

# OWNER'S AND USER'S MANUAL

## M100+™ Laboratory Turbidimeter

Models 28060 & 28061



### **⚠ WARNING**



**THINK  
SAFETY  
FIRST**

Read Manual and all product labels BEFORE using the equipment. Do not use unless you know the safe and proper operation of this equipment. Keep this Manual available for easy access by all users. Replacement Manuals are available at [HFscientific.com](http://HFscientific.com)

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Ft. Myers, FL 33916  
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M100+ (January 2019)  
Rev. 1.74

  
**A WATTS Brand**





# Certificate of Conformity

Certificate: 16338-1S

Master Contract: LC 985589

Project: 16338

Date Issued: March 06, 2018

Issued to: HF Scientific Inc.  
3170 Old Metro Parkway  
Fort Myers, Florida  
33916, USA

Certification System Type 3  
(ISO / IEC Guide 67)

*The products listed below are eligible to bear the LabTest Certification Mark with adjacent indicators 'C' and 'US', and the subject area as shown below.*



Issued by:

Certification Manager

## PRODUCTS

- Test item description: Micro 100 Laboratory Turbidimeter
- Model Nos.:
  - M100+ Infrared, Catalog no.: 28061 (Infrared)
  - M100+ White Light, Catalog no.: 28060 (White Light)
- Ratings:
  - M100+ Infrared: Input Rating- 12VDC, 0.28 A
  - M100+White Light: Input Rating- 12VDC, 0.60 A

## APPLICABLE REQUIREMENTS & SUBJECT AREA

- CAN/CSA-C22.2 No. 61010-1-12 (R2017)
- UL 61010-1 (Ed.3)

## CONDITIONS OF ACCEPTABILITY

- N/A

The 'C' and 'US' Indicators adjacent to the LabTest Certification Mark shall signify that the product has been evaluated by an accredited laboratory to the applicable CSA and UL Standards respectively. The subject area shall be displayed with the LabTest Certification Mark to identify the Standard Number, and Revision Level.

Certificate No.: 16338-2S



## Certificate of Conformity

For

### HF Scientific Inc.

3170 Old Metro Parkway  
Fort Myers, Florida  
33916, USA

For Compliance of:

**Equipment:** Micro 100 Laboratory Turbidimeter  
**Model No.:** M100+ Infrared, Catalog no.: 28061 (Infrared)  
M100+ White Light, Catalog no.: 28060 (White Light)  
**Rated:** M100+ Infrared: Input Rating- 12VDC, 0.28 A  
M100+White Light: Input Rating- 12VDC, 0.60 A  
**Report Nos.:** 16338-2S, 16338-1E

To the following Directive(s):

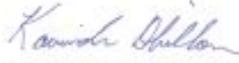
- 2014/35/EU – Low Voltage Directive
- 2014/30/EU – EMC Directive

To the following standard(s):

- EN 61010-1:2010
- EN 61326-1:2013

**Project No.:** 16338  
**Issue Date:** March 06, 2018

**Issued by:**

  
Kavinder Dhillon, Eng.L.  
Certification Manager

[info@labtestcert.com](mailto:info@labtestcert.com)

Refer to project file for complete information on Certificate

[www.labtestcert.com](http://www.labtestcert.com)

## Attention Owners and Users

Thank you for purchasing the M100+™ turbidimeter. This equipment will provide safe and productive operation as long as it is installed, used, maintained, and serviced in accordance with the instructions in this manual and is properly maintained. Importantly, unless the user is adequately trained and supervised, there is a possibility of personal injury, property damage or damage to the equipment.

Owners and users of this equipment bear the responsibility to make certain that this equipment is used properly and safely. **READ THIS MANUAL** carefully, learn how to use and service this equipment correctly, and strictly follow all of the instructions contained in this manual and the requirements of local, state and federal law. Failure to do so could result in personal injury, property damage or damage to the equipment. This manual should be considered a permanent part of your machine and should be kept available for easy reference by any user.

Owners should not permit anyone to touch this equipment unless they are over 18 years of age, are adequately trained and supervised, and have read and understood this manual. Owners should also ensure that no unauthorized personnel comes in contact with this equipment.

If this equipment, or any of its parts, becomes damaged or needs repair, stop using the equipment and contact an experienced service individual immediately. If the warning labels or this manual are misplaced, damaged or illegible, or if you require additional copies, please contact customer service at +1 (239) 337-2116 or 888-203-7248 for these items at no charge.

Please remember that this manual and the warning labels do not replace the need to be alert, to properly train and supervise users, and to use common sense when using this equipment.

If you are ever uncertain about a particular task or the proper method of operating this equipment, ask your supervisor, consult this manual, access [www.hfscientific.com](http://www.hfscientific.com), or contact us at 888-203-7248.

### PRODUCT IDENTIFICATION

Please record your product's identification and purchase information which will help in the event you have questions or need any service.

Model:	Date of purchase:
Serial #:	Seller name/address:

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## Understanding Safety Information

This manual contains safety and use instructions that must be followed during the installation, commissioning, operation, care and maintenance, and service of the M100+. All responsible personnel must read this manual prior to working with this instrument and should familiarize themselves with the following safety symbols, signals, and pictorials.



This is a safety-alert symbol.

- The safety alert symbol is shown alone or used with a signal word (DANGER, WARNING or CAUTION), a pictorial and/or a safety message to alert you to hazards.
- When you see this symbol alone or with a signal word on this instrument or in this Manual, be alert to the potential for death or serious personal injury.

### ***Safety signal words have the following meaning:***

	Identifies hazards which, if not avoided, will result in death or serious injury.
	Identifies hazards which, if not avoided, could result in death or serious injury.
	Identifies hazards which, if not avoided, will result in minor or moderate injury.
	Identifies practices, actions or failure to act which will result in property damage or damage to the equipment.

### ***Pictorials used on the equipment and in this Manual have the following meanings:***

	This pictorial alerts you to the need to read the Manual.
	This pictorial alerts you to electricity, electrocution and shock hazards.

