MICROLAB®

STARLine
Field Verification 2
User Manual

624275/02 May 2013

Important Notice

Table of Contents

1 General Information

The Field Verification 2 Procedures consist of an easy-to-follow program which has to be periodically repeated. The Field Verification 2 can only be performed by trained personnel.

1.1 About this Manual

This manual is meant to help users perform the Field Verification 2 correctly and safely.

To achieve that goal, the manual will describe the different components of the Field Verification 2 and how they work. The manual describes both the hardware and software of the Field Verification 2 in a depth enabling the user to verify the instrument.

After introducing the various parts of the Field Verification 2, an overview of how to perform the Verification Procedures is provided. When you have worked through this manual, you should be capable of verifying the MICROLAB® STARLine Instrument.

Warnings, Attentions and **Notes** are included in this manual to emphasize important and critical instructions. They are printed in italics, beginning with the word '***Warning***' or '***Attention***' accompanied by this  symbol, or the word '***Note***' accompanied by this  symbol, as appropriate.

This manual refers to the MICROLAB® STAR and the VENUS Software for the MICROLAB® STARLine Instruments. The user is requested to also consider the following manuals:

- MICROLAB® STAR Programmer's Guide for MICROLAB® VENUS
- MICROLAB® STAR Operator's Manual for MICROLAB® VENUS
- Packaging List ML STAR FV2 Case P/N 612981

1.2 Field Verification 2 Intended Use

The Field Verification 2 provides the means to verify the:

- Cover Safety
- Barcode Reading
- Positioning of the Pipetting Channels and Multi-Probe Heads
- Pipetting Performance (Trueness and Precision) of the Pipetting Channels and Multi-Probe Heads
- easyPunch features
- Temperature (heating and cooling)
- Shaker Orbit and Frequency

1.3 Operation

The operator of the MICROLAB® STARLine Instrument and the Field Verification 2 must have attended an appropriate training course. The procedures contained within this manual have been tested by the manufacturer and are deemed to be fully functional. Any deviation from the procedures given here could lead to erroneous results or malfunction.

Training courses will be provided by HAMILTON Bonaduz Technical Support and trainers designated by HAMILTON Bonaduz Technical Support.

Only original HAMILTON Field Verification 2 specific parts and tools may be used to verify the MICROLAB® STARLine, e.g. Carriers, Racks, Tips, Consumables, Microtiter Plates, Liquids, etc.

1.4 Safety Precautions and Hazards

The following section describes the main safety considerations, electrical and biological, in operating this product, and the main hazards involved.

Attention:
Read the following safety notices carefully before using the Field Verification 2.

1.4.1 General Precautions

1.4.1.1 Field Verification 2 Equipment

- The Field Verification 2 conforms to European norms regarding interference immunity. It is recommended that the MICROLAB® STARLine Instrument and the Field Verification 2 are kept away from other equipment, so that static electricity is minimized in its immediate environment.

Attention:
Good Laboratory Practices (GLP) are necessary. Protect yourself before working on the Microlab® STARLine Instrument - wear safety gloves, glasses and lab coat. Ensure that decontamination is carried out when applicable. Reference the Operator's Manual ML STAR.

- During operation, the MICROLAB® STARLine Instrument and the Field Verification 2 should be shielded from direct sunlight and intense artificial light.
- Only trained personnel are authorized to perform Verifications on a MICROLAB® STARLine Instrument with the Field Verification 2.

Warning:

The use of incorrect Labware (Carriers, Racks, Tips, Microtiter Plates, etc.) can cause spillage and therefore possible damage to the Balance and the Microlab® STARLine Instrument.

Warning:

The use of Microtiter Plates not provided with the Field Verification 2 can produce incorrect results and a failed Field Verification 2 procedure.

Warning:

A Heater Device can reach temperatures above 60° C. When placing or removing the IR Sensor Measurement Tool onto a Heater, use caution to prevent fingers and hands from being burned.

Warning:

A Heater/Shaker Device can reach temperatures above 60° C. When placing or removing the Shaker Verification Tool onto a Heater/Shaker, use caution to prevent fingers and hands from being burned.

Warning:

A Heater Device can reach temperatures above 60° C. When moving the Heater Device from the Deck after incubation, use caution to prevent fingers and hands from being burned.

Warning:

If the Instrument is located in a Hood or under an exhaust system, switch OFF the fan to avoid any airflow over the Balance. The Volume Verification may fail when the Balance is placed in an unstable environment.

1.4.1.2 Loading

- Microtiter Plates must be placed on the Carrier such that well A1 is in the left/rear position.
- When pouring liquid into the containers, ensure that there is no foam on the surface of the liquid.
- Do not overfill Reagent Containers, Tube or other Liquid Containers.

Attention:

Pour the complete contents of the HAMILTON Verification Solutions into the Reagent Containers.

Warning:

Spilling Field Verification 2 Solutions onto the Balance or the Deck can cause damage to the Balance or the Microlab® STARLine Instrument.

Warning:

Spilled Field Verification 2 Solutions getting onto the bottom of the Microtiter Plate can produce incorrect results and a failed Field Verification 2 procedure.

Warning:

Foam may cause pipetting problems, producing incorrect results and a failed Field Verification 2 procedure.

Warning:

Placing the HAMILTON Verification Solutions Reagent Containers into the wrong positions of the Balance/Reagent Carrier will produce incorrect result and a failed Field Verification 2 procedure.

Warning:

Do not touch the bottom of the Microtiter Plates. Fingerprints on the bottom of the Microtiter Plates can produce incorrect results and a failed Field Verification 2 procedure.

Warning:

Incorrect assembly or improper positioning of the Field Verification 2 components on the Deck can cause a crash resulting in damage to the Balance or the Microlab® STARLine Instrument.

Warning:

*Reference the **Solutions Material Safety Data Sheets (MSDS)***

First Aid Measures:

- ***If inhaled** - If breathed in, move person into fresh air. If not breathing, give artificial respiration.*
- ***In case of skin contact** - Wash off with soap and plenty of water.*
- ***In case of eye contact** - Flush eyes with water as a precaution.*
- ***If swallowed** - Never give anything by mouth to an unconscious person. Rinse mouth with water.*

Warning:

A contaminated Carrier can cause failure of the Microlab® STARLine Instrument to perform Liquid Level Detection properly resulting in a Tip crash which could damage the Balance or the Microlab® STARLine Instrument.

1.4.1.3 Work Routine

- Do not try to open the Front Cover of the Microlab® STARLine Instrument during a run because the system will abort and this may cause loss of data.
- If the system is paused, do not wait too long before resuming the run. Loss of liquid from a full Tip may result in invalid data.
- Discard used Tips. Do not reuse them.

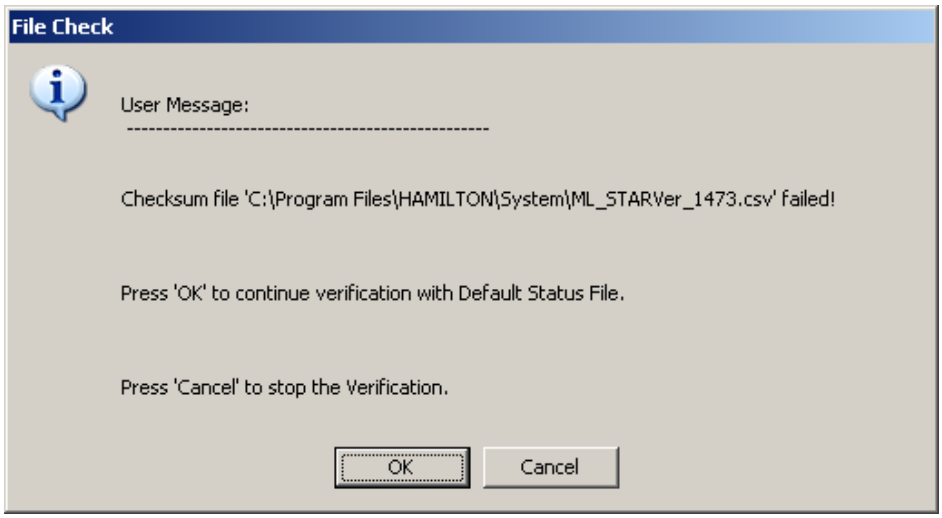
Attention:

If the Field Verification 2 Procedure, is aborted, switch OFF all devices:

- ***Switch OFF the Microlab® STARLine Instrument***
- ***Shut down the PC***
- ***Switch OFF the Mettler Balance***
- ***Switch OFF the Reader384***
- ***Switch OFF all Heaters or Shaker/Heaters***

1.4.2 Computer Precautions

- Use the necessary precaution to guard against software viruses. Use only manufacturer's original installation CD-ROM sets for the Field Verification 2, and the original HAMILTON MICROLAB® STARLine Vector or VENUS Software.
- Running other software programs in parallel to the MICROLAB® Software may negatively affect the running of the MICROLAB® STARLine Instrument.
- Any manipulation of the MICROLAB® STARLine data files or other information determining or affecting the MICROLAB® STARLine functions can result in erroneous test results or instrument failure.
- A .csv file is used to record the Verification Data. Any manual alteration of this file will result in a Checksum Error Screen as shown below. The Default Status File would then be used. Any completed Verification Procedures would have to be repeated.



Attention:
A wrong definition or setup of the COM-Port can result in no communication possible between the computer and the Balance.

1.5 Field Verification 2 Environmental Conditions

Attention:
The following specifications are only for the Field Verification 2 equipment and not the HAMILTON Verification Solutions.

The Field Verification 2 usage specifications are valid under the following environmental conditions:

- Temperature range: 15°C – 35°C
- Relative humidity: 15% - 85% with no condensation
- Pressure: up to 2,000 meters above sea level

The Field Verification 2 storage specifications are valid under the following environmental conditions:

- Temperature range: -20°C – 70°C
- Relative humidity: Maximum of 95% with no condensation

Warning:
Care must be taken for the temperature and humidity during transportation and storage of the Field Verification 2. A Field Verification 2 subjected to extreme temperature and/or humidity can produce incorrect results and a failed Field Verification 2 procedure.

Attention:

- *Protect the* Microlab® *STARLine platform from vibrations*
- *No direct sunlight*
- *Equipment has to be at room temperature*
- *The STAR platform must be powered up and the Balance must be warmed up for at least ½ hour*

1.6 Field Verification 2 Interval Requirements

The Field Verification 2 is performed to show the Microlab® STARLine Instrument is performing to HAMILTON's Specifications.

The intervals recommended are:

- for the Installation Qualification (IQ)
- at least twice a year, preferably in combination with Preventive Maintenance
- after replacement of a verifiable device

2 Packaging

2.1 Field Verification 2 Packaging

The parts of the Microlab® STARLine Field Verification 2 should be packed into the carrying case in the following manner.

Attention:

The Mettler Balance, Reader384 and Reader Check Plate are shipped separately. Retain the original shipping containers to return these items for re-calibration.

The complete Field Verification 2 consists of the following items:

- FV2 Empty Case
- WXS or SAG Mettler Balance
- Calibration Weight (20g)
- Reader384
- Reader Check Plate
- Plate Bar for Reader384
- IR Sensor Measurement Tool
- Black Tape
- Ambient Temperature and Humidity Measurement Tool
- Shaker Verification Measurement Tool
- Tip Rack 384 Tips (Empty)
- Tip Rack 300µl (Empty)
- Tip Rack 5ml (Empty)
- Barcode Verification Carrier

- 3 Reagent Containers
- 4 Teaching Needles 300µl
- 2 Teaching Needles 5ml
- 1 Teaching Needle 384
- Forceps (for handling the Calibration Weight)
- Verification Software (incl. Manual)
- Carrier Box which includes:
  - Centering Carrier
  - Tip-Plate Carrier (VER_CAR_TIPPLATE)
  - Balance and Reagent Carrier (VER_CAR_REAGENT)
  - Glass Measuring Vial Weighing Platform
  - Microtiter Plate Weighing Platform
  - 9ml Glass Measuring Vial
  - Platform Ring
  - Pyramids
  - Windshield for the Glass Measuring Vial

Note:

For Part Numbers, Descriptions and Images of the components for the Field Verification 2, see the Ordering Information Section 8.

Note:

A power cable for use in Switzerland is included. Power cables for use in other countries must be obtained separately.

2.2 Field Verification 2 Consumables Kits Packaging

The Microlab® STAR-specific Consumables Kits consists of 5 different configurations with enough Tips and Microtiter Plates to perform 1 Verification Run with each kit on different instrument configurations as follows:

Kit 1 (P/N 199231)	**Up to eight - 1000µl Pipetting Channels**		
Description	**Part Number**	**Quantity**	**Consumption**
High Volume Tips	235922	1 Rack	96 Tips
Low Volume Tips	235900	1 Rack	64 Tips
MTP 96	279403	8	4

Kit 2 (P/N 199232)	**Up to six - 5ml Pipetting Channels**		
Description	**Part Number**	**Quantity**	**Consumption**
5ml Tips	184020	2 Racks	48 Tips

Kit 3 is reserved

Kit 4 (P/N 199234)	**For CO-RE 96-Probe Head (300µl or 1000µl)**			
Description	**Part Number**	**Quantity**	**Consumption**	
			300µl	**1000µl**
High Volume Tips	235922	1 Rack		96 Tips
Standard Volume Tips	235921	1 Rack	96 Tips	
Low Volume Tips	235900	1 Rack	96 Tips	96 Tips
MTP 96	279403	10	2	5

Kit 5* (P/N 199235)	**For CO-RE 384-Probe Head**		
Description	**Part Number**	**Quantity**	**Consumption**
384 Head 50ul HAMILTON Black Tips	191451	3 Racks	3x 384 Tips
MTP 384	281692	6	2

Kit 6* (P/N 199248)	For CO-RE 384-Probe Head		
Description	**Part Number**	**Quantity**	**Consumption**
384 Head 50ul clear Tips	191102	3 Racks	3x 384 Tips
MTP 384	281692	6	2

Kit 8 (P/N 199411)	For easyPunch		
Description	**Part Number**	**Quantity**	**Consumption**
Verification Cards	N/A	12	4
Deep Well Microplate	282269	1	1

Note:

- *The 50ul CO-RE 384-Probe Head can only be verified if clear Tips from Axygen are used. In this case, Kit 6 is required.*
- *The CO-RE 384-Probe Head STP can be verified with both Kit 5 and Kit 6, depending on the Tips that are normally used. If Axygen Tips are used, Kit 6 is required, if HAMILTON black Tips are used, Kit 5 is required.*

Note:

For Images of the Consumables Kits, see the Ordering Information Section 8.

Attention:

Tips should NEVER be reused.

2.3 Field Verification 2 Solutions

The HAMILTON Verification Solutions (P/N 199030) consists of 3 different Solutions with enough liquids for two runs; for example, one Verification with 8 1000 µl Pipetting Channels plus 1 CO-RE 96-Probe Head or one Verification with 1 CO-RE 384-Probe Head plus 8 1000 µl Pipetting Channels or one Verification with 16 1000 µl Pipetting Channels.

1. Solution 1: 125ml of a dark dye Verification Solution
2. Solution 2: 125ml of a buffer Verification Solution
3. Solution 3: 250ml of a light dye Verification Solution

Attention:

A residual volume has to be considered. For the CO-RE 384-Probe Head, pour all of the Verification Solution into the Reagent Container.

Attention:

Temperature Storage Range for the HAMILTON Verification Solutions is 2°C – 30°C. See the packaging for the Expiration Date.

2.4 Field Verification 2 Tools Re-Calibration Requirements

2.4.1 Re-Calibration Intervals

Tools requiring Re-Calibration	Interval	Calibration Source
Barcode Verification Carrier:	2 years	HAMILTON (http://www.hamilton.ch)
Reader Check Plate:	1 year	HAMILTON (http://www.hamilton.ch)
IR Sensor Measurement Tool:	1 year	Optris (http://www.optris.com)
Balance WXS or SAG:	1 year	Mettler Toledo (http://www.mt.com)
20g Calibration Weight:	2 years	Mettler Toledo (http://www.mt.com)
Ambient Temperature / Humidity Measurement Tool:	1 year	Testo (http://www.testo.com)

2.4.2 Packaging Materials for Re-Calibration

Use the original packaging materials for components requiring shipment for re-calibration.

Components Requiring Re-Calibration
Barcode Verification Carrier: 
Reader Check Plate:  ➔ 
IR Sensor Measurement Tool:  ➔  ➔ 

Components Requiring Re-Calibration

Attention:

Do not restrain or press down on the Platform Ring, Weighing Platform or Plate Weighing Platform when placed on the Balance. This will damage the balance pressure sensor. A damaged balance pressure sensor requires being sent to the manufacturer for repair.

Balance WXS (similar procedure for the SAG285 Balance) and 20g Calibration Weight:

Balance Packaging:

Components Requiring Re-Calibration

Balance WXS (similar procedure for the SAG285 Balance) and 20g Calibration Weight:

Balance Controller Packaging:

Ambient Temperature / Humidity Measurement Tool:

2.4.3 Packaging Materials for Airline Travel and Shipping

Use the original packaging materials for components requiring separation for Airline Travel and Shipping:

Components Requiring Separate Shipment

Reader384:

Attention:

Do not restrain or press down on the Platform Ring, Weighing Platform or Plate Weighing Platform when placed on the Balance. This will damage the balance pressure sensor. A damaged balance pressure sensor requires being sent to the manufacturer for repair.

Components Requiring Separate Shipment

Balance WXS (similar procedure for the SAG285 Balance) and 20g Calibration Weight:

Balance Packaging:

Balance WXS (similar procedure for the SAG285 Balance) and 20g Calibration Weight:

Balance Controller Packaging:

3 Installation

3.1 General

- The Microlab® STAR Field Verification 2 is designed to function with different Microlab® STAR Software Versions and configurations.
- The User Software, Instrument, Labware and external Devices such as Heater and Shakers have to be installed and functioning properly prior to performing the Microlab® STARLine Field Verification 2.
- Installation of the Field Verification 2 Software requires the user to have Administration Rights to the computer.

According to the current installation state of the instrument/software, the following Verifications can be run:

Verification Processes	Software Version
1. Cover Safety Verification	≥ 4.0
2. Barcode Verification	≥ 3.2
3. 1000µl Pipetting Channels Position Verification	≥ 3.2
4. Shaker Verification (CAT Shaker/Heater, Variomag Teleshake, HHS, Inheco Thermoshake)	≥ 4.2
5. CO-RE 96-Probe Head Position Verification	≥ 3.2
6a. CO-RE 384-Probe Head Position Verification	≥ 4.1
6b. CO-RE 384-Probe Head STP Position Verification	≥ 4.2
7. 5ml Pipetting Channels Position Verification	≥ 4.2
8a. Volume Verification CO-RE 384-Probe Head	≥ 4.1
8b. Volume Verification CO-RE 384-Probe Head STP	≥ 4.2
9a. Volume Verification CO-RE 96-Probe Head Type: 300µl	≥ 3.2
9b. Volume Verification CO-RE 96-Probe Head Type: 1000µl	≥ 4.1
10. Volume Verification 1000ul Pipetting Channels	≥ 3.2
11. Volume Verification 5ml Pipetting Channels	≥ 4.2
12. easyPunch Verification	≥ 4.4

Verification Processes	Software Version
13a. Temperature Verification: (TCC, Heating & Cooling Modules, CAT Heater, external Heating/Cooling Devices)	≥ 3.2
13b. Temperature Verification HHS, Inheco Thermoshake	≥ 4.2
13c. Temperature Verification Gel Card Incubator	≥ 4.4

Note:

Shaker Verification (Step 4):

- *Can be done in combination with 1000µl Pipetting Channels or 5ml Pipetting Channels*
- *Shakers must be on a reachable position for the 1000µl Pipetting Channels or the 5ml Pipetting Channels*

3.2 Field Verification 2 Software Installation

***Note:**

- *The 50ul CO-RE 384-Probe Head can only be verified if clear Tips from Axygen are used. In this case, Kit 6 is required.*
- *The CO-RE 384-Probe Head STP can be verified with both Kit 5 and Kit 6, depending on the Tips that are normally used. If Axygen Tips are used, Kit 6 is required, if HAMILTON black Tips are used, Kit 5 is required.*

Attention:

- *When using Kit 5 with HAMILTON Black Tips to perform Volume Verification on the CO-RE 384-Probe Head STP, the **384 Head NTR 50ul Tips Conductive** executable must be downloaded and executed before installing the Field Verification 2 Software.*
- *To download the file, access ToolPool ➔ Customer Area ➔ Labware Download ➔ VENUS one/two ➔ ML STAR Tips, then select **384 Head NTR 50ul Tips Conductive**.*

To perform the Field Verification 2 Software Installation:

1. Insert the CD-ROM into the CD-ROM Drive. The Setup executable should start automatically.
2. If the Setup executable does not start automatically, open the CD-ROM Drive and double-click on the Setup.exe file.
3. Installation will be executed automatically, dialogs will guide the user.

3.3 Field Verification 2 Pre-Defined Deck Layouts

Warning:

Incorrectly modified Deck Layout can cause a crash of the Channels with the Labware resulting in damage to the Balance or the Microlab® STARLine Instrument.

For the Field Verification 2, a Deck Layout can be pre-defined to allow assigning Labware according to individually configured Microlab® STARLine Instruments. Such a Deck Layout can be used to assign fixed or preferred Deck Positions for the Balance (e.g. Reagent Carrier), Tip-Plate Carrier, Temperature Controlled Carrier, Needles Wash Stations, etc.

Also a Pre-Defined Deck Layout **must be created** to define all Sites for Heater and Shaker Verification.

The Pre-Defined Deck Layout for the

- ML-STAR: ➔ "Verification_Star_mod.lay"
- ML-STARlet: ➔ "Verification_Starlet_mod.lay"
- ML-STARPlus: ➔ "Verification_StarPlus_mod.lay"

must be stored in the "… \HAMILTON\Methods\Verification" folder.

It is recommended to use the Standard Verification Layout ('Verification_Star.lay', 'Verification_Starlet.lay', 'Verification_StarPlus.lay') or a layout with pre-defined Sites ("X_Verification_Star_mod.lay", "X_Verification_Starlet_mod.lay", "xGC_Verification_Starlet_mod.lay" (for Gel Card devices) " or X_Verification_StarPlus_mod.lay") as the basis, then add or copy the needed Labware to the corresponding positions on the Deck and delete Labware that is not used.

The files of Labware for the Verification Sites (_*.rck) are located in the "…\\HAMILTON\LabWare\ML_STAR\Verification" folder, e.g. "_HHS.rck" for the HAMILTON Heater Shaker). Carriers for the Heaters/Shakers are located in the standard Labware folder.

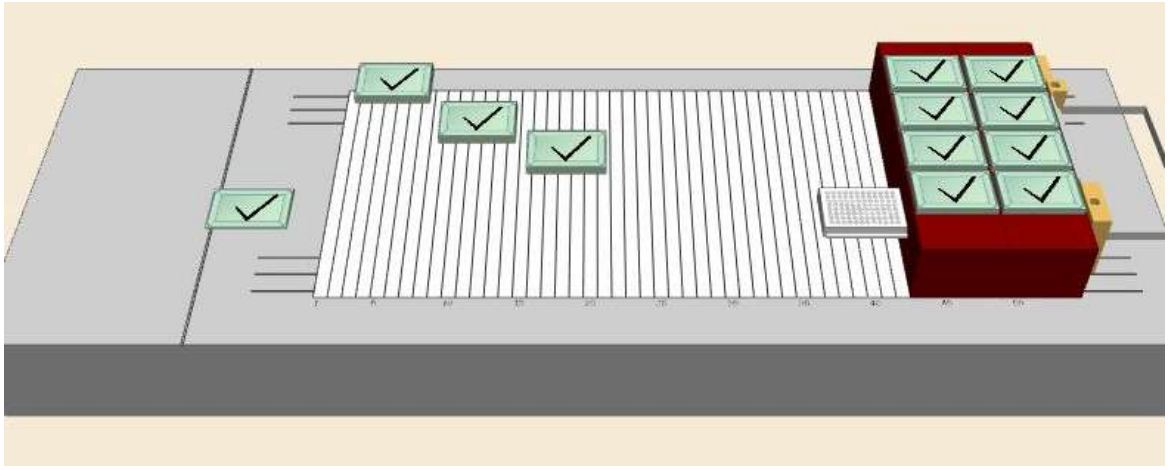
Warning:

Incorrect Labware settings or properties (i.e. Orbit, COM Port, etc.) can cause incorrect results and a failed Field Verification 2 procedure.

To define the Deck Layout with the installed Heater and Shaker Devices, the following features must be known:

- Which device is on which COM Interface, if it has a RS232 connection
- Serial Number of the Shaker and Heater Devices
- Address of the Shaker and Heater Devices, to assign individual devices on the same connection (CAN, Daisy-Chained, …)

- Orbit (peak to peak) of the Shakers
- For ‘Temperature Verification’ (see the Temperature Verification Section 4.13) and the ‘Shaker Verification’ (see the Shaker Verification Section 4.14), a pre-defined Deck Layout is required, with all assigned Sites to be verified.



