6.3 RECALL TEST SETTINGS

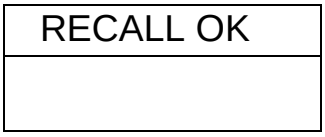
Recalling the test settings can be done by selecting “PST RECALL” then scrolling through the stored settings using the **[Dspl/↑]** or **[Test/↓]** keys to find the desired settings and then pressing the **[Setup/Enter]** key to recall them. When the PST XX number has been selected the name given to the test will be displayed

If PST 00 is selected the default test settings are recalled. These can never be cleared or overwritten. If a test is not stored it is not displayed. For example, if only 3 tests are stored then only those 3 plus the default are seen when recalling the test settings.



Press the **[Setup/Enter]** key to recall PST 07.

The display will show:



The analyzer will then return to normal.

6.4 DELETE TEST SETTINGS

To delete any test setting select “PST DELETE” then scroll through the stored settings using the **[Dspl/↑]** or **[Test/↓]** arrow keys to find the desired settings and then pressing the **[Setup/Enter]** key to delete it.

The display will then show the next test setting stored or if the memory is empty a message will be shown. Press **[→0/T← / Esc]** to return to normal.

6.5 REVIEW TEST SETTINGS

To review the current settings press the **[Test/↓]** key then advance through the settings pressing the **[Setup/Enter]** key at each option to retain the current value. If a setting needs to be changed it can be modified as described in section 6.1.

At the beginning of a test the display will preview the current settings if the user parameter to allow the preview is enabled. See section 10.1.2.

If you need to abort the test before it begins press the **[Start]** or **[→0/T← / Esc]** key to return to normal.

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7.0 RUNNING A TEST

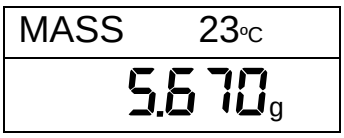
If necessary the user can set a new set of values for a test setting or recall a pre-stored set of values. See section 6. The last used set of values is stored so they are always shown initially, even after power has been turned off. That way if the last test settings are still valid the user can immediately use them.

The basic operation after test settings are set is as follows:

Place an empty sample pan on the analyzer.
Press **[➔0/T🡐 / Esc]** to zero the weight.

Fill the sample pan with the sample. See Section 14 for assistance in how to prepare a sample.

Place the filled pan on the analyzer.

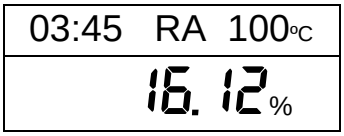


Lower the lid of the weighing chamber. If automatic start has been selected the test will begin after a 5 second delay or after the test settings have been previewed.

If Manual start has been selected press the **[Start]** key.
The test will begin. If the test setting Preview has been enabled (See section 10.1.2) the display will show the current test settings one after the other. The drying test begins immediately after the preview is completed.

If you need to abort the test before it begins press the **[Start]** or **[➔0/T🡐 / Esc]** key to return to normal.

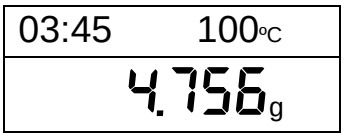
The top line will show the elapsed time of the test and the chamber temperature. The main display will show the current result, updated at the interval time selected when setting test parameters.



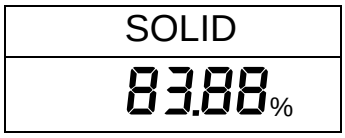
An “A” will be on the left side of the display if %Moisture /Dry or %Solid/Dry is the result selected. The %M or %S will be on the right side of the display showing %Moisture or %Solid.

The display will continue to be updated at the time interval set for the test. During the test the **[Dspl/↑]** key can be pressed to see other information such as current mass, %Solid, time remaining if time limit is set for the test. Each alternate display is shown for 5 seconds then returns to normal display, or if **[Dspl/↑]** is pressed again to go to the next alternate display.

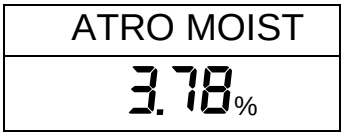
Current Mass



% Solid



Atro Moisture



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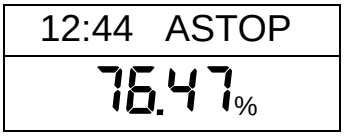
The Alternate displays in order are:

Mass
% Moisture
% Solid
% Atro Moisture
% Atro Solid

During the test the user can stop the test at any time by pressing the **[Start]** key again. Otherwise it continues until the stop condition is met.

