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3M™ 101 Series Integrity Test Device:
Portable, Automated Membrane Filter Integrity Tester for the Beverage Industry

Operation Guide

Table Of Contents

1. General

1.1 Regarding these Instructions

With these Operating Instructions, you can work with the 3M™ 101 Series Integrity Test Device quickly and safely. At the beginning of the Operating Instructions, the Table of Contents provides an overview of all topics. In the Annex, you will find a guide for quick error diagnostics and remedies, along with a glossary that explains all of the technical terms that are used. The index allows you to undertake a targeted search according to terms or topics

- ▶ Read these Operating Instructions carefully and completely prior to working with the Integrity Test device.
- ▶ Observe the safety instructions in particular.
- ▶ These Operating Instructions are included with your product. Retain this document (and all other documents delivered with the device) with care, and keep them within reach at all times.
- ▶ Where applicable, attach any supplement or amendment that you have received to the Operating Instructions.
- ▶ If you lend or sell the device, you must also provide those device documents that have been supplied.
- ▶ If these Operating Instructions are lost, you can request a replacement from 3M Purification Inc.

1.2 Symbols and signs

The following symbols and signs are used in these Operating Instructions:

Info This symbol indicates useful information and tips.

This symbol ´▶´ is placed in front of an action instruction

This symbol ´• ´ indicates an itemized list

1.3 Intended use

The 3M 101 Series Integrity Test Device is a portable filter test device for testing membrane filter cartridges for integrity within a filter housing system.

The 3M 101 Series Integrity Test Device conforms to the directives and standards for electrical equipment, electromagnetic compatibility and the prescribed safety regulations. However, improper use may lead to damages to persons and/or property.

These Operating Instructions have been generated in accordance with the currently used statutory provisions and guidelines. They have been structured in such a manner that correspondingly instructed persons that are able to implement and apply those actions. Actions that go beyond the measures described in these Operating Instructions are exclusively reserved to specialized personnel thus contact 3M Purification Inc. for assistance.

2. Safety Information

2.1 General

Please read, understand, and follow all safety information contained in these instructions prior to the use of this device. Retain these instructions for future reference.

EXPLANATION OF SIGNAL WORD CONSEQUENCES	
⚠ WARNING	Indicates a potentially hazardous situation, which, if not avoided, could result in death or serious injury and/or property damage.
⚠ CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury and/or property damage.

EXPLANATION OF SAFETY AND RELATED SYMBOLS	
⚠ WARNING	Hazardous Voltage

⚠ WARNING

To reduce the risks associated with explosion and fire:
- Only use the battery pack supplied with this device. Do not replace rechargeable battery pack with non-rechargeable or unapproved battery pack. Replace only with 3M approved battery pack.
- Do not expose device to extreme temperatures.

To reduce the risks associated with hazardous voltage:
- Do not modify or disassemble the device. Return to 3M authorized service representative for repair or service. There are no user serviceable parts.
- Do not use the device if damaged.
- Do not use power cord if device is damaged.
- Do not expose device to or in water for a long period of time. Protect device from water jets.
- Only use the SELV charger/power supply provided with the device.

⚠ CAUTION

To reduce the risks associated with impact:
- Do not connect device to a pressure source above 64 psi (4400 mbar).

To reduce the risks associated with environmental contamination:
- Dispose of device, including batteries, in accordance with applicable local regulations or laws.

IMPORTANT NOTES

- ▶ Store the device in a clean, dry place. When stored, the device should be kept in a vertical position with the compressed air connection pointing down.
- ▶ If fluid is introduced into the compressed air connection, it should be immediately removed
- ▶ This device has left our factory in an error-free condition for safety purposes. It is essential that you observe the safety instructions in these Operating Instructions, in order to maintain this condition and to ensure safe operation.
- ▶ Make sure that your device is kept clean. Check this regularly. 3M Purification Inc. offers customer service for this purpose.
- ▶ If the device is used in a manner different from that described in these Operating Instructions, this may lead to damages to the product.

Info Upon such an event, if the product is misused, abused, improperly operated, etc. it will void the warranty. Use the device only in accordance with the information in these Operating Instructions.

Info All individuals who use the device must be appropriately trained and must follow these Operating Instructions precisely.

Info If there are damages that were caused by non-observance of the Operating Instructions, it will void the warranty. 3M Purification Inc. assumes no liability for any consequential damages that arise from this.

Info Neither 3M no 3M Purification inc. is liable for any damages to its product that were caused by improperly installed, maintained or defective devices or systems.

Info Subject to technical changes without prior notice and errors.

3. Introduction Principles

The 3M™ 101 Series Integrity Test Device is a small lightweight portable device used for testing the integrity of membrane filters within the filter housing system to be used in. When testing a filter, the Operator only needs this document and does not need to know or remember any of the testing parameters. Test parameters are entered into the test device program memory once and whenever a test is performed. The test device LED screen displays the test pressure and instructs the operator when to close the pressure valve following stabilization. The pressure hold test will stop automatically when the test is complete indicating a result by means of colored LEDs. Each filter test carried out is automatically saved into the test device memory allowing the operator to recall the results of the test on either the display screen or to print a hard copy by either connecting the unit to a PC with the mini-USB cord or wireless via a Bluetooth™ compatible printer.

The 3M 101 series integrity test device has been designed to test a variety of membrane filters. The unit can be programmed up to 19 individual test protocols.

The 3M 101 series integrity test device is a semi-automatic "intelligent" precision pressure gauge, with a data storage memory. Due to the size of the Integrity Tester, it does not have an integral valve for automatic pressure adjustment; consequently it is not completely autonomous, signaling the operator with text and indicator lights to make a manual adjustment when needed.

During the integrity test, the 3M 101 series integrity test device takes a very precise pressure measurement. It measures the pressure drop within the housing during the test time and calculates the diffusion rate based on the pressure drop and the upstream volume of the housing.