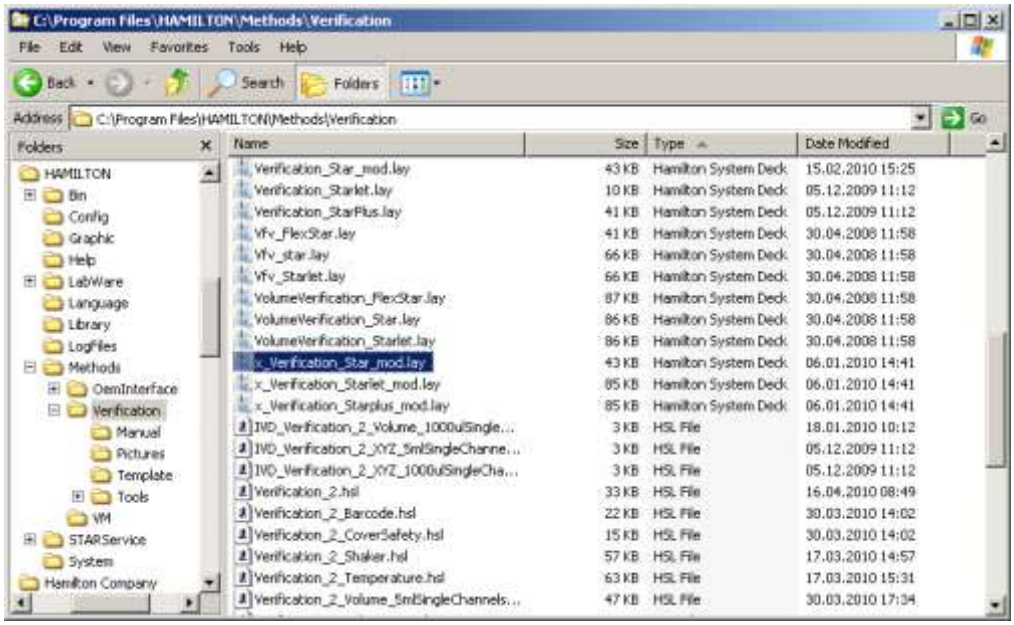
Deck Layout with Assigned Sites

3.4 Editing a Pre-Defined Deck Layout

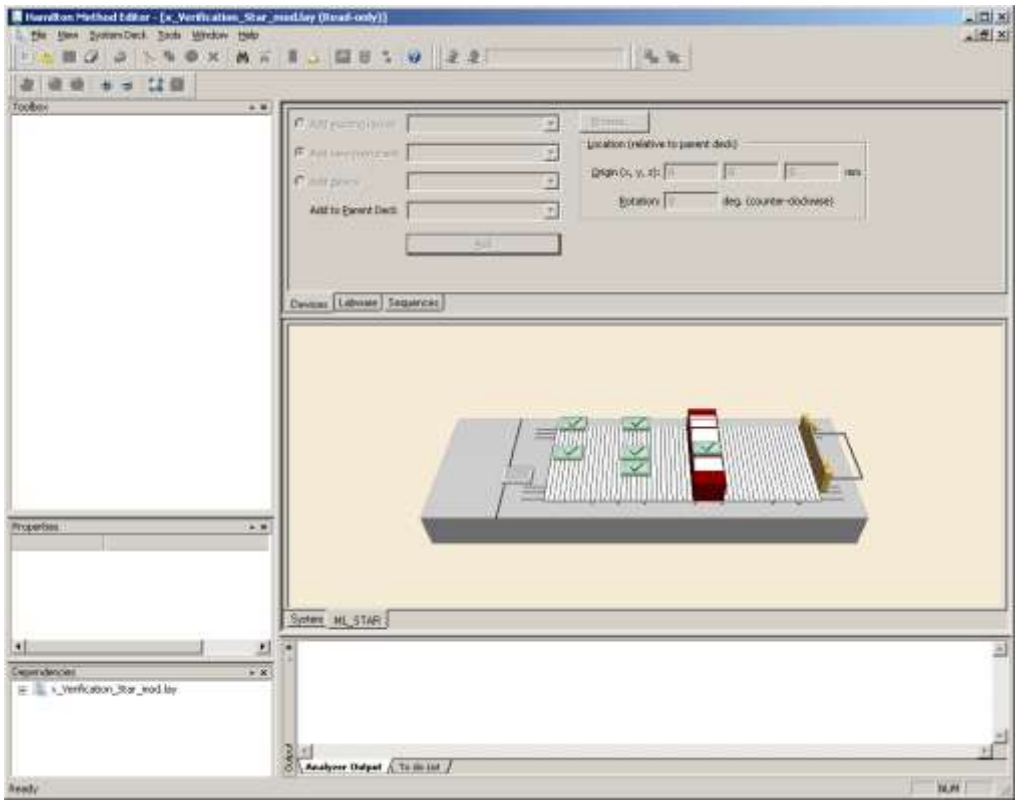
To edit a Pre-Defined Deck Layout:

1. Open “x_Verification_Star_mod.lay” (or “x_Verification_Starlet_mod.lay” or “xGC_Verification_Starlet_mod.lay” or “x_Verification_Starplus_mod.lay”),

   in folder “C:\Program Files\HAMILTON\Methods\Verification”

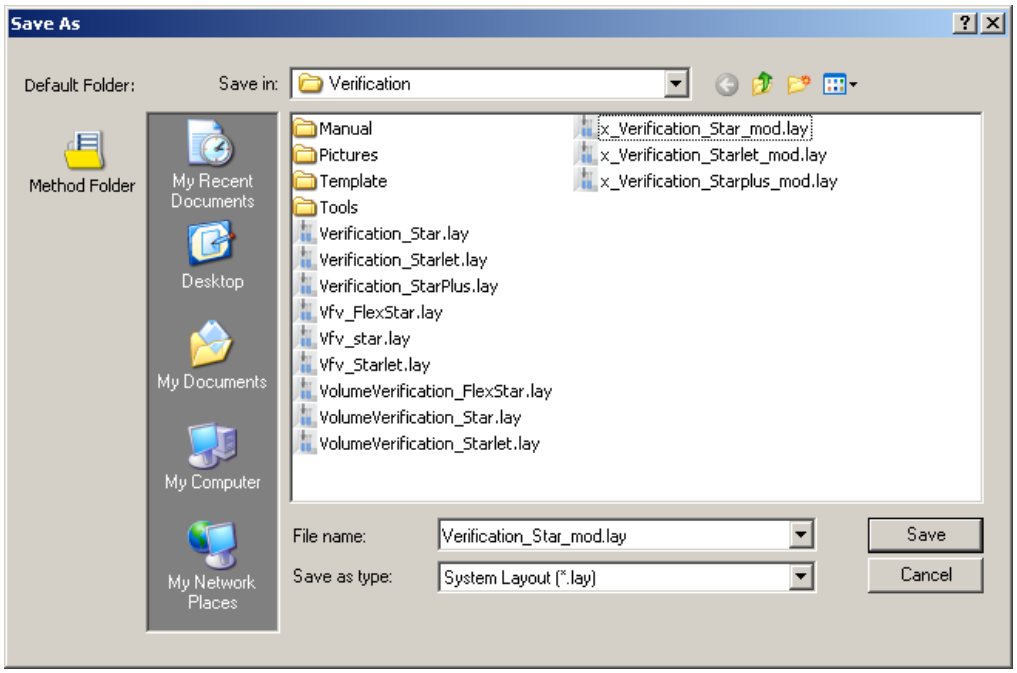


2. Select “File, Save Copy As” and save the file with the name “Verification_Star_mod.lay” to the same folder. (Same as for the STARlet or the STARPlus Layouts).

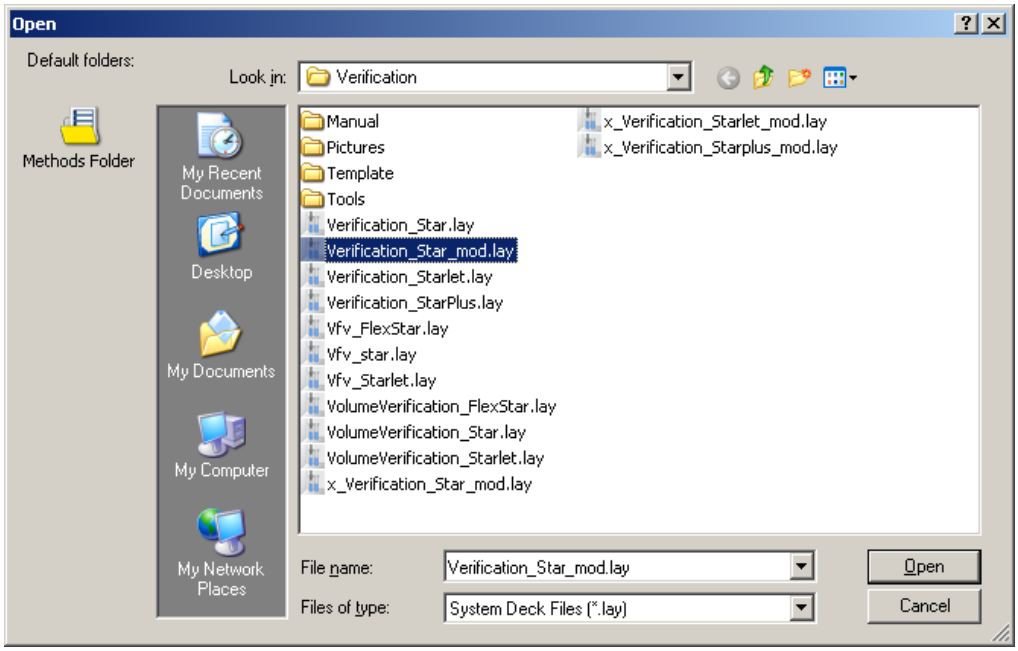


Note:

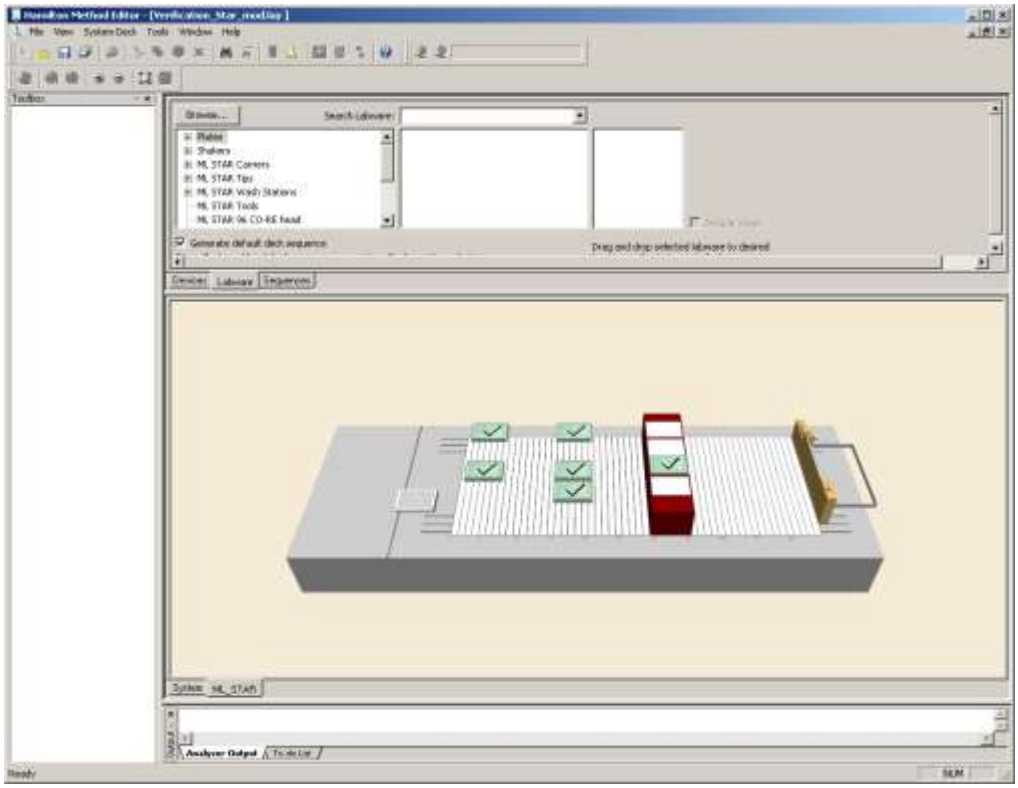
Use the same procedure for the STARlet or the STARPlus.



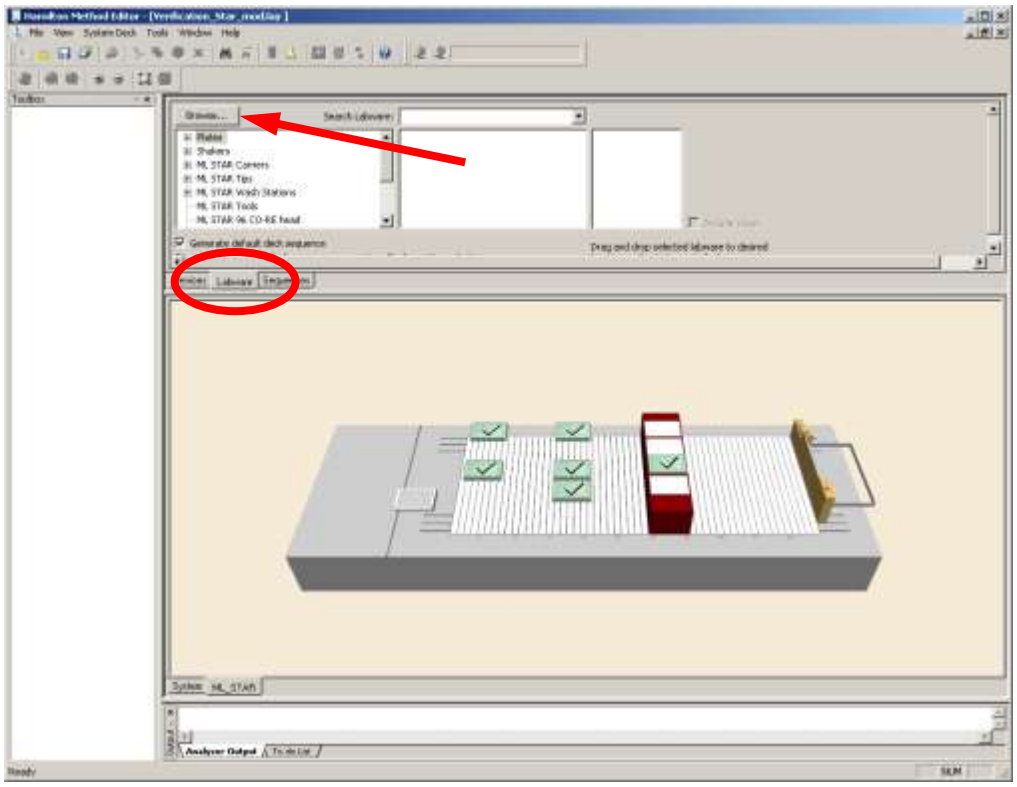
3. Click the file and select Open:



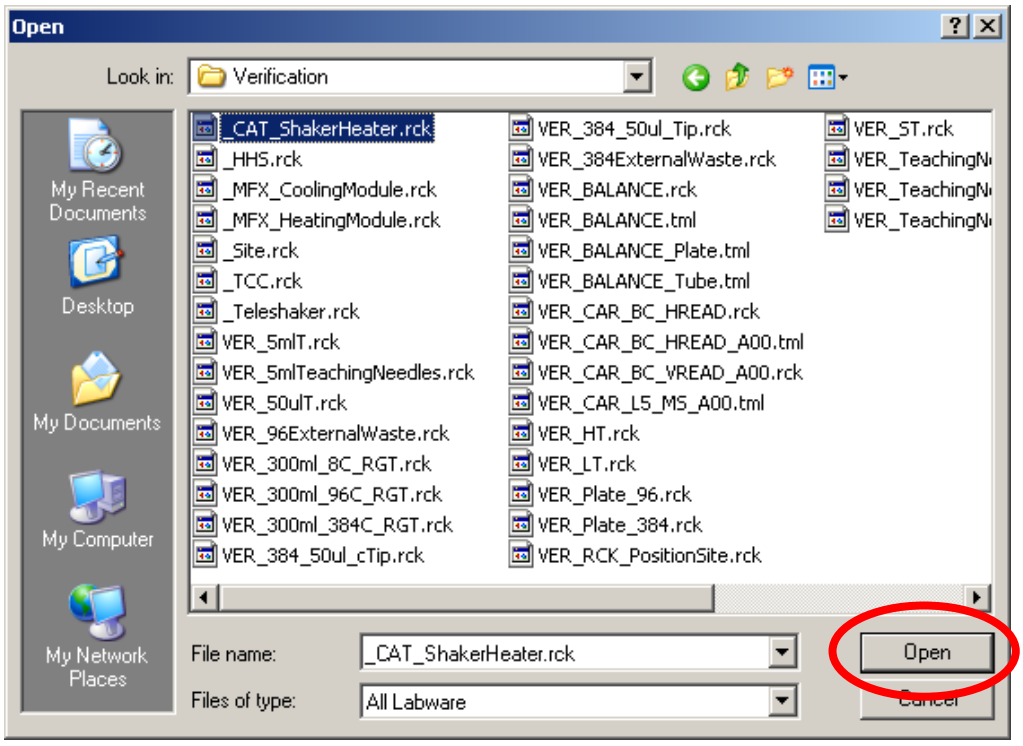
4. Remove devices that are not installed on the Deck by Right-Mouse-Click on the device, then select Delete.



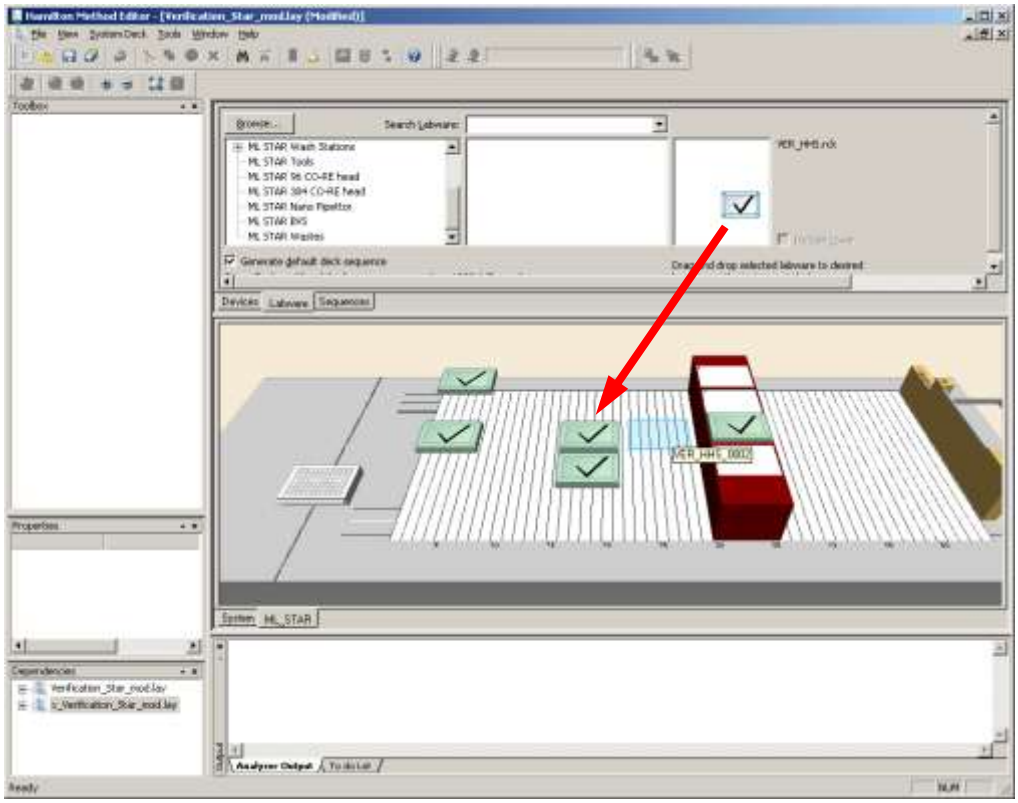
5. Click the Labware Tab.
6. Click Browse.



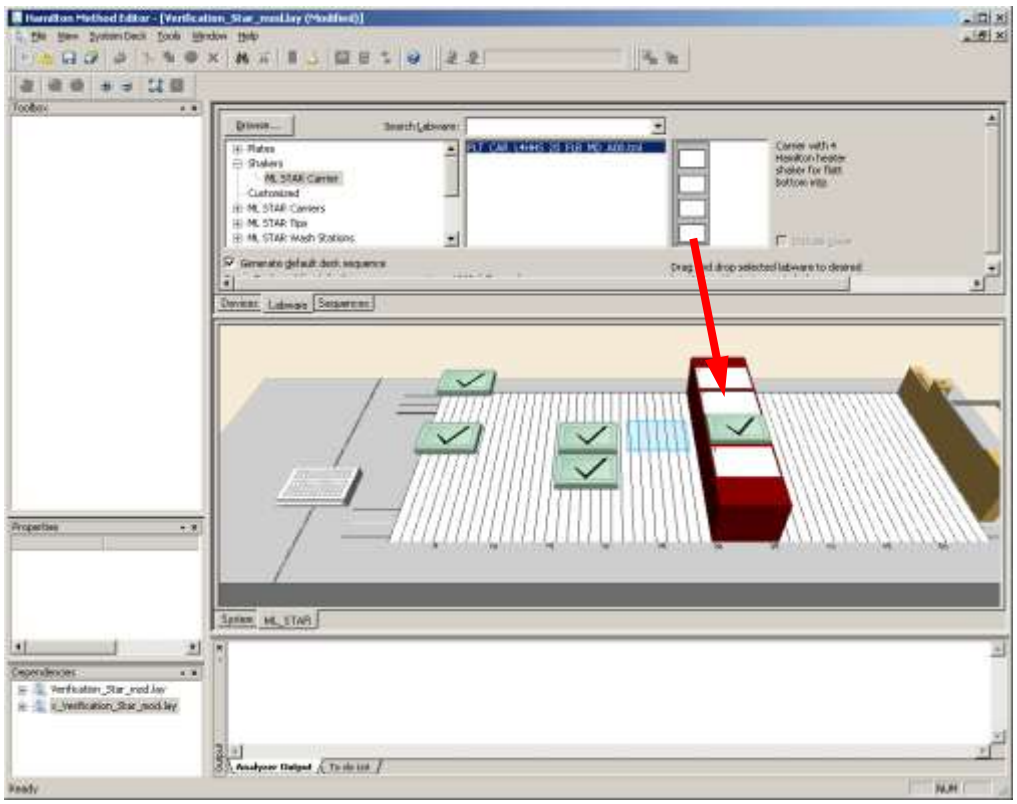
7. Select ML STAR ➔ Verification.
8. To add the device, select the device and click Open.



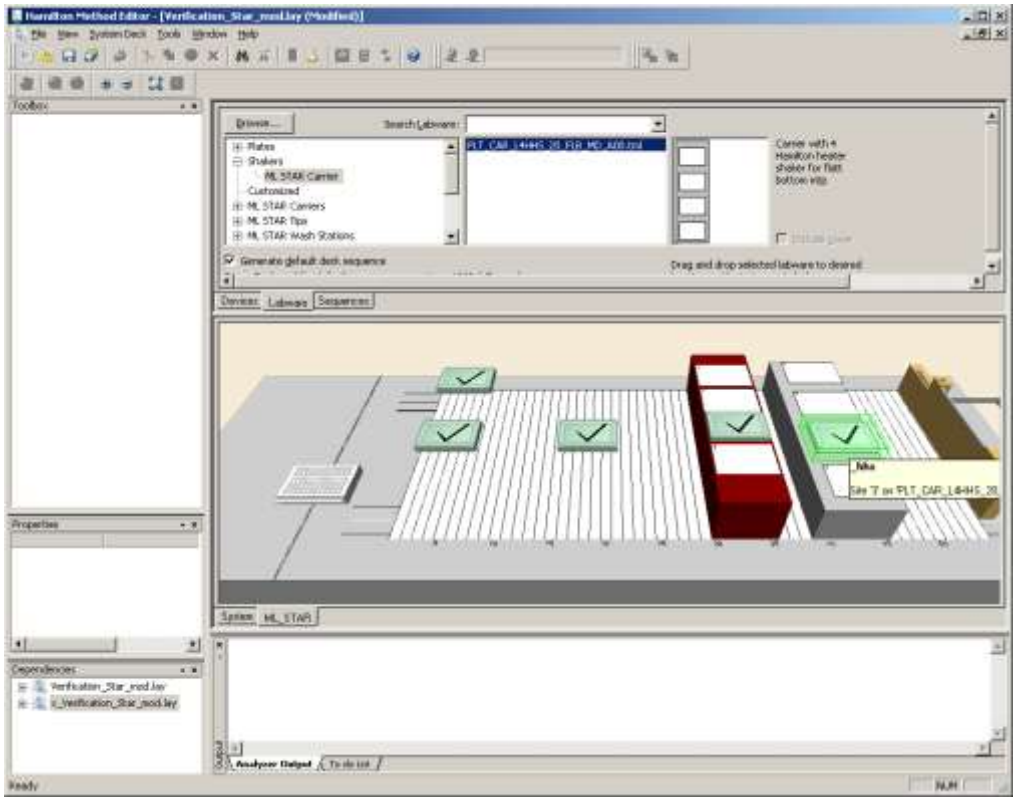
9. Add to the Deck (move the device with the mouse from the window to the Deck).



10. For Carriers, search in the Default Folder; e.g.: (move the device with the mouse from the window to the Deck).



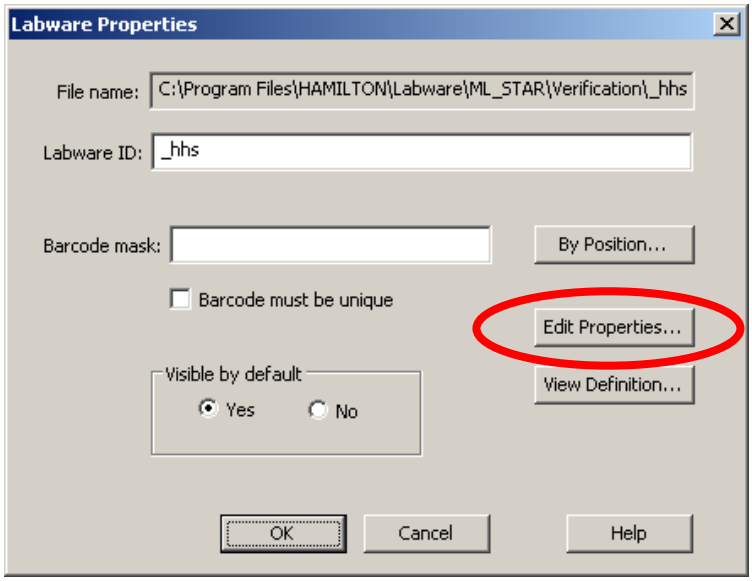
11. For the Labware Properties, Right-Mouse-Click on the device and select Properties.



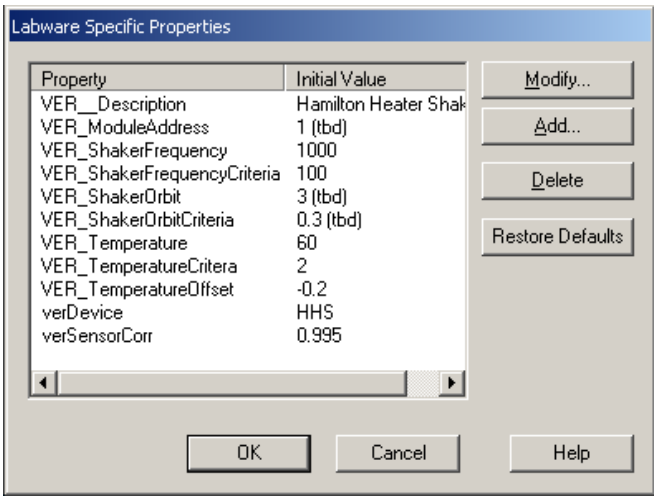
Note:

Labware Properties can be edited and are to be defined by the user. See the appropriate sub-sections from Section 4.

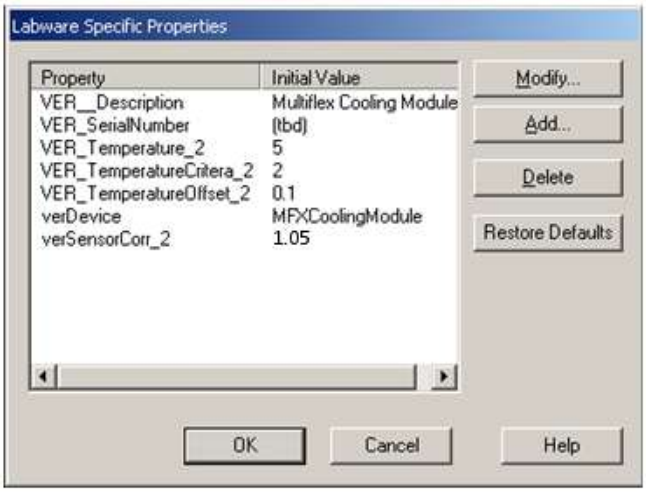
12. To Edit the Labware Properties, click Edit Properties:



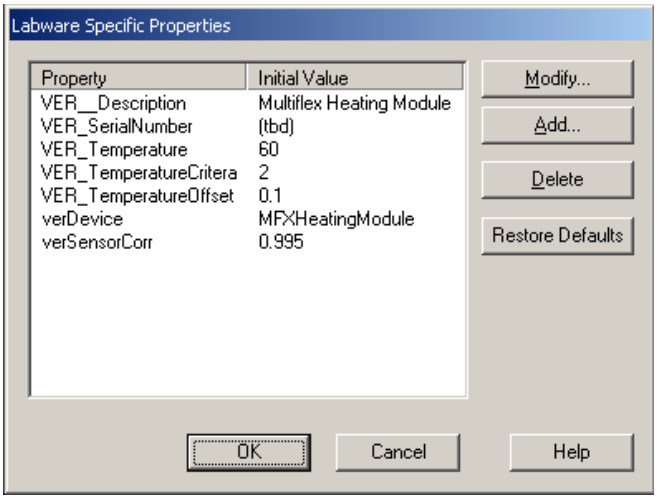
a. To Edit Properties of the HHS, click Modify (See the HAMILTON Heater Shaker Section 4.13.5.1).



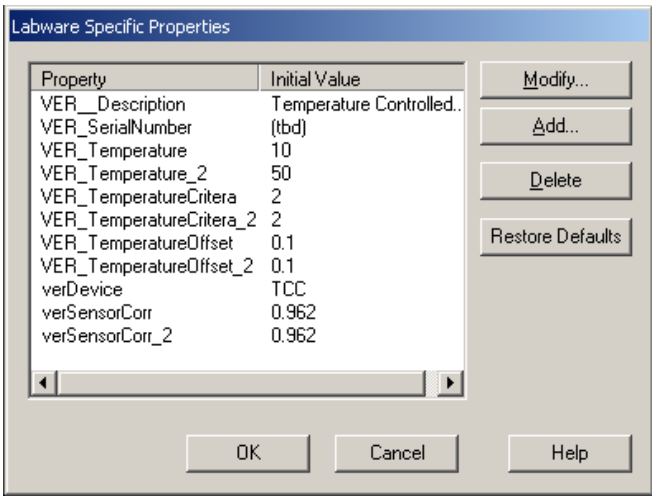
b. To Edit Properties of the MultiFlex Cooling Module, click Modify (See the MultiFlex Cooling Module Section 4.13.5.2).