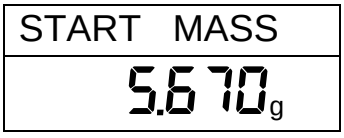
When the test has stopped the beeper will sound 3 short beeps (if enabled, see sec. 10.1.2) and the display will show the end result:

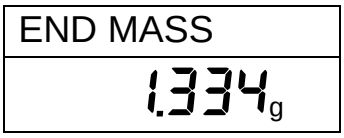


This display shows the test was automatically stopped as stability was reached in 12:44 minutes. If it had stopped at the end of the time period it would have TSTOP on the top line and if manually stopped it would have MSTOP.

At this time the final results are displayed. These results will include elapsed time of the test and final % result.

Display other data by pressing the **[Dspl/↑]** key to show the initial mass and final mass.





The final values for the results can be printed again to the Serial interface by pressing the **[Print/←]** key. See section 8.

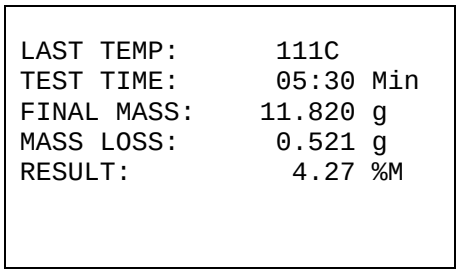
To return to normal weighing press the **[→0/T← / Esc]** key.

8.0 PRINT RESULTS

If the test parameters are set to allow the test results to be printed (see section 6.1.1) then the results of the test are printed both before and after the test is complete. The initial part of the printout will show the test conditions. If the test printing parameter has been set to complete then the results will be printed at the interval time. When a test is completed, the user can print a result from the test.

8.1 PRINTING FINAL TEST RESULTS

While the final values for the test are being displayed after the test has ended, press the **[Print/🡐]** key to output the final results. The format of these results is the same as the last lines of the complete printout:



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10.0 ANALYZER MENUS

The balance has a number of submenus for setting the operation of the analyzer and the communications. The main topics are:

PASSCODES

To control unauthorized access to the menu system.

ANALYZER SETTINGS

Setting of date and time
Date format, YMD, MDY, DMY
User ID
Key Buzzer On/Off
Test Buzzer On/Off
Backlight , On, Off, Auto
Filter and Auto zero settings
Language Selection

SERIAL I/O

Baud rate
Parity
Continuous output
Time for continuous output

CALIBRATION

Weight Calibrate
Temperature Calibration
Cal Report On/Off

10.1 SUPERVISOR MENUS

Pressing the **[Setup/Enter]** key while in normal weighing gives access to the menus.

When **[Setup/Enter]** is pressed and passcodes are not enabled the display will show the first section of the menus, Serial interface. If passcodes are enabled, the analyzer will ask for it by displaying :

With the right digit flashing.

Enter the correct passcode using the numeric entry method.

If a wrong code is entered the analyzer will return to weighing mode.

If the passcode has been enabled and entered, the analyzer will allow the operator to access the Supervisor's menus.

The **[Dspl/↑]** and **[Test/↓]** keys will cycle through the main headings, pressing the **[Setup/Enter]** key will enter the heading and sub-parameters or options can be set. Press **[PST/→]** to come out of a sub-menu and go up one level or **[→0/T← / Esc]** to return to normal weighing from any menu.

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10.1.1 SERIAL INTERFACE PARAMETERS

The parameters affecting the serial setup are set in a similar manner to the other parameters.

Press **[Setup/Enter]** when “SERIAL” is displayed to enter the sub-menu.

The parameters that can be set are shown below, default values are in **bold**:

BAUD RATE	Set the Baud Rate to 2400, **4800**, 9600, 19200 or 38400
PARITY	Set the Parity to **OFF**, EVEN or ODD
CONTINUOUS	To output the weight only at the interval time set in the INTERVAL parameter. Overrides the printing of any test results. Option is ON or **OFF**.
INTERVAL	Sets the time in seconds between output of weight values, if CONTINUOUS output is turned on.