The calculation is based on the following principles :

The filter system is pressurized on the up- stream side to a pressure P1. The housing / filter combination has a known upstream volume of V_1 (Figure 1). At the beginning of the test, the upstream pressure source is isolated and the downstream P_1 left open to ambient. During the test, gas will diffuse from the pressurized upstream side of the filter to the ambient downstream side. This diffusion will be calculated from the decrease in the upstream pressure P_2. The volume of gas lost due to diffusion V_2 can be calculated (Figure 2) as follows:

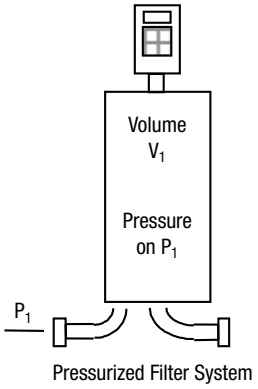


Figure 1

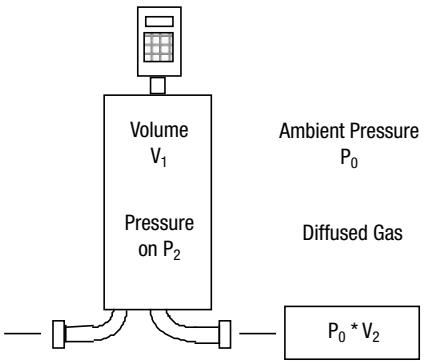


Figure 2

Total volume of gas initially in the filter system :

$$C = P_1 \times V_1$$

The energy of the gas remaining in the upstream volume after the test plus the lost energy due to diffusion through the filter.

$$C = (P_2 \times V_1) + P_0 \times V_2 \qquad \text{Where } P_0 \text{ is ambient}$$

Because P_1 and P_2 can be measured, V_1 and P_0 are known then V_2 can be determined with the following calculation:

$$V_2 = \frac{(P_1 - P_2) \times V_1}{P_0}$$

To calculate the diffusional flow rate mL/min:

$$\text{Diff} = \frac{V_2}{\text{Test time (min)}}$$

Any temperature fluctuation will affect the accuracy of any pressure measurements and the diffusional flow rates. It is important that neither the ambient temperature nor the temperature of the source gas fluctuate during the test period. Testing should not be carried out immediately following steam sterilization of the filter system but only after the housing has cooled to ambient temperature. It is further recommended that testing be performed under normal environmental conditions and temperature extremes are avoided during the testing period.

NOTE: Diffusional flow rate calculations from the measured change in pressure, the Integrity Tester assumes the temperature is at a constant 20 °C and that the atmospheric pressure does not vary from 14.5 psi (1000 mbar).

4. Description of the 3M™ 101 Series Integrity Test Device

4.1 Keyboard and Screen

Indicator lights provide the user a visual indication of the result of the test or prompt the user to the next step:

A **GREEN** light indicates a positive or pass test result.

A **YELLOW** LED light indicates that the Integrity tester is busy and the user must wait for the next step.

A **RED** light indicates a negative or failed test result or asks the user to go on to the next step.

The keyboard is comprised of 6 function keys and 10 number keys:

- ↑ Next Step
- ↓ Previous Step
- START Start a new function,"Proceed", "Yes to a question"
  Finish a function
- STOP Special function, if indicated on the screen
- * Special function, if indicated on the screen
- # 0...9 Number input

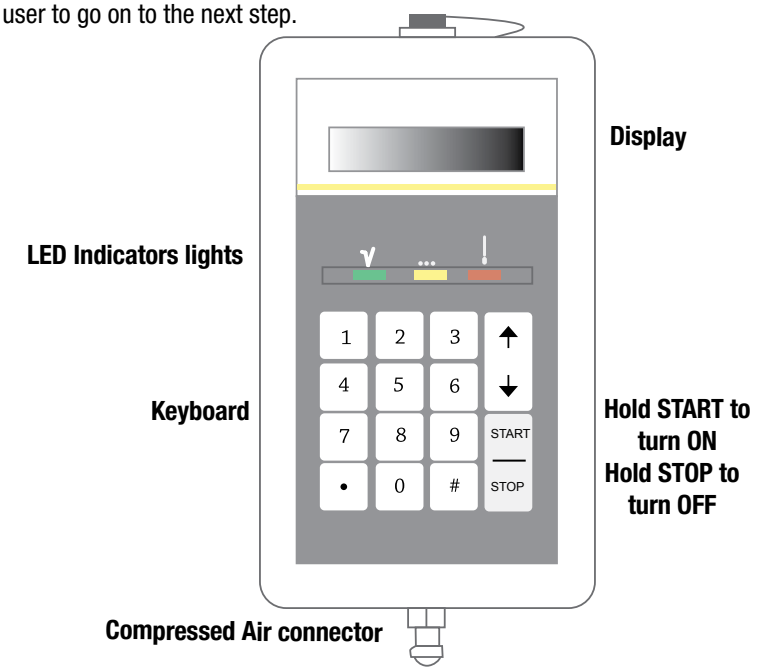


Figure 3

4.2 Connections

The compressed air quick connect is located at the bottom of the device and ensures that any humidity that may have been introduced with the compressed air is able to escape.

The data connection mini-USB port is located at the top of the device and is protected by a hermetic cap. The mini-USB port allows the device to connect to a PC by means of a data transmission cable with mini-USB and USB connectors to enable test results to be downloaded and stored.

The 101-Series Integrity Test Device has Bluetooth™ capability to allow transmission of test data and results to a Bluetooth compatible printer.

The device charging socket allows recharging of the device.

4.3 Powering On/Off the device

Press the "START" key pad to turn on and press & hold the "STOP" key pad to turn off the device.

4.4 Storage case

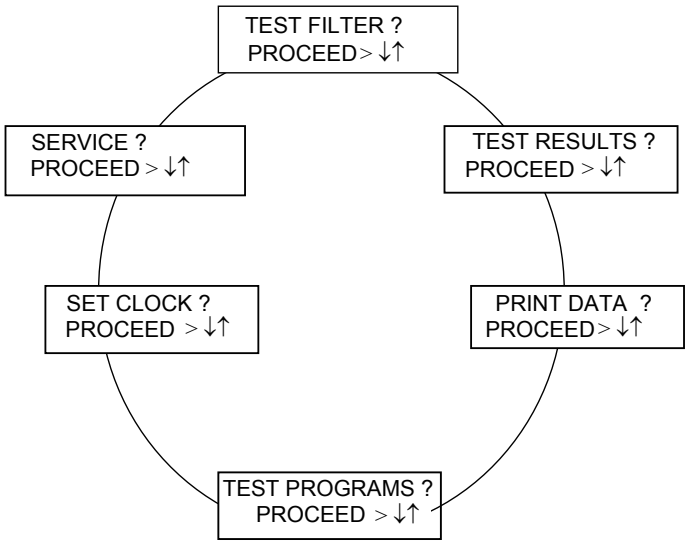
The storage case helps protect the 3M™ 101 Series Integrity Test Device from everyday wear and tear. It is recommended that precautions are taken to ensure that the unit is not exposed to high voltage electrical appliances and is protected from prolonged exposure to high humidity and mechanical load. (See Technical specifications)

5. Diagrams of Menu Functions

5.1 The Main Functions Menu

This menu group consist of six main upper level functions that includes all functions needed to program a filter test, execute a filter test, program various parameters and management of test results.