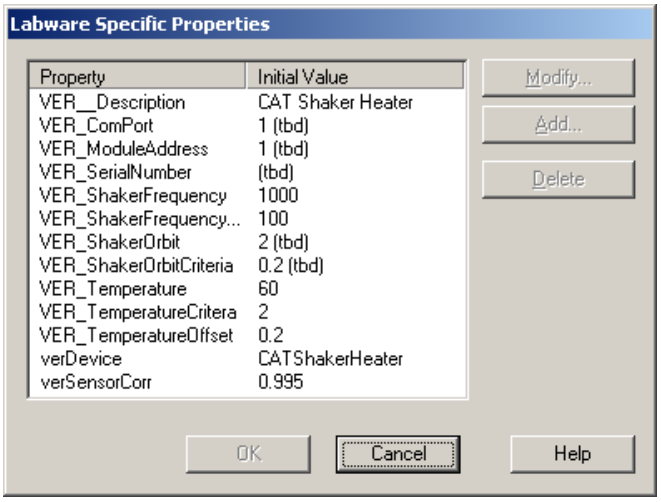
c. To Edit Properties of the MultiFlex Heating Module, click Modify (See the MultiFlex Heating Module Section 4.13.5.3).



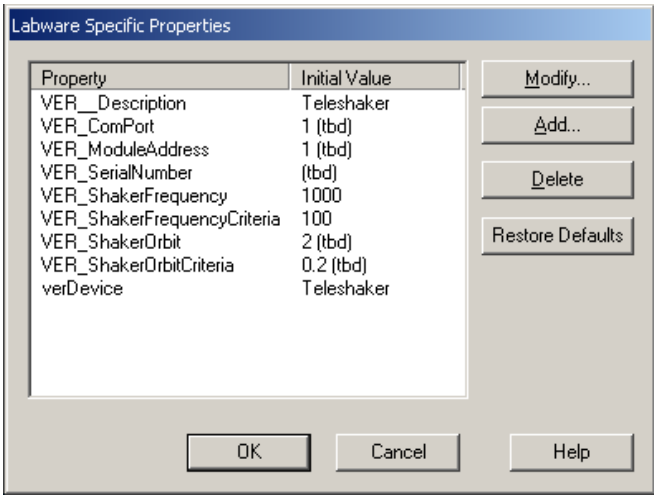
d. To Edit Properties of the TCC, click Modify (See the Temperature Controlled Carrier Section 4.13.5.4).



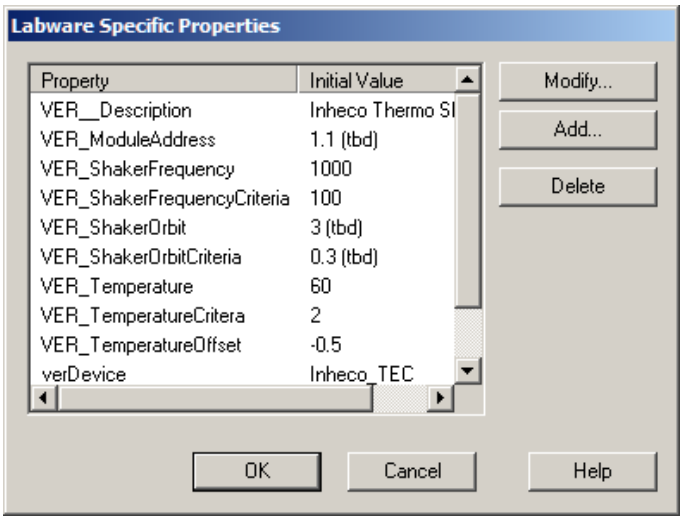
e. To Edit Properties of the CAT Shaker Heater SH10, click Modify (See the CAT Shaker Heater SH10 Section 4.13.5.5).



f. To Edit Properties of the Teleshake, click Modify (See the Teleshake Section 4.14.4.3).



g. To Edit Properties of the Inheco Thermoshake, click Modify (See the Inheco Thermoshake Section 4.14.5.7).



4 Performing the Field Verification 2

Attention:

The following must be known before starting:

- *Which device is on which COM Port*
- *Serial Numbers of external devices such as Heaters and Shakers*
- *Module Addresses*
- *Orbit (peak to peak) of Shakers*

4.1 Starting the Program – Shortcut Desktop

Note:

Before starting the Field Verification 2, if you want to verify Heaters or Shakers, a pre-defined Deck Layout ***must be created*** *to define all Heater and Shaker Verification Sites. (See the Field Verification 2 Pre-Defined Deck Layouts Section 3.3.)*

Attention:

The Excel Software Program must not be open when performing the Field Verification 2 Procedures.

Start the Field Verification 2 by clicking the Microlab STAR Verification 2 Icon on the desktop.

Once the method has started, the following windows appear:

4.2 Start Dialog

In the Start Dialog, the Verification Processes can be selected. Required Verifications are already marked.

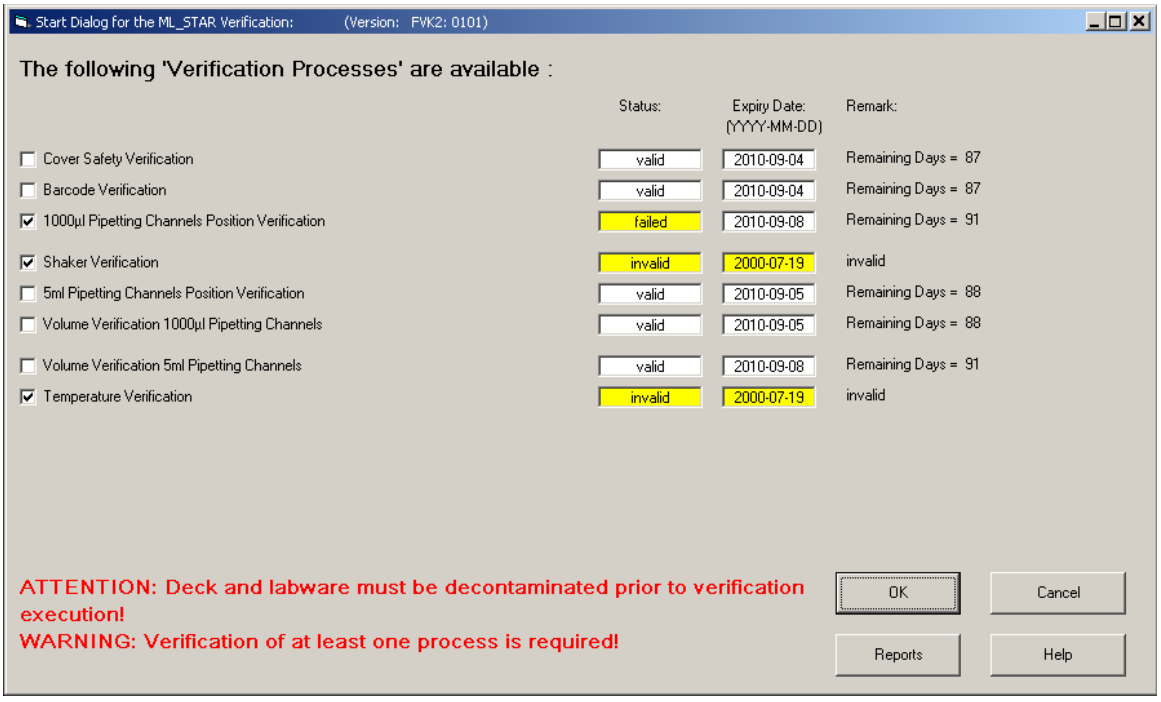
Attention:

Position Verifications must be performed before the Volume Verifications can be performed.

The Verifications will be processed in the order shown.

Note:

Contents of this screen will vary depending on the Instrument's Configuration.

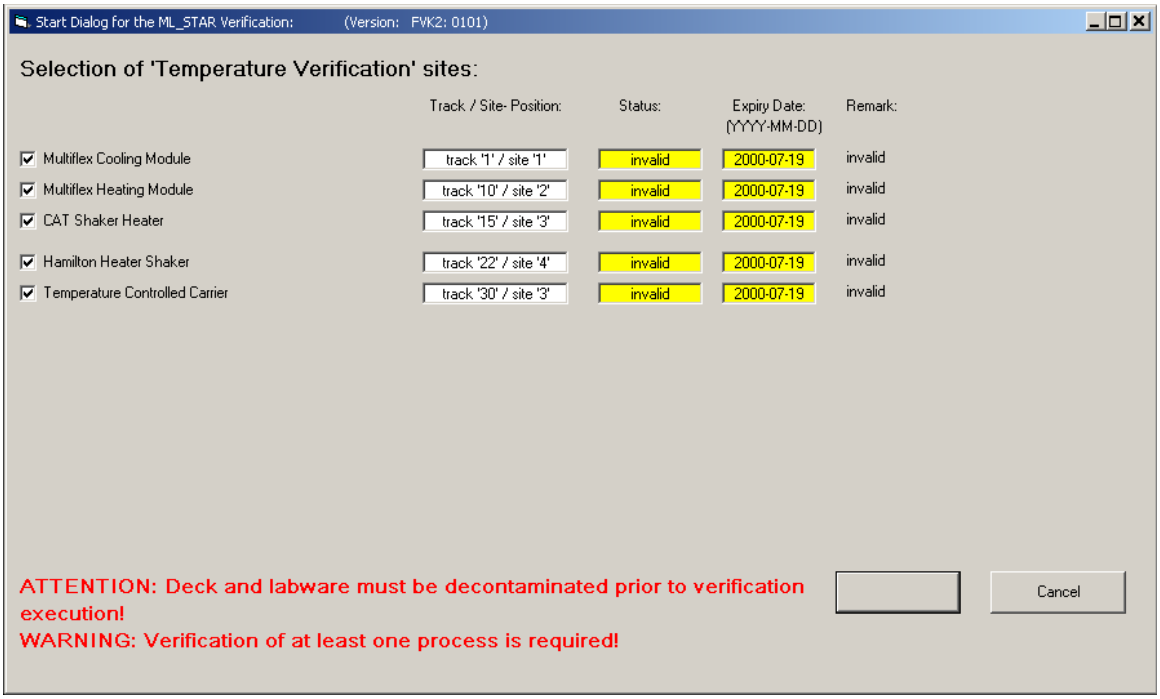


Available Verification Processes Screen

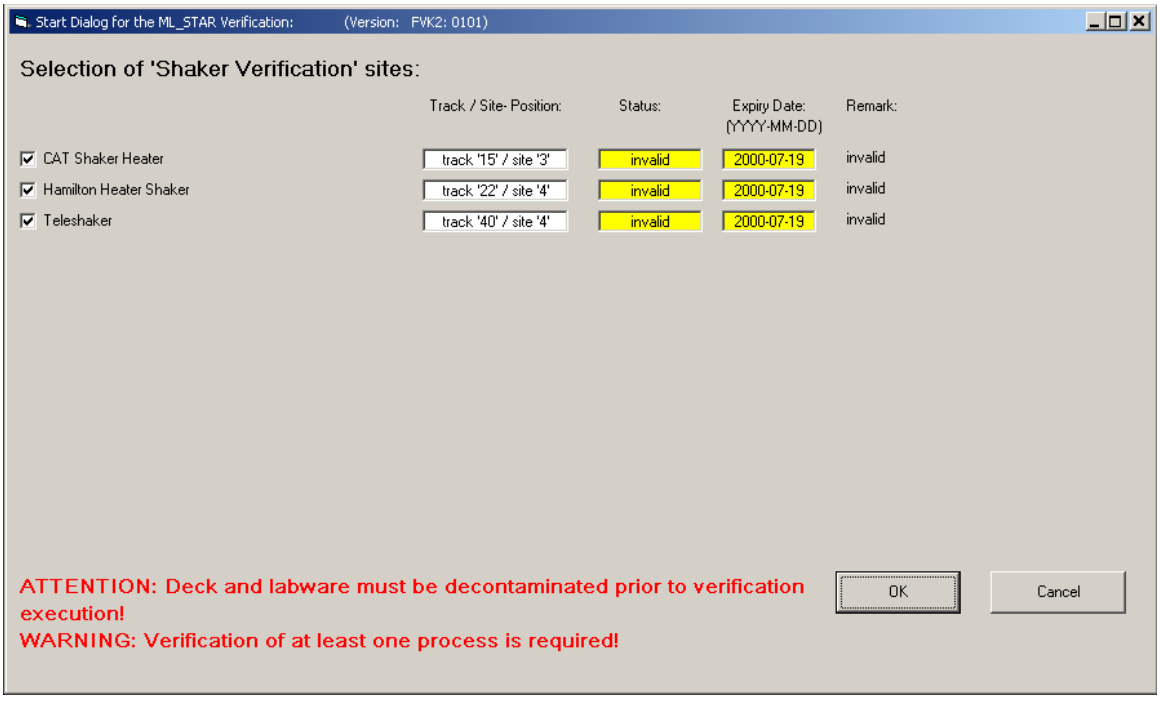
For Temperature and Shaker Verification only a summary is available. If these Verifications are selected the more detailed selection appears as in the following windows.

Note:

Not all temperature devices have to be verified.



Temperature Verification Sites Screen



Shaker Verification Sites Screen

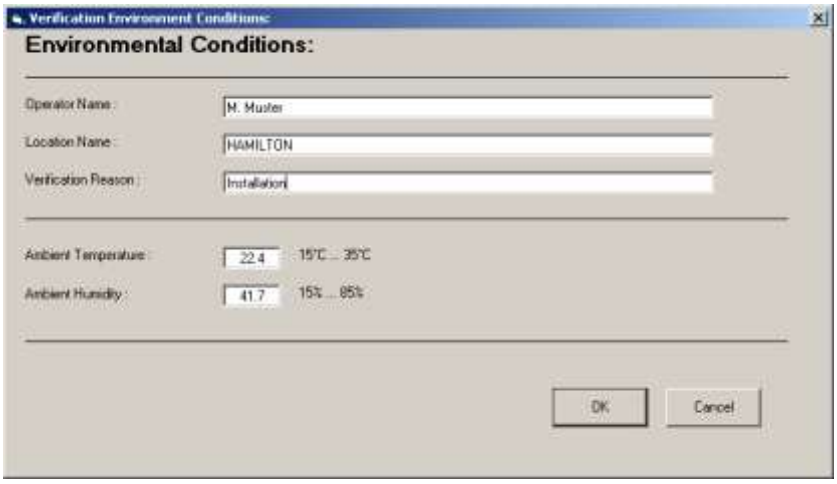
4.3 General Information

Depending on the selected Verifications, general information about the environmental conditions and the test equipment has to be provided. All this information is stored on the PC in an instrument specific file.

Some general information has to be given on the Environmental Conditions Screen before the Field Verification 2 procedures can be started:

- Operator Name:
- Location Name:
- Verification Reason:

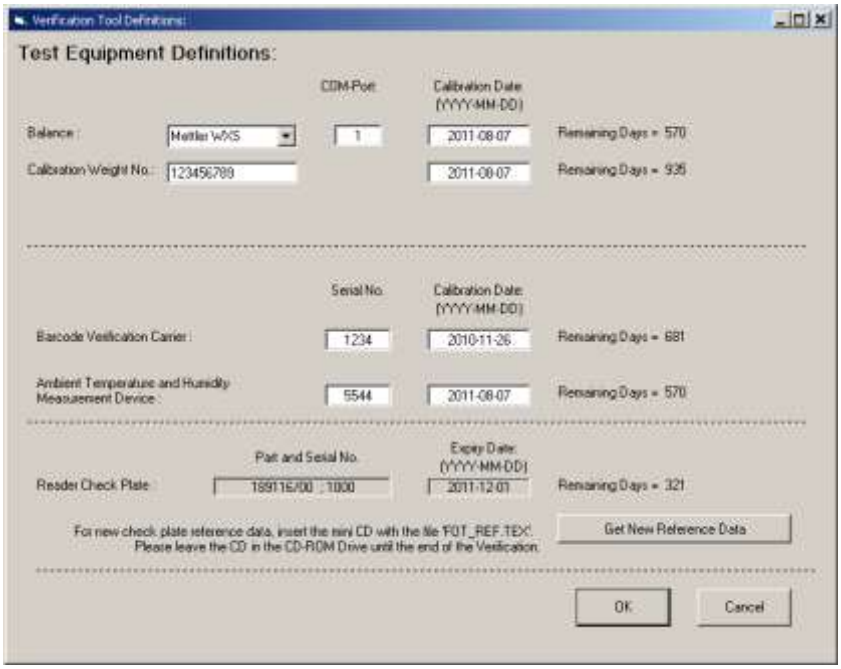
If the Temperature or the Humidity is not within the defined specifications, the Verification will not be performed.



Environmental Conditions Screen

During the start-up procedure, the user will be asked to define test information on the Test Equipment Definitions Screen:

- Serial Numbers for:
  - Barcode Verification Carrier
  - Ambient Temperature and Humidity Measurement Tool
- Balance Communication Port
- Calibration Dates for:
  - Balance
  - Calibration Weight
  - Barcode Verification Carrier
  - Ambient Temperature and Humidity Measurement Tool



Test Equipment Definitions Screen

- The Reader Check Plate Part Number, Serial Number and Expiration Date are obtained directly from the ML STAR Verification Reference Data CD.

Note:

Carefully enter the Date and Serial Number information correctly to avoid having incorrect information produced in the reports.

• **For the Balance:** Select the Type of Balance used and the COM Port. Enter the Calibration Date from the label located on the top of the Balance. The Calibration Date listed is only the Year and Month. Add the number 01 for the first day of the month. (for example 2009-09-01)	
• **For the External Calibration Weight:** Enter the Calibration Date from the label located on the container. The Calibration Date listed is only the Year and Month. Add the number 01 for the first day of the month. (for example 2009-09-01)	
• **For the Barcode Verification Carrier:** Enter the Serial Number and Calibration Date from the labels located on the edges of the Carrier.	
• **For the IR Sensor Measurement Tool:** Enter the Calibration Date from the label located on the cable.	
• **For the Ambient Temperature and Humidity Measurement Tool:** Enter the (Zertifikats-Nr.) for the Serial Number and the (Kalibrier Datum) for the Calibration Date from the label located on the back.	
• **For the Reader Check Plate:** The Part Number, Serial Number and Calibration Date are provided automatically from the ML STAR Verification Reference Data CD.	

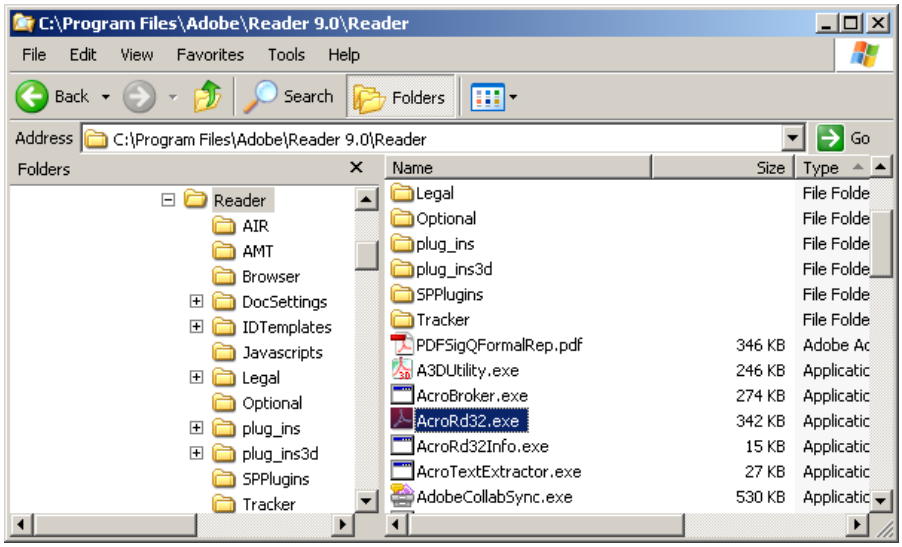
If used programs such as Acrobat Reader and the PDF-File Creator are not found, the corresponding paths also have to be searched.

- **Assign Application Execution Files**

  According to the application version, the operating system and regional setting and application execution file cannot be found at the standard folder. In this case, the corresponding execution file has to be re-assigned, if requested by the Verification Program.

- **Acrobat Reader Application**

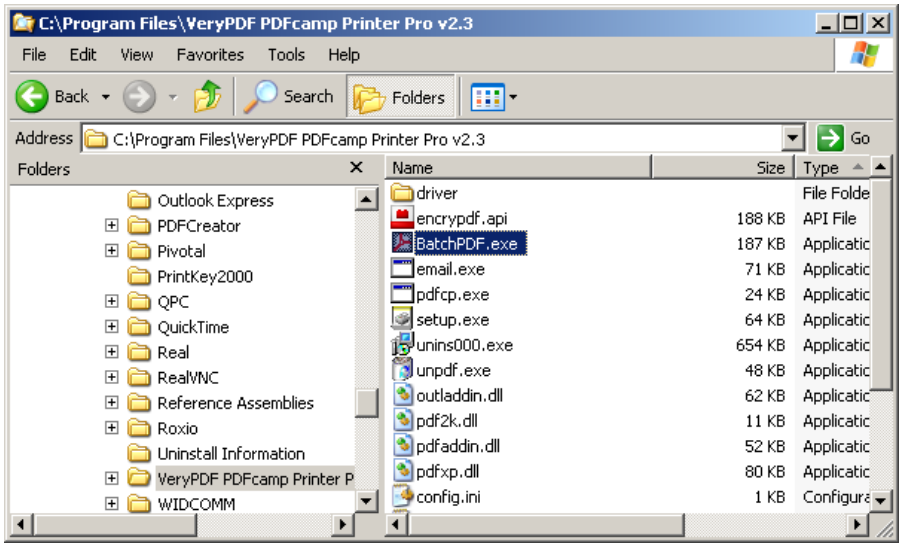
  Search for file 'AcroRd32.exe', if requested by the Verification Program.



- **PDFcamp Printer Pro Application**

  The PDFcamp Printer Pro Application is used to generate the PDF files.

  Search for the 'BatchPDF.exe' file, if requested by the Verification Program.



4.4 Installation of the Balance and Reader384

4.4.1 Balance Installation

Note:

Carefully read the Instructions for Installation and Operation of the Mettler Balance.

Attention:

- *The Balance and Carrier have to be placed within a reachable position for ALL Pipetting Devices (Channels and/or Multi-Probe Heads).*
- *The Balance must be warmed up for at least ½ hour.*

1. Connect the RS232 cable to the computer.

Attention:

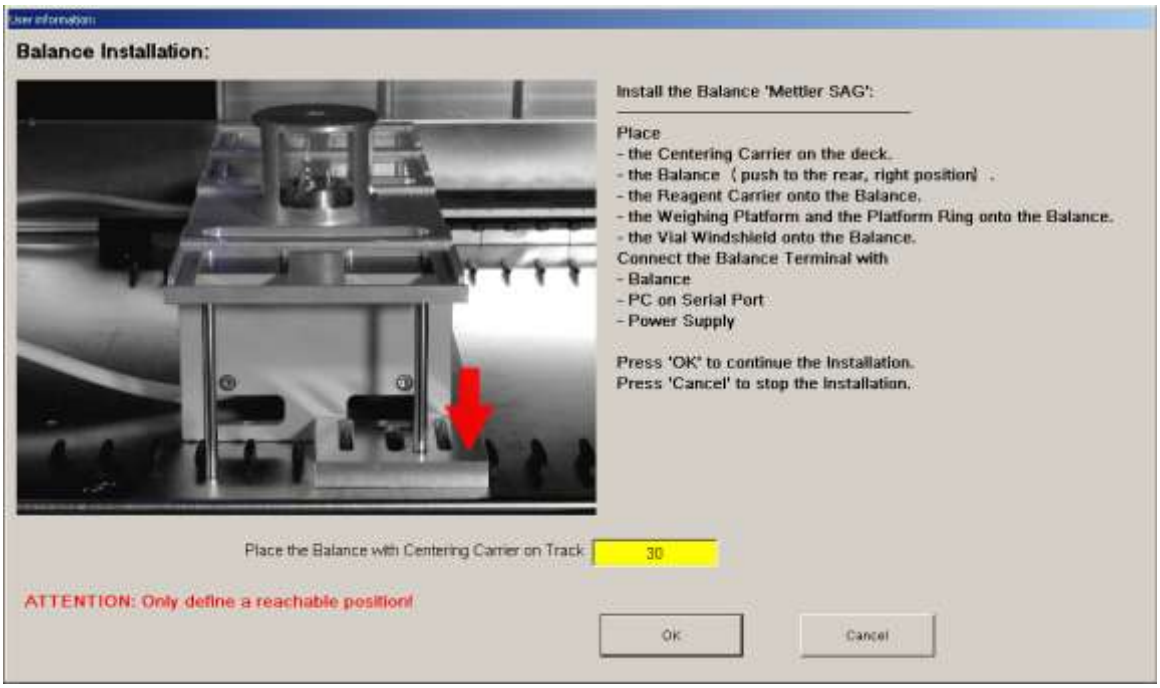
The only possible Communication Ports available for the WXS Balance or SAG285 Balance are COM Port 1 - 20.

2. Connect the RS232 and Power connections to the Balance.

Warning:

The SAG285 Mettler Balance was previously supplied with two different Power Supplies, one for 115VAC and one for 230VAC. Using the incorrect Power Supply for the supply voltage at the customer location can result in damage to the Balance. The Power Supply available now for the SAG285 Mettler Balance is Auto-Switching for 115VAC and 230VAC, with the same Part Number.

3. Place the Centering Carrier and Balance on the Deck. Slide the Balance and Carrier completely to the rear of the Deck.



Centering Carrier on the Balance

Attention:

For correct positioning, the Centering Carrier and the Balance have to be pushed to the back of the Deck.

Attention:

Do not restrain or press down the Platform Ring, Weighing Platform or Plate Weighing Platform when placed on the Balance. This will damage the balance pressure sensor. A damaged balance pressure sensor requires being sent to the manufacturer for repair.

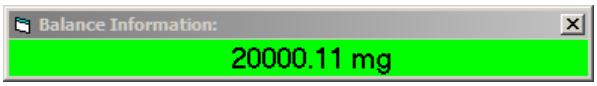
4. Place the Weighing Platform in its socket and place the Platform Ring on it.

Weighing Platform

Platform Ring

A Balance Status Dialog will appear on the top left side of the window with the following background color features:

- **Green : Command Executed Correctly**



- **Yellow: Command is being Executed**

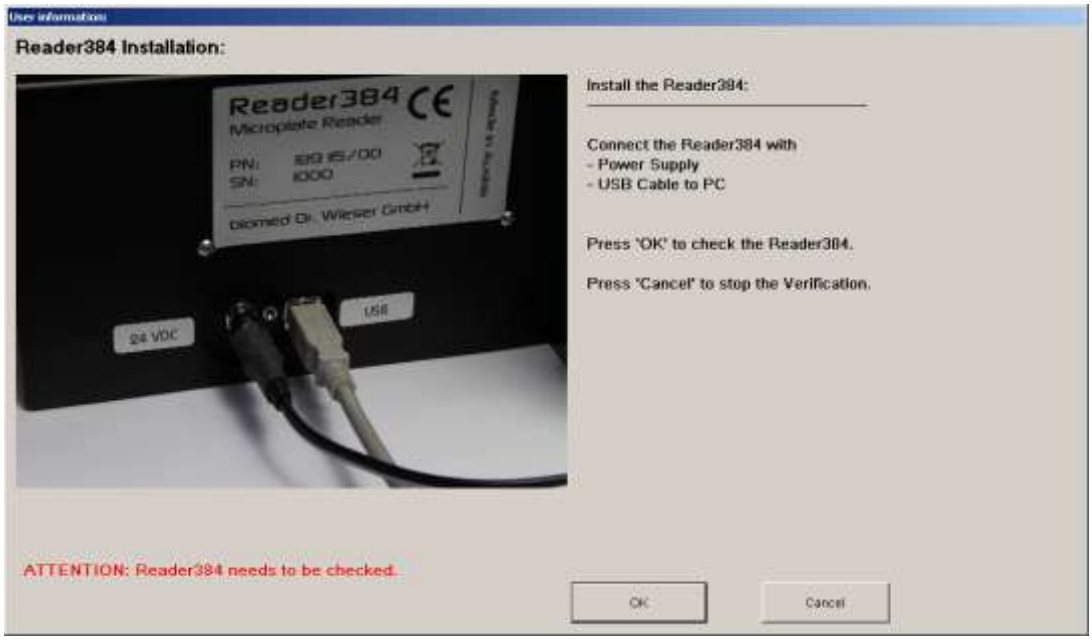
- **Red: Command Failed**

Note:

In case of an unexpected end to run processing, sometimes the Status Dialog must be closed manually to finish the run completely.

