



KORRTM
Medical Technologies Inc.



USER MANUAL



MetaCheck
Metabolic Rate Analysis System

MetaCheck™
Metabolic Analyzer
Model 7100

User Manual

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Congratulations

Your MetaCheck™ Metabolic Analyzer is a clinical quality instrument that measures energy expenditure. It will provide you measurements with similar accuracy as devices used in hospital intensive care units.

I am sure you will find the MetaCheck™ extremely simple to use. The printout provides a graphical way to present the measurement results in a manner that your clients will easily understand. You may find that the greatest power of the product is in educating individuals about their own “Energy Balance”.

Rather than starving themselves, or using diets based on the average population, you can provide your clients with a precise metabolic measurement. This measurement will allow them to determine *what is the most number of calories they can eat and still lose weight!* As they learn to eat to their metabolism, individuals will be put on the road of life-long weight management.

I wish you great success in marketing your facility using the MetaCheck™. I am sure you will find it to be a powerful tool for attracting new business and establish your facility as leading edge and successful.

Sincerely,

Julie K. Kofoed

Vice President of Marketing

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1.1 Device Description

The MetaCheck™ Model 7100 is an indirect calorimeter. It determines resting energy expenditure (REE) by measuring oxygen uptake. Resting energy expenditure is the amount of calories that a patient will expend (burn) in 24 hours of resting.

REE is calculated using the Weir equation with an assumed RQ=0.83. See "Weir, J.B., New Methods for Calculating Metabolic Rate with Special Reference to Protein Metabolism. J. Physiology, 1949 109: pages 1-9"

1.2 Intended Use

WARNING:

*The MetaCheck™ is NOT a medical device.
It is not intended to be used for the diagnosis or treatment of disease.*

*For medical applications, customers should use the REEVUE Indirect Calorimeter from KORR™.
The REEVUE has clearance from the US Federal Food and Drug Administration (FDA)
to be marketed as a medical device.*

The MetaCheck™ is intended for non-medical application to determine energy expenditures in individuals. This is typically used to determine how many calories the individual burns at rest.

The device determines resting energy expenditure (REE), also referred to as resting metabolic rate (RMR) from a measurement of an individual's oxygen uptake.

The MetaCheck™ is typically used in applications to help individuals determine the caloric requirements for them to lose, or maintain weight.

1.3 Theory of Operation

1.3.1 Metabolic Testing

Metabolism is the process of converting food into heat or energy. The rate and efficiency with which the body converts food to energy is referred to as the metabolic rate. The most direct method of measuring metabolic rate is to directly measure the amount of heat produced by the body. This method is referred to as direct calorimetry. Direct calorimetry is difficult and impractical, as it requires a subject to be placed in a special insulated room where the flow of heat into and out of the room is measured and controlled. A more common method of metabolic rate measurement is indirect calorimetry. In indirect calorimetry, the amount of oxygen consumed rather than the amount of heat produced is measured. Every calorie consumed requires a fixed amount of oxygen to be converted to energy. The rate at which oxygen is used is directly proportional to the rate of caloric expenditure. In short, measuring the rate of oxygen consumption is equivalent to measuring the amount of calories being used. The MetaCheck™ is an indirect calorimeter because it measures oxygen consumption and calculates energy expenditure.

1.3.2 Oxygen Consumption

The number of calories burned by the body is directly proportional to the amount of oxygen consumed. The MetaCheck™ calculates oxygen consumption by measuring the concentration of oxygen inhaled and comparing it to the concentration of oxygen exhaled. Oxygen concentration is measured during an automatic calibration cycle prior to each test to ensure accuracy of the measurement. The MetaCheck™ also measures the temperature, relative humidity, and barometric pressure to further improve the accuracy of the calculations.

To measure oxygen consumption, all of the air exhaled by the user must pass through the MetaCheck™. Two one-way valves are configured in the disposable mouthpiece of the MetaBreather™ to ensure that only *fresh* air is inhaled and all exhaled gas passes through the hose and into the MetaCheck™. Because of the “one-way” valves in the MetaBreather™, the user can never inhale gas from the hose or the MetaCheck™, thereby eliminating the possibility of cross-contamination between users. It is important to use a nose clip during a test so that no air escapes through the nostrils and is not analyzed. Failure to use a nose clip would cause a lower REE reading.

1.3.3 Calorie Calculation

The number of calories expended for a given amount of oxygen consumed. The exact relationship between calories consumed and oxygen consumption is also affected by the amount of carbon dioxide produced by the body as well as oxygen consumed. However, the error that occurs by not considering carbon dioxide is never larger than 1% and is usually less than 0.5% during a resting metabolic test.

Because the volume of oxygen changes depending on the barometric pressure (elevation above sea level) and the room temperature where the measurement is made, it is necessary to convert all measurements to a standard temperature and pressure. This standard pressure and temperature is called STPD, (Standard Temperature and Pressure Dry).

The MetaCheck™ measures barometric pressure, relative humidity and temperature during each automatic calibration cycle. Using these measured parameters, VO_2 and metabolic rate measurements are all automatically compensated to standard (STPD) conditions.

1.3.4 Resting Energy Expenditure Measurements



A resting energy expenditure measurement is intended to measure the number of calories that an individual would burn if he or she were to be at rest for 24 hours. For the purpose of comparing the results against published, predicted normal values, it is important that the testing procedure follow some important guidelines. Factors that affect metabolic rate should be considered. In most cases, the measured resting metabolic rate will not be done under theoretically ideal conditions, but it will be indicative of the subject's actual resting level during normal daily conditions.

Basal energy expenditure (BEE) measurements are referred to, but are rarely truly tested, because of the inconvenience and cost to the individual. BEE testing requirements usually include a 24-hour fast, monitored body cycles, and an overnight stay in a clinic. You should note that the MetaCheck™ will accurately measure BEE if the test is administered properly. A resting energy expenditure (REE) test, also called resting metabolic rate (RMR), is a measure of the calories consumed while a subject is at rest. A REE test should be taken when the patient is sitting, or lying, comfortably, relaxed, and awake. This indicates how many calories the body is using while in that resting state. This is measured by the MetaCheck™ and is represented in calories per day.