10.1.2 SETUP PARAMETERS

The user parameters that control the balance are shown under the SETUP. When “SETUP” is displayed, press the **[Setup/Enter]** key. The options for each parameter can be scrolled through by using the **[Dspl/↑]** or **[Test/↓]** keys.

TIME	Set Time using the numeric entry method (see section 6.1)
DATE FORMAT EUROPE (dd/mm/yy) USA (mm/dd/yy) ASIA (yy/mm/dd)	Select the format for the date.
DATE	Set Date using the numeric entry method (see section 6.1) Set year, month date when requested.
USER ID	Enter a user number to identify the analyzer
KEY BEEPER	When enabled will beep any time a key is pressed. On= Enable OFF= Disable
TEST BEEPER	When enabled will beep 3 times quickly when a drying test is completed. On= Enable OFF= Disable
BACKLIGHT	On OFF AUTO

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FILTER	Set the amount of filtering used for weighing. If sever vibration is present a slower filter may be helpful, for maximum speed use the fast filter. Select SLOW, NORMAL or FAST
LANGUAGE	Select the language, English, German, French or Spanish
PREVIEW	Allows the test settings to be previewed on the display at the start of a test. Select On or Off.

The sub-menu is entered by pressing **[Setup/Enter]** –

Use the **[Dspl/↑]** and **[Test/↓]** keys to increase or decrease the value for setting. Press **[Setup/Enter]** to accept the setting and advance to the next item in the menu
Press **[PST/→]** to advance to setting of the next parameter or **[→0/T← / Esc]**to return to normal weighing

10.1.3 CALIBRATION

This menu allows the user to calibrate the weight or the chamber temperature.

Press **[Setup/Enter]** when “CALIBRATE” is displayed.

The options for each parameter can be scrolled through by using the **[Dspl/🡅]** or **[Test/🡇]** key

CAL MASS	Begin the mass calibration function. Return to weighing when finished.
CAL TEMP	Begin the temperature calibration of the weighing chamber, Return to weighing when finished.
CAL REPORT	On = Enabled. Prints out Calibration report after successful calibration (either mass or temperature) OFF = Disabled

Press **[PST/🡆]** to advance to setting of the next menu which is “PASSCODES” or **[🡆0/T🡄 / Esc]** to return to normal weighing.

10.1.3.1 MASS CALIBRATION

Enter the menu for Calibration section. Select CAL MASS. Press **[Setup/Enter]**.

Display will guide you through the steps.
Display will show “Load 0g” , Unload the pan and remove the sample pan.
Press **[Setup/Enter]**.

The display will prompt to select the mass to be used for calibration, i.e. “LOAD 40g”. Use the **[Dspl/🡅] or [Test/🡇]** keys to select the alternate mass size if desired. Calibrate using 20 or 40 grams. Press **[Setup/Enter]**.

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Place the calibration weight shown on the center of the weighing pan. When the stable indicator is on press **[Setup/Enter]**. The analyzer will calibrate to the weight selected.

When calibration is complete the display will return to weighing. If there is a problem an error message will be show. If the weight is unstable “Error Stab” will be displayed. If the weight is too small “Error Low” will be shown. If the weight is too large “Error High” will be shown. After calibration the analyzer will return to normal operation and print the calibration report if it has been enabled. The determination of being high or low will depend upon the calibration values stored during the dealer calibration.

10.1.3.2 TEMPERATURE CALIBRATION

You must have a method to measure the temperature inside the weighing chamber during a special heating test in order to complete the temperature calibration. Contact your dealer for more information. The calibration will require 30-40 minutes to complete.

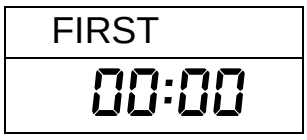
Place a sample pan on the pan support during this test.
Place the temperature probe to be used to monitor the temperature within the weighing chamber on or near the sample pan.

Close the chamber.

Enter the menu for calibration section. Select the Temperature Calibration option, CAL TEMP.
Press the **[Setup/Enter]** key.

The display will guide you through the steps necessary to calibrate the temperature of the heating chamber.

When the analyzer chamber is closed the display will show



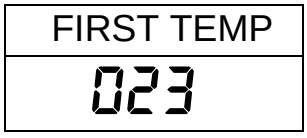
with the timer running. The timer will count up to 20:00 to allow time for the chamber to come to a steady (room) temperature. During this time observe the temperature in the chamber.