4.4.2 Reader384 Installation

1. The user is asked to install the Reader384. Place the Reader384 somewhere near to the PC, but not on the Deck of the Microlab® STARLine Instrument.



Reader 384 Installation Screen

2. Make the connections for the 24VDC Power Supply Adapter and the USB Cable to the computer.

Note:

Make sure that there is no obstruction when the drawer of the Reader384 is opening.

4.5 Reader384 and Balance Checks

Check the Reader384:

To check the Reader384, the user will be asked to place the Reader Check Plate on the Reader Drawer. Follow the software screen instructions as given.

Attention:

Don't forget the Plate Bar.

Attention:

Leave the mini CD in the CD-ROM Drive until the end of the Verification Method.

Check the Balance:

For the External Calibration of the Balance, the user will be asked to place the External Calibration Weight on the Balance. Follow the software screen instructions as given.

Attention:

For Balance Calibration, the External Calibration Weight has to be placed on the Weighing Platform with a pair of forceps (provided). Do not forget to place the Windshield around the Weighing Platform.

External Calibration Weight Container

External Calibration Weight

Attention:

The standard External Calibration Weight (20g) is normally stored in a plastic container. The External Calibration Weight should always be moved with the forceps provided and never by hand.

4.6 Loading of Carriers and Consumables

Follow the instruction given by the software.

Attention:

The Tip Plate Carrier has to be placed within a reachable position for ALL pipetting devices (Channels and/or Multi-Probe Heads).

Attention:

- *Strictly follow the on-screen instructions.*
- *Don't load more Consumables than required. Remove the Consumables when asked.*

4.7 Reading Microtiter Plates in the Reader384

Follow the instruction given by the software.

Attention:

- *For 96 Microtiter Plates, always install the Plate Bar to read the plate on the Reader384.*
- *384 Microtiter Plates are read without the Plate Bar.*

Warning:

The 384 Microtiter Plate is read twice. First it is read then it must be rotated 180° for the second read. Failure to rotate the Microtiter Plate for the second read can produce incorrect results and a failed Field Verification 2 procedure.

4.8 Cover Safety Verification

This Verification checks that the Cover Monitoring and its Locking Mechanism function correctly. Additionally, on the STARPlus, it will check the Plus side Cover Monitoring and its Locking Mechanism. Perform the requested checks.

Generally, follow the software screen instructions as given.

4.9 Barcode Verification

This Verification checks the correct Barcode Reading of the Autoload. The Barcode Verification is processed automatically.

Generally, follow the software screen instructions as given.

4.10 Position Verification

4.10.1 General Description

The Position Verification can be performed depending on the available types of Pipetting Devices. Generally, follow the software screen instructions as given.

4.10.2 Verification Procedure

By using the Capacitance LLD Function, the relative X-Y-Z Positions will be measured for all available Pipetting Devices.

Each type of Pipetting Device will use the appropriate Teaching Needles, touching the pyramid of the Verification Carrier to determine the X-Y-Z Positions.

Note:
The Teaching Needles will need to be placed in different locations for the different Pipetting Devices.

4.10.2.1 1000µl Pipetting Channels Position Verification

1. Select ‘1000µl Pipetting Channel Position Verification’ and press the ‘OK’ button to start the Verification. ‘Cancel’ will abort the Verification Procedure.
2. Fill in all requested data and press the ‘OK’ button to continue.
3. Select a reachable Position on the Deck and type in the desired Track Number where the Plate-Tip Carrier shall be loaded.
4. Place all Labware exactly as described onto the Plate-Tip Carrier.
5. The 1000µl Pipetting Channels Position Verification is processed automatically.
6. Failed or passed. The Verification Procedure will finish with either a ‘failed’ or a ‘passed’ status. Click ‘OK’ to continue.
7. After the ‘OK’ button is pressed, the 1000µl Pipetting Channels Position Verification Report is displayed.

8. A copy may be printed from the window provided now or later. Verification Reports will be found in C:\Program Files\HAMILTON\System.
9. Finally the 'Verification Completed:' window is displayed indicating that the selected Verification Procedure has completed.
10. Click the 'OK' button to continue and the Verification Program will be closed.

4.10.2.2 CO-RE 96-Probe Head Position Verification

1. Select '96 Multi-Probe Head Position Verification' and press the 'OK' button to start the Verification. 'Cancel' will abort the Verification Procedure.
2. Fill in all requested data and press the 'OK' button to continue.
3. Select a reachable Position on the Deck and type in the desired Track Number where the Plate-Tip Carrier shall be loaded.
4. Place all Labware exactly as described onto the Plate-Tip Carrier.
5. Check for free access of the CO-RE 96-Probe Head. Press the 'OK' button to continue.
11. The CO-RE 96-Probe Head Position Verification is processed automatically.
12. Failed or passed. The Verification Procedure will finish with either a 'failed' or a 'passed' status. Click 'OK' to continue.
13. After the 'OK' button is pressed, the CO-RE 96-Probe Head Position Verification Report is displayed.
14. A copy may be printed from the window provided now or later. Verification Reports will be found in C:\Program Files\HAMILTON\System.
15. Finally the 'Verification Completed:' window is displayed indicating that the selected Verification Procedure has completed.
16. Click the 'OK' button and the Verification Program will be closed.

4.10.2.3 CO-RE 384-Probe Head Position Verification

1. Refer to the CO-RE 96-Probe Head Position Verification Section 4.10.2.2; the Verification Procedure is similar.
2. The CO-RE 384-Probe Head Position Verification is processed automatically.

4.10.2.4 5ml Pipetting Channels Position Verification

1. Refer to the 1000µl Pipetting Channels Position Verification Section 4.10.2.1; the Verification Procedure is similar.
2. The 5ml Pipetting Channels Position Verification is processed automatically.

4.11 Volume Verification

4.11.1 General Description

For the 1000µl Pipetting Channels, the CO-RE 96-Probe Head and the CO-RE 384-Probe Head, a dye-pipetting procedure followed by gravimetric and photometric analysis is used to verify the Trueness and Precision.

The 5ml Pipetting Channels are verified by a gravimetric approach.

The following sub-sections describe the procedures. Generally, follow the software screen instructions as given.

4.11.2 Verification Procedure

In case of selected Volume Verifications, the Mettler Balance and the Reader384 need to be checked first (once per day) (see the Reader384 and Balance Checks Section 4.5).

- To check the Reader, the user will be asked to place the Reader Check Plate on the Reader Drawer.
- For the External Calibration of the Balance, the user will be asked to place the External Calibration Weight on the Balance.

After these checks, the user is guided through the loading procedure wherein the Verification Solutions, Tips, Plates and if necessary the 9ml Glass Measuring Vial are loaded on the Balance Carrier and the Tip-Plate Carrier.

After the weighing is performed on the Balance, the user is asked to place the Microtiter Plate into the Reader to measure the OD Values.

Attention:

- *For the 96 Microtiter Plates, always use the Plate Bar to read the plate in the Reader384*
- *For the 384 Microtiter Plates are read without this Plate Bar*
- *384 Microtiter Plates have to be read twice with a 180° turn in between*

Attention:

The 384 Microtiter Plate is read twice. First it is read then it must be rotated 180° for the second read. Failure to rotate the Microtiter Plate for the second read can produce incorrect results and a failed Field Verification 2 procedure.

At the end, the consumables are unloaded, the data is evaluated and a report is generated.

4.11.2.1 Volume Verification 1000µl Pipetting Channels

Due to the combined gravimetric and photometric analysis, up to 8 Pipetting Channels can be verified simultaneously. For more than 8 Pipetting Channels, a reload of consumables is necessary.

Low Volume (10µl):

- Pipetting of 100µl Verification Solution 2 (buffer) with High Volume Tips
- Then, repeat 8 times
  1. Pipetting 10µl Verification Solution 1 (dark dye) with Low Volume Tips
  2. Weighing
- For mixing 150µl Verification Solution 2 (buffer) is pipetted with High Volume Tips
- Shake and read the plate at 405nm

High Volume (1000µl):

- Repeat 5 times:
  1. Pipetting of 1000µl Verification Solution 3 (light dye), 4x 250µl into the Microtiter Plates on the Carrier
- Repeat 3 times:
  2. Pipetting of 1000µl Verification Solution 3 (light dye), 4x 250µl into the Microtiter Plate on the Balance
  3. Weighing
- Shake and read the plates at 405nm

4.11.2.2 Volume Verification 300µl CO-RE 96-Probe Head

Low Volume (5µl):

- Pipetting of 100µl Verification solution 2 (buffer) with Standard Volume Tips into the Microtiter Plate on the Balance
- Pipette 5µl Verification Solution 1 (dark dye) with Low Volume Tips into the Microtiter Plate on the Balance
- Weighing
- For mixing 150µl Verification Solution 2 (buffer) is pipetted with Standard Volume Tips
- Shake and read the plate at 405nm

High Volume (300µl):

- Pipetting of 300µl Verification Solution 3 (light dye) with Standard Volume Tips into the Microtiter Plate on the Balance
- Weighing
- Shake and read the plates at 405nm

4.11.2.3 Volume Verification 1000µl CO-RE 96-Probe Head

Low Volume (10µl):

- Pipetting of 100µl Verification Solution 2 (buffer) with High Volume Tips into the Microtiter Plate on the Balance
- Pipette 10µl Verification Solution 1 (dark dye) with Low Volume Tips
- Weighing
- For mixing 150µl Verification Solution 2 (buffer) is pipetted with High Volume Tips
- Shake and read the plate at 405nm

High Volume (1000µl):

- Pipetting of 1000µl Verification Solution 3 (light dye), 3x 250µl into the Microtiter Plates on the Carrier
- 1x 250µl into the Microtiter Plate on the Balance
- Weighing
- Shake and read the plates at 405nm

4.11.2.4 Volume Verification CO-RE 384-Probe Head

Low Volume (2µl):

- Pipetting of 50µl Verification Solution 2 (buffer) into the Microtiter Plate on the Balance
- Pipette 2µl Verification Solution 1 (dark dye) with new Tips into the Microtiter Plate on the Balance
- Weighing
- Mixing step with the buffer tips
- Shake and read the plate at 405nm

High Volume (50µl):

- Pipetting of 50µl Verification Solution 3 (light dye) with new Tips into the Microtiter Plate on the Balance
- Weighing
- Shake and read the plates at 405nm

4.11.2.5 Volume Verification 5ml Pipetting Channels

At the beginning, the user is guided to fill the 9ml Glass Measuring Vial with 9ml Verification Solution 2 (buffer) and to place it on the Balance.

Low Volume (50µl) and High Volume (5000µl):

Repeat for each Channel eight times

- Pipetting of 50µl Verification Solution 2 (buffer), aspirate and dispense into the 9ml Glass Measuring Vial
- Weighing
- Pipetting of 5000µl Verification Solution 2 (buffer), aspirate and dispense into the 9ml Glass Measuring Vial
- Weighing

For more than 6 Channels, a reload of tips is necessary.

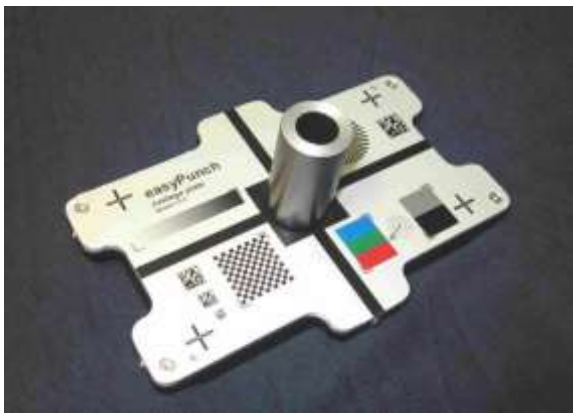
4.12 easyPunch Verification

This Verification checks the easyPunch Device:

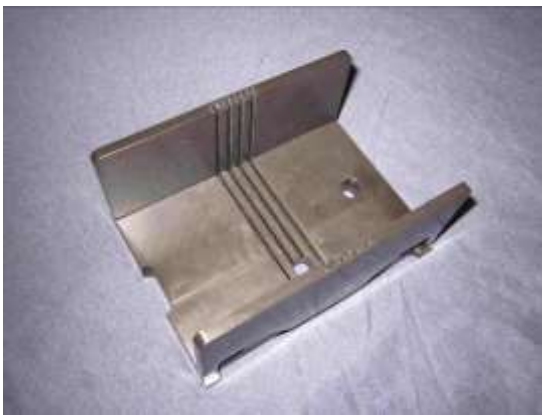
- Camera Focus and Aperture Settings
- Punch Processing
- The Card Handler Alignment
- The Plate Transport Alignment
- Punch Accuracy.

Generally, follow the software screen instructions as given.

4.12.1 easyPunch Tool Overview



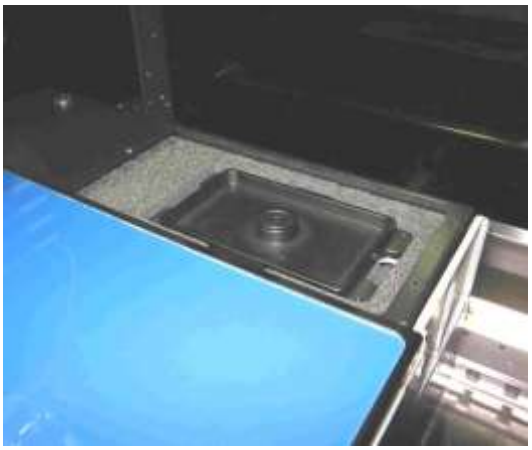
Camera Adjustment Tool



Verification Card Magazine

'Camera Adjustment Tool' and 'Verification Card Magazine' are located in the Toolbox (at the rear of the Punch Module).

The Toolbox Cover has to be unscrewed with a 2.5mm Allen wrench.



4.12.2 Verification Procedure

1. Measure the Card Handler Alignment relative to the Punch Head.
2. Check the Camera Focus and Aperture with the 'Camera Adjustment Tool', located on the front position of the Plate Transport Frame.
3. Check the Plate Transport Alignment by measuring the Plate Transport Frame positioning relative to the Card Gripper with the Camera.
4. Measure the Punch Alignment of 8 punches and card barcode with the Camera.
5. Check the presence of the Punched Paper in the 'Deep Well Microplate' in 8 pre-defined wells as part of the previous step.

4.13 Temperature Verification

4.13.1 IR Sensor Measurement Tool Overview

IR Sensor Measurement Tool with Stand

Black Tape

The IR Sensor is a non-contact Infrared Radiation (IR) Sensor. It calculates the surface temperature based on the emitted infrared energy of objects (Emissivity). The sensor housing of the IR Sensor is made of stainless steel – the sensor electronics is integrated inside the connection cable. Placed the Black Tape on shiny surfaces so that the IR Sensor Measurement Tool can work properly.

Emissivity Definition

The intensity of infrared radiation, which is emitted by each body, depends on the temperature as well as on the radiation features of the surface material of the measuring object. The Emissivity is used as a material constant factor to describe the ability of the body to emit infrared energy. A "blackbody" is the ideal radiation source with an emissivity of 1.0 whereas a mirror shows an emissivity of 0.1.

The actual emissivity of a material depends on the following factors:

- Temperature
- Measuring angle (side effects)
- Geometry of the surface
- Thickness of the material
- Constitution of the surface (polished, oxidized, rough, sandblast)
- Spectral range of the measurement
- Transmissivity (e.g. with thin films)

Due to side effects, it is possible that the sensor see more then only the measuring field. Therefore it is possible that in some cases the Emissivity is se grater the 1.0 to compensate these side effects.

Warning:

A Heater Mechanism can reach temperatures above 60° C. When placing or removing the IR Sensor Measurement Tool onto a Heater, use caution to prevent fingers and hands from being burned.

Warning:

Position the IR Sensor Measurement Tool correctly on the Heater Device to prevent incorrect results and a failed Field Verification 2 procedure.

Warning:

A Failed Temperature Verification can occur if a Heater Device is contaminated. This can also result in contamination of the IR Sensor Measurement Tool. Perform cleaning of the IR Sensor Measurement Tool as described in the Maintenance after Performing the Field Verification 2 Section 4.15, Step 4.b.

4.13.2 Infrared (IR) Sensor Measurement Tool Installation

Warning:

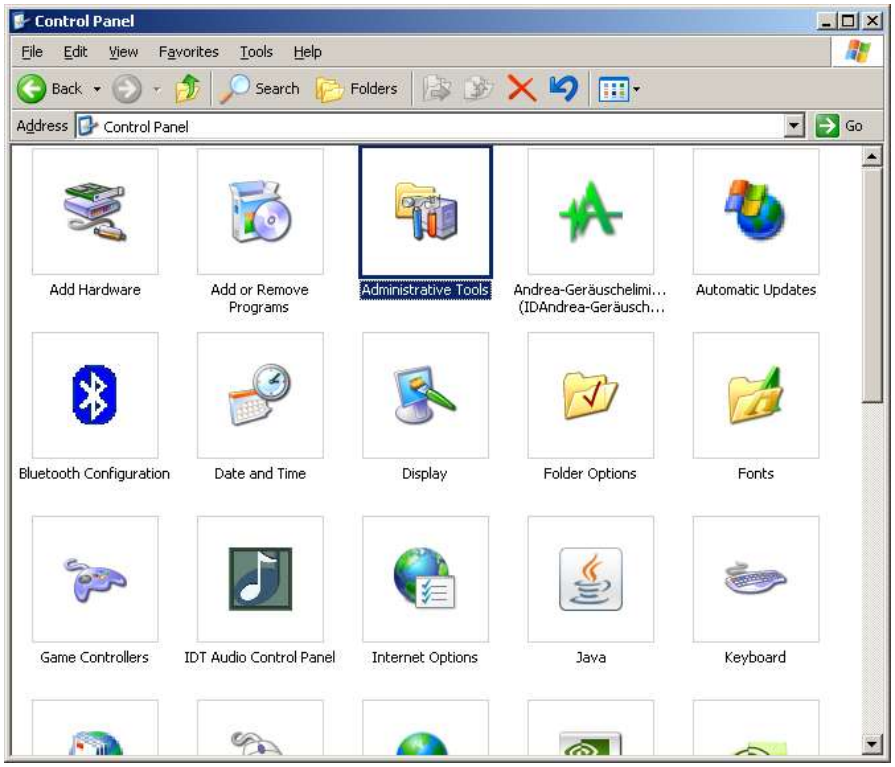
Do not touch the lens of the IR Sensor Measurement Tool because a dirty lens can produce incorrect measurements. Perform cleaning of the IR Sensor Measurement Tool as described in the Maintenance after Performing the Field Verification 2 Section 4.15, Step 4.b.

1. The IR Sensor Measurement Tool Driver will install automatically when connected to the computer.
2. Remove the plastic cap from the Lens of the IR Sensor Measurement Tool before measurement.
3. After the Field Verification 2 Procedures have been completed, assemble the plastic cap onto the Lens of the IR Sensor Measurement Tool for storage in the Field Verification 2 Case.

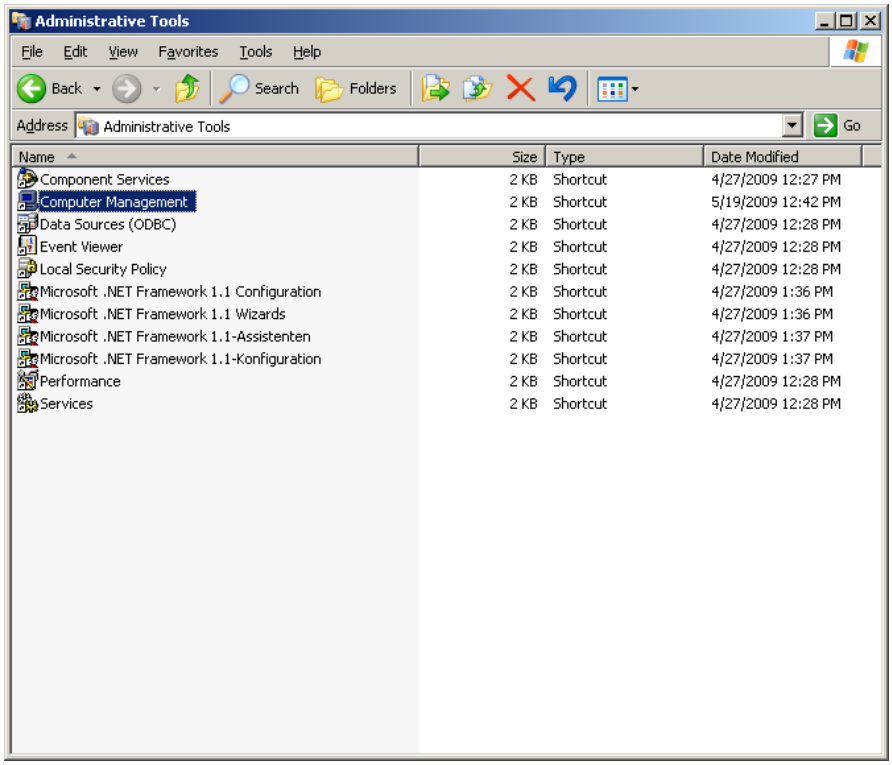
Attention:

The IR Sensor Measurement Tool Driver is not Windows Certified. If errors occur during the installation, press the 'Continue' button to proceed.

4. If the IR Sensor Measurement Tool Driver does not install automatically (possible with Windows 2000), proceed with the following steps.
   a. From the Control Panel, select Administrative Tools.

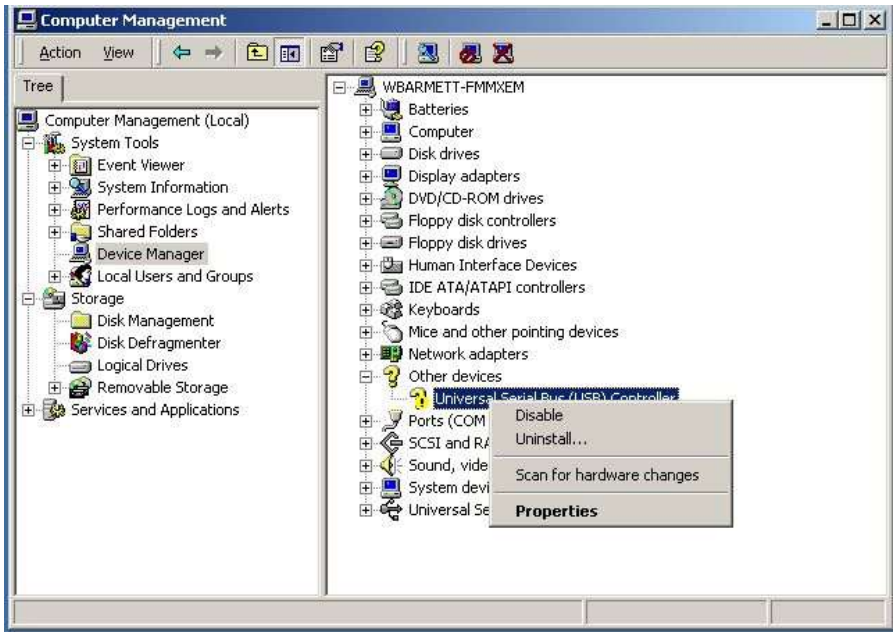


b. On the Administrative Tools Screen, select Computer Management.



c. On the Computer Management Screen, select Device Manager

d. Right-Mouse-Click on the Universal Serial Bus (USB) Controller and select Properties.



e. On the Universal Serial Bus (USB) Controller Properties Screen, click Reinstall Driver…

f. Click Next on the Welcome to the Upgrade Device Driver Wizard Screen.

g. Click Next on the Install Hardware Device Drivers Screen.

h. Click Next on the Locate Driver Files Screen.

i. Click Next on the Driver Files Search Results Screen.

j. Click Finish to complete the Driver Installation.

4.13.3 Temperature Verification Procedure

In case of selected Temperature Verifications, the selected Sites will be heated up (respectively, cooled down) to the first Set Temperature. In the meantime, other Verifications can also be performed.

Before starting other Verification steps, the heat-up time of at least 20 minutes will be checked. The Temperature Verification of the first Set Temperature of all selected Sites will be performed, one after the other, starting at the most left, rear Site, ending at the most right, front Site. The user will be guided to measure the Temperature of each site with the Infrared Sensor.

For Sites with a second Set Temperature, the heat-up period for another 20 minute will be started. After this period, the user will again be guided to measure the Temperature of each Site with the Infrared Sensor.

At the end, all Verified Temperature Sites will be evaluated. The results will be added to the old data of the not selected Sites into a summary status and the Verification Report.

Attention:

After completion of the Temperature Verification, remove the Black Tape from all devices.

4.13.4 General Description

Several different Heating or Cooling Device types can be verified with this Verification Procedure:

Device Type Name	P/N	Remarks
HAMILTON Heater Shaker	See Section 4.13.3	Abbreviation ‘HHS’
MultiFlex Cooling Module	188046	
MultiFlex Heating Module	188045	
Temperature Controlled Carrier	182400	Abbreviation ‘TCC’
CAT Shaker Heater SH10	281760/185440	
Gel Card Incubator	808500	
Inheco Thermoshake	N/A	Controlled by MTC/STC
Independent Heating / Cooling Device	N/A	

It is assumed that all Devices are correctly installed, i.e. including the corresponding libraries. To modify the Devices Labware Properties, see the Editing the Pre-Defined Deck Layout Section 3.4.

4.13.5 Features of the Temperature Verification Devices

A corresponding Rack can be placed on a corresponding Carrier site or located approximately on the Deck. The location on the Deck is used for user-guidance and to define the Verification Device site in the Verification Report.

Features of 'Temperature Verification Devices' are defined as 'Properties' of a corresponding Rack definition. Select 'Properties …' (with Right-Mouse-Click) and than select the 'Edit Properties…" button. For Software versions < 4.0 select 'Labware Data …' button (with Right-Mouse-Click) only.

Values of properties 'VER__Description', 'VER_SerialNumber', 'VER_Temperature', 'VER_TemperatureOffset', 'VER_TemperatureCriteria' and 'verSensorCorr' are used for evaluation. The rest is used to control the device.

The 'verSensorCorr' shows the value of emissivity related to the plate under test. It can range between 0 and 100 %.

Property details of each 'Temperature Verification Device' are described in separate sections below.

Attention:

- *Change property values marked with **(tbd)***
- *Do not change Property Names and Value of Property 'verDevice'*
- *Values not properly defined will lead to exclusion of the corresponding device*

4.13.5.1 HAMILTON Heater Shaker

A maximum of 2 HAMILTON Heater Shakers are connected either on 'TCC Connections' of the Microlab® STAR (devices) or a maximum of 8 devices on an external Power Supply (Heater Shaker Box; P/N 190755). The communication address is set inside the device.

Rack Labware Name: '_HHS.rck'

Properties:

Property Name:	Property Value	Remarks
VER__Description	Hamilton Heater Shaker	
VER_ModuleAddress	-2 / -1 / 1...8 (tbd)	-2: connected on TCC 2 plug (Dip Switch position 6) -1: connected on TCC 1 plug (Dip Switch position 5) 1…8: connected on external power box (Dip Switch positions 0-7)
VER_ShakerFrequency [1)]	1000	[rpm]
VER_ShakerFrequencyCriteria[1)]	100	[rpm]
VER_ShakerOrbit [1)]	3 (tbd)	[mm] User Defined (Also see General Description Section 4.14.3)
VER_ShakerOrbitCriteria[1)]	0.3 (tbd)	[mm] typically 10% of orbit, at least 0.2mm (Also see Heater / Shaker Verification Section 5.5.1)
VER_Temperature	60	[°C] Default Verification Temperature
VER_TemperatureCriteria	2	[°C] Default Value
VER_TemperatureOffset	-0.2	[°C] Offset Temperature according to the Adapter Type. See Section 5.5.2
verDevice	HHS	Do not change!
verSensorCorr	0.995	IR Sensor Correction

1) Additional properties for Shaker Verification (see the HAMILTON Heater Shaker Section 4.14.4.1). If the Shaker Verification is not needed, set the value of 'VER_ShakerFrequency' to '0'.