Chapter 2: User Interface Description

2.1 Front Panel Description

The front panel is comprised of displays, keypad and connections. Figure 2.1 illustrates the MetaCheck™ keypad. The various keys and their functions are described on the following pages.

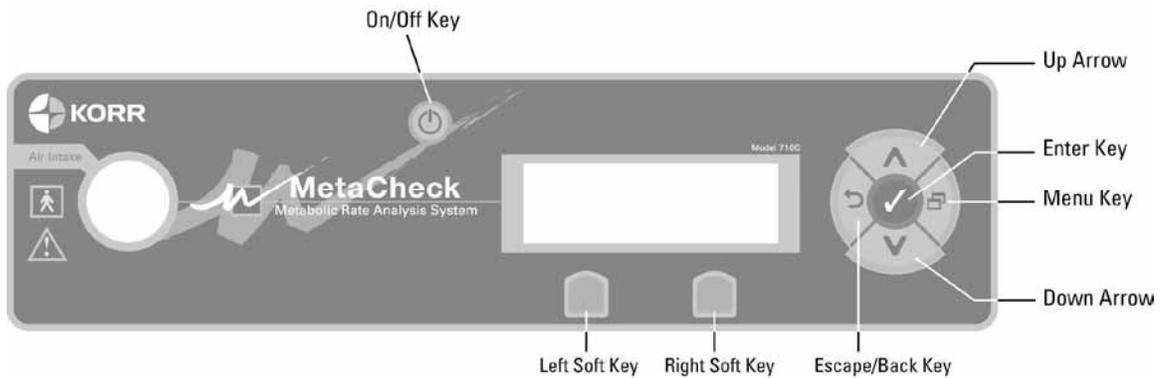


Figure 2.1 MetaCheck™ Keypad

2.1.1 Key Group

A group of keys are located to the right of the display. Most of the user interaction with the MetaCheck™ is with these keys. Figure 2.2 shows the key group.



Figure 2.2 Key Grouping. The key group includes the UP ARROW, DOWN ARROW, ENTER (check), MENU, and the BACK keys.

2.1.2 Soft Keys

Underneath the display are two keys that do not have any labels. These are called “Soft Keys.” The word “Soft” comes from the fact that the key functions are defined by the software in the MetaCheck™. When these keys are active, the bottom line of the display will have text that defines their function. There is a Left Soft Key and a Right Soft Key. Figure 2.3 is an example of a display showing Soft Key labels.

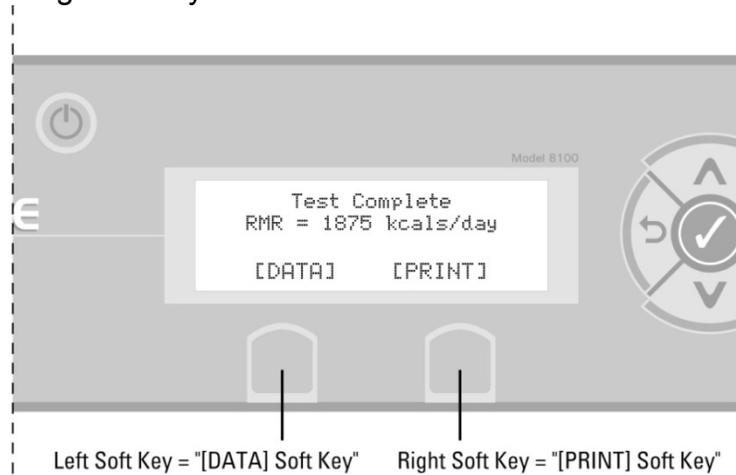
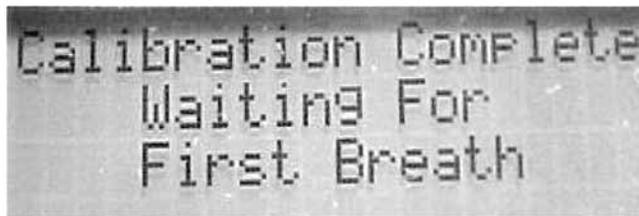


Figure 2.3 Example of Soft Keys defined on the display. In this example the “[DATA] Soft Key” is selected by pressing the key on the left under the display. Likewise, the “[PRINT] Soft Key” is selected by pressing the key on the right under the display.

2.1.3 Display



The MetaCheck™ has a text (LCD) display that is used to show data, system status information and display results. During testing, the display is used to show the measured parameters and to provide user assistance messages.

2.1.4 Key Functions



ON / STANDBY

This key is used to turn the device on and off. In standby (off) mode there is still electrical power going to the device, but the display will be dark.

NOTE: A green light appears next to this key when power is applied. The external power supply must be connected.



ENTER

This key is used to complete or confirm data entry.

For example, when entering the subject age, this key is pressed after the correct age has been set.



UP ARROW

This key is used to *increase* values when entering data.

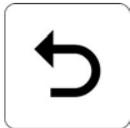
For example, when entering the subject age, this key is pressed to *increase* the number of years.



DOWN ARROW

This key is used to *decrease* values when entering data.

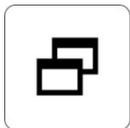
For example, when entering the subject age, this key is pressed to *decrease* the number of years.



BACK

This key is used to go back or to cancel an operation.

For example, if after entering the subject's age a screen appears to enter the subject's weight. Pressing the BACK key would cancel the weight entry and return you back to the screen for entering age.



MENU

This key will bring up the menu. Various functions can be done through the menu such as re-print a report or start a new test.

2.2 Back Panel Connections

Power ← This connection labeled 12VDC is for the power adapter input. Connect the power adapter supplied with the MetaCheck™ to this connection on the rear of the instrument. Use of a power supply other than those provided by KORR™ medical technologies is not recommended and can damage the unit and void the warranty.

Printer ↔ The printer connection is on the rear of the MetaCheck™ instrument. It will connect to the printer as if it were a PC. This cable is included with the MetaCheck™ Quick Start Kit.

