INSTRUCTION MANUAL

CONTECH
CA & CB-SERIES MOISTURE BALANCES

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INTRODUCTION AND FEATURES

CONTECH CA and CB series Moisture balances use Electromagnetic force compensation technique to measure the weight accurately.

Features:

- 5 **MEASUREMENT UNITS**:
  1. % Moisture
  2. % Moisture based on dry weight
  3. Wet Weight to Dry weight Ratio
  4. Dry to Wet Weight ratio
  5. Weight loss in grams.

- 3 **MEASUREMENT MODES**:
  1. AUTO
  2. MANUAL
  3. TIMER
- 10 programmable drying methods.
- Bidirectional RS232 interface to interface with computers and printers.
- Printing and display of test results
- Storage of 50 test results in memory.
- Drying with 500W Halogen lamp for quicker heating of samples.
- GLP compliant.
- Programmable Periodic printing of moisture % while testing.

The moisture balance based on the principle of thermo-gravimetric analysis, heats and dries a sample using a 500W halogen lamp . It calculates and displays the moisture content in %, on the basis of the difference between the wet initial weight and dry final weight.

INSTALLATION

a) Unpacking

Unpack the balance. Save the packing container for future use.

PACKING LIST

1. MOISTURE BALANCE - 1 NO.
2. SWITCH MODE POWER SUPPLY - 1 NO.
3. SAMPLE PAN - 25 NOS.
4. INSTRUCTION MANUAL

b) Electrical requirements

The product requires very stable power. It works on 230V AC supply with PROPER EARTHING. The power outlet used for the balance should not be shared with any other devices which draws current in inconsistent manner like Airconditioner or refrigerator etc.

c) Environmental requirements

For best results, the balance should be placed on a level surface which is free from drafts. It should not be exposed to direct sunlight or radiated heat. The balance should not be subjected to sudden ambient temperature changes. Table used for balance should be sturdy and should not transmit vibration from other equipments and free from the movement of people. No vibration producing equipment should be operated on the same platform as balance.

WARNING !!!!

- Do not use a sample that could trigger a chemical reaction and cause an explosion or emits poisonous gas, when the sample is dried.
- Keep flammable materials away from the balance.
- Do not touch the heating chamber while testing, It may very hot.
- Parts of the balance become very hot. Materials placed near it might catch fire.
- Do not use the balance in ambient ignitable gas. It may cause explosion and fire.
- Use correct power source (voltage, frequency, outlet type) adapted to the specification of the balance. If excessive voltage is used, the balance may damage or cause a fire.
- Moisture balance should opened by trained and authorized persons only. There is a danger of Electric Shock inside.
- Turn off the power switch and remove the power cord from the power outlet, when replacing the halogen lamp. Touching an electrode of the halogen lamp connector carelessly, it may cause to receive an electric shock.
- Do not disassemble the balance. It may cause an error, damage, receiving an electric shock or fire.
- Avoid getting the balance wet. It is not a water-resistant structure. If there is leakage of liquid into the balance, it may cause damage to the balance or receiving electric shock.

- Do not look at the halogen lamp to protect your eyes from damage.
- Do not drop, hit or crack the glassware including the halogen lamp, to avoid an injury.

d) Power on

Power is supplied to the balance through a 4 pin Switch mode power supply supplied along with the balance. Connect the 4 pin SMPS to the balance to a 4 pin round male connector provided at the rear panel of the balance. Insert the connector and rotate the external cover to make the connection firm and proper. Connect the 4 pin SMPS to an AC mains outlet with proper earthing.

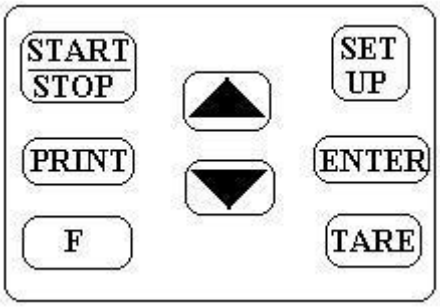
Power to the halogen heater is supplied through mains cord attached to the heater assembly. Connect the mains cord to a mains outlet with PROPER EARTHING. Turn on the Switch which is located on the rear side of the heater assembly..

Balance goes through the self test and subsequently starts displaying weight

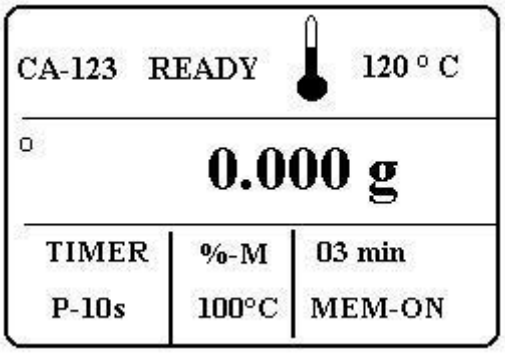
Press TARE key to zero the weight, if required.

NOTE: Please note that these balances need a warm up time of approx. 30 minutes before it is used. No adjustment should be done to the balance during this period. Balance is ready for weighing after warm up period.

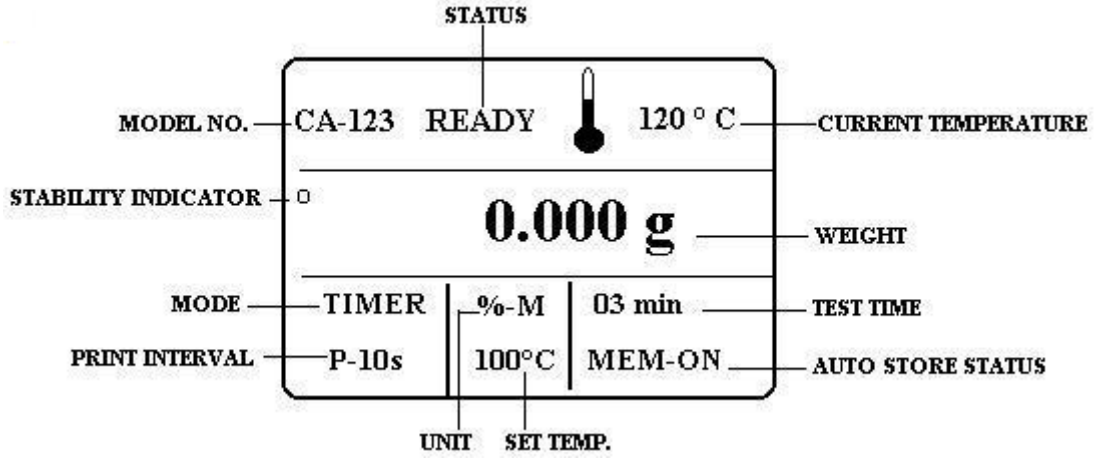
MOISTURE BALANCE KEYBOARD



MOISTURE BALANCE DISPLAY



DISPLAY INDICATIONS :