Screen prompts:



TEST FILTER
PROCEED >↑↓

This function allows the user to select and review stored test protocols.

Use “Up Arrow” and “Down Arrow” keys to move between menu functions and to advance to next step or return to the previous step.

TEST RESULTS?
PROCEED >↑↓

This function allows the Operator to Recall Test Results, and view them on the LED screen.

PRINT DATA?
PROCEED >↑↓

This function allows the Operator to print test results.

TEST PROGRAM?
PROCEED >↑↓

This function allows the Operator to create up to 19 individual test programs, entering test parameters that define each filter tests. This function can be switched off through the device configuration

SET CLOCK?
PROCEED >↑↓

This function allows the Operator to change between summer and winter time. Press start, then “*“ to change between winter and summer options. (To change the time of day, use the SERVICE menu function.)

SERVICE?
PROCEED >↑↓

With the SERVICE function, the Operator can access the service functions menu. These service functions are not necessary for everyday use of the 101-Series Integrity Test device.

Press the “START” key to select a specific function, proceed to the next step or answer “YES” to a question.

START

STOP

By pressing the “STOP” key, the function can be stopped, the test can be aborted or the Operator can select another main function.

5.2 Service Functions

The group of service functions allows changing and verifying specific parameters.

SERVICE?
PROCEED >↑↓

To enter the Service Functions menu press the "#" key when "SERVICE ? PROCEDED > ↑↓ is displayed. When prompted enter " 7" as the security code.

SERVICE?
PROCEED >↑↓

The Service Functions Menu can now be accessed using the up and down arrows.

Use the "scroll up arrow" to move to the next step.

Use the "scroll down arrow" to return to the previous step.

CLOCK SET?
PROCEED >↑↓

This function is used to change the time and date.

CALABRATION?
PROCEED >↑↓

This function is used to calibrate the 3M™ 101 Series Integrity Test device within defined limits.

NOTE: The pressure transducer is factory calibrated and should only be calibrated by a trained technician.

LANGUAGE?
PROCEED >↑↓

This function allows the Operator to choose the language (English, French, German, Italian or Spanish).

INFORMATION?
PROCEED >↑↓

This function is used to request information concerning important operating parameters.

ACCESS CODE?
PROCEED >↑↓

The factory programmed access code is 7, this function allows the Operator to modify the access code with up to a five-digit numerical code to allow access to the Service Functions Menu.

ERASE DATA ?
PROCEED >↑↓

This function erases all of the 3M 101 series integrity tester memory. The function is normally only used before a complete recalibration.

NOTE: Test programs, results and calibration data will be erased.

CONFIGURATION?
PROCEED >↑↓

Here you can set, or activate or deactivate, the device functions:

- Selection of the mbar/psi pressure unit
- Prompt for a user ID ON/OFF: the user ID is requested prior to the start of a filter test.
- Prompt for a TEST ID ON/OFF/ automatic allocation: the test ID is a number that is allocated for each test.
- Entry of ON/OFF parameter: activates the TEST PROGRAM function in the Main Menu.
- Entry of ON/OFF/FULL clock: activates the TIME function in the Main Menu.
- OFF: no access to the time in the main functions
- ON: only displays time, switching to summer / winter time
- FULL: full access to adjustment of date and time
- Entry of Bluetooth™ mode 0-3

  0: Bluetooth off

  1: Bluetooth function, no additional instructions

  2: **Bluetooth function, general instructions (normal setting)**

  3: Bluetooth function, all instructions

- Entry of beeper 0-2
  0: beeper off
  1: normal beeper function (normal setting)
  2: extended beeper function for all memory operations.
- Entry of display timer
  0: timer function off
  1-60: automatic switch-off time after the last key entry, in minutes
- Entry of auto-off timer
  0: timer function off
  1-60: automatic switch-off time after the last key entry, in minutes
- Entry of calibration interval in months
- Entry of maximum deviation of the test pressure at the beginning of the test

MANUAL OPERATION ?
PROCEED >↑↓

In this function, please read off the pressure measurement without performing a filter test Records the number hours the unit has been in operation.

SERVICE PRINT ?
PROCEED >↑↓

Print out all of the device-specific data regarding the Bluetooth printer.

Note the instructions regarding the Bluetooth printer

BLUETOOTH ?
PROCEED >↑↓

In order to be able to use the Bluetooth printer, a connection to the printer must have been created and saved. Establish a new Bluetooth connection through this function.

If a connection already exists, the Bluetooth address of the printer is displayed.

Note the instructions regarding the Bluetooth printer.

START

The START key allows the Operator to call up the function chosen.

STOP

The STOP key, allows the Operator to end a service function and exit the Service functions menu. Press the STOP key several times to return to the main functions menu.

This function is used to calibrate the 3M™ 101 Series Integrity Test device within defined limits.

NOTE: The pressure transducer is factory calibrated and should only be changed by a trained technician.

6. How to carry out an Integrity Test

6.1 Connecting the 3M™ 101 Series Integrity Test Device to the Filter Housing

The 3M Series Integrity Test Device can be connected directly to the housing with a regulated compressed air source and tee. It is important that the 3M Series Integrity Test Device stay vertical so that any water accidentally introduced with the compressed air system cannot enter the 3M Series Integrity Test Device and penetrate the electronics with in the device. See Figure 4 on the next page.

NOTE: When running an integrity test, make sure that the pressure used to fill the filter housing does not exceed the maximum diffusion test pressure of the test filter, device, and the housing.

To prevent measurement errors, follow the following recommendations: - Do not exceed maximum operating pressure (see technical specifications), avoid sudden bursts of pressure

⚠CAUTION

- **To reduce the risks associated with impact:** Do not connect device to a pressure source above 64 psi (4400 mbar).
- Use only clean, dry, oil free, filtered compressed air or nitrogen
- Drain the filter housing before connecting the 3M Series Integrity Test Device , this prevents the possibility of any water penetration.
- Install the Integrity Tester to be a vertical, upright position as shown in Figure 4 on the next page.