Attention:

Before performing the Temperature and Shaker Verification with the Sarstedt Adapter, loosen the four screws and remove the ***Sarstedt Cover****.*

4.13.5.2 MultiFlex Cooling Module

HAMILTON ‘MultiFlex Cooling Module’ only has a power supply connected to the Microlab® STAR. Temperature Settings are set manually.

Rack Labware Name: ‘_MFX_CoolingModule.rck’

Properties:

Property Name:	Property Value	Remarks
VER__Description	MultiFlex Cooling Module	
VER_SerialNumber	(tbd)	User Defined
VER_Temperature_2	5	[°C] Default Verification Temperature
VER_TemperatureCriteria_2	2	[°C] Default Value
VER_TemperatureOffset_2	0.1	[°C] Default Value
verDevice	MFXCoolingModule	Do not change!
verSensorCorr_2	1.05	IR Sensor Correction

4.13.5.3 MultiFlex Heating Module

HAMILTON'MultiFlex Heating Module' only has a power supply connected to the Microlab® STAR. Temperature Settings are set manually.

Rack Labware Name: '_MFX_HeatingModule.rck'

Properties:

Property Name:	Property Value	Remarks
VER_Description	MultiFlex Heating Module	
VER_SerialNumber	(tbd)	User Defined
VER_Temperature	60	[°C] Default Verification Temperature
VER_TemperatureCriteria	2	[°C] Default Value
VER_TemperatureOffset	0.1	[°C] Default Value
verDevice	MFXHeatingModule	Do not change!
verSensorCorr	0.995	IR Sensor Correction

4.13.5.4 Temperature Controlled Carrier

The Temperature Controlled Carriers (‘TCC’) are connected with ‘TCC’ plugs to the Microlab® STAR (maximum 2 devices). The corresponding rack should be ‘snapped’ onto the corresponding TCC Carrier (‘Car_TCC_1.tml’ or ‘Car_TCC_2.tml’). One Rack per Carrier is sufficient for Verification. However, it is possible to check all four Sites. In the Pre-Defined Deck Layout, there are two TCC Carriers with 4 Sites pre-defined. Unnecessary TCC Carriers or Sites can be deleted.

Rack Labware Name: ‘_TCC.rck’

Properties:

Property Name:	Property Value	Remarks
VER__Description	Temperature Controlled Carrier	
VER_SerialNumber	(tbd)	User Defined
VER_Temperature	10	[°C] Default Value, 1st Verification Temperature
VER_Temperature_2	50	[°C] Default Value, 2nd Verification Temperature
VER_TemperatureCriteria	2	[°C] Default Value, criteria for 1st Verification Temperature
VER_TemperatureCriteria_2	2	[°C] Default Value, criteria for 2nd Verification Temperature
VER_TemperatureOffset	0.1	[°C] Default Value, criteria for 1st Verification Temperature
VER_TemperatureOffset_2	0.1 (tbd)	[°C] Default Value, criteria for 2nd Verification Temperature
verDevice	TCC	Do not change!
verSensorCorr	0.962	IR Sensor Correction
verSensorCorr_2	0.962	IR Sensor Correction

4.13.5.5 CAT Shaker Heater SH10

The CAT Shaker Heater Devices (SH10) can be installed in different configurations. The Verification Procedure assumes that either the HSL-library "HSLCatSeries.hsl" or "HSLCatSH10_IVD.hsl" is already installed. Other installations are not supported.

Rack Labware Name: '_CAT_ShakerHeater.rck'

Properties: (for definitions, see the CAT Shaker Heater SH10 Section 4.14.4.2)

Property Name:	Property Value	Remarks
VER__Description	CAT Shaker Heater	
VER_ComPort	1 …255 (tbd)	Serial Port Number, User Defined
VER_ModuleAddress	1 … (tbd)	User Defined
VER_SerialNumber	(tbd)	User Defined
VER_ShakerFrequency [1)]	1000	[rpm]
VER_ShakerFrequencyCriteria[1)]	100	[rpm]
VER_ShakerOrbit [1)]	2 (tbd)	[mm] User Defined (Also see Heater / Shaker Verification Section 5.5.1)
VER_ShakerOrbitCriteria[1)]	0.2 (tbd)	[mm] typically 10% of orbit, at least 0.2mm (Also see Heater / Shaker Verification Section 5.5.1)
VER_Temperature	60	[°C] Default Verification Temperature
VER_TemperatureCriteria	2	[°C] Default Value
VER_TemperatureOffset	0.2	[°C] Default Value
verDevice	CATShakerHeater	Do not change!
verSensorCorr	0.995	IR Sensor Correction

[1)] Additional properties for Shaker Verification (see the Shaker Verification Section 4.14). If Shaker Verification is not needed, set the value of 'VER_ShakerFrequency' to '0'.

4.13.5.6 Gel Card Incubator

HAMILTON ‘Gel Card Incubator’ can only be placed once on the Microlab® STAR Deck, with a fixed nominal temperature at 37°C. Temperature control is automatically activated after the Microlab® STAR has been powered on

Rack Labware Name: ‘_GelCardIncubator.rck’

Properties: (no adoption needed)

Property Name:	Property Value	Remarks
VER__Description	Gel Card Incuabtor	
VER_Temperature	37	[°C] Fixed value
VER_TemperatureCriteria	2	[°C] Default Value
VER_TemperatureOffset	0.0	[°C] Default Value
verDevice	GelCardIncubator	Do not change!
verSensorCorr	0.995	IR Sensor Correction

Up to 2 different positions on the HAMILTON ‘Gel Card Incubator’ can be verified in the same run, using template ‘VER_GelCardIncubator.tml’ on the modified Microlab® STAR Deck definition.

4.13.5.7 Inheco Thermoshake

The “Inheco Thermoshake”, which is controlled by a “Multi/Single TEC Control” Box (MTC/STC), can be installed in different configurations. The Verification Procedure assumes that either the HSL-library “HSLInhecoTECLib.hsl” or “HSLMTecLib.hsl” is already installed. Other installations are not supported by this verification.

Rack Labware Name: ‘_Inheco_TEC.rck’

Properties:

Property Name:	Property Value	Remarks
VER__Description	Inheco Thermo Shaker	
VER_ModuleAddress	1.1 (tbd)	User Defined, with syntax: x.y. x = controller number (TEC dip switch) y = slot number (on TEC)
VER_ShakerFrequency [1)]	1000	[rpm]
VER_ShakerFrequencyCriteria[1)]	100	[rpm]
VER_ShakerOrbit [1)]	2 (tbd)	[mm] User Defined (Also see Heater / Shaker Verification Section 5.5.1)
VER_ShakerOrbitCriteria[1)]	0.2 (tbd)	[mm] typically 10% of orbit, at least 0.2mm (Also see Heater / Shaker Verification Section 5.5.1)
VER_Temperature	60	[°C] Default Verification Temperature
VER_TemperatureCriteria	2	[°C] Default Value
VER_TemperatureOffset	0.5	[°C] Default Value
verDevice	Inheco_TEC	Do not change!
verSensorCorr	0.995	IR Sensor Correction

[1)] Additional properties for Shaker Verification (see the Inheco Thermoshake Verification Section 4.14.4.4). If Shaker Verification is not needed, set the value of ‘VER_ShakerFrequency’ to ‘0’.

4.13.5.8 Independent Heating / Cooling Device

A Microlab® STAR independent Heating or Cooling Device can be defined on the modified Deck. Nominal temperature values have to be set independent from the Microlab® STAR, e.g. with help of buttons, display, a previously executed method or are fixed definitions in the device.

This tool allows the customer to make a configuration for a Heating or Cooling Device that is not already defined.

Rack Labware Name: '_AnyHeaterCooler.rck'

Properties:

Property Name:	Property Value	Remarks
VER__Description	(tbd) Heater or Cooler Description	Description for dialogs and verification report
VER_SerialNumber	(tbd)	
VER_Temperature	10 (tbd)	[°C] First nominal temperature after heating up time of at least 20 minutes
VER_Temperature_2	50 (tbd)	[°C] Second nominal temperature after an additional heating up time of at least 20 minutes
VER_TemperatureCriteria	2 (tbd)	[°C] Temperature criteria for the 1st Verification Temperature
VER_TemperatureCriteria_2	2 (tbd)	[°C] Temperature criteria for the 2nd Verification Temperature
VER_TemperatureOffset	0 (tbd)	[°C] Temperature offset at the surface for the 1st Verification Temperature
VER_TemperatureOffset_2	0 (tbd)	[°C] Temperature offset at the surface for the 2nd Verification Temperature
verDevice	AnyHeaterCooler	Do not change!
verSensorCorr	0.995 (tbd)	IR Sensor Correction
verSensorCorr_2	0.995 (tbd)	IR Sensor Correction

Notes:

If the "VER_Temperature" or "VER_Temperature_2" is set to zero the corresponding part of the Temperature Verification will be skipped.

If the "VER_ TemperatureCriteria" or "VER_ TemperatureCriteria _2" is set to zero the corresponding part of the Temperature Verification will not be validated, i.e. only the measured value will be shown in the report without checking it against the specifications.

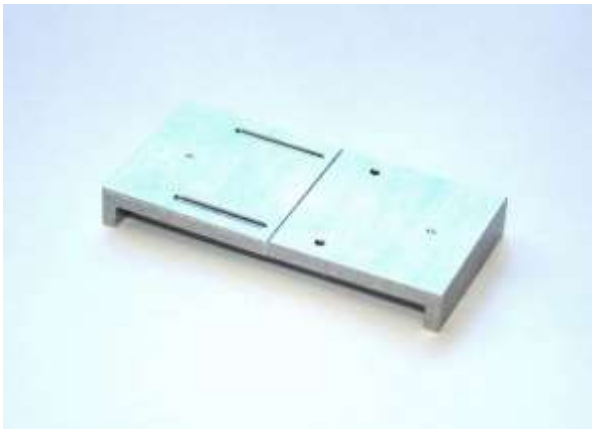
4.14 Shaker Verification

4.14.1 Shaker Verification Tools Overview

The Shaker Verification can be performed within access range of the 1000µl Pipetting Channels or 5ml Pipetting Channels. The corresponding channel can be selected by the user during loading of the 'Shaker Verification Tool' onto the shaker:

P1 .. P#: 1000µl Pipetting Channel (P# = number of the highest available 1000µl Pipetting Channel)

L1 .. L#: 5ml Pipetting Channel (L# = number of the highest available 5ml Pipetting Channel)



Shaker Verification Tool

Teaching Needle

(Placed on the Tip Plate Carrier)

Warning:

A Heater/Shaker Device can reach temperatures above 60° C. When placing or removing the Shaker Verification Tool onto a Heater/Shaker, use caution to prevent fingers and hands from being burned.

Attention:

A soiled Teaching Needle or Shaker Verification Tool can cause the cLLD Signal from the Pipetting Channel to be weak or fail to function correctly which can produce incorrect results and a failed Field Verification 2 procedure.

4.14.2 Shaker Verification Procedure

In case of selected Shaker Verifications, the Shaker Verification will start after the Position Verification of 1000µl Pipetting Channels has been performed.

At the beginning, the Carrier with the Teaching Needle will be loaded and picked up. The user will be guided to place the Shaker Verification Tool on the corresponding site (starting at the most left, rear Site, ending at the most right, front Site), one after the other. Afterwards, the Shaker features (frequency and orbit) will be automatically measured with help of a 'Pipetting Channel', 'Teaching Needle' and the 'Shaker Verification Tool'.

At the end, the 'Teaching Needle' will be ejected back into the Rack. All Verified Shaker sites will be evaluated and the results added to the old data of the not selected sites to a Summary Status and the Verification Report.

4.14.3 General Description

Several different Shaker device types can be verified with this Verification Procedure:

Device Type Name	P/N	Remarks
HAMILTON Heater Shaker	187698	0.5mm orbit
	187699	1.5mm orbit
	187700	2.0mm orbit
	187438	3.0mm orbit
HAMILTON Heater Shaker 2	199037 199027	1.5mm orbit
	199033 199038 188318	2.0mm orbit
	199034 199039 188319	3.0mm orbit
CAT Shaker Heater SH10	185440	1.5mm orbit
	281760	2.0mm orbit

Device Type Name	P/N	Remarks
Teleshake 220V	281527	
Teleshake 110V	281528	
Inheco Thermoshake	N/A	

It is assumed that all Devices are correctly installed, i.e. including the corresponding libraries. To modify the Devices Labware Properties, see the Editing the Pre-Defined Deck Layout Section 3.4.

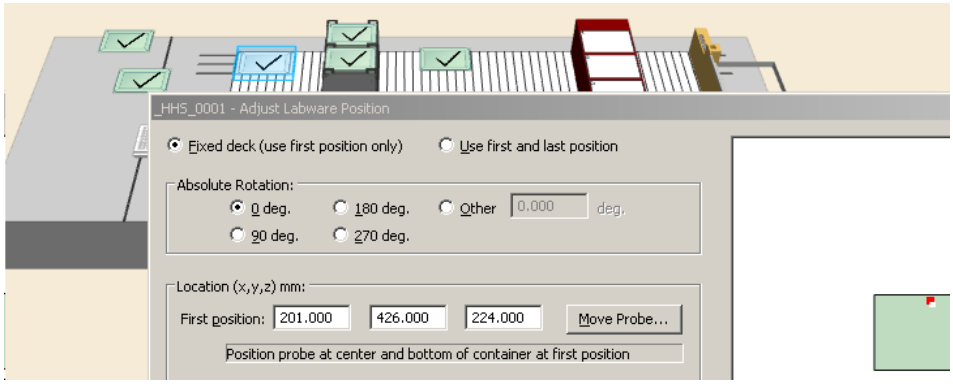
4.14.4 Features of the Shaker Verification Devices

A corresponding Rack can be placed on a corresponding Carrier site and accurately located on the Deck. Only Deck locations which can be accessed by the 1000µl Pipetting Channel can be used for the Shaker Verification.

Note:

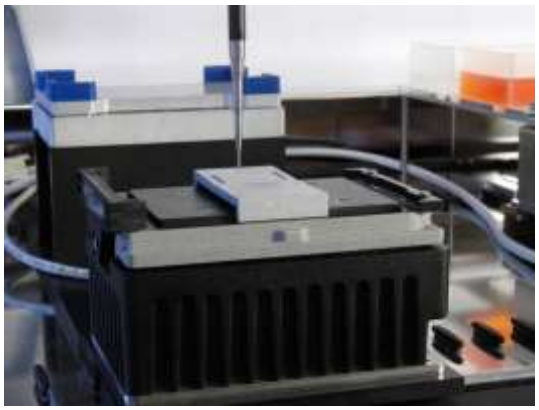
It is only possible to perform Shaker Verification in the Landscape Orientation.

Each assigned site location should be adjusted by selecting ‘Adjust Location …’ (with Right-Mouse-Click) and then select the ‘Move Probe…” Button.



Move the Teaching Needle to the rear reference position of the 'Shaker Verification Tool' (approximately 1mm above the surface, ± 5mm in the X/Y-Direction).

The location on the Deck is for user-guidance and to define the Verification Device Site in the Verification Report.



Features of the 'Temperature Verification Devices' are defined as 'Properties' of a corresponding Rack Definition. Defining the 'Properties' is described in the Features of the Temperature Verification Devices Section 4.13.5.

Values of properties 'VER__Description', 'VER_SerialNumber', 'VER_ShakerOrbit', 'VER_ShakerOrbitCriteria', 'VER_ShakerFrequency' and 'VER_ShakerFrequencyCriteria' are used for evaluation and shown on the Verification Report. The rest is used to control the device. Property details of each 'Shaker Verification Device' are described in separated sections below.

4.14.4.1 HAMILTON Heater Shaker

A maximum of 2 HAMILTON Heater Shakers are connected either on 'TCC Connections' of the Microlab® STAR (devices) or a maximum of 8 devices on an external Power Supply (Heater Shaker Box; P/N 190755). The communication address is set inside the device. The orbit is defined mechanically (see the Part Number Label).

Rack Labware Name: '_HHS.rck'

Properties: (for definitions, see the HAMILTON Heater Shaker Section 4.13.5.1).

If Temperature Verification is not needed, set the value of 'VER_ Temperature to '0'.

Attention:

Before performing the Temperature and Shaker Verification with the Sarstedt Adapter, loosen the four screws and remove the ***Sarstedt Cover****.*

4.14.4.2 CAT Shaker Heater SH10

The CAT Shaker Heater Devices (SH10) can be installed in different configurations. The Verification procedure assumes that either the HSL-library "HSLCatSeries.hsl" or "HSLCatSH10_IVD.hsl" is already installed. Other installations are not supported.

Rack Labware Name: '_CAT_ShakerHeater.rck'

Properties: (for definitions, see the CAT Shaker Heater SH10 Section 4.13.5.5).

If Temperature Verification is not needed, set the value of 'VER_ Temperature to '0'.

4.14.4.3 Teleshake Module

The Variomag Teleshake devices can be installed in different configurations. The Verification procedure assumes that the HSL-library "HSLShakerVariomag.hsl" is already installed. Other installations are not supported.

Rack Labware Name: '_Teleshaker.rck'

Properties:

Property Name:	Property Value	Remarks
VER__Description	Teleshaker	
VER_ComPort	1 …255 (tbd)	Serial Port Number, User Defined
VER_ModuleAddress	1 … (tbd)	User Defined
VER_SerialNumber	(tbd)	User Defined
VER_ShakerFrequency	1000	[rpm]
VER_ShakerFrequencyCriteria	100	[rpm]
VER_ShakerOrbit	2 (tbd)	[mm] User Defined (Also see Heater / Shaker Verification Section 5.5.1)
VER_ShakerOrbitCriteria	0.2 (tbd)	[mm] User Defined, typically 10% of orbit, at least 0.2mm (Also see Heater / Shaker Verification Section 5.5.1)
verDevice	Teleshaker	Do not change!

4.14.4.4 Inheco Thermoshake

The “Inheco Thermoshake”, which is controlled by a “Multi/Single TEC Control” Box (MTC/STC), can be installed in different configurations. The Verification Procedure assumes that either the HSL-library “HSLInhecoTECLib.hsl” or “HSLMTecLib.hsl” is already installed. Other installations are not supported by this verification.

Rack Labware Name: ‘_Inheco_TEC.rck’

Properties: for the definitions, see the Inheco Thermoshake Section 4.13.5.7.

If Temperature Verification is not needed, set the value of ‘VER_ Temperature to ‘0’.

4.15 Maintenance after Performing the Field Verification 2

1. All the used Consumables (Tips, Plates and Solutions used) have to be thrown away after performing the Field Verification 2 procedure.

Attention:
This substance is not classified as dangerous according to Directive 67/548/EEC.

2. All the other items should be cleaned after a run and can be reused several times.
   a. Reagent Containers
   b. Tip Rack (300µl)
   c. Tip Rack (5ml)
   d. Tip Rack for 384 (Empty)
3. Remove the Microtiter Plate and the Plate Bar from the Reader384.
4. Clean all items of the Field Verification 2 as needed.
   a. Clean the Reader Check Plate:
      - Blow off loose particles using clean compressed air
      - Clean the glass with a soft, lint free tissue moistened with water or a water based glass cleaner

Attention:
Never use cleaning compounds which contain solvents for cleaning the Reader Check Plate.

   b. Clean the IR Sensor Measurement Tool Lens:
      - Blow off loose particles using clean compressed air
      - Clean the lens surface with a soft, lint free tissue moistened with water or a water based glass cleaner

Attention:

Never use cleaning compounds which contain solvents (neither for the lens or housing) for cleaning the IR Sensor Measurement Tool.

5. Re-install the plastic cover on the Lens of the IR Sensor Measurement Tool
6. Re-package the items into the Field Verification 2 Case (follow the Packaging List ML STAR FV2 Case P/N 612981 included with the Field Verification 2).

5 Analysis of the Results

5.1 Cover Safety Verification

The Cover Safety Verification checks the Cover Sensor(s) and the Cover Lock(s).

5.2 Barcode Verification

The Barcode Verification checks if the Barcode Reader is able to read all barcodes on the Barcode Verification Carrier. The barcodes on this Carrier are placed at the minimum and maximum of the reading area. The density and the contrast are checked to the dependences, no defective barcodes on the Verification Carrier.

If the Barcode Carrier is readable the Verification will pass.

5.3 Position Verification

The Position Verification checks if the pipetting devices are correctly adjusted in the X-Y-Z Directions.

The following criteria have to be fulfilled in order to pass the Verification.

Instrument Configuration	X-Y-Z Criteria (mm)
1000µl Pipetting Channels	≤ ±0.3 mm
5000µl Pipetting Channels	≤ ±0.3 mm
CO-RE 96-Probe Head	≤ ±0.3 mm
CO-RE 384-Probe Head	≤ ±0.3 mm

5.4 Volume Verification

In addition to the specifications for Temperature and Humidity, the following pipetting criteria have to be fulfilled in order to pass the Verification.

5.4.1 Calculations

Mi = Measured Mass

M1 = average OD values of the Microtiter Plate on the Balance

M2 = average weight per well of the Microtiter Plate on the Balance

P = reference factor P = M2 / M1

Vi = individual well volume (µl)

OD = optical density

δ = density

ODi = individual well OD

Standard Deviation (s):

$$s = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}}$$

Mean value ($\bar{x}$):

$$\bar{x} = \frac{\sum_{i=1}^{n} x_{i,}}{n}$$

Trueness (R [%]):

$$R = \frac{|\bar{x} - x_t|}{x_t} \cdot 100$$

where $\mathbf{X_t}$ = target value

Precision (Coefficient of Variation (CV [%])):

$$CV = \frac{s}{\bar{x}} \cdot 100$$

1000µl Channels:

$Vi = \frac{(ODi * P)}{\delta} * 1000$, in this way, the volume in each well can be calculated.

Trueness and Precision can then be calculated from these volumes.

5ml Channels:

$$Vi = \frac{(Mi)}{\delta} * 1000$$

Trueness and Precision can then be calculated from these volumes.

Multi-Probe Heads:

$Vi = \frac{(ODi * P)}{\delta} * 1000$, in this way, the volume in each well can be calculated.

Trueness and Precision can then be calculated from these volumes.

5.4.2 Pipetting Channels Specifications

Instrument Configuration	Tip Size	Volume	Trueness (%) R	Precision (%) CV
1000µl Pipetting Channels	High Volume Tips	1000µl	2.5	2.0
	Low Volume Tips	10µl	8.0	5.0
5ml Pipetting Channels	5ml Tips	5000µl	2.0	1.5
	5ml Tips	50µl	8.0	5.0

- 1000µl and 5ml are pipetted in jet dispense mode, whereas 10µl and 50µl are pipetted in surface dispense mode.
- Whenever one Pipetting Channel does not fulfill the specification either for Trueness or Precision, the Verification Procedure fails.

5.4.3 Multi-Probe Heads Specifications

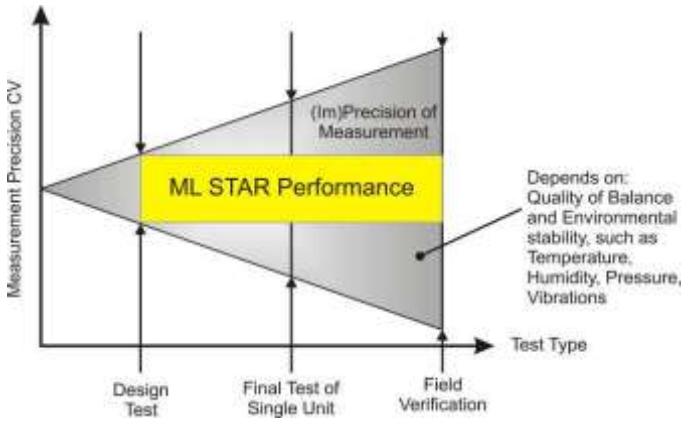
Instrument Configuration	Tip Size	Volume	Trueness (%) R	Precision (%) CV
300µl CO-RE 96-Probe Head	Standard Volume Tips	300µl	3.0	3.0
	Low Volume Tips	5µl	8.0	5.0
1000µl CO-RE 96-Probe Head	High Volume Tips	1000µl	2.5	2.0
	Low Volume Tips	10µl	8.0	5.0
50µl CO-RE 384-Probe Head and 50µl STP	50µl Tips	50µl	4.0	3.0
	50µl Tips	2µl	8.0	5.0

- 50µl, 300µl and 1000µl are pipetted in jet dispense mode, whereas 2µl, 5µl and 10µl are pipetted in surface dispense mode.
- Whenever a CO-RE 96-Probe Head or CO-RE 384-Probe Head does not fulfill the specification either for Trueness or Precision, the Verification Procedure fails.
- If a Single Channel of the CO-RE 96-Probe Head or CO-RE 384-Probe Head does not pipette within the Acceptance Range, the Verification Procedure fails.

- For the CO-RE 96-Probe Head, each value has to be within the confidence interval of: (*R ± 3*CV*).
- For the CO-RE 384-Probe Head, each value has to be within the confidence interval of: (*R ± 4*CV*).

5.4.4 Precision of Measurements

The three sets of specifications for the MICROLAB® STARLine reflect the general imprecision of the measurement of low volumes, associated with the commonly used "gold standard" gravimetrical method.



The precision of the MICROLAB® STARLine has been validated gravimetrically during the design phase of the development using a high precision (6 digit) balance and the necessary controlled environmental conditions (design test). Each individual unit undergoes final testing in our production using a precision balance (5 digits). These measurements take place under the broader environmental conditions, appropriate for the balance. The specifications of the Field Verification 2 allow the use of a transportable balance and to run the measurements under a broader range of environmental conditions, typically found in laboratories around the globe.

The design specifications mentioned above are valid under the following conditions, obtained from measurements at HAMILTON Bonaduz:

- **Test Method:** Gravimetric testing at HAMILTON. The scatter of the test method must be less than 1/6 of the specified precision (for one Channel).
- **Trueness/Precision:** The values given refer to use of 8 Pipetting Channels.
- **Test Size:** ≥ 12 single pipettings per Channel with disposable CO-RE Tips (Pick-Up and Dispense, Tip used only once) per Channel and specified Volume.
- **Test Mode:** Volumes > 20µl as Jet Dispense, ≤ 20µl as (liquid) Surface Dispense.
- **Acceptance Criteria:** Measured values are within specifications if less than the values appearing in the table above.
- **Test Temperature:** 20°C ±} 2K
- **Test Fluid:** HAMILTON Verification Solutions

Note:

No warranty can be given that the above specifications for trueness and precision are met with any other liquid or environment other than the ones specified.

5.5 Heater / Shaker Verification, Evaluation and Reporting

5.5.1 Heater / Shaker Verification

The Heater / Shaker Verification checks if the Temperature, the Orbit and the Frequency are within specifications. The criteria's are listed below:

Instrument	Temperature		Frequency		Orbit	
	Value (°C)	Criteria (°C)	Frequency (rpm)	Criteria (rpm)	Counts (mm)	Criteria (mm)
MultiFlex Cooling Module						
P/N 188046	5	± 2	--	--	--	--
MultiFlex Heating Module						
P/N 188045	60	± 2	--	--	--	--
Teleshake						
P/N 281527	--	--	1000	± 100	2.0	± 0.2
P/N 281528	--	--	1000	± 100	2.0	± 0.2
CAT Shaker Heater						
P/N 185440	60	± 2	1000	± 100	1.5	± 0.2
P/N 281760	60	± 2	1000	± 100	2.0	± 0.2
Temperature Controlled Carrier (TCC)						
P/N 182400	10	± 2	--	--	--	--
	50	± 2	--	--	--	--
HAMILTON Heater Shaker						
P/N 187698	60	± 2	1000	± 100	0.5	± 0.2
P/N 187699					1.5	± 0.2
P/N 187700					2.0	± 0.2
P/N 187438					3.0	± 0.3
HAMILTON Heater Shaker 2						
P/N 199037 P/N 199027	60	± 2	1000	± 100	1.5	± 0.2
P/N 199033 P/N 199038 P/N 188318					2.0	± 0.2

Instrument	Temperature		Frequency		Orbit	
	Value (°C)	Criteria (°C)	Frequency (rpm)	Criteria (rpm)	Counts (mm)	Criteria (mm)
P/N 199034 P/N 199039 P/N 188319					**3.0**	**± 0.3**
Gel Card Incubator						
P/N 808500	**37**	**± 2**	**--**	**--**	**--**	**--**

5.5.2 Heater Analysis and Reporting

The measured Temperature Value represents the Surface Temperature of the heated or cooled device. Depending on the adapters used, there will naturally be a Temperature Offset between the Set Temperature (nominal value) and the Surface Temperature. Each adapter has its own temperature offset, therefore, it is necessary due to different heat exchange behavior.