SETUP PARAMETERS

PARAMETERS REQUIRED FOR THE FUNCTIONING OF THE BALANCE AND FOR TESTING OF SAMPLES CAN BE SET BY MODIFYING THEM TO SUIT VARIOUS APPLICATIONS.

Pres SET UP key

Balance displays the following menu.

SETUP FUNCTIONS
****

BALANCE PARAMETERS
SERIAL PORT SET
TESTING PARAMETERS
DATE/TIME ENTRY
PROGRAMM SET/RECALL
DATA RECALL
QUIT SETUP MODE

Press  or  key to scroll through the menu and Press 

key to select.

BALANCE PARAMETERS : Use this menu to change parameters required for the functioning of the balance.

SERIAL PORT SET : Use this to change parameters associated with Serial port.

TESTING PARAMETERS : Use this option to change drying application parameters.

DATE/TIME ENTRY : Use this option to change Date, Time, Machine ID etc.

PROGRAMM SET/RECALL : To change testing parameters of 10 programmable drying method.

DATA RECALL : To retrieve test data from memory.

BALANCE PARAMETERS.

Balance parameters like Response time, Auto Print, Auto-zero, RTZ, Calibration enable and GLP enable can be modified..

Menu	*Options*	*Explanation*	*Factory settings*
RESPONSE TIME	FAST MEDIUM NORMAL SLOW	ENABLES USER TO CHANGE MEASUREMENT SPEED	NORMAL
AUTO-PRINT	AUTO-ON AUTO-OFF	ENABLE/DISABLE AUTO PRINT OF TEST RESULTS	AUTO-OFF
AUTO-ZERO	A.ZERO-0 A.ZERO-1 A.ZERO-2 A.ZERO-3	AUTOMATIC ZERO TRACKING	A.ZERO-1
R.T.Z.	RTZ-0 RTZ-1 RTZ-2 RTZ-3	RETURN TO ZERO TRACKING	RTZ-1
CALIB	CAL-OFF CAL-ON	EXTERNAL CALIBRATION	CAL-OFF
GLP	GLP-OFF GLP-ON	GLP ENABLE/DISABLE	GLP-OFF

To Enter a menu Press ENTER key. Use  or  key to change and

Press ENTER to select. Press TARE to quit the menu.

SERIAL PORT SET

Serial port parameters like baud rate, number of bits, parity, data terminator and print delay can be modified in this menu.

Menu	*Options*	*Explanation*	*Factory settings*
BAUD RATE	4800 2400	SPEED OF SERIAL PORT COMMUNICATIONS	4800
NO. OF BITS	8-BITS 7-BITS	NO OF BITS	8-BITS
PARITY	NO PARITY EVEN ODD	PARITY BIT	NONE
TERMINATOR	CR CRLF	TERMINATOR STRING	CRLF
PRN-DELAY	DELAY-ON DELAY-OFF	TIME DELAY IN DATA OUTPUT	DELAY-ON

To Enter a menu Press ENTER key. Use  or  key to change and

Press ENTER to select. Press TARE to quit the menu.

TESTING PARAMETERS:

Use this menu to change test parameters like Measurement unit, Measurement Mode, Temperature, Test Time , End point, Auto Store, Print interval.

MEASUREMENT UNITS :

UNIT	EXPLANATION	DISPLAY SYMBOL
% MOISTURE	$\frac{\text{WET WEIGHT} - \text{DRY WEIGHT}}{\text{WET WEIGHT}} \times 100$	%
% MOISTURE-DRY	$\frac{\text{WET WEIGHT} - \text{DRY WEIGHT}}{\text{DRY WEIGHT}} \times 100$	%d
DRY WEIGHT %	$\frac{\text{DRY WEIGHT}}{\text{WET WEIGHT}} \times 100$	dw%
WET WEIGHT %	$\frac{\text{WET WEIGHT}}{\text{DRY WEIGHT}} \times 100$	ww%
GRAMS	WEIGHT IN GRAMS	g

MEASUREMENT MODE :

MANUAL - DRYING PROCESS IS STARTED AND STOPPED BY PRESSING A KEY

AUTO - DRYING PROCESS IS STOPPED IF PROGRAMMED MOISTURE LOSS/ MINUTE IS ACHIEVED

TIMER - DRYING PROCESS IS STOPPED AFTER PROGRAMMED TIME LIMIT REACHED.

END POINT

End point settings determine the sample drying time. END POINT can be modified to change the accuracy of the result. If 0.01% / min is programmed , the drying process is continued till the moisture loss reaches 0.01% per minute. END POINT is applicable only in AUTO measurement mode.

9 settings from 0.01%/minute to 5%/minute are available in the moisture balance.

OPTIONS	END POINT CRITERIA
0.01%/min	MOISTURE LOSS IS 0.01%/MIN OR BELOW
0.02%/min	MOISTURE LOSS IS 0.02%/min OR BELOW
0.05%/min	MOISTURE LOSS IS 0.05%/min OR BELOW
0.1%/min	MOISTURE LOSS IS 0.1%/min OR BELOW
0.2%/min	MOISTURE LOSS IS 0.2%/min OR BELOW
0.5%/min	MOISTURE LOSS IS 0.5%/min OR BELOW
1.0%/min	MOISTURE LOSS IS 1.0%/min OR BELOW
2.0%/min	MOISTURE LOSS IS 2.0%/min OR BELOW
5.0%/min	MOISTURE LOSS IS 5.0%/min OR BELOW

TEMPERATURE

Drying temperature can be changed from ambient to 200 deg C in 1 deg increment to suit various drying needs.