## Specifications

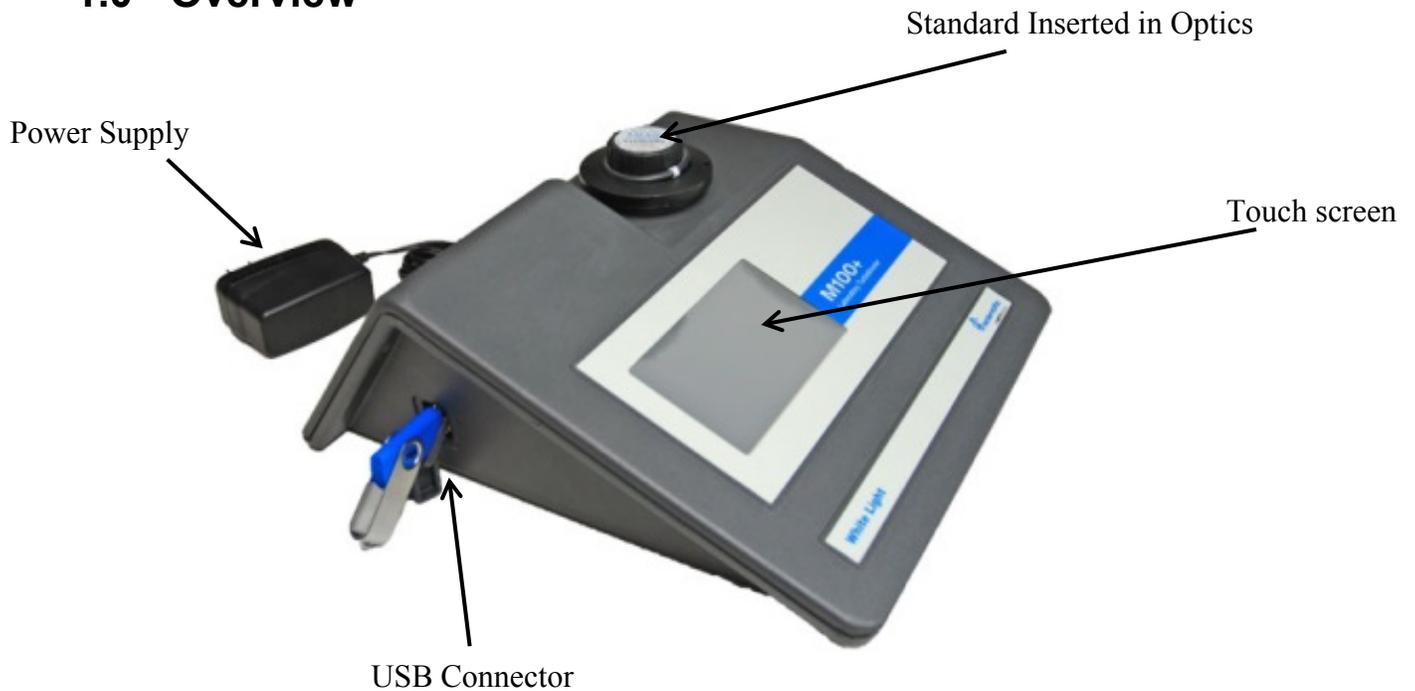
<b>M100+ White Light Model 28060</b>	Conforms to specifications set forth in EPA method 180.1 (Nephelometric Method) § This Model uses a tungsten filament lamp.
<b>M100+ Infrared Model 28061</b>	Conforms to specifications set forth in ISO 7027: Water Quality - Determination of Turbidity. This model uses an IR LED lamp.
<b>Measurement Range</b>	0-4000 NTU
<b>Accuracy<sup>†, ††</sup></b>	±2% of reading or ±0.02 NTU below 40 NTU whichever is greater ±5% of reading above 40 NTU
<b>Repeatability<sup>††</sup></b>	≤ ±1% of reading or ± 0.02 NTU whichever is greater
<b>Resolution</b>	Menu settable up to 0.0000 over the entire range
<b>USB</b>	Printer or download logged data & calibration data & upload new firmware via thumb drive (USB flash stick).
<b>Power Supply</b>	UL, CSA & CE approved 12V DC, Wall Mount
<b>Miscellaneous Specifications</b>	1. USB port for logged data download and software updates. 2. Built-in Diagnostics 3. Three Year Battery Backup With no External Power
<b>Operating Temperature Range</b>	1°C – 40°C (34°F – 104°F)
<b>Sample Temperature Range</b>	0°C – 40°C (32°F – 104°F)
<b>Dimensions</b>	237mm W x 254mm L x 121mm H (10.75" W x 10" L x 4.75" H)
<b>Shipping Weight</b>	2.5 kg (5.5 lbs.)
<b>Certifications</b>	LC mark tested to UL and CSA. Conforms to CE
<b>Warranty</b>	1 Year from date of shipment

§ The specifications found in EPA method 180.1 are essentially the same as the specifications set out in method 2130B of the Standard Methods for the Examination of Water and Wastewater 22<sup>nd</sup> edition and the specifications set out in ASTM Standard Method D1889-94. The M100 PLUS meets or exceeds, the specifications set forth in these methods.

† Instrumental accuracy measured under controlled laboratory conditions at 25°C (77°F)

†† Both the accuracy and repeatability specifications for the M100+ are valid only for measurement of static (non-flowing) samples.

## 1.0 Overview



### 1.1 The M100+ Product Description

The M100+ is a process turbidimeter that allows for the laboratory measurement of the turbidity of sample water. The white light M100+ has been designed to meet the design criteria specified by the US EPA 180.1 on turbidity measurement. The infrared M100+ was designed to meet the design criteria specified in ISO 7027 and DIN 27027 for the measurement of the turbidity of a sample. Both models have long life lamps.

The M100+ instruments are equipped with a USB slot in order to download logged data and calibration information and to update operating software.

The M100+ is equipped with a color touch screen for easy and efficient operation.

## 2.0 Unpacking and Inspection

The table below indicates the items in the turbidimeter shipment.

Item	Quantity
M100+ Laboratory Turbidimeter	1
Accessory Kit for M100+ (2 empty sample cuvettes with caps)	1
Full Range Calibration Kit High Range A, High Range B, 1000 NTU, 10 NTU & 0.02 NTU (shipped in a separate box to ensure freshness)	1
Quick Start Guide	1
Flash Drive Containing Full Owner's and User's Manual	1
Wall Mount Power Supply with Ferrite	1

**NOTICE** A ferrite is included with the power supply. This should be looped twice through the cord near the side that connects to the instrument to eliminate EMI interference.