6.2 Converting the pressure units from mbar to psi

NOTE: The 3M™ 101 Series Integrity Tester is sold with pressure units programmed in mbar. To convert the pressure units displayed in psig, execute the following procedure:

1. After the Integrity Tester has been turned on, press the START key.
2. Using the Up Arrow key select “SERVICE ?”.
3. Enter the Service menu by pressing the “#” key.
4. When requested, enter security code “7”.
5. Using the Up Arrow key, select “configuration ?” and press the START key.
6. You will now be able to change the pressure units to psi by pressing the “ * ” key.
7. Using the Up Arrow key, select * SERVICE * and press the STOP key to return to the main functions menu.

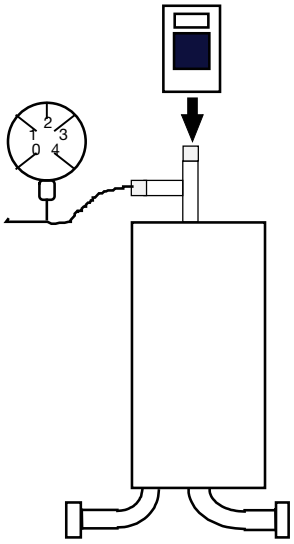


Figure 4

6.3 Running a Pressure Hold Test (PHT)

The 3M 101 Series Integrity Tester will determine whether the entire filter system (housing and piping) has any leaks and whether or not the installed filters are structurally integral. Before testing the filter, the filter cartridge must be fully wetted. (Follow 3M Purification’s recommended wetting conditions for the grade of filter installed.) It is important the operator ensures that the whole surface of the membrane is wet. When wetting out of the filter has been achieved, open the upstream and downstream housing drain valves to drain the housing of excess water.

When the 3M 101 Series Integrity Test Device is first turned on, the display will provide displays ‘CONTINUE: *

Info The keyboard entries and screen texts describe below show the operational sequence in the standard version of the product.

Connect the 3M 101 Series Integrity Test Device to the housing to execute the test. See Figure 4.

TEST FILTER ? PROCEED >↑↓	Immediately after switching on, the device is in the beginning of the FILTER TEST function.
START	Press START.
USER CODE ? PROCEED >↑↓	Appears only if activated in CONFIGURATION: Enter your user code ID (up to a 4 digit numerical code numbers can be used)
TEST PROGRAM NO 12 PROCEED >↑↓	If the test program number to be run is displayed. If the displayed test program number is incorrect, enter correct test program number. The number selected will replaces the displayed number
TEST PROGRAM NO UNKOWN >↑↓	If you have selected a program that has not yet been defined, the "not defined" indicator appears. “filter unknown” will be displayed if the program number selected has not been previously programmed into the 3M 101 Series Integrity Test Device.
START TEST? >↑↓	For the following steps connect the 3M 101 Series Integrity Test Device to the housing, then press START KEY to begin executing the test.
PRESSURE? 10.00 PSI	If there is no pressure on the filter, the 3M 101 Series Integrity Test Device indicate to the Operator to open the compressed air connection valve. The red LED will flash as the pressure increases.

PRESSURIZE 10 PSI
STAB-TIME 55 SEC

The pressure required for the test is displayed. The yellow LED flashes. Manually adjust the pressure at the filter system. As soon as pressure is detected, the indicator moves to the next step.

Manually adjust the pressure at the filter system. If the pressure is outside the tolerance thresholds, the device indicates “CAUTION - DEVIATION!” Adjust the pressure so that it is within the tolerance thresholds. You can adjust the tolerance thresholds in the configuration.

As soon as the pressure is within the tolerance thresholds, the operational sequence of the stabilization period starts automatically and the remaining time is displayed.

NOTE: As the test pressure is approached, slowly and carefully adjust the pressure applied to the housing. DO NOT exceed the test pressure to be used by more than + 1.435 psi (+ 99 mbar). If the test pressure is exceeded by 1.435 psi (99 mbar) and not adjusted prior to beginning of the test, the final result will be displayed as a “FAIL” even if the measured result is less than the maximum PHT limit. The tester recognizes that the correct test pressure has been reached and automatically initiates the stabilization phase.

During stabilization, the pressure reading is the actual pressure to the housing. If the reading is > + 1.435 psi (+ 99 mbar), the pressure to the housing can be reduced as long as it is reduced and stable BEFORE the end of the stabilization periods. During stabilization, the yellow LED is illuminated indicating “please wait”. The elapsed time is displayed in seconds.

Stabilization time can also be shortened by pressing the arrow key

COMPRESS AIR
SWITCH OFF?

Once stabilization time has finished, to continue with the test, close the connected compressed air supply.

Press START key to proceed.

FILTER TEST
SELECT WITH*

Thereafter, the filter test starts automatically if the pressure is within the tolerance thresholds

The tolerance thresholds are set in the device configuration.

TEST TIME 50sec
DIF. 0.7 ml/min

While the filter test is running, the remaining time is shown. With the * key, you can access alternative measured values, such as pressure drop/min or diffusion ml/min. While the test is in-progress, the yellow LED is illuminated indicating “please wait”. The pressure decay and test time are displayed.

Alternative measured values are calculated and displayed only after 30 seconds

RESULT PASS
>↑↓

The test result is displayed at the end.

PASS: filter test passed, diffusion within maximum value.

FAIL: filter test not passed, diffusion outside of the PHT test limits, a red LED will flash.

ABORT: filter test was manually aborted, or automatically aborted through a large pressure drop. Test can be interrupted by pressing the STOP key, the yellow LED will flash.

7. Viewing Documentation

TEST RESULTS?
PROCEED >↑↓

Start the TEST RESULTS function.

TEST RESULTS?
PROCEED >↑↓

Using the arrow keys, you can scroll and choose a test log. Search forward or backward for a particular test.

3/18/2014 18:00
TEST ID 7

There are up to 150 tests in the memory. The date, time and ID code of a test (if activated in the configuration) are displayed

With the # key, you can switch to the last test that was performed

With the START key, the test is displayed

TEST DATA
>↑

The test data follow. Press any key (except STOP) to display other values measured.

USER CODE
55 >↑

The device displays the ID code entered for measurement.
Date and time of a test are displayed.