TESTING TIME

DRYING TIME can be changed from 3 minutes to 120 minutes to suit different applications. This can be changed only if TIMER mode is selected.

STORE

Enable Auto Store feature if the test results are required to be stored in memory automatically once the test is terminated normally.

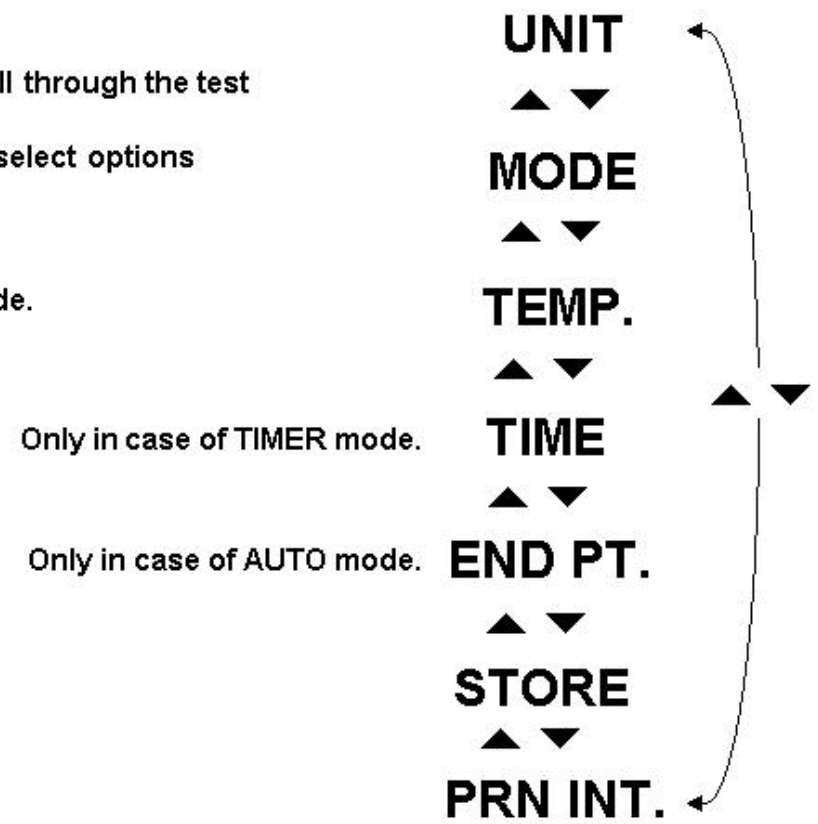
PRINT INTERVAL

PRINT INTERVAL (Displayed PRN INT.) can be selected among 10 Sec, 20 Sec, 30 Sec, 1 min, 2 min options to select the interval for data output during drying process.

CHANGING SETTINGS.

Use ▲ or ▼ keys to scroll through the test menu and press (ENTER) key to select options shown here.

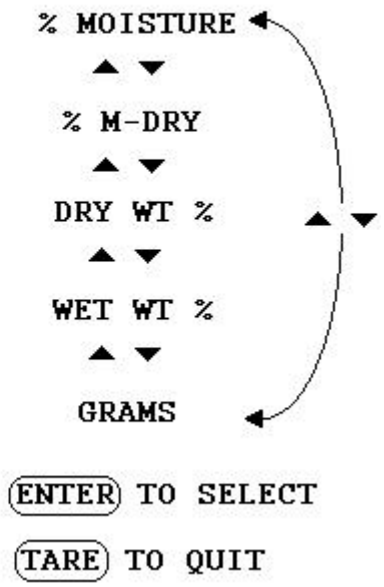
Press (TARE) key to quit this mode.



UNIT

Use ▲ or ▼ keys to scroll through units and press (ENTER) key to select options shown here.

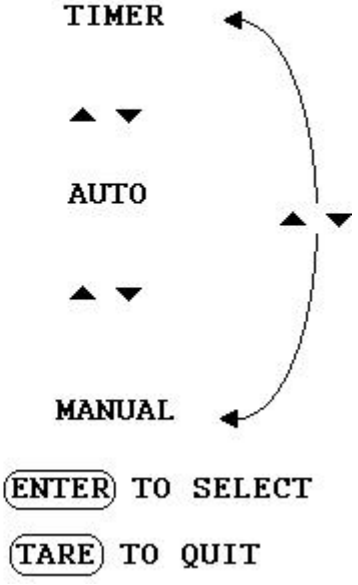
Press (TARE) key to quit this mode.



MODE

Use ▲ or ▼ keys to scroll through modes and press (ENTER) key to select options shown here.

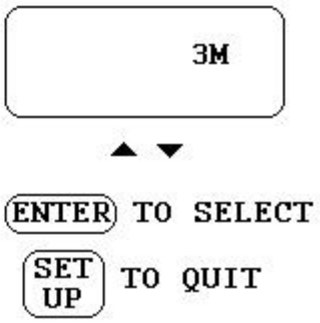
Press (TARE) key to quit this mode.



Use ▲ or ▼ keys to change from 3 min. 120 min and press (ENTER) key to save.
This is applicable only in TIMER MODE.

Press (SET UP) key to quit this mode.

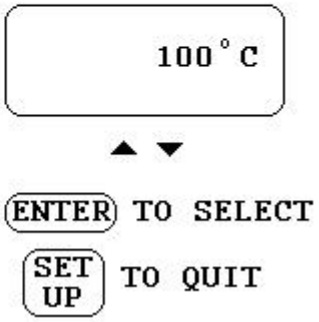
TIME



Use ▲ or ▼ keys to change temperature from ambient to 200°c and press (ENTER) key to save.