**NOTICE** Remove the instrument from the packing carton. Carefully inspect all items to ensure that no visible damage has occurred during shipment. If the items received do not match the order, please immediately contact the local distributor or the HF scientific Customer Service department.

### 3.0 Site Selection



The M100+ must be used in a suitable dry location with adequate ventilation. It should not be located where chemicals such as chlorine are located. It must be operated and stored between 1 and 40°C. The instrument should be used on a stable table top and less than 90 cm (3 feet) from a power source.

Power Requirements:



- The M100+ requires 12VDC for proper operation. The provided supply is rated at 1A.
- The M100+ is supplied with a wall mount power supply intended for operation with 100-240 VAC, 47-63 Hz power source. **BEFORE installing, verify that the line voltage falls within these specifications.**
- Connect the wall mount power supply to the rear panel of the M100+.
- An optional Euro wall mount power supply is available.

### 4.0 Setup, Configuration and Calibration

#### **NOTICE**

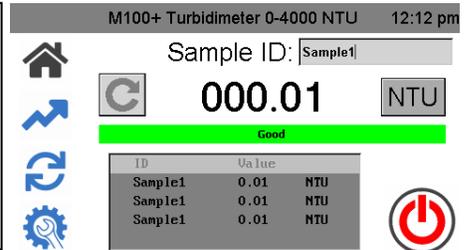
Before using your M100+, you will need to familiarize yourself with the instrument's operating modes and functions and perform some setup, configuration, and calibration.

- The M100+ allows for the measurement of the turbidity of water. The turbidity of the water is usually reported in **Nephelometric Turbidity Units (NTU)** but may be reported in **Formazin Nephelometric Units (FNU)**. This is user selectable.
- Readings up to 4400 are possible but readings above 4000 are outside of the rated specifications. Readings above 4400 NTU will cause the display to flash indicating an over-range condition.
- During normal operation, the instrument will be at the HOME screen. This is this screen where measurements can be viewed.
- Please note, some features depicted in this manual may change with future firmware updates.

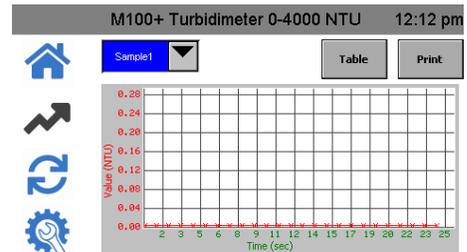
## 4.1 Operating Screens

There are four main operating screens in the form of Icons, **Home** (🏠), **Trend** (📈), **Calibration** (🔄), and **Setup** (⚙️). To change between screens, simply touch the appropriate icon.

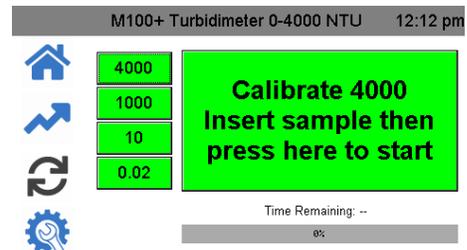
**Home** (🏠) screen is the normal reading screen. This is the default mode when power is applied or restored. The other three operation screens are limited to 15 minutes with no key presses after which the screen will return to Home.



**Trend** (📈) screen is used for displaying trend information. This information can be downloaded to the USB stick or printed to a serial printer.



**Calibration** (🔄) screen is used for calibration. The instrument was calibrated and tested prior to leaving the factory. Therefore, it is possible to use the instrument directly out of the box. Under normal conditions, re-calibration is required once every three months. Quarterly calibration ensures performance within accuracy specifications.



**Setup** (⚙️) screen is where configuration changes can be made. In the **Setup** screen, you can customize the instrument according to needs and preferred operation at any time during normal operation. The **Setup** screen has been split into sub-menus to facilitate instrument configuration. This is also where logged files and calibration logs can be downloaded and where new software, when available, can be uploaded.



## 4.2 Configuring the M100+

The M100+ has been designed to provide the ability to customize the instrument according to your needs at any time during normal operation. The **Setup** screen has been split into sub-menus to facilitate instrument configuration. This section describes how to use each of the sub-menus to configure the instrument.

**Turn Power “ON:”** After confirming that the M100+ is safely and properly plugged into a suitable power source, simply touch the screen to turn the instrument on. Depending on the setting, the instrument will usually power down automatically.

**NOTICE** There is a setting (Auto Power Down) that allows the instrument to stay on and require a manual shut down. An On/Off button will appear on the Home screen. It is not recommended to leave the instrument on constantly as it may cause drift and premature degradation of the lamp. The drift can be corrected by more frequent calibrations.

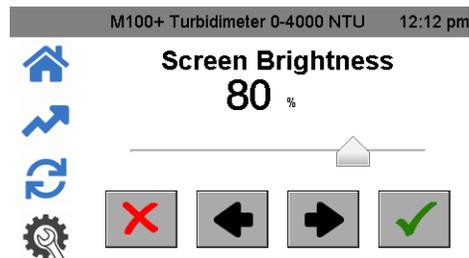
**NOTICE** The following configuration settings can be performed in the **Setup** screen:

- Screen Brightness
- Auto/Manual Readings
- Auto Power Down
- Touch Screen Calibration
- Set Time/Date
- Delete Samples
- Data Resolution
- Offset
- Device ID
- Calibration Reminder
- Calibration Download
- Log Download
- Firmware Update
- Reset Defaults
- About Device

The **Setup** screen has quite a few menu selections. Use the slider on the right-hand side to access to all of the selections.

- At any time any of the Home, Trend, Calibration and Setup screens can be pressed and implemented.
- To select any of the Setup options identified below, press **Setup** icon and then select the option that you wish to change.

#### 4.2.1 Screen Brightness



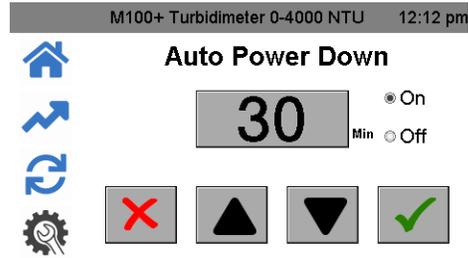
- Press the **Setup** icon. Select Screen Brightness.
- Adjust current Screen Brightness.
- Use ◀&▶ or the drag cursor.
- Push  to save and return to Setup Menu.