During this time the beeper will sound every minute to remind you that a calibration is in progress.

Note the temperature inside the chamber. When the temperature is stable and constant for some time, press **[Setup/Enter]** to enter the lower temperature value.

The display will change to allow the value to be entered.

Using the numeric entry method, enter the temperature inside the chamber, for example 23ºC you would enter:

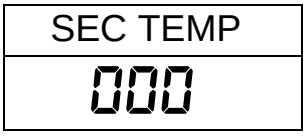


Press **[Setup/Enter]** to continue the test.

The heaters will turn on and begin heating the test chamber. The timer will show the elapsed time as before. The chamber will be heated to approximately 150ºC.

At the end of 20 minutes the beeper will sound, read the temperature in the chamber. Press **[Setup/Enter]** to enter the second temperature value.

Enter this value as before, pressing **[Setup/Enter]** to confirm and store the value.



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The balance will return to normal weighing.

Leave the analyzer to cool .

During the 20 minute soaking time you can force the timers to stop if you observe the chamber temperature is stable by pressing the **[Setup/Enter]** key. Then enter the temperature as described.

If the test is not completed as shown above, the temperature calibration will be abandoned, the display will show “TEMP CAL FAIL” and the analyzer will return to normal without the temperature calibration changing. The test will be stopped if the second temperature is not entered with 30 minutes of starting the high temperature test.

These values will be accepted only if they are within acceptable limits of the values stored during the dealer calibration.

10.1.3.3 CALIBRATION REPORT

During weight or temperature calibration the analyzer can print a report showing details of the calibration. The format of the reports is:

MASS CALIBRATION DATE: 21/02/2009 TIME: 14:21:32 SER NO: AE001234 USER NO: 123456 WT REF: _ _ _ _ _ _ _ MASS: 50 g CALIBRATION BY: _ _ _ _ _ _ _ _ _ _ _ _	TEMPERATURE CALIB. DATE: 21/02/2009 TIME: 14:37:12 SER NO: AE001234 USER NO: 123456 TEMP REF: _ _ _ _ _ _ _ TESTED 23°C/ 142°C CALIBRATION BY: _ _ _ _ _ _ _ _ _ _ _ _	From Analyzer RTC From Memory From memory, blank if not set User to fill in details Text, showing cal wt used or temperature settings used. Room to sign Extra line feeds

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10.1.4 PASSCODES

To enable the security features in the balance it is necessary to set passcodes. There are 2 passcodes called Operator Passcode and Supervisor Passcode. The Operator Passcode allows an authorized user to operate the basic weighing functions of the analyzer but will not allow access to the Supervisor Menus if the Supervisor Passcode has been set.

To change or disable a Passcode it will be necessary to enter the current passcode.

Press **[Setup/Enter]** when “PASSCODES” is displayed to enter this section.

OPERATOR	Enter the current passcode (OLD) first then enter a new passcode if desired. A passcode set to zero will disable the security feature and allow unlimited access.
SUPERVISOR	First enter the current passcode (OLD) and then enter a new passcode if desired. A passcode set to zero will disable the security feature and allow unlimited access.

10.1.4.1 FORGOTTEN PASSCODES

Keep a record of the passcode to ensure you can access this section again. If however you have forgotten your passcode you can still gain access by entering a universal code.

If you have forgotten the current passcode a code of “15” will always allow you to enter the Supervisor area.

Using the Supervisor menus go to the PASSCODE section and reset the operator or Supervisor passcode using the “15” code as the old number when requested.

11.0 SERIAL INTERFACE

The balance has the ability to send or receive data over the serial interface.

The test data can be sent over the interface either automatically or when the user presses the **[Print/🡐]** key.

The user has control over what data is to be printed.

11.1 RS-232 HARDWARE

The RS-232 interface is a simple 3 wire connection. The input and output connections are:

Connector:	9 pin D-sub miniature plug		
	Pin 2	Input to analyzer	RXD
	Pin 3	Output from analyzer	TXD
	Pin 5	Signal ground	GND

Handshaking is not applied.

Baud rate: 2400, 4800, 9600, 19200, 38400

Parity: NONE (=8N1), EVEN (=8E1) or ODD (=8 O 1)

All lines are terminated with carriage return and line feed (<CR><LF>).