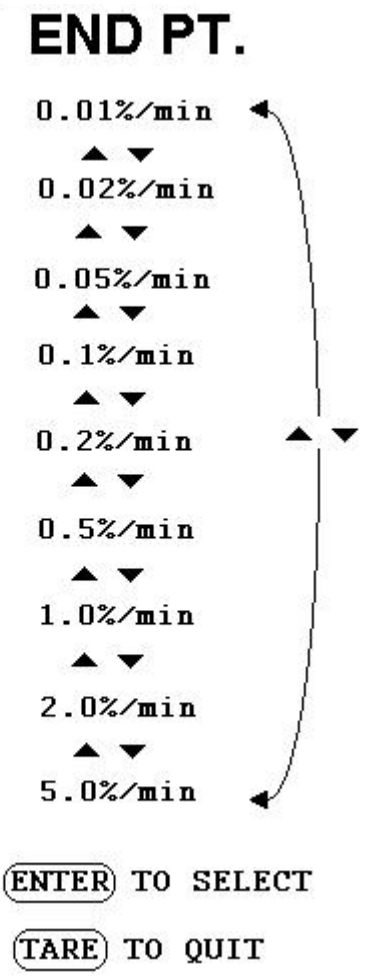
Press (SET UP) key to quit this mode.

TEMP.



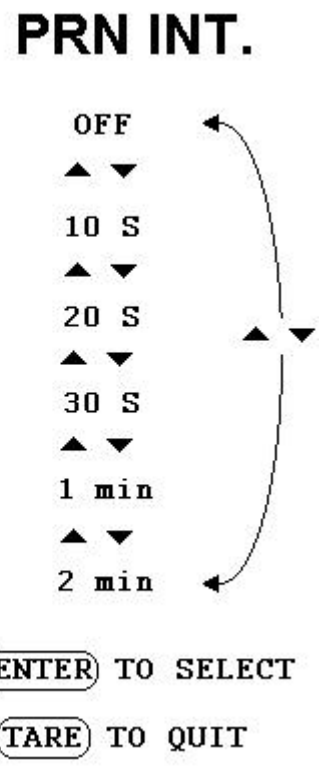
Use ▲ or ▼ keys to change end point criteria and press (ENTER) key to save. This is applicable only in AUTO MODE.

Press (TARE) key to quit this mode.



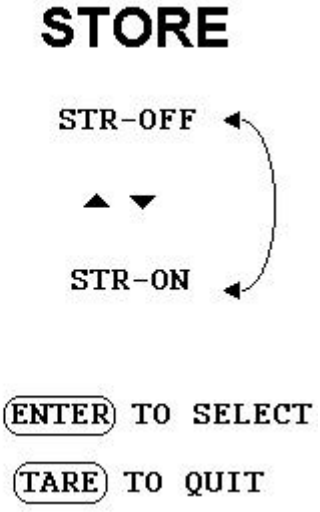
Use ▲ or ▼ keys to scroll through interval times and press (ENTER) key to select options shown here.

Press (TARE) key to quit this mode.



Use ▲ or ▼ keys to change auto store status and press (ENTER) key to save.

Press (TARE) key to quit this mode.



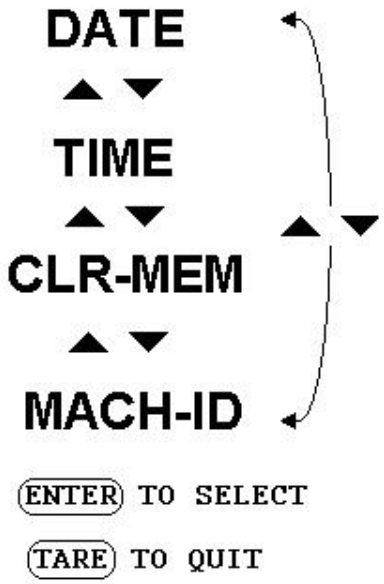
DATE/TIME ENTRY

Date, time and machine-id entries and memory clear functions can be accessed through this menu.

Use ▲ or ▼ keys to scroll through the menu and

press (ENTER) to select the option

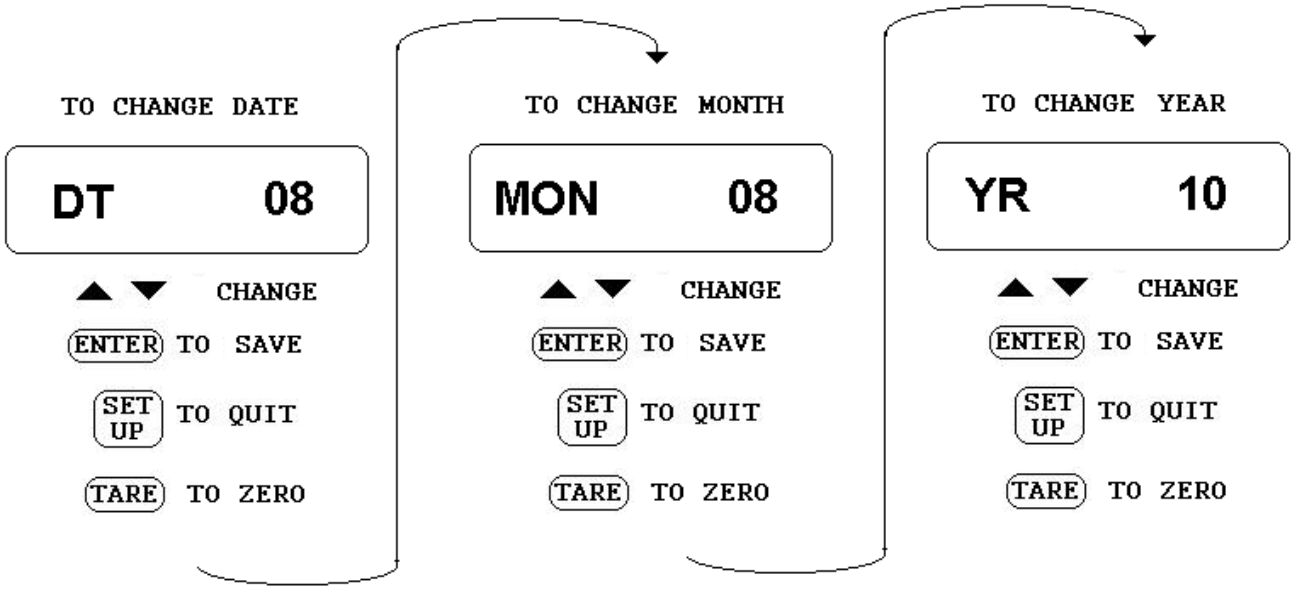
Press (TARE) to quit



DATE ENTRY:

Moisture balance is equipped with Real Time Clock. Hence normally there is no need to change the date and time. However it is possible to change date and time if in need.