#### 4.2.2 Auto/Manual Readings



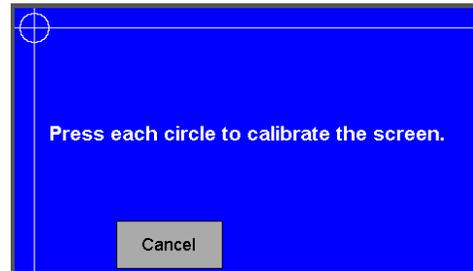
- Press the **Setup** icon. Select Auto/Manual Readings.
- In this screen, a selection can be made of continuous readings (Auto) or for a single reading (Manual).
- If Auto is selected the rate of updates can be selected from 1 to 60 seconds using the ▲&▼ buttons.
- Select  to save and confirm.
- If Manual is chosen, a button will appear in the **Home** icon to take readings.
- Manual readings take approximately 10 seconds to display. It will say “capturing” to indicate that it is processing.

### 4.2.3 Auto Power Down



- Press the **Setup** icon. Auto Power Down.
- The M100+ can be set to power down automatically.
- The factory setting is to power down after 30 minutes.
- To save lamp life it is recommended that auto power down is used.
- The time can be adjusted using the ▲&▼ buttons.
- If you need to keep the instrument on you can select OFF for the Auto Power Down. In this case, you will turn the M100+ off using the  button on the **Home** screen.

### 4.2.4 Touch Screen Calibration



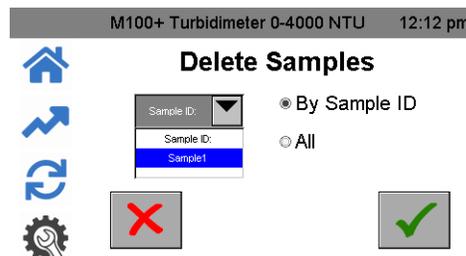
- Press the **Setup** icon. Select Touch Screen Calibration.
- This has been factory adjusted.
- Adjust if the alignment is needed.
- May need to be done if new software downloaded.
- Five position setup.
- If this calibration fails. Restart by pulling and reinserting the power plug. Press top screen time banner for 5 seconds to reset to factory default screen setting. Then attempt the calibration again.

#### 4.2.5 Set Date/Time



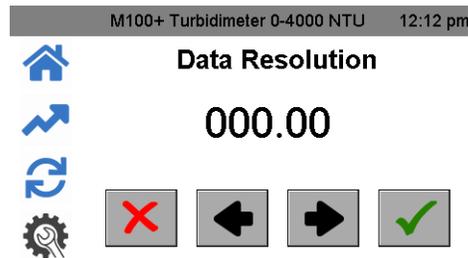
- Press the **Setup** icon. Select Set Date/Time.
- **Date/Time**: Set the date and time by using the ▲&▼ buttons. When complete, press the  to save the setting and return to **Setup** menu.
- **Time Format**: Allows you to select 12 or 24 hour time. This menu will change slightly if the 24-hour format is selected. Use the ▲&▼ buttons to select your option.
- **Daylight Saving Time**: Allows you to enable Daylight Saving Time in the USA, Canada and other countries that follow the US Energy Savings Act of 2005.

#### 4.2.6 Delete Samples



- Press the **Setup** icon. Select Delete Samples.
- Select either All or By Sample ID.
- If **Sample ID** is selected, select sample.
- Press  to delete sample.

#### 4.2.7 Data Resolution



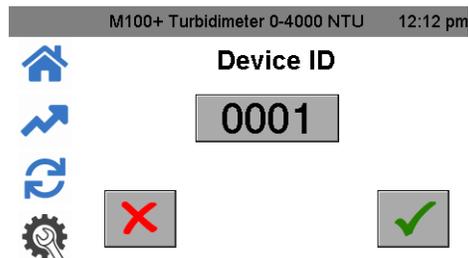
- Press the **Setup** icon. Select Data Resolution.
- Sets the resolution or number of digits after decimal point shown in **Home** screen.
- Use **←&→** to set the resolution. The screen shows a representation.
- Push **✓** to save and return to Setup Menu.

#### 4.2.8 Offset



- Press the **Setup** icon. Select Offset.
- Adjusts the reading slightly to allow for agreement with another instrument.
- Turn On to use then use the **▲&▼** buttons to set the offset.
- Allowable resolution is -1.00 to +1.00 in increments of 0.01 NTU

#### 4.2.9 Device ID



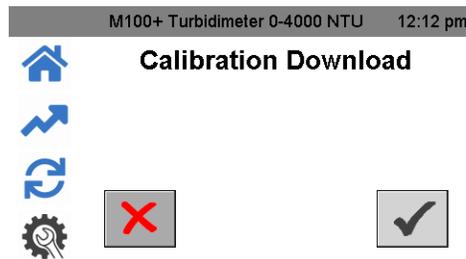
- Press the **Setup** icon. Select Device ID.
- Sets the Device ID for data logging purposes.
- Touching the number box brings up and keypad. Enter the number on the keypad and press the **✓**.
- This returns to screen above. If this is acceptable press **✓**.
- If this is not acceptable press the **✗**.

#### 4.2.10 Calibration Reminder



- Press the **Setup** icon. Select Calibration Reminder.
- Sets how often a calibration reminder comes up on **Home** screen.
- The USEPA recommends calibration every quarter (90 days).
- Use the ▲&▼ buttons to set period in days.
- Set to **OFF** if not desired.
- Push  to save and return to **Setup** Menu.

#### 4.2.11 Calibration Download



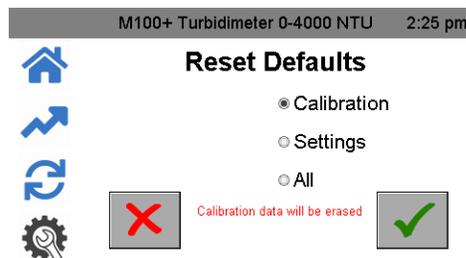
- Press the **Setup** icon. Select Calibration Download.
- Allows USB thumb drive download of calibration history.
- Insert USB thumb drive into the USB port.
- Push  to transfer the information and return to the **Setup** screen.
- See Data Retrieval section 5.3 for more information.