In continuous output mode, the serial output format will be a single line in the form “12.567 g<CR><LF>”.

11.3 INPUT COMMANDS

The balance can be controlled with the following commands sent using remote keys such as from a PC. The commands can be sent in both upper case letters and lower case letter, i.e. “!KT” or “!kt” are both acceptable. Press the Enter key of the PC after each command (the action of Carriage Return is denoted as <CR> as shown below).

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Basic Input Commands:

!KT<CR>	**Tares the analyzer to display the net weight. This is the same as pressing the [➔0/T🡐 / Esc] key when the analyzer is in the normal weighing mode.**
!KS<CR>	**Will begin or end a drying test, the same as pressing the [Start] key.**

11.4 PRINTING RESULTS

The balance can print results during a test at the time intervals selected, see section 6.1.1. In this case the format of the printing will be as shown below. The first section will print the initial conditions and the settings used for a test. During the test the current results will be printed. At the end of the test the final results will be printed.

A typical test report will look as:

MOISTURE TEST DATE: 13/12/2008 TIME: 09:38:07 SER NO: XXXX45678	Heading From Analyzer Serial number
TEST NO: _ _ _ _ _ _ _ _ _	
USER NO: 9876543210	A blank line for users to fill in a number if they wish. User number
Result: % Moisture Heating: Single Temp: 120 C Interval: 30 Sec Stop: Stable 0.002 g 30 Sec Start: Manual	Test settings
INIT MASS: 12.341 g	Measured initial mass.
MODE TEMP TIME RESULT Single 65C 00:30 1.26 %M Single 159C 01:00 2.11 %M Single 157C 01:30 3.15 %M Single 158C 02:00 3.79 %M Single 156C 02:30 4.11 %M Single 157C 03:00 4.19 %M Single 157C 03:30 4.22 %M Single 157C 04:00 4.24 %M Single 157C 04:30 4.26 %M Single 157C 05:00 4.27 %M Single 157C 05:30 4.27 %M	Test Heading Results printed once every 30 seconds as set by the INCR time..
********** AUTO STOP **********	Or MAN STOP if user stopped
LAST TEMP: 111C TEST TIME: 05:30 Min FINAL MASS: 11.820 g MASS LOSS: 0.521 g RESULT: 4.27 %M	Summary of the test

After the test has finished the user can print either the complete test again or only a summary by pressing the **[Print/←]** key before returning to normal weighing.

The complete report is a copy of the data as shown above. If the summary report is selected then the following is printed similar to the above except without the interval readings.

MOISTURE TEST	Heading

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FILE NAME: RES00032 DATE: 13/12/2008 TIME: 09:38:07 SER NO: XXXXXXXXXXX	File name used by analyzer to store result From Analyzer Serial number
USER NO: XXXXXXXXXXX	User number
TEST NO: _ _ _ _ _ _ _ _ _	Leave a blank line for users to fill in a number if they wish, not from Analyzer memory
Preset: PST 05 Bread-4 Result: % Moisture Heating: Single Temp: 120 C Interval: 30 Sec Stop: Stable 0.002 g 30 Sec Start: Manual	Settings of the test conditions
INIT MASS: 12.341 g	Measured initial mass.
********** AUTO STOP ********** LAST TEMP: 157C TEST TIME: 05:30 Min FINAL MASS: 11.820 g MASS LOSS: 0.521 g RESULT: 4.27 %M	Or MAN STOP if user stopped Summary of results
	Extra LF's at end of the report

11.5 ANALYZER CONFIGURATION THROUGH THE SERIAL INTERFACE

The analyzer can use the serial interface to set parameters for weighing test and for analyzer configuration. The parameters are set by sending a line of data that has the description and the setting desired.
It is possible to create a text file that contains all the data necessary to set he test conditions for a particular test (or analyzer configuration) and send this to the analyzer. The commands are not case sensitive, i.e. parity=0 and PARITY=0 are both accepted.

11.5.1 TEST PARAMETERS

The parameters that control a test are listed below. To change a test parameter it is necessary to send a command for the parameter to modify along with the value to change.

For example to change the test parameters to use a single heat and set the temperature to 115ºC send 2 commands.