1. Turn on the unit.



CAUTION: Ensure the Single Patient Use “**MetaBreather™**” hose is not attached during calibration. Remember to dispose of the hose/mouthpiece after use.

2. Wait for device to be ready.

- Calibration will start automatically when device is turned on.
- When calibration is complete the device indicates “**Waiting for First Breath**”.

3. Begin the test.

- Extend the hose to full length.
- Place the mouthpiece of the **NEW** Single Patient Use “**MetaBreather™**” in the patient’s mouth.
- Attach the hose to the “**Air Intake**” on the device.
- Place the nose clip securely on the patient’s nose.

4. Perform the test.

- Advise the patient that the lips need to create a seal around the mouthpiece
- Encourage the patient to relax and breathe normally.
- When test is complete the device indicates “**Test Complete**”
“**Remove the Hose**”.
- Dispose of the “**MetaBreather™**” hose, mouthpiece and nose clip after use.

5. Enter the patient’s information (Y/N).

- If comparison data and BMI calculation is desired, select “Yes” then use the arrow keys to enter the patient’s age, weight, height, and gender.
- Otherwise, select “No.”

6. Print the report.

- The report can be printed after the patient’s information has been entered, by pressing the “Print” soft key.
- The machine will automatically begin the “Drying Mode” when ON/OFF key is pressed. When performing successive tests this mode may be bypassed by pressing the ON/OFF key twice.

4.1 Environment

In order for the MetaCheck™ to operate properly, it should be placed in a properly ventilated area. The device performs within specifications when used at temperatures between 59°F (15°C) and 86°F (30°C).

4.2 Parts and Connections

Upon shipment, the MetaCheck™ is supplied with a power adapter and power cord. If you intend to use a printer with the MetaCheck™, connect the printer to the MetaCheck™ using the cable and adapter provided in the Quick Start Kit before turning on the MetaCheck™. The power cord plugs into the wall and the power adapter then plugs into the power plug on the back of the MetaCheck™.

4.3 On/Standby control

Press the On/Standby key on the front of the MetaCheck™ to turn on the system. The green light below the [on/off] key indicates that the device is powered on. Pressing the on/standby key when the device is already on will place the device into “reset mode”. In this mode, an internal fan is engaged to move air through the MetaCheck™ to prevent condensation that can occur during normal use and ensure longer system life. The MetaCheck™ will automatically turn off after 20 minutes. Only connect the mouthpiece when the system is being used for a test. No mouthpiece should be connected any time when the internal fan is running.

4.4 Display Screen

The splash screen appears when the device is first turned on. Line number two changes from Firmware Version to EEP File Version to Print File Names.

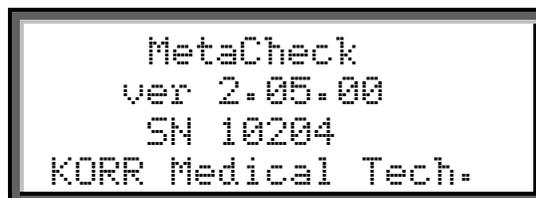


Figure 4.1 MetaCheck™ Splash Screen

Chapter 5: Conducting a Metabolic Rate Test

5.1 Warm Up

Upon turning on the MetaCheck™, it will take a moment to warm up. The warm up screen is shown following the splash screen. It will automatically end and begin calibration when the device has warmed up. The enter key will override the warm up and skip directly to calibration. This may be desired when doing a large number of tests in succession.

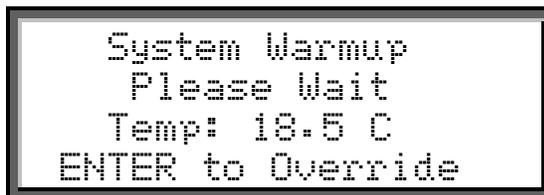


Figure 5.1

5.2 Automatic Calibration

The MetaCheck™ will calibrate immediately following warm-up. It is completely self-calibrating. During the calibration, NO HOSE OR MOUTHPIECE SHOULD BE ATTACHED! If the hose is attached, the MetaCheck™ will beep and display “Please remove the hose.”

Calibration will typically take 2 to 3 minutes to complete. The third line of the display will show temperature, barometric pressure, relative humidity, and oxygen readings during calibration. The fourth line has **** that will scroll across the screen during calibration.

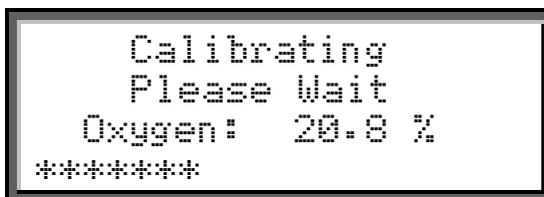


Figure 5.2 Calibration Screen

During calibration, the MetaCheck™ will draw room air into the system and past the oxygen sensor. Removing the hose and/or filter from the MetaCheck™ during calibration assures the free flow of air and thereby accurate calibration. After the oxygen sensor has been calibrated to room air, the system detects baseline, or “zero”, flow. During this time it is imperative that no gas flows through the

MetaCheck™. If gas flow is detected, the system will indicate that error number 112 (Device cannot be Zeroed) has occurred. If this error is detected, calibration time will be prolonged. However, no user interaction, other than to prevent any flow through the system, is needed to correct this problem.

When calibration is complete, the text on the display will read “Calibration complete, waiting for first breath.” The MetaCheck™ will “chirp” periodically to indicate this.

Warning: Do not connect the Metabreather before calibration is complete and the text on the display indicates that the system is waiting for the first breath.



Figure 5.3 Calibration Complete

5.3 Connect the MetaBreather™ to the MetaCheck™.

The MetaBreather™ is expandable to a length of approximately 5 feet (1.5 meters). Extend the hose to its full length prior to connecting the hose to the air intake on the MetaCheck™ instrument. Place the filter between the hose and air intake.

5.3.1 Comfort

Verify with the patient that the mouthpiece will be comfortable. Flex the tube to a position that will support itself. The mouthpiece can be rotated within the tube to ensure comfort.