## 4.2.12 Firmware Update



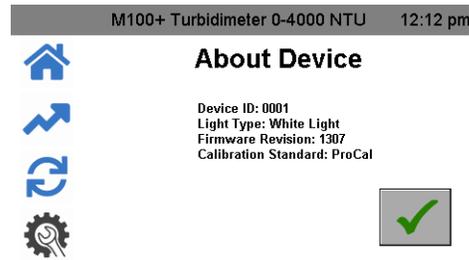
- Press the **Setup** icon.
- This screen is used to update firmware via USB.
- Insert the USB thumb drive containing the software into the USB port.
- Push  to continue.
- If the inserted USB thumb drive contains a lower revision number than that currently installed, then the M100 will ask if you are sure you want to continue.
- Push  to continue.
- The upload will take several minutes. During the initial upload, the screen will show “busy” and screen anomalies may appear until the upload is complete.
- Finally, the screen will turn off when complete.
- Any firmware updates will be posted to our website [www.hfscientific.com](http://www.hfscientific.com).
- The current firmware version is shown in About Device. See 4.2.16 below.

## 4.2.13 Reset Defaults



- Press the **Setup** icon.
- This menu allows resetting the calibration and/or settings. This clears the calibration and new calibration will be required to operate the instrument.
- Settings may change so these should be checked.

#### 4.2.14 About Device



- Press the **Setup** icon.
- This menu shows the current setting of the Device ID, the lamp type, and the firmware revision number.
- Firmware revision can be compared to available firmware on the website.
- Push  to continue.

#### 4.3 Calibrating the M100+

- The instrument was calibrated and tested prior to leaving the factory. Therefore, it is possible to use the instrument directly out of the box. Under normal conditions, re-calibration is required once every three months. Quarterly calibration ensures performance within accuracy specifications.

**NOTICE** The EPA and ISO recommend that on-line turbidimeters be calibrated with a primary standard at least once every three months if they are to be used for reporting purposes.

#### 4.3.1 Calibration Standards

- If the M100+ will be used over the entire range of 0.02 to 4000 NTU, a complete calibration as described below will be required which includes the two High Range standards.
- If instrument accuracy is only required below 1000 NTU, a calibration may be performed using the 1000 NTU standard, the 10 NTU standard, and 0.02 NTU standard. To calibrate starting at 1000 NTU, simply press the 1000 button on the calibration screen.
- If instrument accuracy is only required below 10 NTU, such as for potable water, a calibration may be performed using only a 10 NTU and a 0.02 NTU standard. To calibrate starting at the 10 NTU, simply press the 10 button on the calibration screen.
- We recommend that the following materials be used during calibration to achieve the full-scale accuracy stated in this manual:
  - High Range A *ProCal* Calibration Standard available from HF scientific
  - High Range B *ProCal* Calibration Standard available from HF scientific
  - 1000 NTU *ProCal* Calibration Standard available from HF scientific
  - 10.0 NTU *ProCal* Calibration Standard available from HF scientific
  - 0.02 NTU *ProCal* Calibration Standard available from HF scientific

#### **NOTICE**

It is well known that diluted Formazin is unstable. If Formazin is used to calibrate the instrument, ensure that a fresh stock suspension of Formazin is used to achieve the accuracy quoted for the instrument.

A Formazin Stock Solution Kit is available from HF scientific (Catalog No. 50040).

The HF scientific **ProCal**, primary calibration standards (refer to section 8.0 *Accessories and Replacement Parts List*), are more stable than Formazin and have a minimum shelf life of 12 months. Prior to recalibration, review the expiration dates, to ensure that the standards have not expired.

#### 4.3.2 Care of ProCal Standards

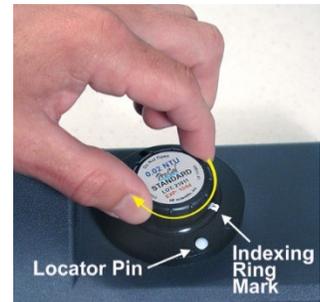
The information below is provided as a general guidelines for the proper care of ProCal standards.

- ProCal standards should only be handled by the top, black cap or by the very bottom of the cuvette.
- Keep the cuvette glass clean of fingerprints and debris.
- Cuvettes can be cleaned with any domestic glass cleaner and the provided microfiber cloth.
- Prevent ProCal standards from freezing. This will most likely destroy them.
- Standards under 100 NTU must be freshly poured from the supplied bottle as they are are not stable in the glass cuvette.
- There are no need to shake standards, but standards over 1000 NTU should be upended gently before use.
- Replace standards at the expiration date.

#### 4.3.3 Indexing Calibration Cuvettes

To achieve the greatest accuracy, and account for normal scratches and aberrations in cuvette glass when calibrating, HF Scientific recommends indexing the cuvettes.

Standards and standard kits purchased from HF Scientific are supplied with indexing rings. Complete instructions regarding how to index the cuvettes are included in the calibration kits.