DATE 29.01.2014
TIME 17:52

Date and time of test was performed.

RESULT
PASS >↑↓

The evaluation of the selected test is displayed:
PASS: tested system passed integrity test.
FAIL: tested system failed integrity test.
NOT CARRIED OUT: test was not carried out.

TEST PROGRAM Nb. 1
01x10“0.20 >↑↓

The number of the applied test program and the specified filter type are displayed

TEST-METHOD
PRESSURE DROP TEST

Type of test is displayed

DIFFUSION RATE
10.0ml/min

Test diffusion rate is displayed

Using the * key, you can access other values:
- Pressure drop overall, a negative value signifies a pressure increase
- Pressure drop/min
- Diffusion rate

0.0ml/min
OTHER VALUES *

Using the arrow keys, you can continue scrolling through the various results of a test.

RESULT Pass >↑↓

The pressure value at the start of the stabilization period.

STABILIZATION TIME 60 sec

Displays the actual stabilization period.

TEST PRESSURE 10.17 psi >↑↓

Displays the test pressure at the start of the filter test.

TEST TIME 120 sec >↑↓

Displays the actual test period.

ATMOSPHERIC PRESURE 14.70 psi

Displays the entered air pressure (see Service Menu). The air pressure value has a minor influence on the measurement results, and is therefore documented.

FILTER TYPE 01x10“0.20 >↑↓

The following additional information on the filter stored in the program follows:
Filter type, filter batch, filter series, housing, fluid type and the filter parameters.

FILTER LOT 45

Tested filter lot number displayed.

FILTER SERIAL NO 55

Tested filter serial number displayed.

HOUSING 1

Test housing type displayed.

FLUID TYPE WATER

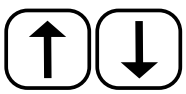
Test fluid type used for test is displayed.

FILTER PARAMETERS

At this point, using the (▶) arrow keys will displays entered test parameters of the selected performed test.

STABILIZATION PRESSURE 12.00 PSI

Using the arrow keys, you allow you to scroll.
Search forward or backward for a particular programmed test parameters used.



STABILIZATION TIME 60 sec

Programmed stabilization time.

TEST PRESSURE 12.00 psi	Programmed test pressure.
TEST TIME 120 sec >↑↓	Programmed test time.
DIFFUSION RATE 60.0ml/min	Programmed test cartridge diffusion rate at above pressure.
UPSTREAM VOLUME 1860 ml	Programmed test system upstream volume.
NO. OF CARTRIDGES 1	Programmed test cartridge quantity.

8. Selecting Other Main Menu Functions

After being switched on, the 3M Series Integrity Test Device first calls up the filter test function. To carry out another function, the operator must first halt the current filter test program.

TEST PROGRAM NB 1 ENTER >↑↓	Device display indicates it is at test function program #1.
STOP	Press STOP to exit current programming activity.
TEST PROGRAM ? PROCEED >↑↓	Return to the main function menu.

9. Entering a Test Program

9.1 Test Parameter limits

The 3M™ Series Integrity Test Device can create and store 19 different test programs for the testing of 19 different filter / housing combinations. For this purpose, you must enter the data for your system in the device.

Parameters	Permitted data range
Program number (no. of test program)	1-19
Pore size	0.1 µm– 2.00 µm
Maximum diffusion rate per cartridge	0.1 ml/min – 999.0 ml/min
Number of cartridges	1 – 99
Test pressure	0.71 psi (50 mbar) – 60 psi (4,100 mbar)
Stabilization period	30 sec – 1,800 sec
Test period	30 sec – 1,800 sec
Upstream Volume of the housing	10 ml – 999,999 ml
Filter type	Enter max. of 20 numeric characters only*
Filter batch	Enter max. of 20 numeric characters only*
Filter series	Enter max. of 20 numeric characters only*
Housing	Enter max. of 20 numeric characters only*
Fluid type	Select one of three fluid type options

Note: * Can only enter numeric values using device. Using Winfilter 3.01 software enables, alphanumeric values can be entered

9.2 Calculation of the Diffusion Rate

When the Operator is programming the Integrity tester to run an integrity test, the test limit must be calculated. The maximum diffusion rate for a cartridge must be determined and entered into the test program. The 3M 101 Series Integrity Test Device provides the maximum diffusion rate limit for each filter grade per 10” filter element. For longer length filter cartridges, this diffusion rate per 10” filter element must be multiplied:

Diffusion rate = diffusion rate limit per 10” filter cartridge x number of 10” cartridges in the installed

Housing. For example:

Calculation for a 20” cartridge is: maximum diffusion rate = FFIT limit value per 10” cartridge x 2

Calculation for eleven (11) 30” cartridges is: maximum diffusion rate = FFIT limit value per 10” cartridge x 33

9.3 Calculation of the Upstream Volume

The following two methods are used to assess the upstream volume of a system:

1. Install the filter cartridges to be tested into the filter housing. Flush the system with ambient temperature water in accordance with the manufacturer’s recommended flushing conditions, ensuring that any entrapped air is removed from the housing by venting the housing during this flushing step. Close the housing vent valve after all the trapped air has been released from the housing. After the recommended flush volume and time, close the upstream water inlet valve. Place a suitable sized container under the upstream inlet drain valve of the filter housing, open the upstream drain valve and collect the water that runs out when the housing upstream vent valve is opened. Weigh the amount of water collected and calculate the upstream housing volume.

2. Manually measure the housing and calculate the volume as if the housing was a cylinder. Measure and calculate the volume of inlet piping from the upstream shut off value to the housing inlet and add this value to the calculated housing volume. Measure and calculate the volume occupied by a cartridge, multiply the value by the number of cartridges and subtract this value from the housing and piping volume calculated.

3. For help, contact your 3M Purification Inc. representative.

9.4 Entering Test Program

Programming may be performed manually on the device, or with the assistance of the WinFilter3.01 software. Programming through WinFilter3.01 is particularly much easier regarding the entry of model numbers and series numbers, and is therefore recommended.

Notes:

- The entry arrow appears bright if an entry is not in the valid range. As soon as the entry is in the valid range, the arrow appears black.
- Entries may be deleted with the “#” hash key.