Select **DATE** option from the DATE/TIME ENTRY menu by pressing (ENTER) key.

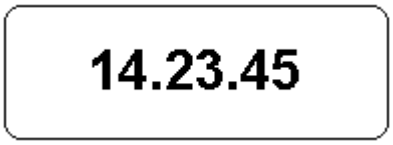


TIME ENTRY:

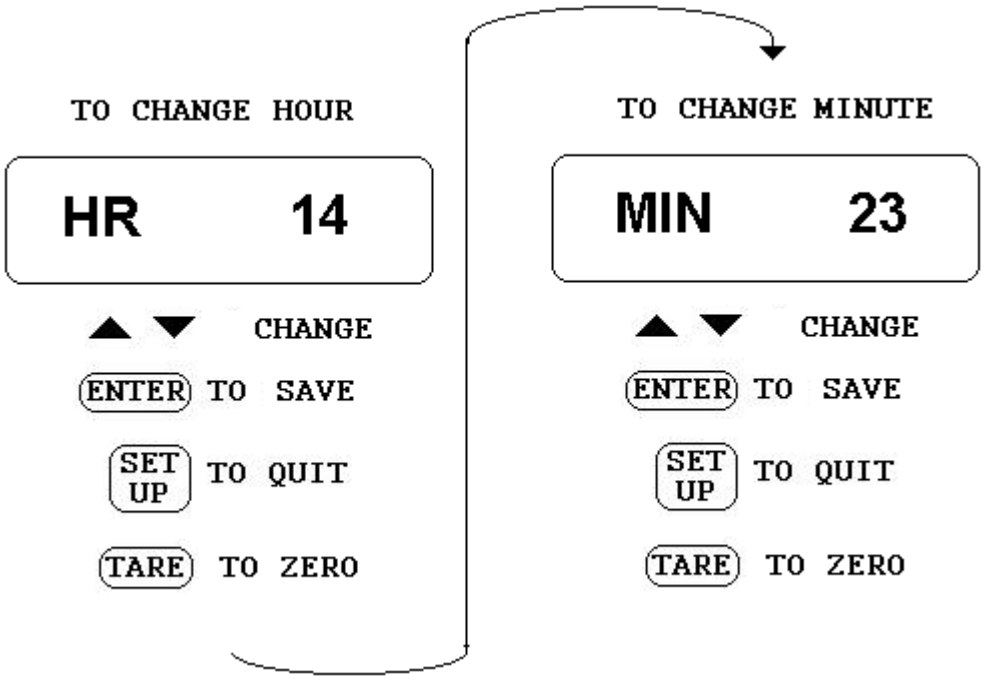
Moisture balance is equipped with Real Time Clock. Hence normally there is no need to change the date and time. However it is possible to change date and time if in need.

Select **TIME** option from the DATE/TIME ENTRY menu by pressing [ENTER] key.

Balance displays current time say,



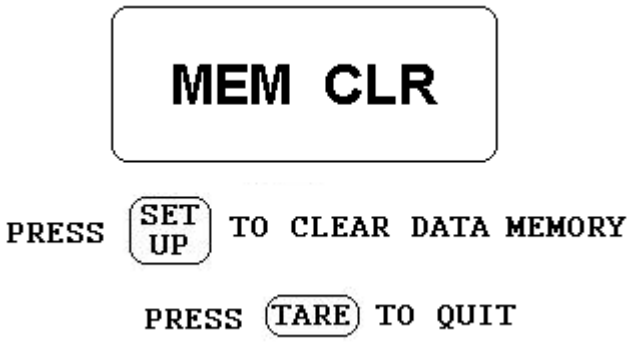
Press [SET UP] key to change TIME. Press [TARE] to quit.



MEMORY CLEAR:

Test results stored in the memory can be erased using this option. Up to 50 test results can be stored in balances' memory. User will have to clear the memory after 50 results are stored.

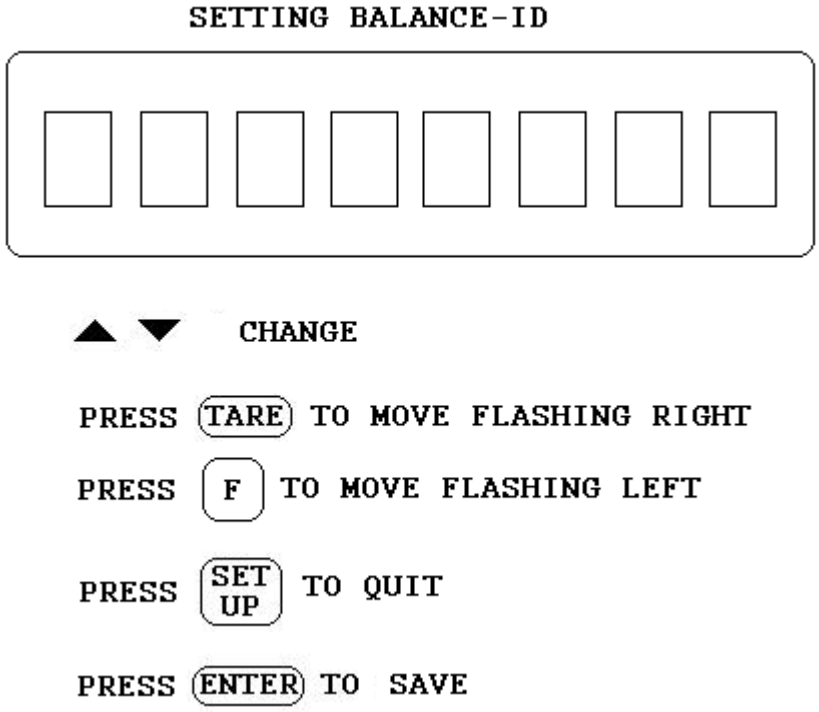
Select **CLR-MEM** option from the DATE/TIME ENTRY menu by pressing (ENTER) key.