Heat=0<cr><lf>
Single Temp=115<cr><lf>

All commands are in English regardless of the language selected for the analyzer operation. The commands can be sent in both upper case letters and lower case letter, i.e. “!KT” or “!kt” are both acceptable.

```
Moisture Result=1;          #0=%M, 1=%S, 2=%Atro_M, 3=%Atro_S   default=0;
Single Temp=100;            #050C to 160C,                      default=100;
Interval Time=20;           #05 sec to 99 sec                   default=15;
Stable Range=0.010;         #grams default=0.010
Stable Time=10;             #seconds, 01-99                     default=02;
Start mode=0;               #0=Manual  1=Auto                   default=0;
```

Care must be used as some commands depend upon others to be effective, For example sending a command for setting the heat to use a ramp but not sending a temperature or time to use may cause incorrect operation if they are not set to reasonable values.

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The current settings can be printed or observed as described in sections 6.1.2 and 6.3.

11.5.2 BALANCE SETUP PARAMETERS

The parameters related to analyzer configuration are listed below. To change a test parameter it is necessary to send a command for the parameter to modify along with the value to change.

All commands are in English regardless of the language selected for the analyzer operation. The commands can be sent in both upper case letters and lower case letter, i.e. “PARITY=0” or “parity=0” are both acceptable.

```
Baud Rate=2;                #0=2400,1=4800,2=9600,3=19200,4=28400, default=1;
Parity=0;                   #0=none,1=Even,2=Odd  ,default= 0;
Print Test=1;               #0=off,1=on, default=1;
Output Format=0;            #0=complete 1=summary ,default=0;
Continuous=1;               #0=off,1=on, default=0;
Interval=20;                #00-99 ,default=1;
Date Format=1;              #0=Europe,1=USA,2=ASIA default=0;
User ID=1234567890;         #length=10 alpha-numeric characters;
Key Beeper=1;               #0=off;1=on default=1;
Test Beeper=1;              #0=off;1=on default=1;
Backlight=2;                #0=off,1=on,2=auto  default=2;
Filter=1;                   #0=slow,1=normal,2=fast, default=1;
Stability=2;                #0=1d,1=2d,2=5d,3=10d   default=2;
Auto Zero=3;                #0=off,1=1d,2=2d,3=5d   default=5;
Operator=000000;            #operator password    ,must be 6 bytes;
Supervisor=000000;          #Supervisor password  ,must be 6 bytes;
Calibration Report=1;       #0=off,1=on  default=1;
Language=0;                 #0=English, 1=German, 2=French, 3=Spanish
```

These commands are the same as will be set using the SETUP menu as described in section 10. For example to change the beeper so it does not sound at the end of a drying test, send the command

test Beeper=0<cr><lf>

When the analyzer receives a valid command, it will return the message E0. If an invalid input command is received, the command is returned as follows:

Message returned	Remarks
E1	The analyzer can not recognise this command.
E2	String length is not right. i.e. key beeper=20<cr><if>
E3	String exceeds range. i.e. key beeper=2<cr><if>
E4	The string contains non-numeric character. i.e. key beeper=a <cr><if>
E5	You do not have the authority to use this commands.

11.5.3 ANALYZER RECALL PARAMETERS

When parameters and results are saved in the memory, in order to recall all the saved records, it is necessary to send a command as follows:

Recall config<cr><lf>	Get all the set up parameters

The balance will return the list of parameters or data stored in the analyzer menu. The test results, test presets and analyzer configuration are all stored separately.

To recall an individual parameter send the parameter name followed by a question mark. For example sending heat=?<cr><lf> , the analyzer will send back a message HEAT=0 for single heating applications.

11.5.4 REQUEST VALUES OF PARAMETERS

If the command for a parameter is sent with a “?” the balance will send the value currently stored in the analyzer. For example send:

Single temp=?<cr><lf> and the balance will send back

Single Temp=115<cr><lf>

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11.6 CONTINUOUS OUTPUT

The balance can use the interface to send the weight only to the output. This setting is configured in the Serial Communications parameters, see section 10.1.1. When the output is set for Continuous the test reports are not printed during a drying test and test results are not stored.

The weight will be printed using the time interval set with the Continuous parameters, from 01 to 99 seconds.

The format is xxxxxxxxx<cr><lf> where the first 9 characters are the weight with leading zeroes replaced by spaces. The first character may be a “-“ for negative weight.