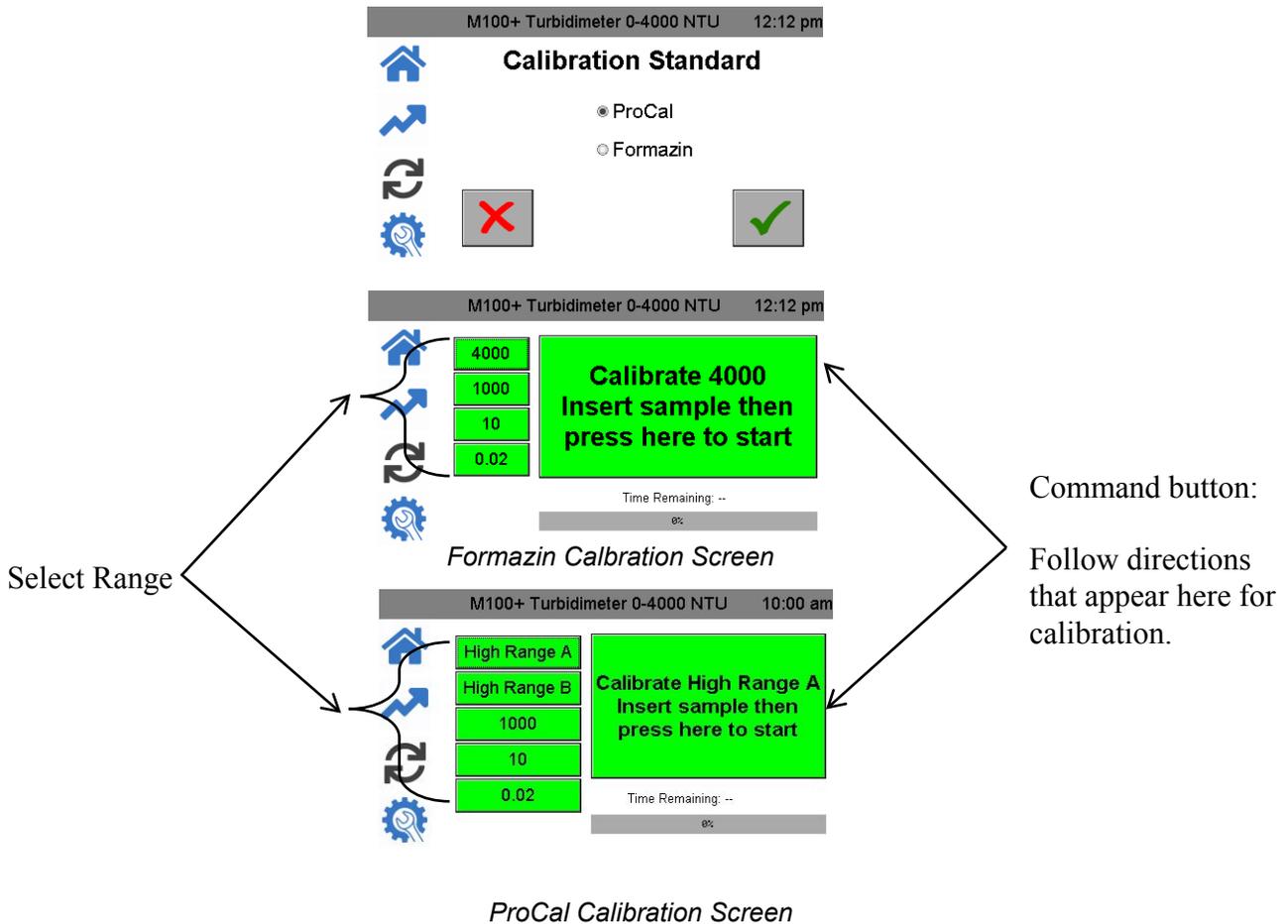


The following steps allow repeatable indexing of calibration standards:

1. With the instrument in the Home screen, insert the standard.
2. Indexing is best performed if the automatic reading is enabled and set to 1 sec/reading. See section 4.2.2 for more information on Auto/Manual Readings.
3. Slowly rotate the standard, inside the optical well, one complete revolution (360°). While rotating the standard slowly, observe the measured turbidity and locate the position of the cuvette having the lowest reading.
4. With the calibration standard positioned at the location having the lowest turbidity reading, install the Indexing Ring over the cap on the standard so that the pointer of the Indexing Ring faces directly forward.

When using the standards in the future, always insert the standard so that the pointer of the indexing ring faces forward. Slowly rotate the standard back and forth about 5° to find the lowest point. The standard is now indexed and ready for use.

#### 4.3.4 Calibration Procedures



- Select the calibration function of the instrument by pressing the **Calibrate** icon.
- Select the appropriate calibration standard - either Formazin or ProCal - then press .
- The calibration menu will be displayed as shown above.
- On the left-hand side are selections for the range for calibration. Select the highest value required for your application.
- Ensure standards are indexed as described in section 4.3.3 prior to calibration.
- The calibration standards should be cleaned with a microfiber cloth and any standard window cleaner solution.
- Handle standards only by the black cap to prevent fingerprints or other smudges from affecting the readings.
- Have the standards prepared for the range you intend to calibrate.
- To calibrate for 0-4000 NTU using ProCal, you will need the High Range A, High Range B, 1000 NTU, 10 NTU, and 0.02 NTU standards.
- To calibrate for 0-4000 NTU using Formazin, you will need the 4000 NTU, 1000 NTU, 10 NTU, and 0.02 NTU standards.
- The command button will guide you through the calibration.

Calibration steps (Using ProCal):

1. Press the High Range A button on the left side of the screen.
2. Insert the High Range A standard.
3. Press the Command button in the middle of the screen to start the calibration.
4. A countdown will appear from 30.
5. When the count is complete the screen will request the High Range B.
6. Press the High Range B button on the left side of the screen.
7. Insert the High Range B standard.
8. A countdown will appear from 30.
9. When the count is complete the screen will request the 1000 NTU.
10. Insert the 1000 NTU standard.
11. Press the Command button start the calibration of the 1000 NTU.
12. A countdown will appear from 60.
13. When the count is complete the screen will request the 10 NTU.
14. Insert the 10 NTU standard.
15. Press the Command button start the calibration of the 10 NTU.
16. A countdown will appear from 60.
17. When the count is complete the screen will request the 0.02 NTU.
18. Insert the 0.02 NTU standard.
19. Press the Command button start the calibration of the 0.02 NTU.
20. A countdown will appear from 30.
21. When complete, all the buttons on the left should be all green and the Command button should say Calibration Good

Calibration steps (Using Formazin):

1. Press the 4000 button on the left side of the screen.
2. Insert the 4000 NTU standard.
3. Press the Command button in the middle of the screen to start the calibration.
4. A countdown will appear from 30.
5. When the count is complete the screen will request the 1000 NTU.
6. Insert the 1000 NTU standard.
7. Press the Command button start the calibration of the 1000 NTU.
8. A countdown will appear from 60.
9. When the count is complete the screen will request the 10 NTU.
10. Insert the 10 NTU standard.
11. Press the Command button start the calibration of the 10 NTU.
12. A countdown will appear from 60.
13. When the count is complete the screen will request the 0.02 NTU.
14. Insert the 0.02 NTU standard.
15. Press the Command button start the calibration of the 0.02 NTU.
16. A countdown will appear from 30.
17. When complete, all the buttons on the left should be all green and the Command button should say Calibration Good

#### 4.3.5 Alternate Calibration Ranges

- Alternately you could choose to calibrate to 1000 NTU, which requires 1000 NTU, 10 NTU, and 0.02 NTU. Press the 1000 button on the left side and start at step 5 above.
- A calibration for the only the 10 NTU range requires only the 10 NTU and 0.02 NTU. Press the 10 button on the left side and start at step 9 above.
- For the two alternate ranges, these will still read the full range with a reduced accuracy above the range of calibration.