MACHINE-ID:

Machine identification number can be assigned to the balance using this option.

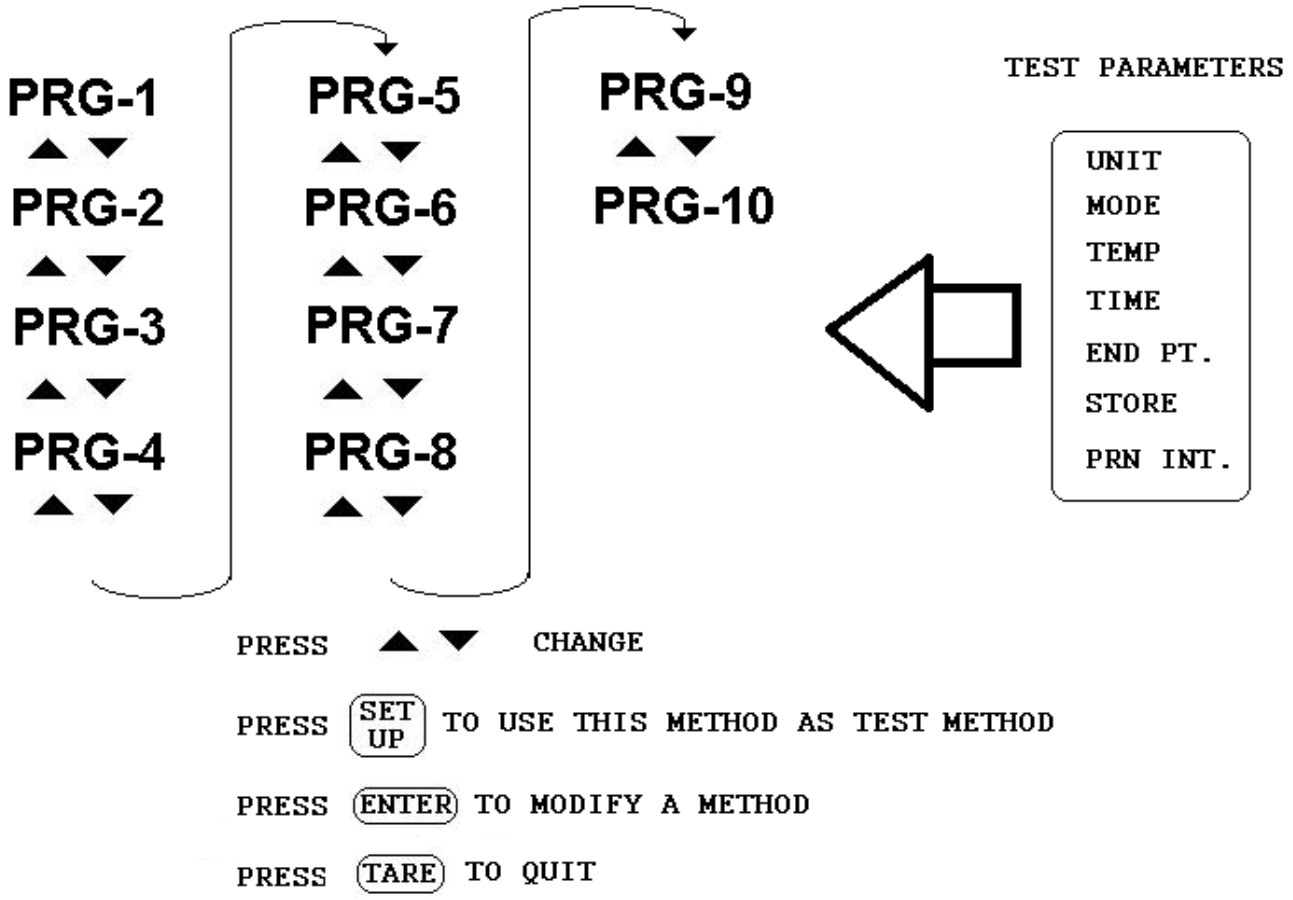
Select **MACH-ID** option from the DATE/TIME ENTRY menu by pressing (ENTER) key.



PROGRAM SET/RECALL.

Moisture balance has a provision for storing 10 drying methods (**PRG-1 to PRG-10**) in memory for easy recall. All the Testing Parameters i.e., Measurement unit, Measurement Mode, Temperature, Test Time, End point, Auto Store and Print interval can be modified and stored in individual memory for later use.

To modify a particular memory, Press ENTER key to select.



For example,
If PRG-1 is selected to use as test method, all the test parameters stored under PRG-1 , will be used for testing next sample.

TO MODIFY A TEST METHOD FOLLOW INSTRUCTIONS MENTIONED UNDER SUB HEADING **TESTING PARAMETERS** EARLIER.

OPERATION OF MOISTURE BALANCE.

Set the test parameters as per the requirement.

Select **MODE, UNIT, TEMPERATURE, TIMER/END PT., PRINT INTERVAL, MEMORY STORE STAUS, AUTO PRINT** to suit a particular drying test.

Though moisture balance can be used with sample weight of 0.005g and above, it is always recommended to use sample of sufficient weight (at least 2g) for better accuracy and repeatability of test results. If an accuracy of 0.5% is needed, use at least 5g sample and for 0.1% accuracy use at least 15-20g. Samples with lower weight may result in lesser accuracy and repeatability.

Spread the sample evenly on the pan to make sample heating uniform and also to get better results.

Do not use a sample that could make a dangerous chemical reaction and cause an explosion or poisonous gas, when the sample is dried.

Do not use samples which contain volatile substances, as it will result in incorrect results.

Do not allow testing samples to absorb moisture from the atmosphere. If required maintain samples at constant temperature.

When testing samples repeatedly, user must ensure to put samples on a sample pan, which is at room temperature. Placing samples on a hot sample pan may give wrong results, as some moisture may be lost even before the test is begun. In such cases, it is recommended to use multiple pans.

While doing multiple testing, it is recommended to wait till the temperature of the heating chamber is cooled down to room temperature for better accuracy.

Ensure to avoid external disturbances like air conditioners or any vibration producing equipments from affecting the weighing results. Unstable weighing will result in inaccurate test results.