TEST PROGRAMS ? PROCEED >↑↓	Start the TEST PROGRAMS function.
START	
TEST PROGRAM NO. 1 PROCEED >↑↓	Enter the desired program number between 1 and 19, e.g. 3.
START	
TEST PROGRAM NO. 3 PROCEED >↑↓	The program number is displayed .
PORE SIZE ▶ 0.33 µm >↑↓	Enter the parameters shown in the following. Note the limits provided in the above table. A filled triangle (▶) in front of the value indicates that the value is within the valid range. Otherwise, an empty triangle is displayed. Using the # key will delete a value.
DIFFUSION RATE PER CARTRIDGE >↑↓	Enter the diffusion rate per filter cartridge. If filters are larger than 10" is used, multiply the diffusion rate by the number of 10" modules per filter.
PER CARTRIDGE MAX ▶ 20.0ml/min	Enter the maximum value according to your test cartridge product brochure. If different cartridge sizes are contained in the filter, you can also indicate the total value of the diffusion rate and only one cartridge here.
PER CARTRIDGE MAX ▶ 20.0ml/min	Indicate how many cartridges are included in the housing to be tested.
TEST PRESSURE ▶12.00 psi >↑↓	Enter the test pressure according to the data sheet for your filter.
STABILIZATION TIME ▶180sec >↑↓	Enter the stabilization period.
TEST TIME ▶ 300sec >↑↓	Enter the test period.

UPSTREAM VOLUME ▶10100ml	Enter the net upstream volume of the housing. Note that hoses and other external components, along with the filter cartridges, must be taken into account.
FILTER TYPE 02x00”0.33 >↑↓	Entering a filter type can facilitate the identification of the test program With the * key, you can reset the filter length: Display format: Number of cartridges x cartridge length (inches) x pore size. You can edit the value for cartridge length using numerical keys. With the # key, you can delete the entry. With the WinFilter3.01 software, you can enter any text here.
FILTER-LOT 3 >↑↓	Here, you can enter the filter lot number as a pure numerical value using the keypad, or as any text with the WinFilter3.01 software.
FILTER SERIAL NO. 3 >↑↓	The entry is possible only as pure numerical values, or as any text with the WinFilter3.01 software.
HOUSING 13 >↑↓	The entry is possible only as pure numerical values, or as any text with the WinFilter3.01 software.
FLUID TYPE WATER >↑↓	Using the * key, select among the pre-programmed fluid types (water, IPA/water, and product) or use the WinFilter3.01 software for any text entry.
PROGRAM TEST CALCULATED >↑↓	The following displays will provide calculated test parameters.
DIFFUSION RATE MAX 40.0ml/min	The overall diffusion rate of all filter cartridges.
PRESSURE DROP MAX 0.880 psi/min	The maximum permitted pressure drop per minute of testing filters.
TEST PROGRAMS ? SELECT WITH * >↑↓	Returned to main menu.

10. Printing Results

10.1 Bluetooth Printout

The direct print-out of the test data takes place wirelessly through a Bluetooth printer, that is available as an accessory with the 3M™ 101 Series Integrity Test Device.

Notes:

In order to be able to print via Bluetooth™, the Bluetooth setting must be activated in the Service Menu in the CONFIGURATION function. For this purpose, set the Bluetooth mode value to 2, as described on page 7.

In addition, a connection to this printer must be created and saved in the BLUETOOTH function. If a connection to a printer has been created once, it will be automatically established as soon as the printer and the filter test device are switched on. If the printer or the device is switched off, the Bluetooth connection is terminated. The Bluetooth connection requires that the printer is located in close proximity (a few meters) to the filter test device.

Printer functions can be accessed only when the Bluetooth connection is active. If the Bluetooth connection is broken, you receive a “PRINTER NOT READY” display.

Strong radio signals or other Bluetooth transmitters can interfere with the connection. Therefore, it is best to disable Bluetooth devices that could interfere with the connection.

Start the PRINT DATA function from the Main Menu. With this function, you can print a test log in conjunction with the Bluetooth printer.

Press the START key to start printing.

Using the arrow keys, find the first data record in the data memory that is to be printed.

Press the START key to select the first data record that is to be printed.

Now, using the arrow keys, find the last data record that is to be printed.

Press the START key to select the last data record that is to be printed.

The display window shows the number of data records printed

Start the print-out with the START key.

10.2 Viewing Test data and Results using a Computer

10.2.1 Downloading Winfilter Software to a Computer

In order to view program settings, data and results on a computer, the Winfilter 3.01 version software needs to be installed on the computer. For installation, place the provided CD disk containing the Winfilter 3.01 and all support software in the computer CD drive, follow all instructions provided on the computer during the installation process. Upon completion of the program installation, a Winfilter 3.0 icon will appear on computer desktop.

10.2.2 Transferring Test Data and Results to a Computer

Using provided USB (A Type) & USB mini-b cable, connect the 101-Series Integrity Test device to a computer with the installed Winfilter 3.01 data backup program. Turn on the 101-Series Integrity Test device. Access the Winfilter program by either clicking on the computer desktop Winfilter icon (or the Windows icon accessing computer program directories). The Winfilter3.01 program allows you to program, transfer, view and print test program parameters, test data and results.

Notes:

If you have carried out a data backup, all data in the device are preserved, but are marked therein as backed up. Thus, they are approved for being overwritten with new data, without requiring the appearance of a warning message. The memory is thus once again freely available.

Info Data Loss!

Perform the data backup as soon as possible, when you receive a warning message from the device that only ten, or fewer than ten, free memory locations are available. If the memory is full, the device starts to overwrite the oldest data with new measurements. Thus, the oldest data is gradually lost.

11. How to run Device Auto-Test

The 3M™ 101 Series Integrity Test Device performs constant monitoring of the most important operating data. If an error arises, it is reported immediately.

The device displays important error messages, such as leaks in the filter, until the user confirms them by pressing any key. Non-critical error messages are automatically hidden after eliminating the cause of the error.

Based on the following table, you can isolate the possible errors that arise, along with the possible causes. If only specialized personnel can resolve an error that arises, this is noted in the “Remedy” column: “Contact 3M Purification Customer Service”.