The output will appear as:
_ _ _ 12.345
_ _ _ 12.345, etc.

12.0 SPECIFICATIONS & FEATURES

Capacity	40g
Readability	0.001g / 0.01%
Repeatability weighing	0.002g s.d.
Stabilisation Time	~3-4 sec.
Suggested Minimum Sample size	2g
Repeatability moisture determination (Sample is sodium tartrate dihydrate)	3g sample 0.15% 10g sample 0.05%
Pan size	90mm
Test method	%moisture %solids %moisture / dry weight %solid / dry weight
End Criteria	Manual stop Auto stop change < set amount/time
Maximum test time	99 minutes (1.5+ hours)
Heater	Custom Halogen Lamp, 400W, 230VAC or 115VAC 50/60Hz

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Temperature chamber	50 -160C set in 1C steps
Temperature profile	Standard (one step)
I/O	RS-232 Bi-directional serial port
Stored Test Setting	1 Default setting, 49 user settings
Data Output	Ability to send data out via RS-232 Serial port
Beeper	To sound when keys are pressed or to announce end of a test, independently enable/disable
Language	English, German, French or Spanish
RTC	Real Time Clock Date formats, YMD, DMY, MDY Time 24 hour clock
Calibration	Manual calibration using external mass 20g or 50g
Power	Factory set, 115VAC or 230VAC, 50-60Hz., 400 watt.
Fuse	5A, time lag, High Breaking capacity, 5 x20mm
Environment	0ºC to 40ºC, up to 90% RH. non-condensing

13.0 MENU STRUCTURE

WEIGHING

OPERATOR

[0/I] key Standby/operate

[→0/T← / Esc] Zero/Tare function

[Print/←] key Print results

[Start] key Begin drying a sample

[Dspl/↑] key Display alternate data on LCD

[PST/→] key Store/Recall preset Test

PST Store PST XX

If PST XX is available then

Store Current test

If PST is used then display

OVERWRITE?

{Setup/Enter} to Store current test

or ESC then return to weighing

PST Recall PST XX Get stored data

Delete PST XX

Delete PST number shown

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[Test/🡻] key	Set Test Conditions	Result	% moisture		
			% Solid		
			% ATRO Moisture		
			% ATRO Solid		
		Heat	Single	Set Temperature	
		Interval	Set Interval time		
		Stop	Stable		
				Set Stable value	
				Set Stable Time	
		Start	Manual		
			Auto		
		Print Test	On		
			Off		
		Format	Complete		
			Summary		
[Setup/Enter] key	Sup. Passcode enabled?		No	Display Supervisor menus	
			Yes	Enter Supervisor Passcode	
				Display Supervisor menus	

SUPERVISOR MENU

SERIAL	Setup Interface Parameters	**Baud Rate**	2400/4800/9600/19200/38400	
		Parity	Off / Even/ Odd	
		Continuous	On/Off	
		Interval	01 to 99 seconds	
SETUP	Setup analyzer parameters	**Time**	Hour	Set 00 to 23
			Minute	Set 00 to 59
			Second	set 00 to 59
		Date Format	Europe (dd/mm/yy)	
			USA (mm/dd/yy)	
			ASIA (yy/mm/dd)	
		Date	Year	Set 00 to 99
			Month	set 00 to 12
			Day	set date (00 to 31)
			Weekday	Set day of the week (Sun-Sat)
		User ID	Set ID number , 10 alpha-numeric characters	
		Key Beeper	OFF / ON	
		Test Beeper	OFF / ON	
		Backlight	OFF / ON / Auto	
		Filter	Set Filter slow, normal, fast	
		Language	Set to English, German, French or Spanish	
		Preview	Set On or Off	

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CALIBRATION

CAL Mass Start weight calibration
CAL Temp Start Chamber Temperature Calibration
Calibration Report OFF / ON

PASSCODES Set Passcodes

Operator
Enter old
Enter new
Supervisor
Enter old
Enter new

14.0 SAMPLE PREPARATION

Sample preparation is the single most important item for accurate results. The sample must be prepared so the whole of the sample is heated uniformly and the moisture is near the surface of the material.

For powders no further preparation is necessary. For most other materials the sample should be ground, chopped, grated or otherwise made as fine as possible. Liquids or paste may need to be spread onto glass fibre pads to distribute them evenly and thinly. Some materials that may splatter as they are heated (oils, butter) may need to be spread on the glass fibre pads or mixed with dry sand.