KEEP SAMPLE PAN ON THE PAN HOLDER.

PRESS 

KEY TO MAKE WEIGHT READING ZERO.

PUT SAMPLE ON THE PAN.

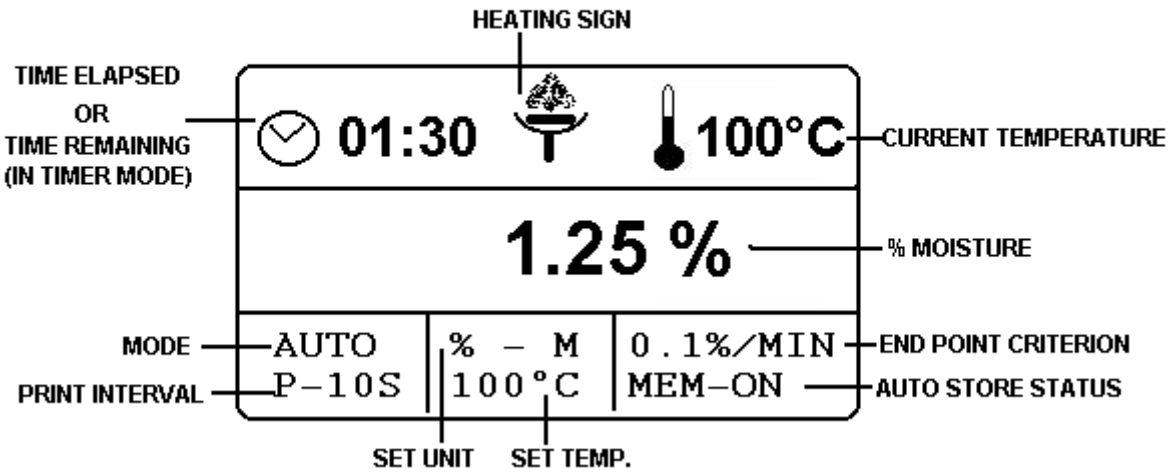
CLOSE THE HEATING CHAMBER.

PRESS 

KEY.

HALOGEN HEATER IS TURNED ON AND THE DRYING TEST IS COMMENCED.

DISPLAY DURING TESTING



Balance will continuously display % moisture (or whichever unit is selected) along with current temperature and elapsed time (or remaining time in TIMER mode) along with other set parameters.

Heater will quickly reach the set temperature and will remain at the set temperature till the test is terminated.

Test will continue till the END POINT CRITERION is met,

IN AUTO MODE : % MOISTURE LOSS/min IS REACHED

IN TIMER MODE : SET TIME IS REACHED

IN MANUAL MODE : PRESS START/STOP

Balance will output data through the serial port at the Print interval set. It will output Time, Weight and % moisture.

IN CASE ANY EMERGENCY, A DRYING TEST CAN BE TERMINATED BY PRESSING

START/STOP **KEY, IRRESPECTIVE OF THE SET MODE/UNIT.**

Sample Printout appears as below.

EL.TIME min.	WEIGHT g	MOISTURE %
00:00	2.739 g	0.00 %M
00:10	2.742 g	0.00 %M
00:20	2.718 g	0.76 %M
00:30	2.681 g	2.11 %M
00:40	2.682 g	2.08 %M
00:50	2.655 g	3.06 %M
01:00	2.655 g	3.06 %M
01:10	2.655 g	3.06 %M
01:20	2.656 g	3.03 %M
01:30	2.653 g	3.13 %M
01:40	2.649 g	3.28 %M
01:50	2.646 g	3.32 %M
02:00	2.646 g	3.32 %M
02:10	2.648 g	3.32 %M
02:20	2.648 g	3.32 %M
02:30	2.648 g	3.32 %M

ONCE A DRYING TEST IS ENDED, RESULTS ARE OUTPUT THROUGH THE SERIAL PORT IF AUTO PRINT OPTION IS SET. HEATER IS TURNED OFF.

BALANCE DISPLAYS THE RESULTS ON THE DISPLAY.

08/04/10 17:43:16
WET WT : 2.739g
DRY WT : 2.648g
RESULT : 3.32%M
TIME : 02:35min
TEMP : 100 ^{O}C
MODE : AUTO

PRESS ANY KEY TO CONTINUE

RESULTS ARE STORED IN MEMORY AUTOMATICALLY, IF STORE FUNCTION IS ENABLED.

RESULTS CAN ALSO BE STORED BY PRESSING 

KEY AFTER THE TEST IS ENDED.

RESULTS CAN BE SEEN ON THE DISPLAY BY PRESSING  KEY.

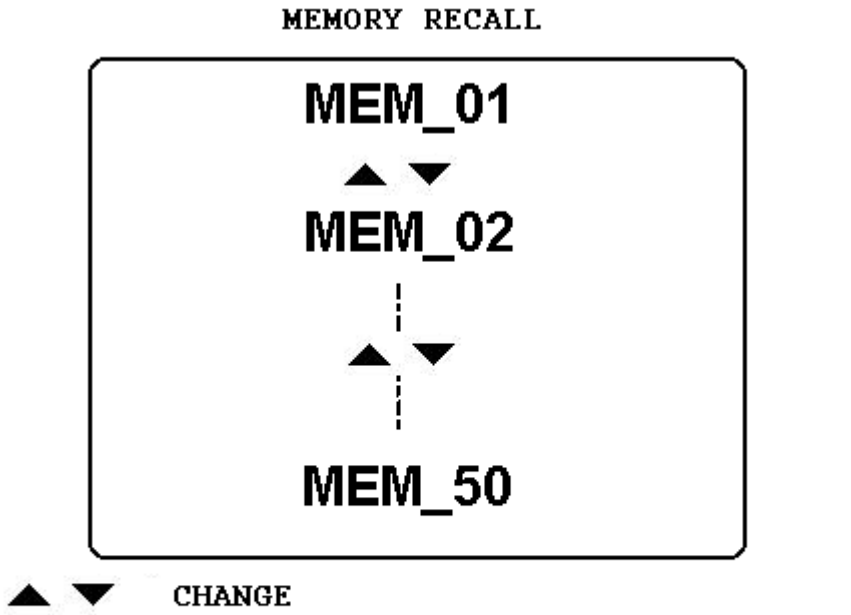
TO PRINT RESULTS, PRESS  key.