5.3.2 Safety

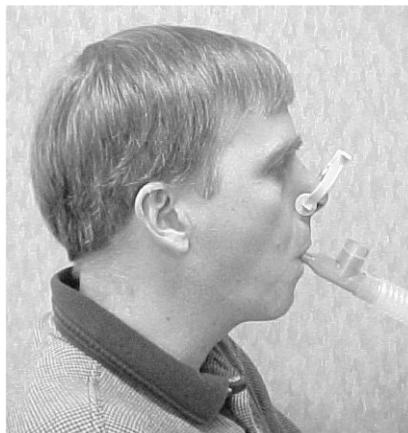
The MetaCheck™ will analyze all of the air exhaled during the test. To ensure that only exhaled air passes through the system, one-way valves are built into the MetaBreather™ mouthpiece. During inspiration, the intake valve is open allowing room air to enter the mouthpiece and the exit valve is closed ensuring that no room air enters the MetaCheck™. During exhalation, the intake valve is closed to prevent leakage to the room and the exit valve is open ensuring that all expired gas passes freely through the MetaCheck™.

5.4 Position the nose clip.

When the patient is comfortable, place the nose clip on the patient's nostrils. The nose clip is used to block airflow through the nostrils and ensures that the MetaCheck™ analyzes ALL of the exhaled air. A nose clip is not necessary if a full face mask is used for testing.

5.5 Place the MetaBreather™ mouthpiece in the patient's mouth.

Warning: Always use a KORR factory authorized MetaBreather to ensure correct metabolic rate measurements and protect your MetaCheck device warranty.



The MetaBreather™ mouthpiece should be placed in the mouth. The lips should close around the mouthpiece forming a seal. Be sure that the lips form an air-tight seal around the mouthpiece so that all expired gas air passes through the hose. The hose used with the mouthpiece is specially designed to support the mouthpiece during a test. The mouthpiece can also be

rotated within the hose to promote comfort. To do this, bend the hose in such a way that it supports the weight of the hose and mouthpiece when they are in place. The hose will retain its form after it has been bent. It is important that the patient relaxes as much as possible during the test.

5.6 Begin Testing

The MetaCheck™ is designed to measure the patient's *resting* energy expenditure. This means that the patient should be encouraged to rest to the greatest degree possible during the test. A reclining position and quiet atmosphere is recommended.

5.6.1 Test Length

The default test duration is 10 minutes. The test length may be changed from the user menu.

5.6.2 Administration

The patient should be advised to relax and breathe normally. Remind them to keep a tight seal around the mouthpiece to insure that all exhaled air goes through the device. The patient may remove the mouthpiece or nose clip at any time during the test for 1 or 2 breaths. Removing the nose clip or mouthpiece for a few breaths during the test will not degrade the accuracy of the measurement.

5.6.3 Display Screens

The following screens can be displayed during testing. The user may switch between them by pressing the up and down [arrow] keys. Changing the displayed screen during the test will not affect the accuracy of the results.

Each screen displays different data on the first two lines:

Screen 1

- REE: The current resting energy expenditure (REE) calculated at that point of testing, displayed in Calories per day.
- TIME: The length of time the test has been running.



```
REE:    2347 kcal/dy
Time:   10:03
      Data Stable
>>>>>>
```

Figure 5. 4 Testing Screen 1

Screen 2

- VO₂: The volume of oxygen consumed displayed in milliliters per minute.
- REE: The current resting energy expenditure (REE) calculated at that point of testing, displayed in calories per hour.

```
VO2:      339 ml/min
REE:      2347 kcal/hr
          Data Stable
>>>>
```

Figure 5.5 Testing Screen 2

Screen 3

- OXYGEN: Percent oxygen detected.
- RESP RATE: Respiratory rate in breaths per minute.

```
Oxygen:    16.5 %
Resp Rate: 18.4 bpm
          Data Stable
>>>>>>>>>>>>>>>>
```

Figure 5.6 Testing Screen 3

Screen 4

- REE: The current resting energy expenditure (REE) calculated at that point of testing, displayed in kJoules per day.
- TIME: The length of time the test has been running.

```
REE:      9.82 kJ/day
Time:     10:04
          Data Stable
>>>>>>>>>>>>>>>>
```

Figure 5.7 Testing Screen 4

The third and fourth lines remain the same throughout all testing screens. The third line will read “data stable” only when the readings have stabilized. This line is blank if the readings have not yet stabilized.

The fourth line is an indication of the tidal volume as the test subject breaths through the mouthpiece. If these arrows are

extremely inconsistent, encourage patient to relax and breathe normally.

5.7 Concluding the test

The test will automatically end when the maximum time has been reached. If the auto end test option is enabled from the menu, then the test will automatically end when the test readings have stabilized, or the test reaches the maximum time. The user may also end the test manually by pressing the enter key anytime after the tests minimum time has been reached. Please see section 6.7 for more information on setting the test times and auto end options.

When the test is complete, the display will instruct the user to remove the hose. The user may override this message by pressing the [enter] key, or [enter] soft key. Dispose of the complete hose and mouthpiece assembly. Reuse may cause cross-contamination. Proper device operation requires the use of a new disposable mouthpiece for each patient.



Figure 5.8 Test Complete Screen

6.1 Enter Patient Data

After the hose has been removed, the user is asked if they want to enter the subject's data, height, weight, age, and gender. This data is used to calculate the predicted or *normal* metabolic rate expected for that patient. The MetaCheck™ then compares the actual measurement to the predicted value. This data is also used to calculate their BMI.

The entered data is not used for the REE measurement and is only required if the predicted normal value or BMI is desired. Press the [yes] soft key to enter data, press the [No] soft key, or [enter] key if you do not wish to enter data.



Figure 6.1 Subject Data Screen

6.1.1 Enter Age

Use the [arrow] keys to enter the subject's age, press the [enter] key to accept the age as it is currently displayed.



Figure 6.2 Enter Age Screen

6.1.2 Enter Height

Use the [arrow] keys to enter the subject's height, press the [enter] key to accept the height as it is currently displayed.