- The formula for the Temperature Offset is as follows:

  $T_{0ffset} = T_{target} - T_{set}$

  where

  T_{0ffset} = Temperature Offset of the corresponding site, defined as property [°C]

  T_{target} = Surface Temperature, which can be measured by the IR Sensor Measurement Tool [°C]

  T_{set} = Set Temperature of device, which is controlled by the device processor, defined as property [°C]

- All the devices are in a stable condition before the Verification measurement. The Surface Temperature is just measured a short time to reduce the influence of the external measurement device.

  During Verification, the following value is determined:

  $T_{measured}$ = Measured Temperature value with a device specific emissivity factor

Evaluation:

The Temperature deviation of the Target Temperature to the Measured Temperature must be within the acceptance criteria:

$T_{deviation} = | (T_{target} - T_{measured})| = | (T_{set} + T_{0ffset} - T_{measured})| \leq T_{acceptance\ criteria}$

where:

$T_{deviation}$ = Actual Temperature [°C]

$T_{acceptance\ criteria}$ = Temperature acceptance criteria, defined as property [°C]

Labware	Adapter Type	Set Temperature °C	Offset Temperature °C
HHS/HHS2	DWP 2ml	60	-0.2
	DWP 1ml	60	-0.4
	Autolys	60	-1.4
	Sarstedt	60	-0.5
	Flat	60	-0.2
CAT	DWP 1ml	60	+0.2
TCC		10	+0.1
		50	+0.1
MultiFlex Cooling Module		5	+0.1
MultiFlex Heating Module		60	+0.1
Gel Card Incubator		37	0.0

Note:

The offset values have been defined through experimentation with the given adapters. Other adapters can be used, however, the offset values must be established for these different adapters.

Attention:

Before performing the Temperature and Shaker Verification with the Sarstedt Adapter, loosen the four screws and remove the ***Sarstedt Cover****.*

5.5.3 Shaker Analysis and Reporting

Assumption:

All Verified Shakers perform a circular (orbital) movement around a vertical axis.

Orbit / Amplitude:

The Orbit (Rotation Distance) is defined as peak to peak distance in one direction, e.g. distance between extreme positions in the Y-Direction of the Plate or Shaker Verification Tool, measured in millimeters [mm].

The Amplitude is defined as the distance from the center of the shaking movement and it is 50% of the peak to peak distance.

Frequency:

The Frequency of Revolution is measured in revolutions per minute [rpm], which counts the amount of rotation around the center.

Shaker Status:

Excluded - The operator confirmed the Verification of this device was excluded.

Confirmed - The operator confirmed the Verification was carried out independently and passed the specifications.

Passed - The device passed the Field Verification 2 procedure.

Failed - The device failed the Field Verification 2 procedure.

5.6 easyPunch Verification

The easyPunch Verification checks different features of the punch processing:

Camera Focus:

Using the ‘Camera Adjustment Tool’ as a reference, the focus is checked against empirically evaluated limits, which are stored in the Camera Settings.

➔ Verification result is ‘passed’ or ‘failed’

Camera Aperture:

Using the ‘Camera Adjustment Tool’ as a reference, the Aperture Setting is checked against empirically evaluated limits, which are stored in the Camera Settings.

➔ Verification status is ‘passed’ or ‘failed’

Card Handler Alignment:

Empty ‘Card Handler’ is moved to the ‘Punch Head’ and touches the surface of the punch matrix as a reference in X-, Y- and Z-directions with all gripper fingers. The surface detection is done similar to cLLD (capacitive change measurement).

➔ Verification status is ‘passed’, when deviations in X- , Y- and Z-direction to nominal values are ≤ ± 0.3mm, else it is ‘failed’.

Plate Transport Alignment:

Empty ‘Card Handler’ and ‘Plate Transport Frame’ are positioned below the Camera at a defined nominal distance. The distance in X- and Y-directions is measured by the Camera.

➔ Verification status is ‘passed’, when deviations in X- and Y-directions are ≤ ± 0.5mm, else it is ‘failed’.

Punch Processing:

The following processing steps are performed 8 times during this check:

1. One of 4 loaded ‘Verification Cards’ is picked up out of the ‘Verification Magazine’ alternatively.
2. The ‘Verification Card’ Barcode is read with the Camera and decoded.
3. The center sample area 2 (or 3) are measured by the Camera.
4. The ‘Verification Card’ is punched at the corresponding center into a pre-defined well of the ‘Deep Well Microplate’.
5. The punched paper snippet is detected in the corresponding wells of the ‘Deep Well Microplate’ by the Camera.
6. The punched hole in the ‘Verification Card’ is measured by the Camera.
7. The ‘Verification Card’ is put back into the magazine.

➔ Verification status is ‘passed’, when all 8 punched paper snippets are detected in the corresponding wells of ‘Deep Well Microplate’, else it is ‘failed’.

Punch Accuracy:

The measured punched hole deviation from the sample area center by the Camera during the ‘punch processing’ (see above).

➔ Verification status is ‘passed’, when deviations in X- and Y-direction are ≤ ± 0.4mm, else it is ‘ failed’.

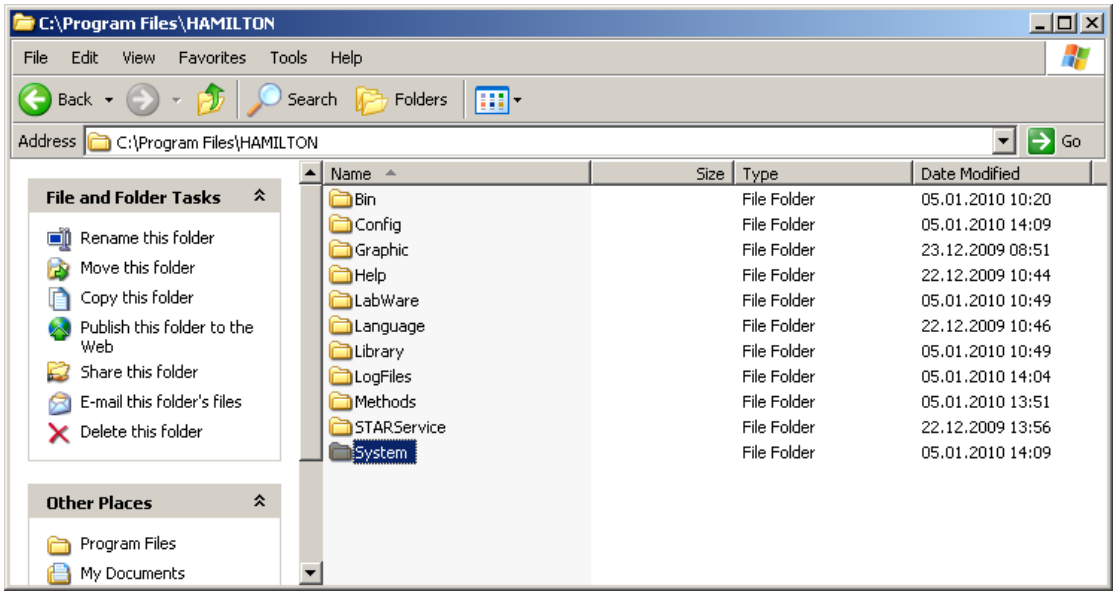
Card Identification:

This feature checks if the Camera is able to read the barcode label on all ‘Verification Cards’ during the ‘punch processing’ (see above) . The barcode are different in type and density and the contrast is checked to the dependences, no defective barcodes on the Verification Carrier.

➔ Verification status is ‘passed’, when all 4 read barcodes matched the predefined barcode during the ‘punch processing’, else it is ‘failed’.

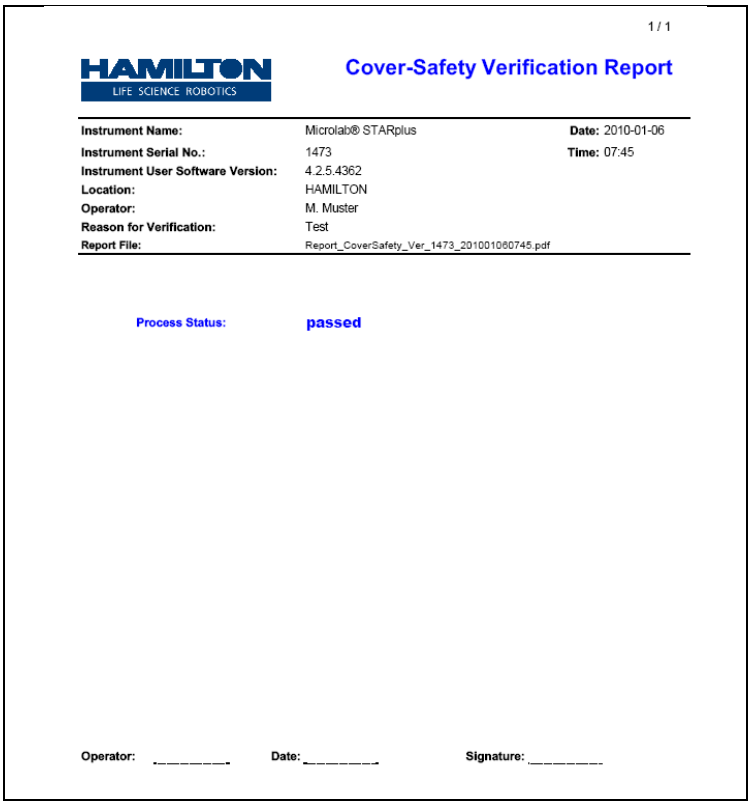
6 Reports Examples

The Reports are stored in the C:\Program Files\HAMILTON Folder as shown below.



Please find below examples of the different reports produced from the Field Verification 2 Software procedures.

- **Cover-Safety Verification Report**



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HAMILTON LIFE SCIENCE ROBOTICS

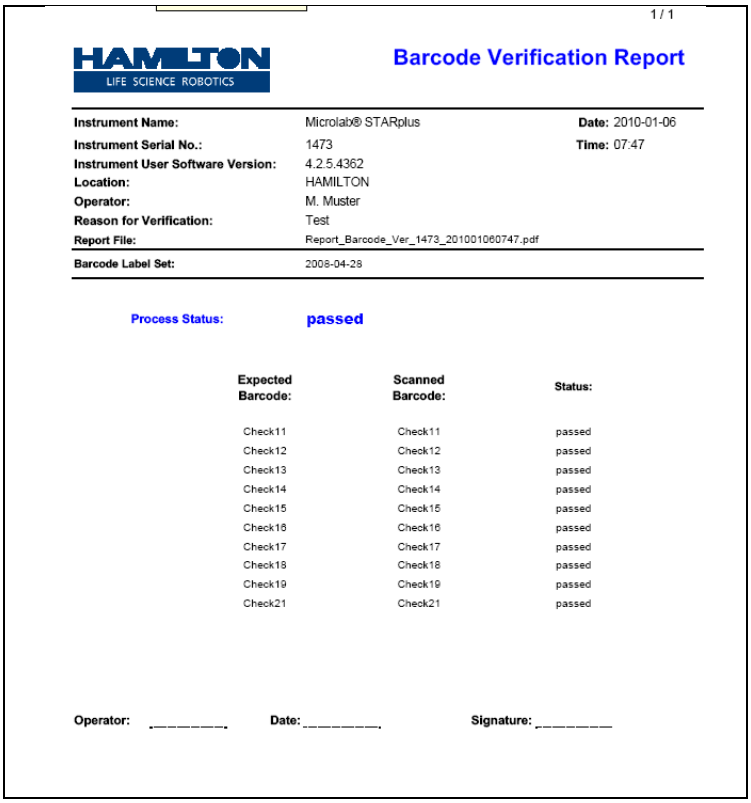
Cover-Safety Verification Report

Instrument Name:	Microlab® STARplus	**Date:** 2010-01-06
Instrument Serial No.:	1473	**Time:** 07:45
Instrument User Software Version:	4.2.5.4362	
Location:	HAMILTON	
Operator:	M. Muster	
Reason for Verification:	Test	
Report File:	Report_CoverSafety_Ver_1473_201001060745.pdf	

Process Status: **passed**

Operator: _____ **Date:** _____ **Signature:** _____

- **Barcode Verification Report**



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HAMILTON LIFE SCIENCE ROBOTICS

Barcode Verification Report

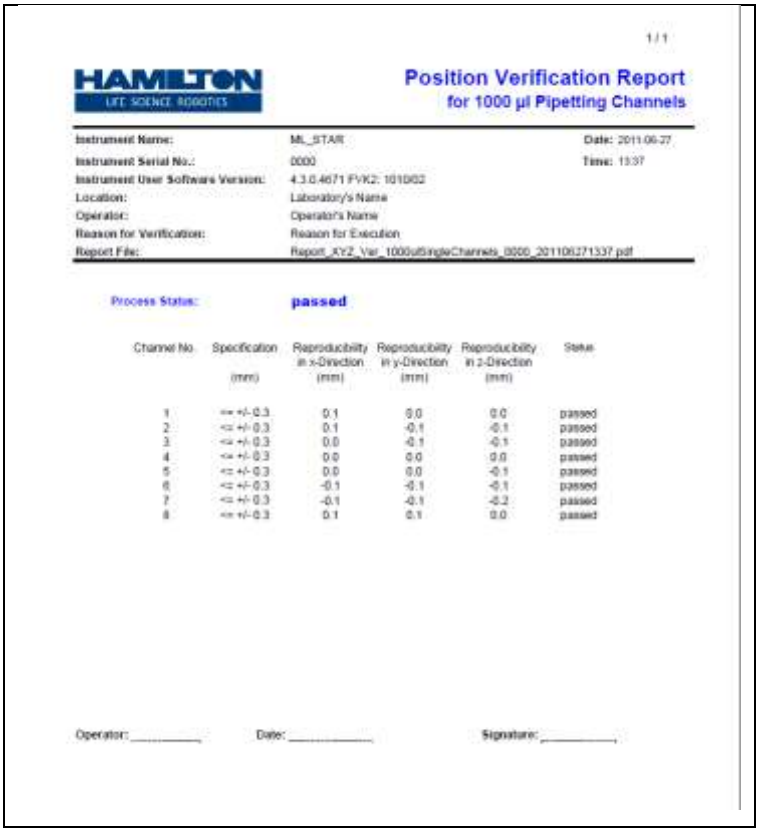
Instrument Name:	Microlab® STARplus	**Date:** 2010-01-06
Instrument Serial No.:	1473	**Time:** 07:47
Instrument User Software Version:	4.2.5.4362	
Location:	HAMILTON	
Operator:	M. Muster	
Reason for Verification:	Test	
Report File:	Report_Barcode_Ver_1473_201001060747.pdf	
Barcode Label Set:	2008-04-28	

Process Status: **passed**

Expected Barcode:	Scanned Barcode:	Status:
Check11	Check11	passed
Check12	Check12	passed
Check13	Check13	passed
Check14	Check14	passed
Check15	Check15	passed
Check16	Check16	passed
Check17	Check17	passed
Check18	Check18	passed
Check19	Check19	passed
Check21	Check21	passed

Operator: _____ **Date:** _____ **Signature:** _____

- **Position Verification Report for 1000µl Pipetting Channels**



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HAMILTON LIFE SCIENCE ROBOTICS

Position Verification Report
for 1000 µl Pipetting Channels

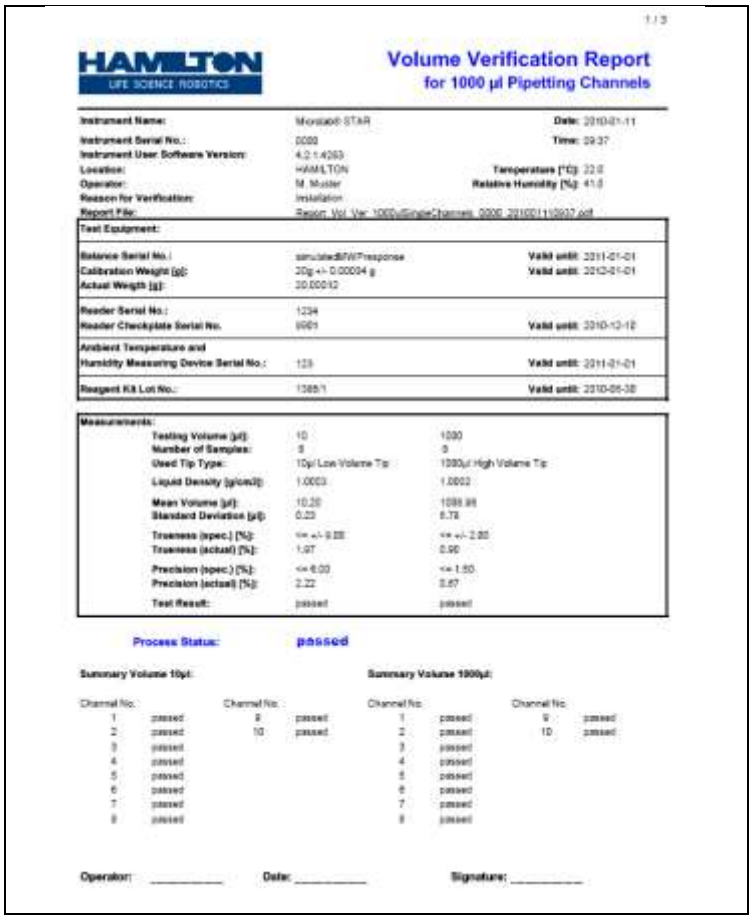
Instrument Name:	ML_STAR	**Date:** 2011-06-27
Instrument Serial No.:	0000	**Time:** 13:37
Instrument User Software Version:	4.3.0.4671 FVK2: 1010602	
Location:	Laboratory's Name	
Operator:	Operator's Name	
Reason for Verification:	Reason for Execution	
Report File:	Report_XY2_Ver_1000ulSingleChannels_0000_20110627133 7.pdf	

Process Status: **passed**

Channel No.	Specification (mm)	Reproducibility in x-Direction (mm)	Reproducibility in y-Direction (mm)	Reproducibility in z-Direction (mm)	Status
1	<= +/- 0.3	0.1	0.0	0.0	passed
2	<= +/- 0.3	0.1	-0.1	-0.1	passed
3	<= +/- 0.3	0.0	-0.1	-0.1	passed
4	<= +/- 0.3	0.0	0.0	0.0	passed
5	<= +/- 0.3	0.0	0.0	-0.1	passed
6	<= +/- 0.3	-0.1	-0.1	-0.1	passed
7	<= +/- 0.3	-0.1	-0.1	-0.2	passed
8	<= +/- 0.3	0.1	0.1	0.0	passed

Operator: _____ Date: _____ Signature: _____

- **Volume Verification Report for 1000µl Pipetting Channels (Page 1 of 3)**



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HAMILTON
LIFE SCIENCE ROBOTICS

Volume Verification Report
for 1000 µl Pipetting Channels

Instrument Name:	Microlab® STAR	**Date:**	2010-01-11
Instrument Serial No.:	0000	**Time:**	09:37
Instrument User Software Version:	4.2.1.4263		
Location:	HAMILTON	**Temperature [°C]:**	22.0
Operator:	M. Muster	**Relative Humidity [%]:**	41.0
Reason for Verification:	Installation		
Report File:	Report_Vol_Ver_1000µlSingleChannels_0000_20100111 0937.pdf		

Test Equipment:

Balance Serial No.:	simulatedBWPresponse	**Valid until:** 2011-01-01
Calibration Weight [g]:	20g +/- 0.00004 g	**Valid until:** 2012-01-01
Actual Weight [g]:	20.00012	
Reader Serial No.:	1234	
Reader Checkplate Serial No.	9901	**Valid until:** 2010-12-12
Ambient Temperature and Humidity Measuring Device Serial No.:	123	**Valid until:** 2011-01-01
Reagent Kit Lot No.:	1388/1	**Valid until:** 2010-06-30

Measurements:

Testing Volume [µl]:	10	1000
Number of Samples:	8	8
Used Tip Type:	10µl Low Volume Tip	1000µl High Volume Tip
Liquid Density [g/cm3]:	1.0003	1.0002
Mean Volume [µl]:	10.20	1000.88
Standard Deviation [µl]:	0.23	8.78
Trueness (spec.) [%]:	<= +/- 9.00	<= +/- 2.00
Trueness (actual) [%]:	1.97	0.09
Precision (spec.) [%]:	<= 6.00	<= 1.50
Precision (actual) [%]:	2.22	0.87
Test Result:	passed	passed

Process Status: passed

Summary Volume 10µl:

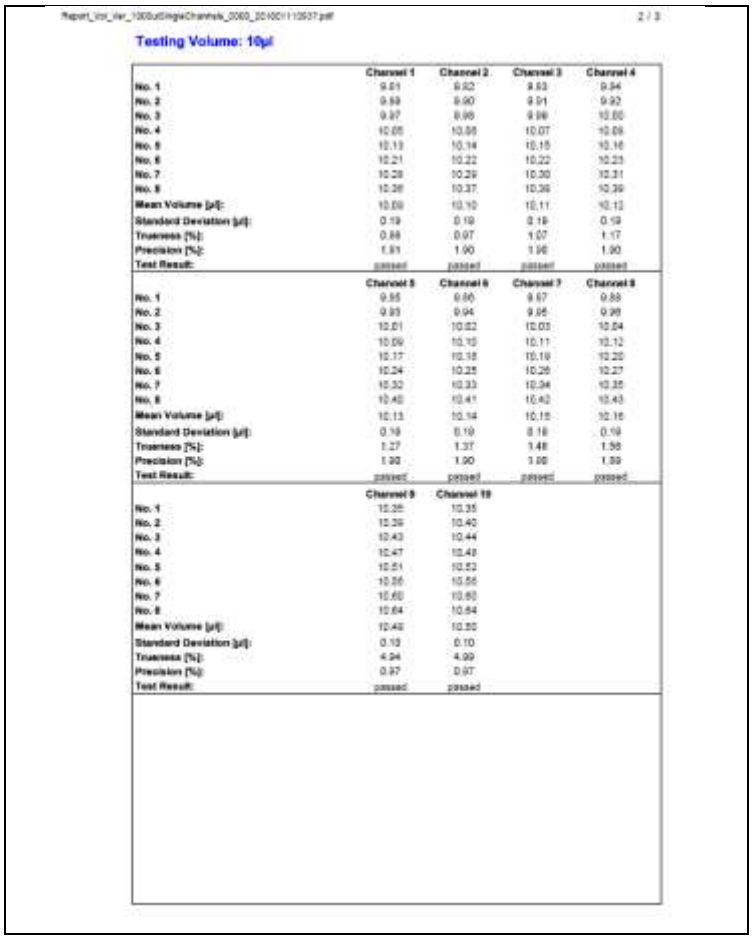
Channel No.		Channel No.	
1	passed	9	passed
2	passed	10	passed
3	passed		
4	passed		
5	passed		
6	passed		
7	passed		
8	passed		

Summary Volume 1000µl:

Channel No.		Channel No.	
1	passed	9	passed
2	passed	10	passed
3	passed		
4	passed		
5	passed		
6	passed		
7	passed		
8	passed		

Operator: _____ **Date:** _____ **Signature:** _____

- **Volume Verification Report for 1000µl Pipetting Channels (Page 2 of 3)**



Report_Vol_Ver_1000µlSingleChannels_0000_20100111 0937.pdf 2 / 3

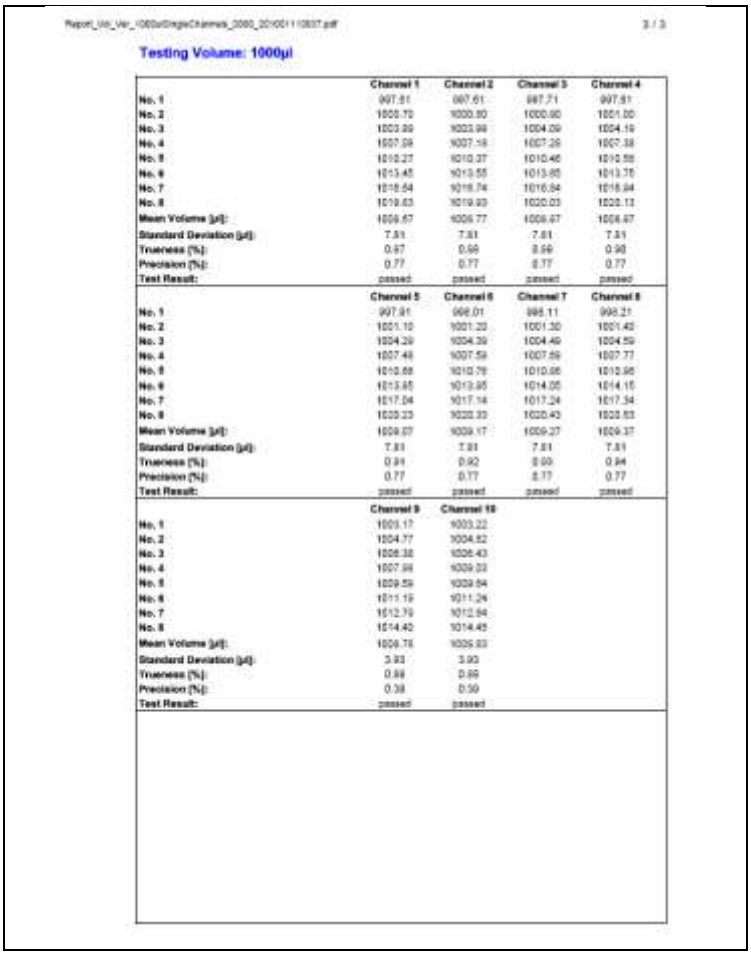
Testing Volume: 10µl

	Channel 1	Channel 2	Channel 3	Channel 4
No. 1	9.81	9.82	9.83	9.84
No. 2	9.89	9.90	9.91	9.92
No. 3	9.97	9.98	9.99	10.00
No. 4	10.05	10.06	10.07	10.09
No. 5	10.13	10.14	10.15	10.16
No. 6	10.21	10.22	10.22	10.23
No. 7	10.28	10.29	10.30	10.31
No. 8	10.36	10.37	10.38	10.39
Mean Volume [µl]:	10.09	10.10	10.11	10.12
Standard Deviation [µl]:	0.19	0.19	0.19	0.19
Trueness [%]:	0.88	0.97	1.07	1.17
Precision [%]:	1.91	1.90	1.90	1.90
Test Result:	passed	passed	passed	passed

	Channel 5	Channel 6	Channel 7	Channel 8
No. 1	9.85	9.86	9.87	9.88
No. 2	9.93	9.94	9.95	9.96
No. 3	10.01	10.02	10.03	10.04
No. 4	10.09	10.10	10.11	10.12
No. 5	10.17	10.18	10.19	10.20
No. 6	10.24	10.25	10.26	10.27
No. 7	10.32	10.33	10.34	10.35
No. 8	10.40	10.41	10.42	10.43
Mean Volume [µl]:	10.13	10.14	10.15	10.16
Standard Deviation [µl]:	0.19	0.19	0.19	0.19
Trueness [%]:	1.27	1.37	1.48	1.58
Precision [%]:	1.90	1.90	1.90	1.89
Test Result:	passed	passed	passed	passed

	Channel 9	Channel 10
No. 1	10.35	10.35
No. 2	10.39	10.40
No. 3	10.43	10.44
No. 4	10.47	10.48
No. 5	10.51	10.53
No. 6	10.56	10.56
No. 7	10.60	10.60
No. 8	10.64	10.64
Mean Volume [µl]:	10.49	10.50
Standard Deviation [µl]:	0.10	0.10
Trueness [%]:	4.94	4.99
Precision [%]:	0.97	0.97
Test Result:	passed	passed