Trial and error is often the only method to find the best method for the material.

When the sample is placed on the weighing pan it should be spread as thin and evenly as possible, do not compact the material. Ensure enough material is used to assure good repeatability of the results. Typically samples of 3 to 8 grams are used.

Some materials will require special preparation. For example when testing cheese, if the cheese is very soft it may be necessary to use dry sand as a buffer material so it does not splatter or form a skin. To do this it would be necessary to prepare the sand by drying it in an oven until you were certain no moisture remains. Put the sand on the sample pan and tare the analyzer. Mix the sand with the cheese so you have smooth mixture, spread this mixture on the sample pan and then do the test.

An alternative to this preparation is to spread the cheese on dry spun glass gauze to assist in spreading the heat and preventing splatter or skins forming. Remember to tare the analyzer with the gauze in the weighing pan for accurate results.

Other materials will hold water within them in a way that is not suitable for this type of test. For example sugar will bind the water to the sugar molecules so strongly that heat will not remove the water before the sugar is burned.

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Some plastics also are not suitable for this type of method due to the very low percent moisture and the heat required to extract this moisture.

KNOW THE MATERIAL

In addition it is important to know enough about the materials so that you do not endanger or inconvenience others. For example some solvents have very low flash points that are not suitable for drying with heat sources that can reach 100ºC. Other materials will cause odor or fumes that will be dangerous or objectionable, for example, drying fertilizer slurry without using a vent to extract the odor.

15.0 GUIDANCE NOTES

The following guide notes are offered as examples of temperature, display update time and expected results when drying various substances. The preparation, distribution and amount of product can all significantly affect the results. It is important to find suitable procedures to process the material, usually by trial and error.

In general it is recommended that a temperature of 100ºC, a time interval of 10 seconds, and a sample sized 3-8g be selected for initial test. After a number of tests with these conditions this will provide a basis for comparing other times, temperatures or sample preparations.

The items in the following table are taken from actual test results. The user of the analyzer will need to determine the best procedures for their samples.

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MOISTURE ANALYZER EXAMPLES

MATERIAL	SAMPLE MASS (g)	DRYING TEMPERA-TURE.(º C)	STROBE TIME(s)	AVERAGE WATER CONTENT	STANDARD DEVIATION	DRYING TIME(min)
BUTTER	2-5	138	15	16.3	0.1	4.5
CEMENT	8-12	138	15	0.8	0.1	4-5
CHARCOAL	8-10	120	10	3.8	0.1	8-10
CHOCOLATE POWDER	2-4	100	5	1.9	0.1	4
COCOA POWDER	2-3	106	20	0.1	0.1	2
COFFEE CREAMER POWDER	2-3	130	15	78.5	0.1	6-8
CORNFLAKES	2-4	120	15	9.7	0	5-7
DRY APPLE PULP	5-8	100	10	76.5	0.1	10-15
DUST	5-10	104	10	7.3	0.3	8-15
FLOUR	8-10	130	10	12.5	0.1	4-5
GROUND COFFEE	2-3	106	5	2.8	0.1	4
MARGARINE	3-4	138	20	16	0.1	10
MAYONNAISE	1-2	138	20	56.5	0.4	10
MILK	2-3	120	15	88	0.2	6-8
MILK CHOCOLATE	2-5	106	15	1.3	0.1	3.5
MILK POWDER	2-4	90	15	5	0.2	6
MUSTARD	2-3	130	20	76.4	0.7	10
PAPER	2-4	106	20	6.4	0.1	10
POLYAMIDE	2-5	138	20	2	0.2	75
POTATO FLAKES	3-4	106	15	6.9	0.1	7.5
POWDERED SOUP	2-3	80	15	3	0.2	4.5-7
RED WINE	3-5	100	15	97.4	0.1	15-20
SLIME	11-12	130	15	80	-	90
SUGAR	4-5	138	15	11.9	0.1	10
SUNFLOWER OIL	10-14	138	20	0.1	0	2
WET APPLE	5-8	100	10	7.5	0	5-10
WHITE GLUE	2-5	136	15	54.3	0.1	6-8
YOGHURT	2-3	110	15	86.5	0	4.5-6.5

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