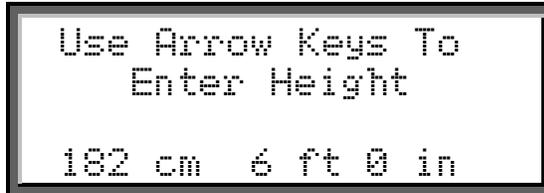


Figure 6.3 Enter Height Screen

6.1.3 Enter Gender

Use the [arrow] keys to enter the subject's gender, press the [enter] key to accept the gender as it is currently displayed.

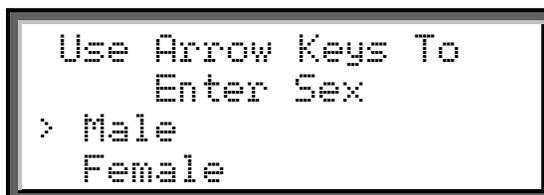


Figure 6.4 Enter Gender Screen

6.1.4 Enter Weight

Use the [arrow] keys to enter the subject's weight, press the [enter] key to accept the weight as it is currently displayed.



Figure 6.5 Enter Weight Screen

6.2 Test Results Screen

The test results screen allows you to scroll through the various values calculated by the METACHECK™. Use the Up and Down [arrows] to scroll through the values. Use the [Chg data] soft key to re-enter the user data. Use the [Print] soft key to print a copy of the report.

Indication	Description	Units
Screen 1		
Test number	This is the number MetaCheck™ assigns to each test in the order tests are performed	
REE	Measured resting energy expenditure.	Calories per day
Screen 2		
REE	Measured resting energy expenditure.	Calories per day
NORMAL	The predicted metabolic rate according to the Harris-Benedict formula.	Calories per day
% Above/Below Normal	The actual measured REE compared to the predicted normal	Percentage difference
Screen 3		
REE	Measured resting energy expenditure.	kJoules per day
NORMAL	The predicted metabolic rate according to the Harris-Benedict formula.	kJoules per day
% Above/Below Normal	The actual measured REE compared to the predicted normal	Percentage difference
Screen 4		
VO2	Volume oxygen consumption	Milliliters per minute
VO2	Volume oxygen consumption. If no weight is entered under patient data, this field will show ***.	milliliters per minute per kilogram
FeO2	Fraction of oxygen in expired air.	%
Screen 5		
Tidal Vol	Average Volume of gas breathed out each breath	Liters
Min Vol	Average Volume of gas breathed out per minute	Liters per minute
Resp Rate	Average rate of breathing	breaths per minute
Screen 6		
Age/Sex	Age and gender of patient	Years
Ht	Height of patient	Centimeters, Feet Inches
Wt	Weight of patient	Kilograms Pounds
Screen 7		
FFM estimated	Estimated Fat Free Mass based on REE Readings.	Kilograms
Test Time		Minutes:Seconds

```
                25
REE: 2347 kcal/day
[Chg Data]      [Print]
```

Figure 6.6 Results Screen 1

```
REE: 2347 kcal/day
Normal: 2226 kcal/day
5.4 % Above Normal
[Chg Data]      [Print]
```

Figure 6.7 Results Screen 2

```
REE: 9.82 kJ/day
Normal: 9.32 kJ/day
5.4 % Above Normal
[Chg Data]      [Print]
```

Figure 6.8 Results Screen 3

```
V02: 339 ml/min
V02: 3.23 ml/m/kg
FeO2: 15.61 %
[Chg Data]      [Print]
```

Figure 6.9 Results Screen 4

```
Tidal Vol: 1.22 L
Min Vol: 9.02 LPM
Resp Rate: 0.86 BPM
[Chg Data]      [Print]
```

Figure 6.10 Results Screen 5

```
Age: 28 Yr   Sex:  M
Ht: 183 cm   6'  2"
Wt: 104.9 kg 230 lb
[Chg Data]   [Print]
```

Figure 6.11 Results Screen 6

```
FFM Estimate: 90.0 kg
Test Time: 10:04

[Chg Data]   [Print]
```

Figure 6.12 Results Screen 7

6.3 Print Screen

The printing screen is shown while the METACHECK™ is printing the report. It will automatically return to the test results screen when the report has printed. After the report is printed and the test is complete, the MetaCheck™ can be turned off.

```
Printing Report
Please Wait
```

Figure 6.12 Print Screen

6.4 Print Last Test

The print last test screen is shown if the last test was never successfully printed. Press the [Print] soft key to get to the results screen and print the previous test, press the [Skip] soft key to continue on with the warm up sequence.



Figure 6.13 Print Last Test Screen

6.5 Turning off the MetaCheck™

When the user turns off MetaCheck™ at the completion of a test, the display screen will go dark, but will read “unit drying.” A fan will run for 10 minutes to dry out the components inside the MetaCheck™. After 10 minutes, the unit will automatically turn off.

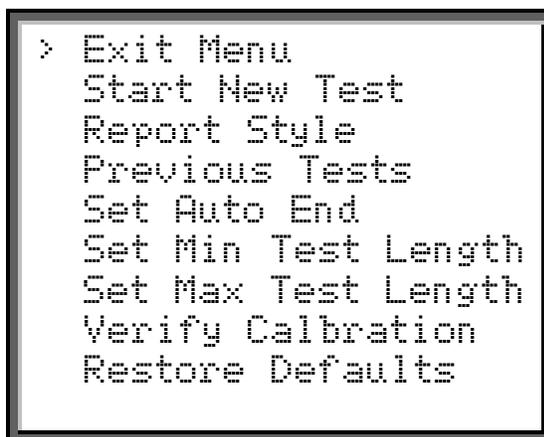
6.6 Starting Another Test

To perform another test in rapid succession, press the Menu key, and select the “Start New Test” option. The MetaCheck™ will immediately begin calibration to prepare for a new test. Be sure to remove and dispose of the mouthpiece and hose.

6.7 Menu Screens

The user menu is displayed when the [menu] key is pressed. Only four options are displayed at a time. The [arrow] keys scroll through the menu. The [enter] key selects the current menu option.