Error	Cause	Remedy
Warning message: Battery pack nearly empty	Battery pack is nearly empty	Charge battery pack
Error message: Charge battery	Battery pack is empty	Connect power supply and charge battery pack
The battery is running out quickly	Battery pack is aged	Change battery pack
Error message: Overpressure	The pressure is greater than the specified measurement range! As it increases further, the device may be damaged.	Reduce applied pressure
	Calibration parameters, measurement error	In the Service Menu: 1. Check calibration parameters 2. Contact 3M Purification Customer Service
	Pressure sensor not operating correctly	Contact 3M Purification Customer Service

Error	Cause	Remedy
Error message: Pressure sensor	Calibration parameters: Offset and/or reinforcement incorrect	In the Service Menu: 1. Check calibration parameters, and (if necessary) recalibrate 2. Contact 3M Purification Customer Service
	Pressure sensor not operating correctly	Contact 3M Purification Customer Service
Defective pressure measurement	Pressure sensor not operating correctly	Contact 3M Purification Customer Service
	Calibration parameters: Offset and/or reinforcement incorrect	In the Service Menu: 1. Check calibration parameters and (if necessary) recalibrate 2. Contact 3M Purification Customer Service
Filter test does not start	Empty test program selected	Select a test program with valid test parameters
	Test parameters are invalid	Recharge batteries (see Manual). Re-enter test parameters.
	Pressure is outside of tolerance	Check test pressure
	Test programs and documentation data are invalid, due to defective buffer battery	Contact 3M Purification Customer Service
Time/date is incorrect	Time/date is not valid, due to empty buffer battery	Recharge battery (see Manual) and readjust time and date in the Service Menu
Integrity Device does not switch on	Battery pack is empty	Charge battery pack
	Battery pack is not operating correctly	Replace battery pack
	Fuse is not operating correctly	Contact 3M Purification Customer Service
Red charging LED does not blink when charging battery pack	Defective power adapter	Replace power adapter
	Fuse is not operating correctly	
Red charging LED is blinking rapidly	Charging function was aborted	Remove charging plug and insert again
No access to the Service Menu	Wrong security code entered	Enter correct security code. Ask your service technician.

12.- Setting Up BlueTooth Connection

To be able to print via Bluetooth, a wireless link between the 3M™ 101 Series Integrity Test Device and the Bluetooth printer needs to be established. Using the BLUETOOTH function in the submenu of the Service function of the 3M 101 Series Integrity Test Device allow setting up and save the printer BLUETOOTH code. The Bluetooth connection requires that the printer is located in close proximity (a few meters) to the filter test device.

Note: Strong radio signals or other Bluetooth transmitters can interfere with setting up the connection between devices. Therefore, it is best to disable Bluetooth devices with the immediate area that could interfere with the connection

USA-Federal Communications Commission (FCC)

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instructions, it may cause harmful interference to radio communications.

However, there is no ensured specification that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by tuning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the distance between the equipment and the receiver.

- Connect the equipment to outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help.

Any changes or modifications not expressly approved by the party responsible for compliance could void the users authority to operate the equipment.

Caution: Exposure to Radio Frequency Radiation.

This device must be installed with a separation distance of 20 cm from the user and should not be co-located or operating in conjunction with any other antenna or transmitter.

Canada – Industry Canada (IC)

This device complies with RSS 210 of Industry Canada.

Operation is subject to the following two conditions:

(1) This device may not cause interference.

(2) This device must accept any interference, including interference that may cause undesired operation of this device.

(French)

L ‘ utilisation de ce dispositif est autorisée seulement aux conditions suivantes :

(1) Il ne doit pas produire d’interference.

(2) L’ utilisateur du dispositif doit étre pr?t ? accepter toute interference radioélectrique reçu, m?me si celle-ci est susceptible de compromettre le fonctionnement du dispositif.

Caution: Exposure to Radio Frequency Radiation.

The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit RF field in excess of Health Canada limits for the general population; consult Safety Code 6, obtainable from Health Canada’s website www.hc-sc.gc.ca/rpb

The printer BLUETOOTH code can be viewed once recognized by going to “BLUETOOTH ?” function in the submenu of the SERVICE function of the 101-Series Integrity Test Device .

When both the 3M™ 101 Series Integrity Test Device and printer are turned on, connection between devices is automatic and the 3M 101 Series Integrity Test Device will display “PRINTER CONNECTED”. If the printer or the 3M 101 Series Integrity Test Device is switched off, the Bluetooth connection is terminated. The 3M 101 Series Integrity Test Device will intermittently display “PRINTER NOT READY” once the Bluetooth

SERVICE ?
PROCEED >↑↓

Scan through device menu until “SERVICE ?” is displayed.

START

Press START on keypad to initiate process to enter SERVICE submenu.

ACCESS CODE ?
##

Enter service ACCESS CODE value for entering service submenu level.

* SERVICE *
PROCEED >↑↓

Once accessed to device service submenu level will first display “* SERVICE *”.

Use arrow keys to scan through submenu to locate BLUETOOTH function.

BLUETOOTH ?
PROCEED >↑↓

START

Press START keypad to display the device printer Bluetooth status.

PRINTER ##-##-##-
##-##-##>↑↓

One of the following displays will appear:

A six value alphanumeric code that indicates the device has been previously set up a wireless link with a printer. Press the “STOP” key to avoid changing code.

PRINTER
_ _ _ _ _ _ >↑↓

Six underscore markings (without alphanumeric values) displays indicate device has not been prior set up with a printer.

Press either arrow keypad to initiate creating a printer Bluetooth wireless connection.

CREATE NEW
CONNECTION ?

START

Press START keypad to initiate process for device to seek and create a Bluetooth link with a printer. This may take about a minute.

SEEKING PRINTER...
>↑

Device will display “SEEKING PRINTER…”, searching a printer Bluetooth wireless link.

PRINTER ##-##-##-
##-##-##>↑↓

When device successfully links with printer, an alphanumeric code will be displayed.

Note, if device is not able to link with printer, the “PRINTER NOT READY” will temporarily displayed.

Press UP arrow key to return to start of BLUETOOTH? Menu.

STOP

To quit Bluetooth link process, press “STOP” keypad to back out of service menu or press & hold “STOP” keypad to turn off device

START

Press START keypad to restart device, then proceed back to the BLUETOOTH function in SERVICE menu as previously noted.

Press the START keypad will display printer Bluetooth code.

13. Battery Pack

13.1 Recharging:

If the warning message for an empty battery appears, you can recharge the 3M Series Integrity Test Device device using the supplied charger. Use only the original charger for recharging. For this purpose, insert the plug of the charger into the lateral charging socket. The red charging indicator light displays the status of the charging function by flashing:

Flashing once every second = charge

Once every 2 seconds = battery full, trickle charge continues

Twice per second = charging error, charging function has stopped

After a maximum of four hours, the rechargeable batteries are fully charged. Overcharge protection has been installed; the device can remain connected to the charger.