- **Volume Verification Report for 1000µl Pipetting Channels (Page 3 of 3)**



Testing Volume: 1000µl

	Channel 1	Channel 2	Channel 3	Channel 4
No. 1	997.61	997.61	997.71	997.61
No. 2	1000.70	1000.80	1000.90	1001.00
No. 3	1003.89	1003.99	1004.09	1004.19
No. 4	1007.09	1007.19	1007.28	1007.38
No. 5	1010.27	1010.37	1010.46	1010.56
No. 6	1013.45	1013.55	1013.65	1013.75
No. 7	1016.64	1016.74	1016.84	1016.94
No. 8	1019.83	1019.93	1020.03	1020.13
Mean Volume [µl]:	1008.67	1008.77	1008.87	1008.97
Standard Deviation [µl]:	7.81	7.81	7.81	7.81
Trueness [%]:	0.87	0.88	0.88	0.90
Precision [%]:	0.77	0.77	0.77	0.77
Test Result:	passed	passed	passed	passed

	Channel 5	Channel 6	Channel 7	Channel 8
No. 1	997.91	998.01	998.11	998.21
No. 2	1001.10	1001.20	1001.30	1001.40
No. 3	1004.29	1004.39	1004.49	1004.59
No. 4	1007.48	1007.59	1007.68	1007.77
No. 5	1010.68	1010.78	1010.88	1010.98
No. 6	1013.85	1013.95	1014.05	1014.15
No. 7	1017.04	1017.14	1017.24	1017.34
No. 8	1020.23	1020.33	1020.43	1020.53
Mean Volume [µl]:	1009.07	1009.17	1009.27	1009.37
Standard Deviation [µl]:	7.81	7.81	7.81	7.81
Trueness [%]:	0.91	0.92	0.93	0.94
Precision [%]:	0.77	0.77	0.77	0.77
Test Result:	passed	passed	passed	passed

	Channel 9	Channel 10
No. 1	1003.17	1003.22
No. 2	1004.77	1004.82
No. 3	1006.38	1006.43
No. 4	1007.98	1008.03
No. 5	1009.59	1009.64
No. 6	1011.19	1011.24
No. 7	1012.79	1012.84
No. 8	1014.40	1014.45
Mean Volume [µl]:	1008.78	1008.83
Standard Deviation [µl]:	3.93	3.93
Trueness [%]:	0.88	0.88
Precision [%]:	0.38	0.39
Test Result:	passed	passed

- **Volume Verification Report for 1000µl CO-RE 96 Probe Head (Page 1 of 2)**

HAMILTON LIFE SCIENCE ROBOTICS

Volume Verification Report
for 1000 µl CO-RE 96 Probe Head

Instrument Name:	Microlab® STAR	Date:	2010-01-11
Instrument Serial No.:	0000	Time:	09:46
Instrument User Software Version:	4.2.1.4283		
Location:	HAMILTON	Temperature [°C]:	22.0
Operator:	M. Muster	Relative Humidity [%]:	41.0
Reason for Verification:	Installation		
Report File:	Report_Ver_1000µl96erPipHead_0000_20100111 0846.pdf		

Test Equipment:		
Balance Serial No.:	simulatedMettlerpromise	Valid until: 2011-01-01
Calibration Weight:	20g +/- 0.00034 g	Valid until: 2012-01-01
Actual Weight [g]:	20.00012	
Reader Serial No.:	1234	
Reader Checkplate Serial No.	9801	Valid until: 2010-12-10
Ambient Temperature and Humidity Measuring Device Serial No.:	123	Valid until: 2011-01-01
Reagent Kit Lot No.:	1585/1	Valid until: 2010-05-30

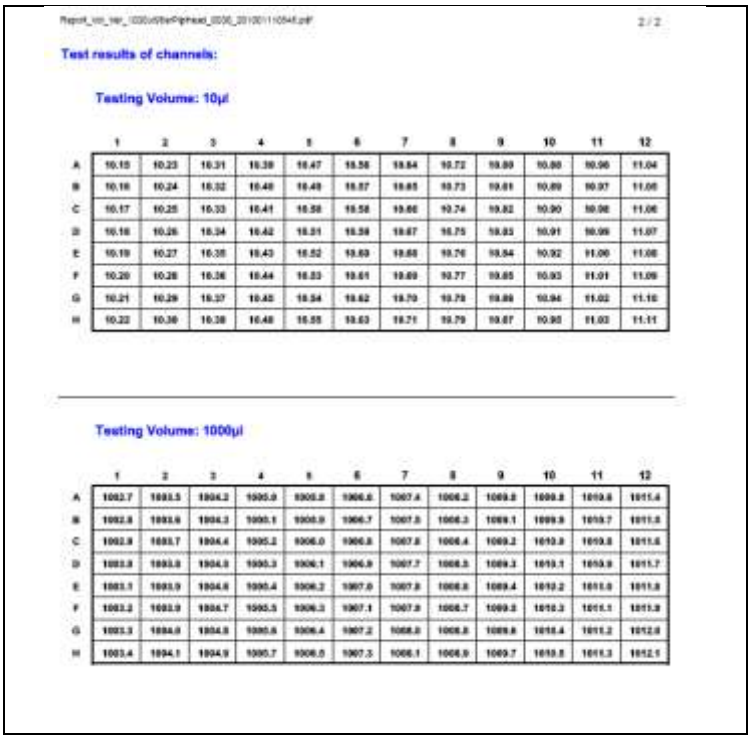
Measurements:		
Testing Volume [µl]:	10	1000
Number of Samples:	96	96
Used Tip Type:	10µl Low Volume Tip	1000µl High Volume Tip
Liquid Density [g/cm3]:	1.0003	1.0002
Mean Volume [µl]:	10.03	1007.4
Standard Deviation [µl]:	0.28	2.6
Trueness (spec.) [%]:	<= +/- 9.00	<= +/- 2.00
Trueness (actual) [%]:	0.32	0.74
Precision (spec.) [%]:	<= 5.00	<= 1.50
Precision (actual) [%]:	2.66	0.26
Minimal value [µl]:	10.15	1002.7
Maximal value [µl]:	11.11	1012.1
Test Result:	passed	passed

Process Status: passed

Summary of channels: passed passed

Operator: _____ Date: _____ Signature: _____

- **Volume Verification Report for 1000µl CO-RE 96 Probe Head (Page 2 of 2)**



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Test results of channels:

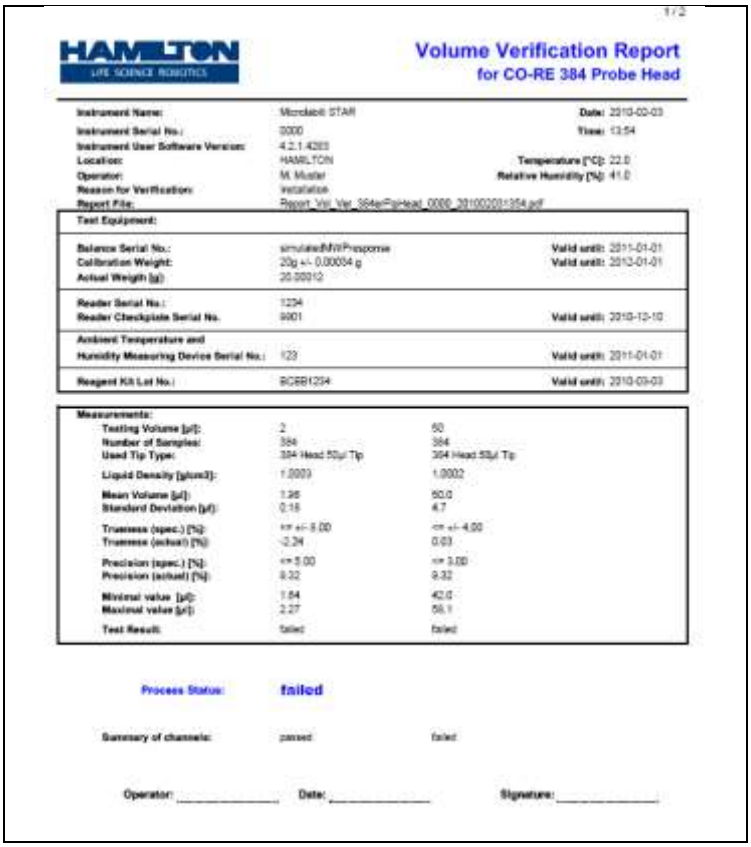
Testing Volume: 10µl

	1	2	3	4	5	6	7	8	9	10	11	12
A	10.15	10.23	10.31	10.39	10.47	10.56	10.64	10.72	10.80	10.88	10.96	11.04
B	10.16	10.24	10.32	10.40	10.48	10.57	10.65	10.73	10.81	10.89	10.97	11.06
C	10.17	10.25	10.33	10.41	10.50	10.58	10.66	10.74	10.82	10.90	10.98	11.06
D	10.18	10.26	10.34	10.42	10.51	10.59	10.67	10.75	10.83	10.91	10.99	11.07
E	10.19	10.27	10.35	10.43	10.52	10.60	10.68	10.76	10.84	10.92	11.00	11.08
F	10.20	10.28	10.36	10.44	10.53	10.61	10.69	10.77	10.85	10.93	11.01	11.09
G	10.21	10.29	10.37	10.45	10.54	10.62	10.70	10.78	10.86	10.94	11.02	11.10
H	10.22	10.30	10.38	10.46	10.55	10.63	10.71	10.79	10.87	10.95	11.03	11.11

Testing Volume: 1000µl

	1	2	3	4	5	6	7	8	9	10	11	12
A	1002.7	1003.5	1004.2	1005.0	1005.8	1006.6	1007.4	1008.2	1009.0	1009.8	1010.6	1011.4
B	1002.8	1003.6	1004.3	1005.1	1005.9	1006.7	1007.5	1008.3	1009.1	1009.9	1010.7	1011.5
C	1002.9	1003.7	1004.4	1005.2	1006.0	1006.8	1007.6	1008.4	1009.2	1010.0	1010.8	1011.6
D	1003.0	1003.8	1004.5	1005.3	1006.1	1006.9	1007.7	1008.5	1009.3	1010.1	1010.9	1011.7
E	1003.1	1003.9	1004.6	1005.4	1006.2	1007.0	1007.8	1008.6	1009.4	1010.2	1011.0	1011.8
F	1003.2	1003.9	1004.7	1005.5	1006.3	1007.1	1007.9	1008.7	1009.5	1010.3	1011.1	1011.9
G	1003.3	1004.0	1004.8	1005.6	1006.4	1007.2	1008.0	1008.8	1009.6	1010.4	1011.2	1012.0
H	1003.4	1004.1	1004.9	1005.7	1006.5	1007.3	1008.1	1008.9	1009.7	1010.5	1011.3	1012.1

- **Volume Verification Report for 50µl CO-RE 384 Probe Head (Page 1 of 2)**



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Volume Verification Report
for CO-RE 384 Probe Head

Instrument Name:	Microlab® STAR	Date: 2010-02-03
Instrument Serial No.:	0000	Time: 13:54
Instrument User Software Version:	4.2.1.4203	
Location:	HAMILTON	Temperature [°C]: 22.0
Operator:	M. Muster	Relative Humidity [%]: 41.0
Reason for Verification:	Installation	
Report File:	Report_Vol_Ver_384erPipHead_0000_20100203t1354.pdf	

Test Equipment:

Balance Serial No.:	simulatedMWPresponse	Valid until: 2011-01-01
Calibration Weight:	20g +/- 0.00004 g	Valid until: 2012-01-01
Actual Weight [g]:	20.00012	
Reader Serial No.:	1234	
Reader Checkplate Serial No.	9901	Valid until: 2010-12-10
Ambient Temperature and Humidity Measuring Device Serial No.:	123	Valid until: 2011-01-01
Reagent Kit Lot No.:	BCBB1234	Valid until: 2010-03-03

Measurements:

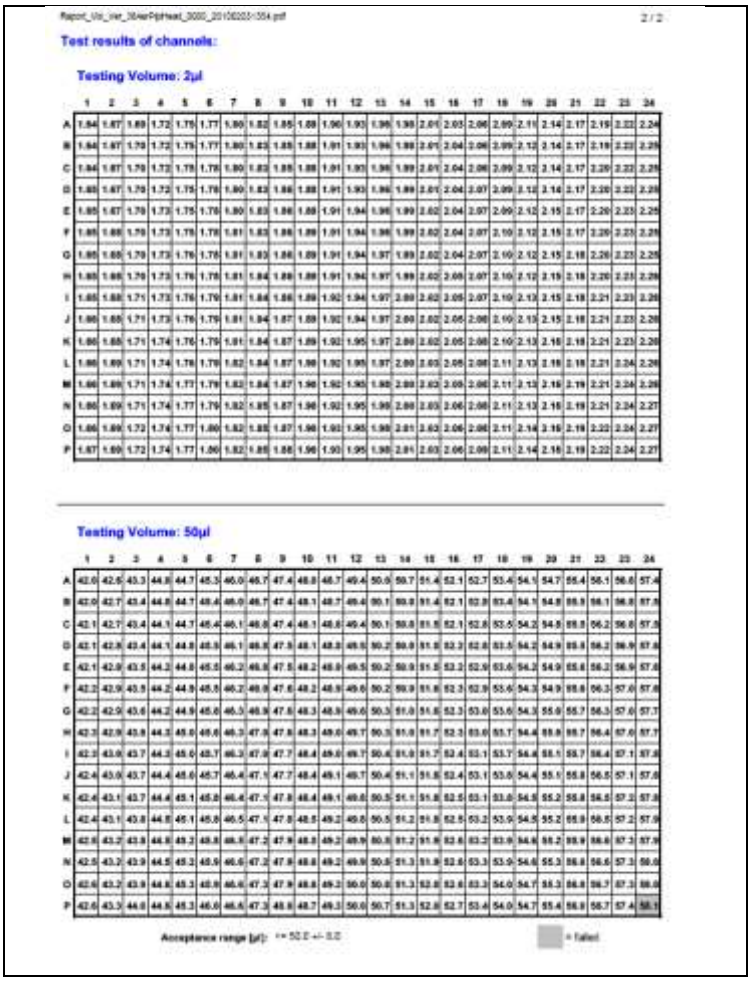
Testing Volume [µl]:	2	50
Number of Samples:	384	384
Used Tip Type:	384 Head 50µl Tip	384 Head 50µl Tip
Liquid Density [µl/cm3]:	1.0003	1.0002
Mean Volume [µl]:	1.96	50.0
Standard Deviation [µl]:	0.16	4.7
Trueness (spec.) [%]:	<= +/- 8.00	<= +/- 4.00
Trueness (actual) [%]:	-2.24	0.03
Precision (spec.) [%]:	<= 5.00	<= 3.00
Precision (actual) [%]:	8.32	9.32
Minimal value [µl]:	1.64	42.0
Maximal value [µl]:	2.27	58.1
Test Result:	failed	failed

Process Status: **failed**

Summary of channels: passed failed

Operator: _____ Date: _____ Signature: _____

- **Volume Verification Report for 50µl CO-RE 384 Probe Head (Page 2 of 2)**



Test results of channels:

Testing Volume: 2µl

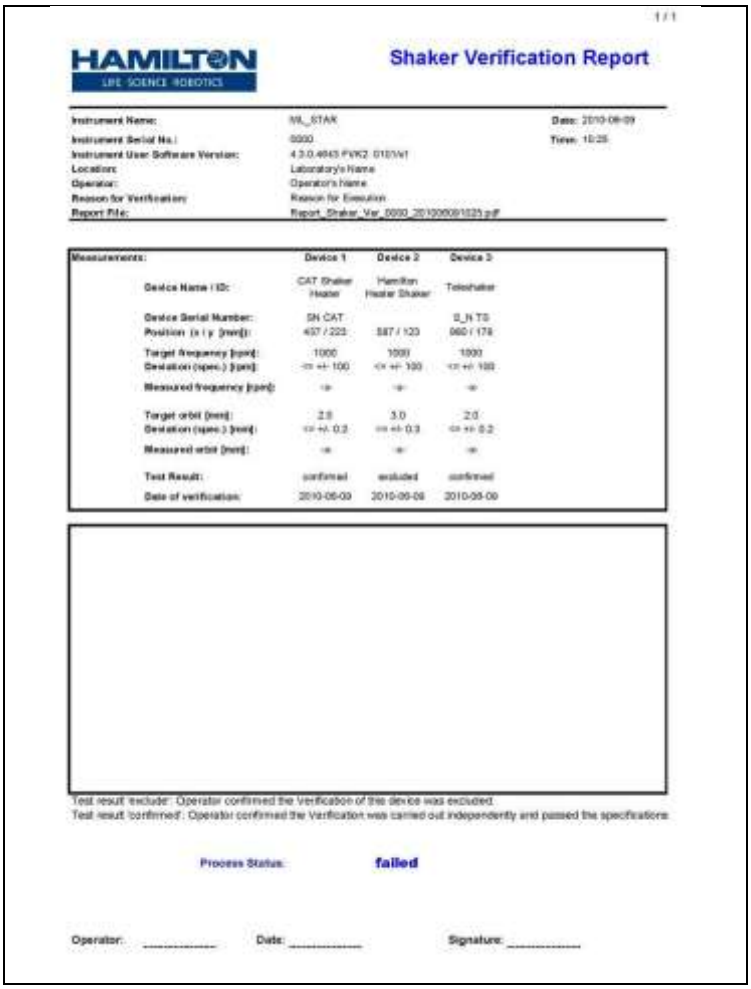
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
A	1.64	1.67	1.69	1.72	1.75	1.77	1.80	1.82	1.85	1.88	1.90	1.93	1.96	1.98	2.01	2.03	2.06	2.09	2.11	2.14	2.17	2.19	2.22	2.24
B	1.64	1.67	1.70	1.72	1.75	1.77	1.80	1.83	1.85	1.88	1.91	1.93	1.96	1.99	2.01	2.04	2.06	2.09	2.12	2.14	2.17	2.19	2.22	2.25
C	1.64	1.67	1.70	1.72	1.75	1.78	1.80	1.83	1.85	1.88	1.91	1.93	1.96	1.99	2.01	2.04	2.06	2.09	2.12	2.14	2.17	2.20	2.22	2.25
D	1.65	1.67	1.70	1.72	1.75	1.78	1.80	1.83	1.86	1.88	1.91	1.93	1.96	1.99	2.01	2.04	2.07	2.09	2.12	2.14	2.17	2.20	2.22	2.25
E	1.65	1.67	1.70	1.73	1.75	1.78	1.80	1.83	1.86	1.89	1.91	1.94	1.96	1.99	2.02	2.04	2.07	2.09	2.12	2.15	2.17	2.20	2.23	2.25
F	1.65	1.68	1.70	1.73	1.76	1.78	1.81	1.83	1.86	1.89	1.91	1.94	1.96	1.99	2.02	2.04	2.07	2.10	2.12	2.15	2.17	2.20	2.23	2.25
G	1.65	1.68	1.70	1.73	1.76	1.78	1.81	1.83	1.86	1.89	1.91	1.94	1.97	1.99	2.02	2.04	2.07	2.10	2.12	2.15	2.18	2.20	2.23	2.25
H	1.65	1.68	1.70	1.73	1.76	1.78	1.81	1.84	1.86	1.89	1.91	1.94	1.97	1.99	2.02	2.05	2.07	2.10	2.12	2.15	2.18	2.20	2.23	2.26
I	1.65	1.68	1.71	1.73	1.76	1.79	1.81	1.84	1.86	1.89	1.92	1.94	1.97	2.00	2.02	2.05	2.07	2.10	2.13	2.15	2.18	2.21	2.23	2.26
J	1.66	1.68	1.71	1.73	1.76	1.79	1.81	1.84	1.87	1.89	1.92	1.94	1.97	2.00	2.02	2.05	2.08	2.10	2.13	2.15	2.18	2.21	2.23	2.26
K	1.66	1.68	1.71	1.74	1.76	1.79	1.81	1.84	1.87	1.89	1.92	1.95	1.97	2.00	2.02	2.05	2.08	2.10	2.13	2.16	2.18	2.21	2.23	2.26
L	1.66	1.69	1.71	1.74	1.76	1.79	1.82	1.84	1.87	1.90	1.92	1.95	1.97	2.00	2.03	2.05	2.08	2.11	2.13	2.16	2.18	2.21	2.24	2.26
M	1.66	1.69	1.71	1.74	1.77	1.79	1.82	1.84	1.87	1.90	1.92	1.95	1.98	2.00	2.03	2.05	2.08	2.11	2.13	2.16	2.19	2.21	2.24	2.26
N	1.66	1.69	1.71	1.74	1.77	1.79	1.82	1.85	1.87	1.90	1.92	1.95	1.98	2.00	2.03	2.06	2.08	2.11	2.13	2.16	2.19	2.21	2.24	2.27
O	1.66	1.69	1.72	1.74	1.77	1.80	1.82	1.85	1.87	1.90	1.93	1.95	1.98	2.01	2.03	2.06	2.08	2.11	2.14	2.16	2.19	2.22	2.24	2.27
P	1.67	1.69	1.72	1.74	1.77	1.80	1.82	1.85	1.88	1.90	1.93	1.95	1.98	2.01	2.03	2.06	2.09	2.11	2.14	2.16	2.19	2.22	2.24	2.27

Testing Volume: 50µl

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
A	42.0	42.5	43.3	44.0	44.7	45.3	46.0	46.7	47.4	48.0	48.7	49.4	50.0	50.7	51.4	52.1	52.7	53.4	54.1	54.7	55.4	56.1	56.8	57.4
B	42.0	42.7	43.4	44.0	44.7	45.4	46.0	46.7	47.4	48.1	48.7	49.4	50.1	50.8	51.4	52.1	52.8	53.4	54.1	54.8	55.5	56.1	56.8	57.5
C	42.1	42.7	43.4	44.1	44.7	45.4	46.1	46.8	47.4	48.1	48.8	49.4	50.1	50.8	51.5	52.1	52.8	53.5	54.2	54.8	55.5	56.2	56.8	57.5
D	42.1	42.8	43.4	44.1	44.8	45.5	46.1	46.8	47.5	48.1	48.8	49.5	50.2	50.8	51.5	52.2	52.8	53.5	54.2	54.9	55.5	56.2	56.9	57.5
E	42.1	42.9	43.5	44.2	44.8	45.5	46.2	46.8	47.5	48.2	48.9	49.5	50.2	50.9	51.5	52.2	52.9	53.6	54.2	54.9	55.6	56.2	56.9	57.6
F	42.2	42.9	43.5	44.2	44.9	45.5	46.2	46.9	47.6	48.2	48.9	49.6	50.2	50.9	51.6	52.3	52.9	53.6	54.3	54.9	55.6	56.3	57.0	57.6
G	42.2	42.9	43.6	44.2	44.9	45.6	46.3	46.9	47.6	48.3	48.9	49.6	50.3	51.0	51.6	52.3	53.0	53.6	54.3	55.0	55.7	56.3	57.0	57.7
H	42.3	42.9	43.6	44.3	45.0	45.6	46.3	47.0	47.6	48.3	49.0	49.7	50.3	51.0	51.7	52.3	53.0	53.7	54.4	55.0	55.7	56.4	57.0	57.7
I	42.3	43.0	43.7	44.3	45.0	45.7	46.3	47.0	47.7	48.4	49.0	49.7	50.4	51.0	51.7	52.4	53.1	53.7	54.4	55.1	55.7	56.4	57.1	57.8
J	42.4	43.0	43.7	44.4	45.0	45.7	46.4	47.1	47.7	48.4	49.1	49.7	50.4	51.1	51.8	52.4	53.1	53.8	54.4	55.1	55.8	56.5	57.1	57.8
K	42.4	43.1	43.7	44.4	45.1	45.8	46.4	47.1	47.8	48.4	49.1	49.8	50.5	51.1	51.8	52.5	53.1	53.8	54.5	55.2	55.8	56.5	57.2	57.8
L	42.4	43.1	43.8	44.5	45.1	45.8	46.5	47.1	47.8	48.5	49.2	49.8	50.5	51.2	51.8	52.5	53.2	53.9	54.5	55.2	55.9	56.5	57.2	57.9
M	42.5	43.2	43.8	44.5	45.2	45.8	46.5	47.2	47.9	48.5	49.2	49.9	50.5	51.2	51.9	52.6	53.2	53.9	54.6	55.2	55.9	56.6	57.3	57.9
N	42.5	43.2	43.9	44.5	45.2	45.9	46.6	47.2	47.9	48.6	49.2	49.9	50.6	51.3	51.9	52.6	53.3	53.9	54.6	55.3	56.0	56.6	57.3	58.0
O	42.6	43.2	43.9	44.6	45.3	45.9	46.6	47.3	47.9	48.6	49.2	50.0	50.6	51.3	52.0	52.6	53.3	54.0	54.7	55.3	56.0	56.7	57.3	58.0
P	42.6	43.3	44.0	44.6	45.3	46.0	46.6	47.3	48.0	48.7	49.3	50.0	50.7	51.3	52.0	52.7	53.4	54.0	54.7	55.4	56.0	56.7	57.4	58.1

Acceptance range [µl]: +- 52.0 +- 0.2 = failed

- **Shaker Verification Report**



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HAMILTON
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Shaker Verification Report

Instrument Name:	ML_STAR	Date: 2010-06-09
Instrument Serial No.:	0000	Time: 10:25
Instrument User Software Version:	4.3.0.4845 FW2 010\Vd	
Location:	Laboratory's Name	
Operator:	Operator's Name	
Reason for Verification:	Reason for Execution	
Report File:	Report_Shaker_Ver_0000_20100609 1025.pdf	

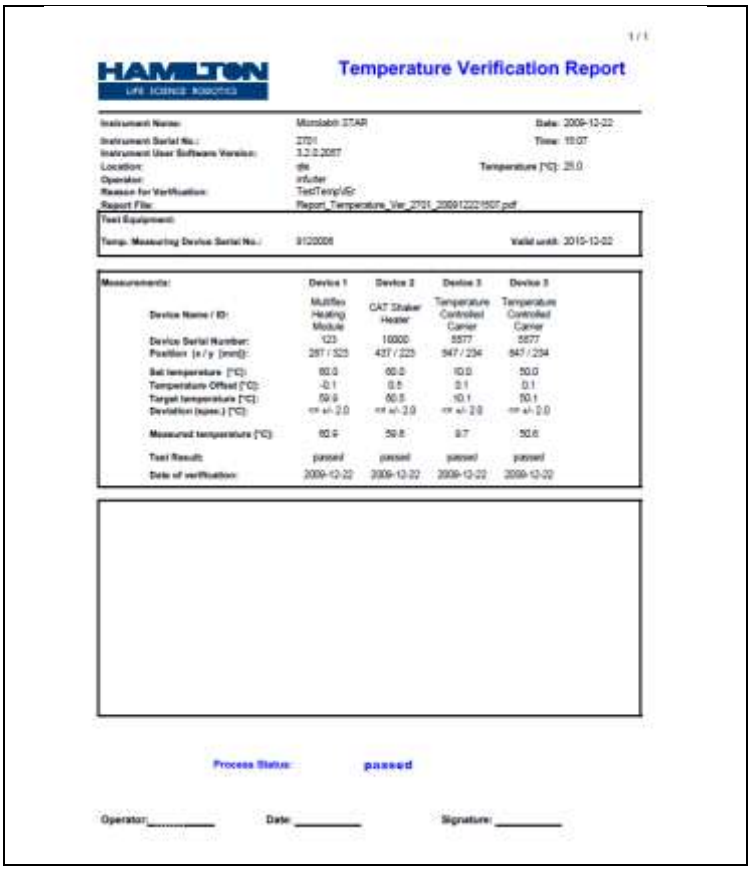
Measurements:	Device 1	Device 2	Device 3
Device Name / ID:	CAT Shaker Heater	Hamilton Heater Shaker	Teleshaker
Device Serial Number:	SN CAT		S_N TS
Position (x / y [mm]):	437 / 223	587 / 123	960 / 178
Target frequency [rpm]:	1000	1000	1000
Deviation (spec.) [rpm]:	<= +/- 100	<= +/- 100	<= +/- 100
Measured frequency [rpm]:	-	-	-
Target orbit [mm]:	2.0	3.0	2.0
Deviation (spec.) [mm]:	<= +/- 0.2	<= +/- 0.3	<= +/- 0.2
Measured orbit [mm]:	-	-	-
Test Result:	confirmed	excluded	confirmed
Date of verification:	2010-06-09	2010-06-09	2010-06-09

Test result 'exclude': Operator confirmed the Verification of this device was excluded.
Test result 'confirmed': Operator confirmed the Verification was carried out independently and passed the specifications.