Exit Menu	Leaves the menu and returns you to either the test results screen or the calibration screen.
Start New Test	Begins a new test.
Report Style	Allows user to select, which report style to print, when more than one report is loaded.
Previous Tests	Allows user to choose from the different test printouts stored on the machine.
Set Auto End	The auto end test option allows the MetaCheck™ to automatically end the test when the test readings have stabilized.
Set Min Test Length	Allows user to set the minimum length of test. The minimum time may be set between 10 and 30 minutes.
Set Max Test Length	Allows user to set the maximum length of test. The maximum time may be set between 10 and 30 minutes.
Verify Calibration	Allows the user to check the calibration of the MetaCheck™ unit.
Restore defaults	Resets the MetaCheck™'s options to factory default for the items listed above.



```
> Exit Menu
  Start New Test
  Report Style
  Previous Tests
  Set Auto End
  Set Min Test Length
  Set Max Test Length
  Verify Calibration
  Restore Defaults
```

Figure 6.13 Menu Options

6.7.1 Report Style

The report menu allows the user to select the style of report to use when a report is printed. The options in this menu depend on the reports that are loaded in the device, and may vary. The [arrow] keys scroll through the menu. The [enter] key selects the current menu option.

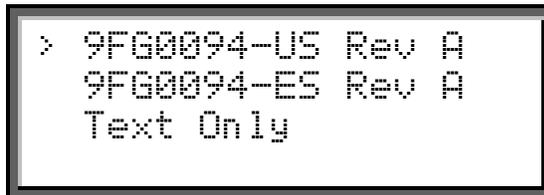


Figure 6.14 Report Style Screen

6.7.2 Previous Test Screen

The select previous test screen allows the user to view and print test data that is stored in the device. The [arrow] keys change the test ID number. The [enter] key selects the displayed value.



Figure 6.15 Previous Test Screen

6.7.3 Set Auto End

The auto end test option allows the MetaCheck™ to automatically end the test when the test readings have stabilized, and the test time is longer than the test minimum time. Tests will not run longer than the test maximum time.

Note: If minimum time is set equal to maximum time this option has no effect.



Figure 6.16 Auto Test End Screen

6.7.4 Set Maximum Length

Allows user to set the maximum length of test. The maximum time may be set between 10 and 30 minutes.

Note: If maximum time is set less than the minimum time, the minimum time will automatically be adjusted to be equal to maximum time.



Figure 6.17 Set Maximum Test Length Screen

6.7.5 Set Minimum Length

Allows user to set the minimum length of test. The minimum time may be set between 10 and 30 minutes.

Note: If minimum time is set longer than maximum time, the maximum time will automatically be adjusted to be equal to minimum time.



Figure 6.18 Set Minimum Test Length Screen

6.7.6 Verify Calibration

The verify calibration screen allows the user to check the calibration of the unit using a calibration syringe.

```
> Verify Oxygen  
Verify Flow/Volume  
Verify misc.  
Auto Cal
```

Figure 6.19 Main Calibration Screen

```
Oxygen Reading  
  
15.6 %
```

Figure 6.20 Verify Oxygen Screen

```
Flow/Vol Reading  
Flow:      0.0 LPM  
Vol:       1000 ml  
[ZERO]
```

Figure 6.20 Verify Oxygen Screen

```
Misc. Reading  
P: 87.3 kPa 655 mmHg  
Temp: 19.8 C  
% RH: 23.8 %
```

Figure 6.21 Verify Misc. Cal Screen

7.1 Error Messages

The MetaCheck™ may detect certain errors and display them on the LCD of the MetaCheck™. It will give the error number and a brief description of the problem. Additional information is provided below.

7.1.1 Error 100: No Printer Detected



Figure 7.1 Error 100 Screen

If this appears, the MetaCheck™ cannot detect a printer.

1. If this error appeared while you were printing, wait until that job is finished, and then press “enter” again.
2. Verify that the printer cable is firmly plugged into each device.
3. Turn off each device. Remove the cable from each end, plug them back in, and turn the power back on. The measured data from your test will be saved until you are successfully able to print a report or until a new test is executed.
4. Check to see if there is a paper jam in the printer that needs to be cleared.

7.1.2 Error 101: System Timed out. No Breath Detected



Figure 7.2 Error 101 Screen

This error will occur when the MetaCheck™ does not detect a breath within two minutes of calibration. When this occurs, press the “Enter” button to restart and the MetaCheck™ will turn off and back on. Auto-calibration will be necessary before a test is performed.

7.1.3 Error 102: O₂ Sensor Exhausted



Figure 7.3 Error 102 Screen

The oxygen sensor is no longer functioning and must be replaced by a qualified service technician before the MetaCheck™ can be used for further testing. The oxygen sensor must be replaced.

7.1.4 Error 103: Unit Requires Calibration

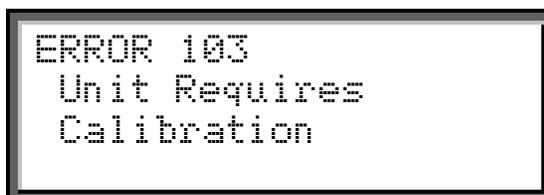


Figure 7.4 Error 103 Screen

This message will be displayed when automatic calibration cannot be completed properly. Extreme temperature or humidity may cause this error. If the message persists while temperature and humidity are stable and within the normal working range, KORR™ Medical Technologies must recalibrate the system.