#### 4.3.6 Failed Calibration

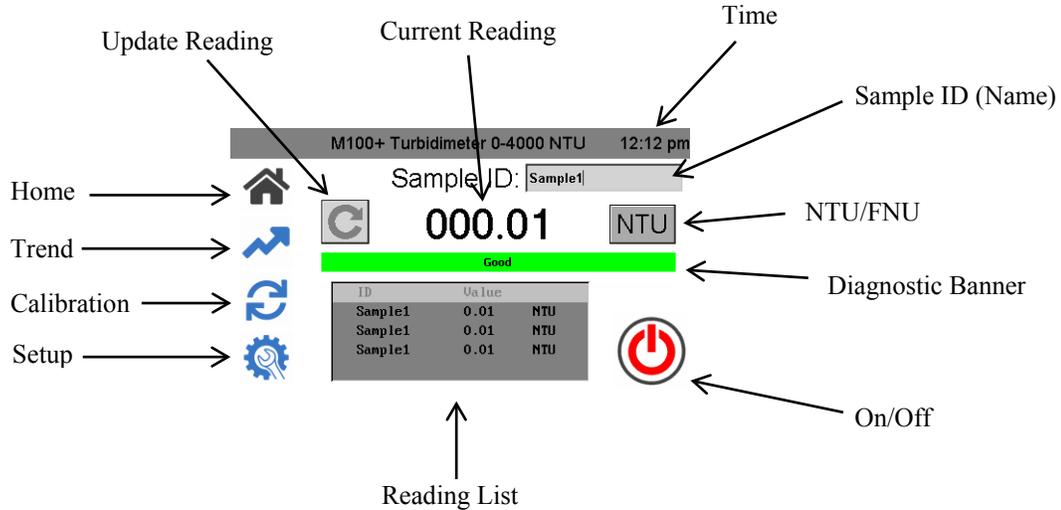
In the case of a failed calibration, the last good calibration is restored once the user exits to the Home Screen. A failure will be evident at the calibration screen will show all red.

The instrument can be used with this calibration with a potentially reduced accuracy. The bad calibration will be noted in the calibration log and as a reminder, a yellow diagnostic banner will show on the home screen indicating that the last calibration had failed and that the instrument was using the previous calibration. The only way to remove this indication is to successfully complete a calibration.

Check the standards for cleanliness and expiration date. If everything looks good, attempt the calibration again. If the calibration fails after the second attempt, the most likely causes are that standards are bad or the lamp needs replacement.

## 5.0 Operation

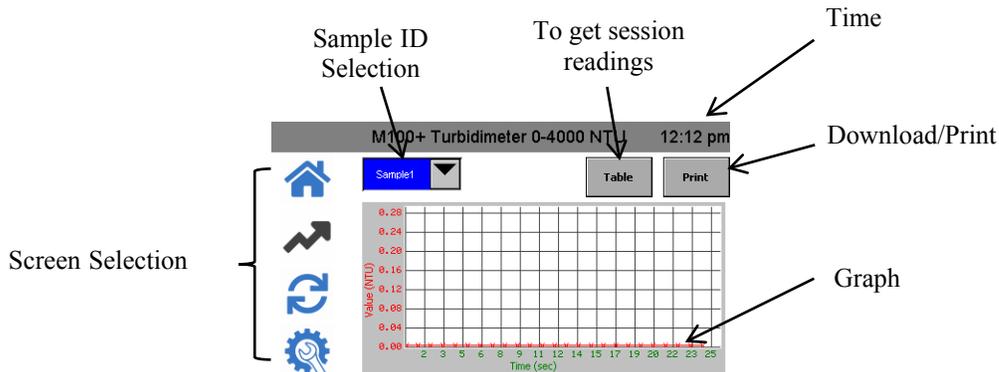
### 5.1 Home Screen



All operations start on the **Home** screen. Refer to the above figure for all operations.

- When the instrument is in Automatic Readings (section 4.2.2.), Update Reading button will not show. This is used only for manual updates.
- The current reading is always shown in the large number format.
- Toggle between NTU & FNU by touching the button.
- Pressing Sample ID brings up a keypad to allow you to provide a name.
- Sample ID shows up to five previous readings. All readings are saved. See **Trend** screen below.
- The instrument can be turned off manually even if Auto Power Down is selected.

## 5.2 Trend Screen



- Select Sample ID first.
- After a reading session in the **Home** screen, if **Trend** screen is selected, the Reading List from the **Home** screen is cleared but this information is now saved under Sample ID in the **Trend** screen. If a new session is started in the **Home** screen under the same Sample ID the readings will be appended to the session readings.
- The axis scaling of the Sample graph can be adjusted in Chart Range & Options (see section 4.2.4).
- If a USB thumb drive is connected, Session Readings shown will be transferred to the flash drive after pressing **Download/Print**.
- If USB printer is connected, Session Readings shown will be printed after pressing **Download/Print**.
- Sample ID will be saved until deleted. See Delete Samples section 4.2.7.

## 5.3 Data Retrieval

- All data is saved in CSV format and is date & time stamped.
- There are several methods to download particular information.
- Sample ID Data can be downloaded to a USB thumb drive or printed in the **Trend** screen after pressing **Download/Print**.
- Calibration data can be downloaded into an inserted USB thumb drive in the Calibration Download menu after pressing the  button. See section 4.2.12 for more information on Calibration Download
- Logged data can be downloaded to an inserted USB thumb drive in the Log Download menu after pressing the  button. See section 4.2.13 for more information on log download.

### 5.3.1 USB Connection

**NOTICE** The M100+ has two USB connections, a USB-A on the side and a USB-B on the back. Only the side connection is active at this time. The USB-B at the back of the instrument may be used in a future firmware update.

The USB-A connection can be used to upload new software or download logged data and calibration reports via a USB thumb drive.

Firmware uploads (updated firmware) can be made by loading the firmware onto a USB thumb drive and inserting it into the USB-A connector. The update will not affect configurations or stored data; however it is always advisable to check the configuration as menus may change.

#### To upload firmware:

- See section 4.2.14 for more information on firmware updates.

**NOTICE** for software updates.

• Check our website

To keep the USB contacts from getting contaminated a USB plug cover is provided. It is recommended that this cover is replaced whenever the USB is not being used.