Over time and usage battery life will decrease. If you notice battery pack life is too short, replace the battery pack with a new original battery pack.

⚠ WARNING
To reduce the risks associated with hazardous voltage: • **Only use the charger supplied with this device**
To reduce the risks associated with explosion and fire: • **Only use the battery pack supplied with this device.** • **Do not replace rechargeable battery pack with non-rechargeable or unapproved battery pack. Replace only with 3M approved battery pack.**

13.2 Replacing:

To remove cover to battery pack compartment, unscrew its two screws. Remove the cover (Photo #1), exposing the battery pack. Remove battery pack from its compartment (Photo #2), continue pulling out battery pack wiring to device until the white connector become exposed. Disconnect battery pack from device by pulling apart the connector (Photo #3). Connect new battery pack connector end with the device connector end. Note, the connector ends can only be connected in one way. Tuck battery wiring back into device casing space until battery pack can properly be seated in battery compartment. Place compartment cover back in place and its two holding screws. To restart the device you have to insert the charger in the charger socket.

Photo #1

Photo #2

Photo #3

14. Storing the 3M™ 101 Series Integrity Test Device

It is important that the Integrity tester is stored in a clean, dry place. The foam-lined storage and transportation case is ideally suitable for this purpose

- If fluid is introduced into the compressed air connection during a test, it must be immediately removed.
- When stored, it is suggested that the Integrity tester be kept in a vertical position with the compressed air connection pointing down.
- In the case of extended storage, the Operator must ensure that the batteries do not completely run down as this will lead to complete memory loss. It is recommended that every 2 - 3 months the Integrity tester is switched on and the batteries allowed to fully discharge. The batteries should then be fully recharged and the unit placed back in storage.

15.Technical Facts

15.1 Device Features

Ambient Conditions	
Temperature Range	41° – 104 °F (5 - 40 °C)
Maximum Humidity Limit	95% relative humidity
Polution Degree	2
Altitude limit (max.)	6,562 ft (2000 m)
Electrical Data	
Battery Pack	4x 1.2 VDC NiMH battery pack / 4.8 VDC pack
Battery Capacity	200 mAhr, 4.8 V
Time Taken To Recharge The Battery	4 hrs
Operating Time For	
Continuous Test Operation (The Yellow LED Flashes)	6 hrs
Normal Operation	7 hrs - 12 hrs
Data Storage (With Fully Charged Batteries)	4 months / 25 °C
Power Supply (adapters for various countries available)	100 - 240 VAC, 50/60Hz, / 9.0 VDC 1000 mA SELV output
Charger Socket	Cylindrical connector 5.5mm x 2.1mm, Negative pole outside
Data Transmission	
Wireless (printer only)	BlueTooth
Wired connection	mini-USB cord
Programs	
Maximum Number Of Test Programs	19
Maximum Number Of Test Reports Memorized	150
Pressure Measurement	
Measurement Range	0…60 psi (0 ... 4137 mbar)
Accuracy relative at 68 °F (20 °C)	< 0.2%
Temperature Error	+ 0.29 psi (± 20 mbar) for ± 15 Kelvin
Compressed Air Connector	Staubli® RBE 03.6150
Case	
Material Of Case	ABS
Compatibility Of Case	fuel, sea-water, detergent, light alkalis/acids, alcohol
Incompatibility Of Case	benzene, acetone
Dimensions	210 x 105 x 45 mm
Weight	1.1 lb. (500 gram)
Miscellaneous	
Display	2 x 20 digits
LED Indicators	red, green, yellow
Recharge Control Light	red
Keyboard	16-key touch sensitive Polycarbonate Film

15.2 Device Handling TIPS

Recommendations
Operate and store the device in dry conditions. Do not operate or store the device in damp surroundings for a long period of time.
Operate the device within the defined pressure range. Do not exceed a test pressure of 60 psi (4,137 mbar). The device has a maximum operating pressure of 65 psi (4,500 mbar).
Operate the device within the defined temperature range. Operating outside the defined temperature range leads to erroneous measurement results or error messages.
Connect to the filter system only with standard compressed air couplings, matching the nipple, depending on the design of the device. Changes to the air pressure nipple of the device can lead to leaks, damages to the battery pack or data loss.
Charge the device at least every two months. Storing for more than two months without a charge can lead to damages to the battery pack or data loss.
Use original power adapter. Use of a power supply different from the original power supply can cause damages to the device.
Caution: If the device is stored above 30 °C for a long period of time, the life of the battery pack will be reduced, even if the device is switched off. In order to avoid data loss, charge the device more often.

15.3 Maintenance Plan

Part of device/system	Maintenance instruction	Interval	Action
General	Visual inspection	At least prior to every use	If dirty, clean with a damp cloth
Battery	Charge battery	At least every 30 days	—
Pressure sensor	Calibrate pressure sensor	At least every 12 months	—

15.4 Spare Parts Ordering List

Parts	3M #
3M™ 101 Series Integrity Test Device Int'l Charger/Power supply cord adapters	70020334440
3M™ 101 Series Integrity Test Device Battery pack	70020334457
USB/USB-mini cord	70020334465
ABS black case	70020334473
3M™ 101-Series Integrity Test Device Op-Manual	34-8719-8229-3
Printer Charger/Power supply cord	70020334507
Printer Battery pack	70020334515
Thermo print paper, roll	70020334523
PrinterOp-Manual	70020334531

16. Disposal

The device (including accessories and batteries) does not belong in the household waste. Dispose of the device, including batteries, in accordance with applicable local regulations or laws.

⚠ CAUTION

To reduce the risks associated with environmental contamination:
- Dispose of device, including batteries, in accordance with applicable local regulations or laws.

17. Service

For further questions, suggestions or problems with the device, is at your convenience please contact your 3M Purification Inc. technical contact via phone (1-800-243-6894) or email.

Product Use: Many factors beyond 3M's control and uniquely within user's knowledge and control can affect the use and performance of a 3M product in a particular application Given the variety of factors that can affect the use and performance of a 3M product, user is solely responsible for evaluating the 3M product and determining whether it is fit for a particular purpose and suitable for user's method of application.

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