This condition occurs when the MetaCheck™ cannot complete its automatic calibration sequence. If this occurs:

1. Make sure that the patient is not breathing into the MetaCheck™ during calibration.
2. Verify that the mouthpiece, hose, or filter are not connected to the MetaCheck™ during calibration.
3. Check the air intake and remove any visible obstacle.
4. Restart the MetaCheck™ and attempt a second calibration

7.1.5 Error 104: Stuck key detected



Figure 7.5 Error 104 Screen

This error can occur if one of the keys has remained depressed. A stuck key will not be visually obvious. If this occurs:

1. Press each button several times firmly
2. Restart the machine
3. Call KORR™ Medical Technologies for further assistance

7.1.6 Error 105: Negative flow detected, check hose connection

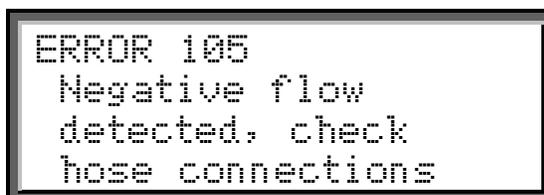


Figure 7.6 Error 105 Screen

This may occur if there is a backwards flow of air. Air should not exit the MetaCheck™ through the “Air Intake” during a test. This may occur if the Single-Patient-Use MetaBreathers™ are re-used. If this error message is shown:

1. Check the seal between the hose, filter and air intake
2. Retest with a new Single-Patient-Use MetaBreather™.

7.1.7 Error 106: VO₂ Too Low

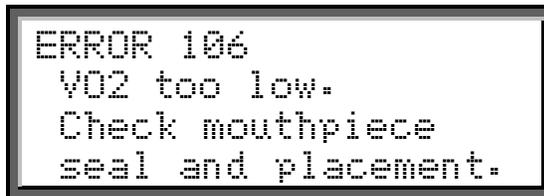


Figure 7.7 Error 106 Screen

This will occur if a VO₂ reading is extremely low. Check the following:

1. The seal between the mouthpiece and the lips is not airtight
2. Air is escaping through the nose
3. The mouthpiece has been removed for more than 3 breaths (15 seconds)
4. The valves in the MetaBreather™ mouthpiece are defective.

To resolve this error condition, correct these problems and restart the test. If you suspect there was a fault in the Metabreather mouthpiece, replace the mouthpiece before repeating the test.

7.1.8 Error 107: Oxygen Reading Too High

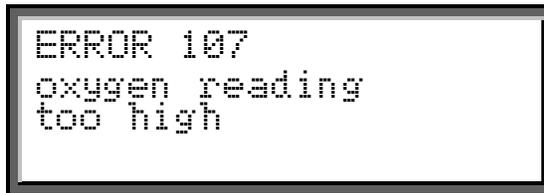


Figure 7.8 Error 107 Screen

This error will generally occur when there is a source of purified oxygen. Individuals who are receiving supplemental oxygen may experience this error condition.

To resolve this problem, be sure that only normal room air is inhaled.

If you experience this error condition in absence of an external oxygen source, contact KORR™ for further assistance.

7.1.9 Error 108: Serial Buffer Overflowed



Figure 7.9 Error 108 Screen

If this error appears, contact KORR™ Medical

7.1.10 Error 109: Data Buffer Overflowed



Figure 7.8 Error 109 Screen

If this error appears, contact KORR™ Medical

7.1.12 Error 111: User Defaults Have Not Been Set



Figure 7.9 Error 111 Screen

If this error appears, contact KORR™ Medical

7.1.13 Error 112: Device Could Not be Zeroed. Please Reset the MetaCheck™.

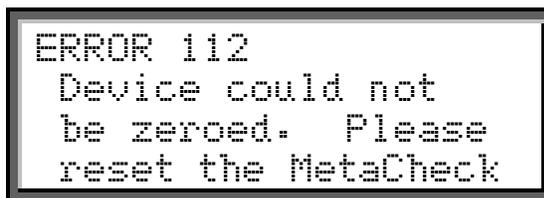


Figure 7.10 Error 112 Screen

If this error appears, contact KORR™ Medical

7.1.14 Error 114: Replace O₂ Sensor Soon

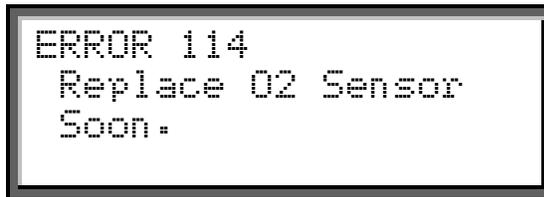


Figure 7.11 Error 114 Screen

This error indicates that the oxygen sensor is almost depleted and should be replaced soon. The Oxygen (O₂) sensor in the MetaCheck™ has a life expectancy of 2-3 years. The device performs a test on the oxygen sensor during each auto-calibration at startup.

When this message appears, it is important to have the oxygen sensor replaced soon by a qualified service technician. The METACHECK™ can still be used if the “**Replace O2 Sensor Soon**” message is shown. Device will still operate within specifications. However, once the “**Error 102: O₂ Sensor Exhausted**” appears, the device will not perform measurements.

7.1.15 Error 115

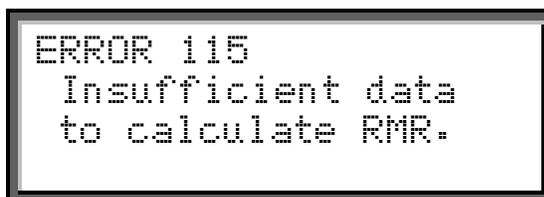


Figure 7.12 Error 115 Screen

This error indicates that the test has ended without enough data to calculate an RMR value.

7.1.16 Error 116



Figure 7.12 Error 115 Screen

This error indicates that an error has occurred with the oxygen sensor. Turn off the MetaCheck™, and allow it to sit for a few minutes before turning it back on. If the error continues to appear, contact KORR™ Medical.

7.2 Returns and Repairs

NOTE:

SERVICE and REPAIRS should only be carried out by the manufacturer or service personnel specifically trained and approved by KORR™ Medical Technologies, Inc.

If you feel that your unit needs to be returned to KORR™ for repair or replacement, please identify the serial number found on the back of the MetaCheck. If possible, locate the invoice and the name and/or organization of the purchaser.

If you have purchased an extended warranty, please have that documentation ready as well.

Call KORR™ Medical Technologies, Inc at (801) 483-2080 and have the above information ready, or go online to www.KORR.com to enter a service request.

For details on the KORR™ Medical Technology service policy, see the section labeled "Service Policy."