**NOTICE** A USB- Type B plug is provided at the back. This is currently not active but was supplied for a potential future update. Keep the supplied plug in place to prevent damage.

## 6.0 Troubleshooting

### 6.1 M100+ Fault Detection

The M100+ performs continuous diagnostic monitoring. The diagnostic indicator in the Home screen will display any errors or warnings in writing.

- A green indicator shows that everything is good.
- A red indicator denotes an error.
- Potential errors are a bad lamp or the reading is taking place in a band that has not been calibrated.
- A yellow indicator is a warning and could show either faulty database or the device plugged into the USB is incompatible

Symptom	Cause	Cure
Readings are higher than expected	Bubbles in solution	Clean the inside and outside of the cuvette with a detergent solution. Rinse with deionized water. Do not shake samples.
	Instrument out of calibration	Recalibrate Refer to section 4.3
USB download not working	Check thumb drive is not fully inserted	Insert USB thumb drive fully
	Thumb drive is not formatted	Format to FAT32
Readings are erratic	Bubbles in solution	See readings higher than expected above.
Readings are lower than expected	Instrument out of calibration	Recalibrate. Refer to section 4.3
Screen calibration not working	Incorrect screen calibration stored	Hold upper (time) banner on any screen for 5 seconds to load default screen calibration then go to calibrate screen as shown in section 4.2.5

### 6.2 Diagnostic Table

### 6.3 Technical and Customer Assistance

If for any reason assistance is needed regarding this instrument please do not hesitate to contact either the HF scientific Technical Service Department or the HF scientific Customer Service Department for parts orders.

HF scientific  
 3170 Old Metro Parkway  
 Fort Myers, Florida 33916-7597  
 Phone: (239) 337-2116 Fax: (239) 332-7643  
 Toll-free: 888-203-7248

Email: [HF.Info@Wattswater.com](mailto:HF.Info@Wattswater.com)  
[www.hfscientific.com](http://www.hfscientific.com)

## **7.0 Routine Maintenance**

Routine maintenance includes calibration, as mentioned, in section 4.3 and cleaning of the cuvettes.

### **7.1 Cleaning the Cuvette**

Measurement cuvettes used for the sample should be clean and free of marks or scratches.

Cleaning is accomplished by cleaning the interior and exterior with a detergent solution and then rinsing several times with distilled or deionized water. Ensure the cuvettes are clean prior to use.

If cuvettes become scratched or stained they should be replaced. Replacement cuvettes are available from HF scientific your local HF scientific agent. Use Cat # 50051 pack of 3 cuvettes with caps or 50052 for a pack of 10 cuvettes with caps.

### **7.2 Replacing the Source Lamp**

The Infrared and White Light source lamps in the M100+ instruments are designed for long life. These lamps, however, are not covered by the warranty. If the lamp should need replacement, we recommend calling HF Service Department for assistance. These can also be purchased with instructions to change. Calibration will be required if a lamp change is made.

### **7.3 Battery**

This instrument uses a battery for back up of the clock feature with an expected life of over 3 years. The battery is non-rechargeable and no attempt to charge it should be made. If the battery needs to be replaced contact HF scientific and arrange for service.

## 8.0 Accessories and Replacement Parts List

The items shown below are recommended accessories and replacement parts.

Accessory	Cat. #	Photo
Replacement Lamp Assembly White Light with Instructions	24082S	
Replacement Lamp Assembly IR Light with Instructions	21369S	
Operating Manual, M100+	29293	N/A
<i>ProCal</i> Calibration Kit, .02, 10 & 1000 NTU	39957	
<i>ProCal</i> Calibration Kit, .02, 10, 1000, High Range A & High Range B	39940	
<i>ProCal</i> Calibration Standard 10 NTU 125ml	39825	
Formazin Stock Kit	50040	N/A
Formazin Stock Solution, 4000 NTU, 500 ml	70914	
Replacement Cuvette – 3 Pack	50051	
Replacement Cuvette – 10 Pack	50052	

## 9.0 Limited Warranty

HF scientific inc., as a vendor, warrants to the original purchaser of this instrument that it will be free of defects in material and workmanship, in normal use and service, for a period of one year from date of invoice. HF scientific inc.'s obligation under this warranty is limited to replacing, at its factory, the instrument or any part thereof. Parts, which by their nature are normally required to be replaced periodically, consistent with normal maintenance, specifically reagent, desiccant, sensors, lamps, and fuses are excluded. Also, excluded is accessories and supply type items.

The original purchaser is responsible for the return of the instruments, or parts thereof, to HF scientific' inc.'s factory. This includes all freight charges incurred in shipping to and from HF scientific inc.'s factory.

HF scientific inc .is not responsible for damage to the instrument, or parts thereof, resulting from misuse, environmental corrosion, negligence or accident, or defects resulting from repairs, alterations or installation made by any person or company not authorized by HF scientific inc.

The remedy described in the first paragraph of this warranty shall constitute the sole and exclusive remedy for breach of warranty. HF scientific inc. assumes no liability for incidental, consequential or special damage of any kind, and the original purchaser, by placement of an order for the instrument, or parts thereof, shall be deemed liable for any and all damages incurred by the use or misuse of the instruments, or parts thereof, by the purchaser, its employees, or others, following receipt thereof.

Carefully inspect this product for shipping damage, if damaged, immediately notify the shipping company and arrange an on-site inspection. HF scientific inc cannot be responsible for damage in shipment and cannot assist with claims without an on-site inspection of the damage.

This warranty is given expressly and in lieu of all other warranties, expressed or implied. Purchaser agrees that there is no warranty on merchantability or fitness for a particular purpose and that there are no other warranties, expressed or implied. HF scientific inc hereby specifically disclaims all other warranties, express or implied. No agent is authorized to assume for HF scientific inc., any liability except as set forth above. Some States do not allow limitations on how long an implied warranty lasts, and some States do not allow the exclusion or limitation of incidental or consequential damages. Therefore the above limitations may not apply to you. This Limited Warranty gives you specific legal rights, and you may have other rights that vary from State to State. You should consult applicable state laws to determine your rights. SO FAR AS IS CONSISTENT WITH APPLICABLE STATE LAW, ANY IMPLIED WARRANTIES THAT MAY NOT BE DISCLAIMED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO ONE YEAR FROM THE DATE OF ORIGINAL SHIPMENT.

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