CONTECH MOISTURE BALANCE
MODEL : CA-123
S.No. : 1000294
M/C ID.: UNIT 1
08/04/10 17:43:17
SAMPLE :
TEST MODE : AUTO
TEST UNIT : % MOIST
TEMPERATURE : 100 DEG C
INITIAL WT. : 2.739 g
FINAL WT. : 2.648 g
TOTAL TIME : 02:35min
FINAL RESULT: 3.32 %M
REMARKS :

DATA RECALL.

This option enables the user to retrieve test results stored in memory.

Press (ENTER) key to select this option from the main menu.



If there is no data stored in memory, balance displays

NO DATA

Once the data is retrieved , it can be printed by pressing the (PRINT) key and can displayed by pressing (▲) as mentioned earlier

BIDIRECTIONAL RS-232 INTERFACE.

Bi-directional RS-232 interface is provided in these balances to communicate with devices like computer, printer etc. The interface is provided through a nine pin D-type connector provided at the rear side of the balance. Connections are as below.

Pin 2 – RXD – Receive Data
Pin 3 - TXD – Transmit Data
Pin 7 – Ground.

The Serial data transmitted and received are in standard ASCII mode (+/- 15V) - ASYNCHRONOUS , 8 BITS, NO PARITY, 1 STOP BIT.

Baud rate : 2400 OR 4800 SELECTABLE.

A Stable weight data is output as follows:

S	+	w	w	w	w	w	.	w	w	w		g		CR	LF

S – stable Data
blank space - 20 hex
CR- Carriage Return – 0D hex
LF – Line feed - 0A hex

An unstable weight data is output as follows:

U	+	w	w	w	w	w	.	w	w	w		g		CR	LF

U – stable Data
blank space - 20 hex (32 DEC)
CR- Carriage Return – 0D hex (13 DEC)
LF – Line feed - 0A hex (10 DEC)

Current Temperature is output in the following format:

t	t	t	C	CR	LF

t t t = CURRENT TEMPERATURE
C = Unit(Centigrade)
CR- Carriage Return – 0D hex (13 DEC)
LF – Line feed - 0A hex (10 DEC)

Moisture %, during drying process, is sent as per the following format:

m	m	m	m	.	m	m	%	CR	LF

mmmm.mm% = CURRENT MOISTURE %
CR- Carriage Return – 0D hex (13 DEC)
LF – Line feed - 0A hex (10 DEC)

During drying process, request for complete data could be sent to the balance.

The complete Data is output is :

t	t	t	C		m	m	m	:	s	s	M		+	w	w	w	w	w	.	w	w	w	g		M	M	M	M	.	M	M	%	CR	LF

Temperature **Time** **Weight** **Moisture**

blank space - 20 hex (32 DEC)
CR- Carriage Return – 0D hex (13 DEC)
LF – Line feed - 0A hex (10 DEC)

The balance could be controlled by an external device like computer with the following commands.

SOFTWARE COMMANDS

W1	OUTPUTS WEIGHT
WD	OUTPUTS DRYING DATA
WM	OUTPUTS % MOISTURE
WT	OUTPUTS DRYING TEMPERATURE
WB	START A DRYING TEST
WE	STOP A DRYING TEST
WR	OUTPUTS DRYING DATA CONTINOUSLY
Z	TARES THE WEIGHT
T	TARES THE WEIGHT

CALIBRATION WITH EXTERNAL WEIGHTS

CA-Series balances can be calibrated for weight with standard mass. Balances can be calibrated with 50g, 100g, 200g, 500g ,1kg, 2kg, 5kg weights depending on the models.

Enable CALIB function in BALANCE PARAMETERS in SETUP mode before attempting to calibrate the balance.(Refer SETUP functions for more details). This function should not be made available to the end user, if there is any restriction in usage of this function.

CALIBRATING THE BALANCE.

Use only good calibrated weights for performing auto calibration.

Press TARE key to make the weight read zero.

Keep the standard mass on the pan and wait for it to become stable.

Press F key.

Balance will display **CAL**

Subsequently displays **----------**

After calibration it will display **CAL-DONE**

If the weight is not within the calibrating range of the balance , it will display

CAL-FAIL

In case of GLP enabled balances , if GLP is enabled in SETUP function, the balance will print the GLP report in the following format.

CONTECH
MODEL : CA-123
SERIAL NO : 1000294
M/C ID : UNIT 1
DATE : 08.04.10
TIME : 17:35:24
CALIBRATED(EXT.WT.)
CALIB. WT : 100.000g

Signature :

RESETTING CALIBRATION TO FACTORY SETTING

Press SET UP key and immediately press F key. Balance will display

REFRESH

Balance weight calibration will now be restored to factory settings.

SPECIFICATIONS OF MOISTURE BALANCE

MODEL:	CB-50	CA-123	CA-223
WEIGHING RANGE	50g	120g	220g
READABILITY	0.001g	0.001g	0.001g
REPEATABILITY	± 0.001g	± 0.001g	± 0.001g
MOISTURE MEASUREMENT METHOD	DRYING SAMPLE WITH 500W HALOGEN LAMP		
MEASUREMENT MODE	AUTO, TIMER, MANUAL		
MEASUREMENT UNITS	% MOISTURE, % MOISTURE BASED ON DRY WT, DRY WEIGHT RATIO, WET WEIGHT RATIO, WEIGHT IN GRAMS		
MOISTURE% READABILITY	0.01%		
MOISTURE% REPEATABILITY	0.02% FOR SAMPLE WEIGHT > 5g 0.1% FOR SAMPE WEIGHT < 5g		
PROGRAM MEMORY	10		
STORAGE MEMORY	50 RESULTS		
COMMUNICATION INTERFACE	BIDIRECTIONAL RS232C		
POWER REQUIREMENTS	230V, 50Hz, +/- 10% AC		
DIMENSIONS	335mm X 205mm X 252mm (LXBXH)		
NET WEIGHT	8 kg Approx.		