Chapter 8: Warnings and Precautions

- Warning:** The MetaCheck™ is NOT a medical device. The MetaCheck™ is NOT intended for the diagnosis or treatment of disease.
- Warning:** The MetaCheck™ disposable MetaBreather™ is a Single Patient Use device. Re-use of the disposable mouthpiece may contribute to the spread of disease. Malfunction of the mouthpiece leading to inaccuracy of MetaCheck™ is likely if the mouthpiece is reused.
- Warning:** Read and understand all instructions in the this User Guide before using the MetaCheck™
- Warning:** Always follow basic safety precautions when using the MetaCheck™ to reduce the risk of injury, fire, or electrical shock.
- Warning:** Protect the MetaCheck™ from extreme temperatures or moisture that can damage internal components and sensors.
- Warning:** Use of power sources not expressly recommended for this equipment may lead to overheating, fire, electrical shock or other hazards. Use only power sources provided by KORR™ Medical Technologies.
- Warning:** The MetaCheck™ should only be used with the KORR™ factory authorized MetaBreather. Use with any other patient interface device will compromise accuracy and patient safety and may void factory warranty.

Chapter 9: Maintaining Device Effectiveness

- Always use a new Single-Patient-Use **disposable** mouthpiece for each test. Re-use of a mouthpiece can lead to spread of disease and incorrect metabolic rate measurements.
- Do **not** connect the mouthpiece before calibration is complete. Wait until the display indicates that the system is waiting for the first breath.
- Protect the MetaCheck™ from extreme temperatures or moisture that can damage internal components and sensors.
- Clean the exterior case with a lint-free damp cloth (70% Isopropyl Alcohol). Do not use solvents.
- Do not obstruct free flow of air to vent holes on the on either side of the MetaCheck™.

Chapter 10:

Specifications

Parameter	MetaCheck™ Specification
Power Requirements	External 12-volt power supply from device, less than 1.5 Amps.
Barometric Pressure Sensor	
Accuracy	± 2 mmHg
Resolution	1 mmHg
Min/Max Range	525 to 795 mmHg
Temperature Sensor	
Accuracy	± 1 °C
Resolution	0.1 °C
Min/Max Range	10 to 40 °C
Relative Humidity Sensor	
Accuracy	± 10 %RH
Resolution	1 %RH
Min/Max Range	10 to 95 %RH Non-Condensing
a) Oxygen Sensor	
Type	Galvanic Fuel Cell
Accuracy	± 0.2 %O ₂
Resolution	0.01 %O ₂
Min/Max Range	0 to 30 %O ₂
Nominal Sensor Life	> 30 months
b) Air Flow Sensor	
Type	Fixed-orifice Differential Pressure Pneumotach
Accuracy	± 2% of reading
Resolution	10 ml / sec (0.01 LPM)
Min/Max Range	- 40 to 150 LPM (-600 to 2500 ml / sec)
Breathing Rate	5 to 40 breaths/min
Tidal Volume	200 to 3000 ml

Parameter	MetaCheck™ Specification
c) Oxygen Consumption Calculation	
Range	< 70 to > 720 ml /min O ₂
Resolution	1 ml/min O ₂
d) Metabolic Rate Calculation	
Calculation Method	Weir Equation with assumed RQ = 0.83
Range	500 to > 5,000 kcal/day
Resolution	7 kcal/day
Measurement Time	10 minutes
e) Physical Dimensions	
Size	20 x 30 x 10 cm
Weight	5.75 lbs. (2.6 kg)
f) Measurement Conditions	
Temperature Range	15 to 30 °C (59 to 86 °F)
Barometric Pressure Range	525 to 795 mmHg
Relative Humidity Range	10 to 88% RH non-condensing
g) Storage Conditions	
Temperature Range	-20 to 60 °C (-4 to 140 °F)
Barometric Pressure Range	375 to 795 mmHg
Relative Humidity Range	10 to 95 % RH non-condensing

This KORR™ Medical Technologies, Inc., product, together with its standard accessories, except for certain disposable products, is guaranteed for a period of TWO YEARS from the date of shipment.

This warranty covers the repair or replacement, at KORR's sole discretion, of the product or defective parts. KORR™ reserves the right, at its sole discretion, to perform warranty service at its factory, at an authorized repair station, or at the customer's facility.

Claims for damages during shipment must be filed promptly with the transportation carrier.

Any instrument or accessory returned to KORR™ for warranty service must be accompanied by a clear and detailed explanation of the defect or problem found, and must specify the model name, model number, and serial number as it appears on the product. Written or verbal permission must be received before any product is returned to KORR™ for warranty service.

The warranty does not cover: a) consequences caused by accident, abuse, tampering, misuse, alteration, or other external causes; b) consequences caused by operating the product outside of the permitted or intended uses as described by KORR™; c) consequences caused by failure to follow KORR's specific operating instructions; d) consequences caused by service performed by anyone other than a KORR™ representative or at a KORR™ authorized repair station; e) use of a faulty breathing device not manufactured by KORR™.

KORR™ strongly recommends use of a KORR™ manufactured MetaBreather™ to ensure measurement accuracy. KORR™ cannot guarantee the ability of this product to accurately measure metabolic rates when a breathing device other than a MetaBreather™ is used. Furthermore, improper or incorrectly performed maintenance or repair voids the warranty.

To the extent permitted by law, this warranty and the remedies set forth above are exclusive and in lieu of all other warranties, remedies, and conditions, whether oral or written, statutory, express, or implied. If KORR™ cannot lawfully disclaim statutory or implied warranties, then to the extent permitted by law all such warranties shall be limited to the duration of the express warranty and to the repair or replacement of the product as specified above. Furthermore, KORR™ expressly disclaims any liability for direct, indirect, incidental, special, or consequential damages of any nature. If any term of this warranty is held to be illegal or unenforceable, the legality or enforceability of the remaining terms shall not be affected or impaired.

KORR™ Medical Technologies provides Warranty Service Support to its customers for products under standard or extended KORR™ warranty. Service requests can be submitted via the web at www.KORR.com or by telephone at (801) 483-2080. Details for shipping service items to the KORR™ factory are available for download on the KORR™ website.

KORR™ also provides factory direct technical support to its customers through a technical support group located in Salt Lake City, Utah. It is suggested that any person calling in for technical support have the inoperative equipment available for preliminary troubleshooting as well as product identification.

FOR MORE INFORMATION CONTACT 



www.KORR.com

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1.800.895.4048