Process Status: **failed**

Operator: _____ Date: _____ Signature: _____

- **Temperature Verification Report**



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HAMILTON
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Temperature Verification Report

Instrument Name:	Microlab STAR		Date: 2009-12-22
Instrument Serial No.:	2701		Time: 15:07
Instrument User Software Version:	3.2.0.2087		
Location:	ghi		Temperature [°C]: 25.0
Operator:	infuser		
Reason for Verification:	TestTemp\dGr		
Report File:	Report_Temperature_Ver_2701_20091222 1507.pdf		

Test Equipment:

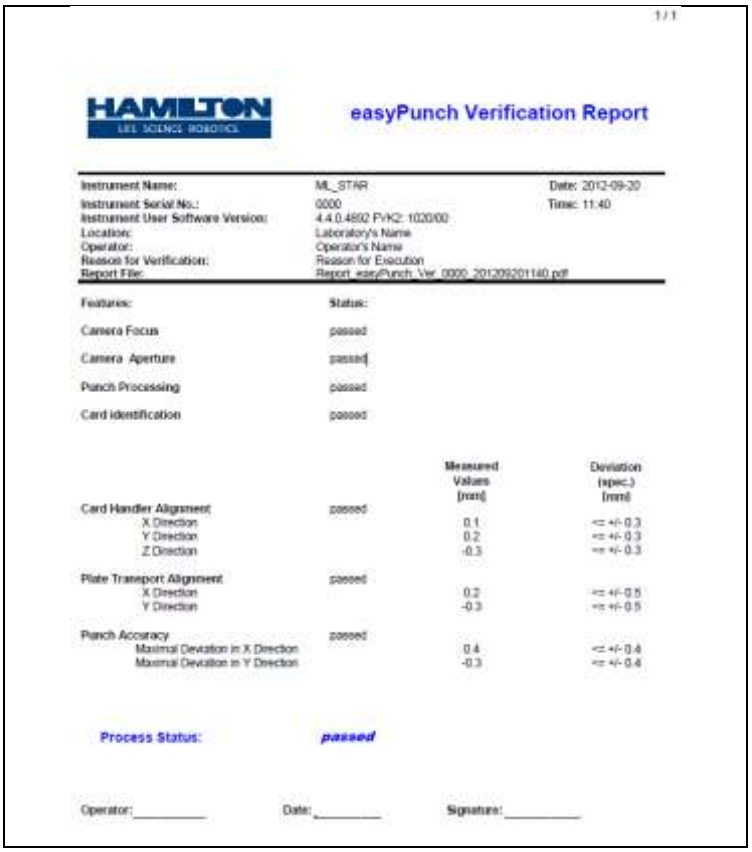
Temp. Measuring Device Serial No.:	9120008	Valid until: 2010-12-02

Measurements:	Device 1	Device 2	Device 3	Device 4
Device Name / ID:	MultiFlex Heating Module	CAT Shaker Heater	Temperature Controlled Carrier	Temperature Controlled Carrier
Device Serial Number:	123	10000	5577	5577
Position (x / y [mm]):	287 / 323	437 / 223	947 / 234	947 / 234
Set temperature [°C]:	60.0	60.0	10.0	50.0
Temperature Offset [°C]:	-0.1	0.5	0.1	0.1
Target temperature [°C]:	59.9	60.5	10.1	50.1
Deviation (spec.) [°C]:	<= +/- 2.0	<= +/- 2.0	<= +/- 2.0	<= +/- 2.0
Measured temperature [°C]:	60.6	59.8	9.7	50.6
Test Result:	passed	passed	passed	passed
Date of verification:	2009-12-22	2009-12-22	2009-12-22	2009-12-22

Process Status: **passed**

Operator: _____ Date: _____ Signature: _____

- **easyPunch Verification Report**



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HAMILTON LIFE SCIENCE ROBOTICS

easyPunch Verification Report

Instrument Name:	ML_STAR	Date: 2012-09-20
Instrument Serial No.:	0000	Time: 11:40
Instrument User Software Version:	4.4.0.4892 FVK2: 1020/00	
Location:	Laboratory's Name	
Operator:	Operator's Name	
Reason for Verification:	Reason for Execution	
Report File:	Report_easyPunch_Ver_0000_20120920114[illegible].pdf	

Features:	Status:	Measured Values [mm]	Deviation (spec.) [mm]
Camera Focus	passed		
Camera Aperture	passed		
Punch Processing	passed		
Card identification	passed		
Card Handler Alignment	passed		
X Direction		0.1	<= +/- 0.3
Y Direction		0.2	<= +/- 0.3
Z Direction		-0.3	<= +/- 0.3
Plate Traneport Alignment	passed		
X Direction		0.2	<= +/- 0.5
Y Direction		-0.3	<= +/- 0.5
Punch Accuracy	passed		
Maximal Deviation in X Direction		0.4	<= +/- 0.4
Maximal Deviation in Y Direction		-0.3	<= +/- 0.4

Process Status: ***passed***

Operator:_____ Date:_____ Signature:_____

7 Troubleshooting

Error	Possible Causes	Corrective Action
Verification Failed	Verification liquid too cold / too hot	• Wait until the equipment and the liquid is up to or down to room temperature
	Wrong liquid	• Use only the correct HAMILTON Verification Solution
	Windshield not mounted	• Mount the Windshield
	Conditions are not stable enough	• Close doors, windows • Allow the Balance and the Microlab® STARLine Instrument to equilibrate to room temperature for at least ½ hour
	Reader Mis-adjusted by handling	• Run the Reader Check Plate
Failed Volume Verification of Single Channels	Not enough liquid in the Vial	• Fill the Vial correctly
	Wrong liquid used	• Use only the correct HAMILTON Verification Solution
	Soiled Reagent Container	• Clean Reagent Container
Failed Volume Verification of Multi-Probe Heads	Microtiter Plate not correct placed on the balance	• Place the Microtiter Plate on the Balance correctly
	Microtiter Plate soiled	• Clean the Microtiter Plate
	Fingerprints on the bottom of the Microtiter Plate	• Clean the Microtiter Plate • Use care when handling the Microtiter Plate
	Wrong Microtiter Plate	• Use only Microtiter Plates out of the Field Verification 2
	Plate Bar in the Photometer	• Check if the Plate Bar is necessary or not
	Soiled Reagent Container	• Clean the Reagent Container with deionized water

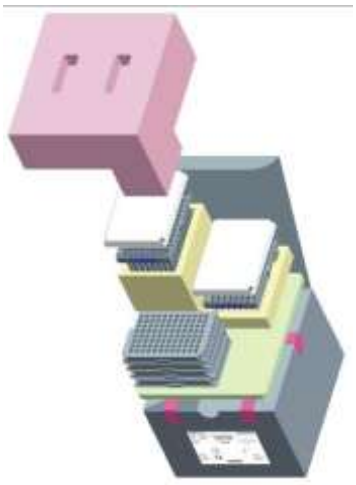
Error	Possible Causes	Corrective Action
Failed Volume Verification of CO-RE 384-Probe Head	Failed to rotate the 384 Microtiter Plate 180° on the Reader384 after the first read	• Rotate the 384 Microtiter Plate on the Reader384 after the first read for the second read
No communication to the Balance	Wrong / Disconnected Power Supply	• Check for the correct Power Supply • Check for the Power Supply connections to the Balance and the Mains Power
	Wrong / Disconnected Communication Cable	• Check the Communication Cable • Set the COM Port Manually
Balance Calibration Failed	Soiled Calibration Weight	• Clean the Calibration Weight with a lint free tissue
Crash on the Balance	Wrong position of the Balance	• Correct the position
No communication with the Reader	Wrong / Disconnected Power Supply	• Check for the correct Power Supply • Check for the Power Supply connections to the Reader and the Mains Power
	Wrong / Disconnect Communication Cable	• Check the Communication Cable • Use the USB Port on the rear of the PC
Reader Check Failed	Soiled Reader Check Plate	• Clean the Reader Check Plate (Refer to the *Maintenance after Performing the Field Verification 2 Section 4.15, Step 4.a.*)
No communication with the IR Sensor Measurement Tool	No USB Driver	• Disconnect, then reconnect the USB Cable to the computer for activation of the USB Driver
	Defective Cable	• Check the USB Connection • Check the IR Sensor Measurement Tool by connecting it to another computer for proper operation
No communication with the Heater Shaker	Wrong COM-Port	• Set the correct COM-Port
	Wrong Node set to the Heater Shaker	• Set the correct Node

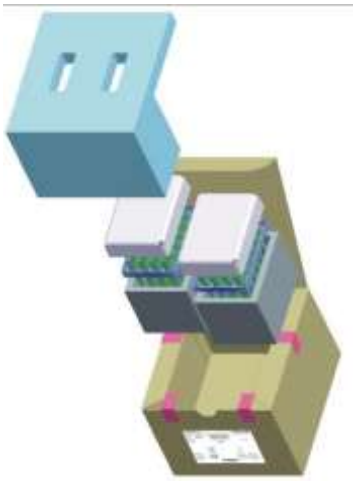
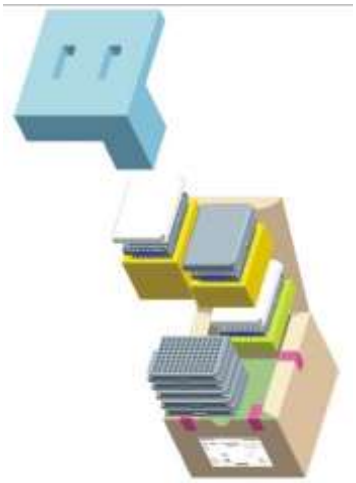
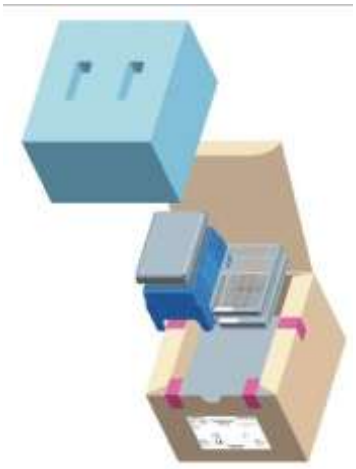
Error	Possible Causes	Corrective Action
Incorrect Result for a Heater Device	IR Sensor Measurement Tool not mounted properly on the Heater Device	• Correct the positioning of the IR Sensor Measurement Tool
Failed Temperature Verification	Soiled Lens on the IR Sensor Measurement Tool	• Clean the Lens of the IR Sensor Measurement Tool (Refer to the *Maintenance after Performing the Field Verification 2 Section 4.15, Step 4.b.*)
	Surface of the Shaker is too reflective	• No Black Tape on the measuring surface for the IR Sensor Measurement Tool • Use the Black Tape
Failed Shaker Verification	Soiled Teaching Needle No/weak cLLD Signal	• Clean the Teaching Needle • Clean the Shaker Verification Tool

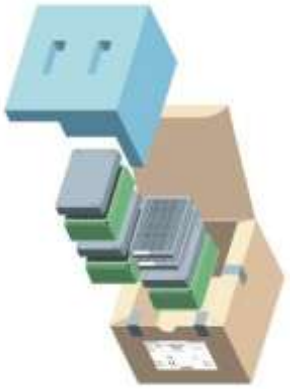
If there are problems concerning the Microlab® STARLine Instrument, refer to the Microlab® STARLine Manuals.

8 Ordering Information

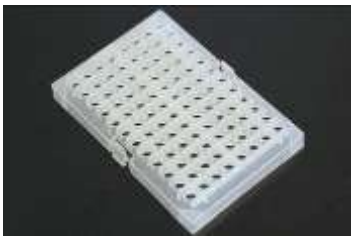
8.1 Field Verification 2

Part Number	Description	Image
199040	Field Verification 2 (with Balance, with Reader384)	
199044	Field Verification 2 (no Balance, with Reader384)	
199030	HAMILTON Verification Solutions	
199231	Consumable Kit 1 – Single Channel – 1000µl	

Part Number	Description	Image
199232	Consumable Kit 2 – Single Channel – 5ml	
199233	Reserved	
199234	Consumable Kit 4 – 96 Head	
199235	Consumable Kit 5 – 384 Head	

Part Number	Description	Image
199248	Consumable Kit 6 – 384 Head – Clear Tips	
199320	Hamilton Plates & Solutions Kit	
199411	Consumable Kit 8 – easyPunch (containing Verification Cards and Deep Well Microplate)	

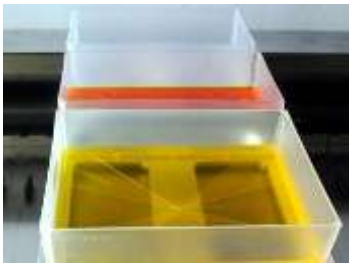
8.2 Field Verification 2 Replacement Parts Listing

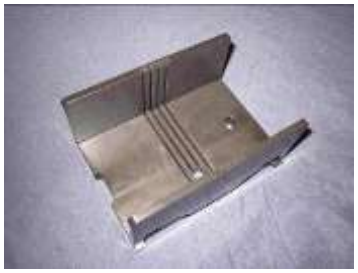
Part Number	Description	Image
173192	Tip Rack 300µl (Empty)	
173238	Platform Ring	
182176	Teaching Needle 300µl (requires 4)	
184141	Tip Rack 5ml (Empty)	
184184	Teaching Needle 5ml (requires 2)	
185270	Barcode Verification Carrier	

Part Number	Description	Image
189115	Reader384	
189116	Reader Check Plate	
189118	Plate Bar for Reader384	
190059	Pyramids	
190073	Measuring Vial Weighing Platform	
190920	Mettler Balance WXS	

Part Number	Description	Image
191291	Teaching Needle 384 (requires 1)	
191451	Tip Rack 384 Tips (Empty)	
198189	Shaker Verification Measurement Tool	
199025	FV2 Empty Case	
199247 Adapter Frame 396017 IR Sensor	IR Sensor Measurement Tool	

Part Number	Description	Image
199330	Windshield for the 9ml Glass Measuring Vial	
199349	9ml Glass Measuring Vial	
199360	Microtiter Plate Weighing Platform	
235062	Power Cable (Great Britain) 2.0M (Ordered separately)	
239008	Forceps (for handling the Calibration Weight)	
281473	Calibration Weight (20g)	

Part Number	Description	Image
281863	Reagent Containers 1x (3 containers are required to perform the Field Verification 2)	
355008	Power Cable (Swiss) 1.5M (included with the Field Verification 2)	
355009	Power Cable (USA) 2.5M (Ordered separately)	
355010	Power Cable (Germany, France, Italy) 2.5M (Ordered separately)	
355090	RS232 9F/9M 2.0M D-Sub	

Part Number	Description	Image
355171	Cable USB Type 2.0 A-B 3M Ferrite for Reader384	
396169	Power Supply Mettler Balance SAG285 Note: The Power Supply is now available as Auto-Switching with the same Part Number	
396231	Ambient Temperature and Humidity Measurement Tool	
803063	easyPunch Camera Adjustment Tool (part of instrument, stored in tool box)	
803170	easyPunch Verification Card Magazine (Part of Instrument, stored in Tool Box)	
911143	Field Verification 2 Software	

Part Number	Description	Image
7281941	Black Tape (1 Roll)	

9 Glossary

Term	Definition
1000µl Pipetting Channel	A Pipetting Channel with a 1000µl Head for aspirating and dispensing up to a 1000µl volume of liquid.
5ml Pipetting Channel	A Pipetting Channel with a 5ml Head for aspirating and dispensing up to a 5ml volume of liquid.
Abort	The action to immediately stop the operation of an Instrument or function.
Acceptance Range	The values which are to be considered acceptable.
Accuracy	A quality which characterizes the closeness of an indicated value of a measuring Instrument to the corresponding true value.
Acrobat Reader	Software used to open and display PDF Files.
Actual Temperature	The physical temperature of a device.
Adjustment	Detailed positional setting for the hardware.
Administration Rights	The specific permission needed by a user to carry out a certain function with the Microlab® STAR Software.
Alignment	The condition of being in satisfactory adjustment and having the parts in proper relative position.
Ambient Temperature	The room temperature surrounding a device.
Amplitude	Defined as the distance from the center of the shaking movement and it is 50% of the peak to peak distance.
Analysis	The process of breaking a complex topic or substance into smaller parts to gain a better understanding.
Aspirate	Aspirate is the activity of sucking up liquid by a pipetting device.
Assigned Sites	Deck locations which are designated to a particular device.
Autoload	Autoload is an assembly enabling automatic loading and identification of Carriers onto the Microlab® STAR.
Autoload Tray	Hardware unit. On it the Carriers can be placed and held outside the Microlab® STAR. The Loading Tray is attached to the Microlab® STAR, to support the automatic loading and unloading process.
Axygen	A company which manufacturers laboratory consumables.
Axygen Tips	A type of Disposable Tip.

Term	Definition
Balance	A device used to measure weight.
Balance Calibration	The setting of a balance with a Calibration Weight of a known weight.
Balance Carrier	The Carrier which hold the Balance on the Deck.
Balance Plate	A Plate placed on the top of the Balance Weighing Platform for positioning the Vial.
Barcode Reader	Component of the Autoload Unit.
Barcode Verification	A procedure to check the capability of the Autoload Barcode Reading in the Field Verification 2 process.
Barcode Verification Carrier	A special Carrier with Barcodes attached for checking the function of the Barcode Reader.
Calibration	All operations for the purpose of determining the values of a deviation from a theoretical axis.
Calibration Date	A date which indicates when a device was last calibrated.
Calibration Requirements	The interval for performing calibration on a device.
Calibration Weight	A weight used to check/adjust the Balance.
CAN Bus	Controller Area Network Bus.
Capacitance LLD Function	The method used to detect Liquids by monitoring a signals change because of a change in its capacitance circuit.
Carrier	A Carrier is a template describing a discrete number of positions for locating Labware items such as Racks or Containers. A Aarrier is the only Labware item that can be placed directly on the Deck.
Carrier Site	A location on the Deck where a Carrier is designated to be placed.
Case	The Container used to contain the Field Verification 2 materials.
CAT Shaker Heater	A combined Heater and Shaker Device.
CD	See Compact Disk.
Centering Carrier	A special Carrier used to fix the position of the Balance on the Deck.
Channel	See Pipetting Channel.
Clear Tips	Tips that are made of transparent plastic.

Term	Definition
cLLD Signal	The signal used to detect capacitive Liquid Level Detection.
Coefficient of Variation	A normalized measure of dispersion of a probability distribution. It is defined as the ratio of the standard deviation to the mean.
COM	Communication.
COM Interface	Communication Interface.
COM Port	Communication Port.
Communication Cable	Cable used to interconnect devices to provide communication between them.
Communication Interface	A place for connecting the Communication Cable.
Communication Port	A place for connecting the Communication Cable.
Compact Disk	Used to deliver software and other files for use on a computer.
Consumable Kit	A kit that contains items that are used up during a procedure.
Consumables	Items which are used up during a procedure.
Container	A Container is a vessel for holding fluid, including tubes, microwells, reagent containers, etc.
Container Identification	Barcode for identification of containers. Serves for unambiguous identification of the vessel, e.g. a sample test tube.
Cooling Device	A device that can make a lower temperature than the environmental temperature.
Cooling Module	A module which contains Cooling Devices.
CO-RE	Compression induced O-ring Expansion.
CO-RE 384-Probe Head	The CO-RE 384-Probe Head is a high-throughput dispenser built with the same technology as a Microlab® STAR Pipetting Channel. The CO-RE 384-Probe Head has 384 individual 30µl or 50µl plungers, driven by one common motor for simultaneous aspiration and dispensing. The 384 Channels are not independent and always work simultaneously. 384 O-Rings are squeezed simultaneously to pick-up and release special 384 Head Tips or a set of Steel Needles hands-free. The Head is not able to detect the tip type; and there is no tip presence detection available. cLLD (capacitive Liquid Level Detection) is available on two individual channels (A1 and P24).

Term	Definition
CO-RE 96-Probe Head	The CO-RE 96-Probe Head is a high-throughput dispenser built with the same technology as a Microlab® STAR Pipetting Channel. The CO-RE 96-Probe Head has 96 individual 300µl or 1000µl plungers, driven by one common motor for simultaneous aspirating and dispensing. The 96 Channels are not independent and always work simultaneously. 96 O-Rings are squeezed simultaneously to pick-up and to release standard or low-volume tips hands-free. The Head is not able to detect the tip type; and there is no tip presence detection available. cLLD (capacitive Liquid Level Detection) is available on two special Channels (A6 and H7 or A1 and H12).
Corrective Action	Steps taken which are necessary to resolve a problem.
Cover	The cover shelters the whole Microlab® STAR, leaving user access for loading and unloading of the racks onto their respective carriers. All activities must be suspended before the cover is opened. The cover should always be closed while the Microlab® STAR is in use.
Cover Lock	A device that fixes a Cover into position.
Cover Monitoring	Continuous checking of the Cover to confirm it is in the closed position.
Cover Safety Verification	A procedure to check the Cover Sensor and the Cover Lock
Cover Sensor	A device that senses if the Cover is closed.
CV	See Coefficient of Variation.
Deck	The Deck is the physical work surface used by the Microlab® STAR. It includes discrete bounded sites for locating carriers.
Deck Layout	The organization of the different devices on the Deck of the Microlab® STAR Instrument.
Deck Positions	The Deck's physical work surface is divided into Positions or Slots to accommodate the different Labware.
Decontamination	Action to eliminate potentially harmful bacteria or viruses from the surfaces of a device.
Deep Well Plate	A Microtiter Plate which has deep wells and can contain over 1ml of fluid.
Devices	Mechanical, electromechanical, or electronic components which are designed to perform a specific function. Also known as Labware.

Term	Definition
Dip Switch	A small switch used to make a selection for an electronic component.
Dispense	To distribute quantities of liquid from a pipetting device.
DWP	See Deep Well Plate (Microtiter Plate).
Dynatech Laboratories	A company which manufacturers laboratory consumables.
easyPunch	A Hamilton device on the Microlab® STAR to handle and provide photographical analyses a punch card and punch a defined area into a Microtiter Plate.
Editor	A software package which can be used to change the information contained in a file.
Emissivity	The intensity of infrared radiation, which is emitted by each body, depends on the temperature as well as on the radiation features of the surface material of the measuring object. The Emissivity is used as a material constant factor to describe the ability of the body to emit infrared energy. A “blackbody” is the ideal radiation source with an emissivity of 1.0 whereas a mirror shows an emissivity of 0.1. The actual emissivity of a material depends on the following factors: • Temperature • Measuring angle • Geometry of the surface • Thickness of the material • Constitution of the surface (polished, oxidized, rough, sandblast) • Spectral range of the measurement • Transmissivity (e.g. with thin films)
Environmental Conditions	The conditions on the outside of an instrument or a device which can affect how an instrument or a device functions, such as: Temperature Humidity Atmospheric Pressure
Expiration Date	A date defined by the manufacturer for when a product should no longer be used.
External Calibration	The action of using an external tool to set the calibration of a device.
External Calibration Weight	A weight which has a specific measurement that is used to calibrate a Balance.

Term	Definition
Field Verification 2	A tool used to perform verification steps for the Microlab® STARLine Instruments.
Field Verification 2 Solutions	Solutions of different colors which are mixed during the verification process to determine the accuracy and precision of a pipetting device.
Frequency	The Frequency of Revolution is measured in revolutions per minute [rpm], which counts the amount of rotation around the center.
Front Cover	The user access for loading and unloading of the racks onto their respective carriers. All activities must be suspended before the cover is opened. The cover should always be closed while the Microlab® STAR is in use.
Gel Card Incubator	Microlab® STAR device to store Gel Cards at 37°C.
Gel Card Incubator	Microlab® STAR device to store gel cards at 37°C.
Glass Measuring Vial	A container used on a Balance to contain a liquid to be measured.
Glass Measuring Vial Weighing Platform	Part of a Balance where a container can be placed during measurement.
GLP	Good Laboratory Practice.
Good Laboratory Practices	Established guidelines which should be followed when working in a laboratory environment.
Heater Device	A device that can make a higher temperature than the environmental temperature.
Heating Module	A module which contains Heating Devices.
HHS	HAMILTON Heater Shaker
HSL	HAMILTON Standard Language.
HSLShakerVariomag	The name of the Hamilton Shaker Variomag Teleshake Library.
Humidity	The amount of water vapor in the air.
Humidity Measurement Tool	A means of measuring the relative humidity percentage in an environment.
Infrared Radiation	The electromagnetic radiation with a wavelength between 0.7 and 300 micrometers, which equates to a frequency range between approximately 1 and 430 Terahertz.
Installation	The act of preparing a device to be used.

Term	Definition
Instrument	Hardware of the Microlab® STAR (Mechanics, Electronics, and Firmware).
Instrument Configuration	Information about the available components on the Microlab® STAR Instrument which are stored on the EEPROM of the Master or Dual Processor PCB. If components are added or removed from the instrument, the Instrument Configuration must be updated by the Service Engineer.
Intended Use	The anticipated application of a product or device for the consumer.
IQ	Installation Qualification
IR Sensor	A sensor which can detect in the very high spectrum of visible light.
IR Sensor Correction	A value used to offset the reading based on the emissivity of a surface.
IR Sensor Measurement Tool	The IR Sensor is a non-contact Infrared Temperature (IR) Sensor. It calculates the surface temperature based on the emitted infrared energy of objects (Emissivity).
IR Sensor Measurement Tool Driver	A software utility used to interface the IR Sensor Measurement Tool to a computer.
Kalibrier Datum	The German equivalent of Calibration Date.
Labware	Refers to movable items to be placed on the Microlab® STAR Deck, such as Carriers, Containers, or Racks.
Labware Properties	Variables which are associated to a Labware Device.
Liquid	Includes all kinds of liquids, among which are included reagents, controls, standards.
Liquid Level Detection	Detection of liquid surface which may be achieved either by pressure or capacitive signal detection.
LLD	Liquid Level Detection.
Loading, unloading	The process by which carriers are brought onto the work surface of the Microlab® STAR. This happens automatically by means of the Autoload unit.
Locking Mechanism	A device which secures a closure so that it cannot be opened.
Mains Power	The power provided from a wall outlet.
Maintenance	See Preventive Maintenance.

Term	Definition
Material Safety Data Sheet	A form containing data regarding the properties of a particular substance. An important component of product stewardship and workplace safety, it is intended to provide workers and emergency personnel with procedures for handling or working a substance in a safe manner, and includes information such as physical data, toxicity, health effects, first aid, reactivity, storage, disposal, protective equipment and spill handling procedures.
Measured Temperature	A temperature which is measured by an external measuring device.
Measurement Vial	A container used on a Balance to contain a liquid to be measure.
Methods	The method contains all instructions as to how the content of the source vessels is to be processed. The assignment of the vessels to positions happens "virtually", however, in the Deck Layout Definition.
Mettler Balance WXS	A type of balance used to measure weight.
Mettler Toledo	A manufacturer of weight measurement devices.
MFX_CoolingModule	The name of the MultiFlex Cooling Module Library.
MFX_HeatingModule	The name of the MultiFlex Heating Module Library.
Microlab	A registered product name for HAMILTON Bonaduz company.
Microlab® STAR	The Microlab® STAR Instrument with X-Arm, Deck, Autoload and optional extensions such as iSWAP, Washing Station, and Temperature Controlled Carrier. The number of Channels may vary from 1 up to 16.
Microlab® STAR Software	User software which controls the Microlab® STAR instrument.
Microtiter Plate	The terms ‘Microplate’ and ‘Microtiter Plate (MTP)’ mean the same and are also referred to simply as ‘plate’. A flat plate with multiple ‘wells’ in a fixed pattern used as small test tubes.
Microtiter Plate Weighing Platform	Part of a Balance where a Microtiter Plate can be placed during measurement.
ML STAR	An abbreviated name for the Microlab® STAR product line of instruments.

Term	Definition
ML STAR Verification Reference Data CD	Contains information including Part Number, Serial Number and Expiration Date about the Reader Check Plate which is used to verify proper operation of the Reader384.
Module Address	Used to electronically identify a module.
MSDS	See Material Safety Data Sheet.
MTP	See Microtiter Plate.
MultiFlex Cooling Module	A device used to cool Microtiter Plates to achieve a specific chemical or biological reaction.
MultiFlex Heating Module	A device used to heat Microtiter Plates to achieve a specific chemical or biological reaction.
Multi-Probe Head	A electro/mechanical device which has multiple pipetting devices which function together, i.e. CO-RE 96-Probe Head or CO-RE 384-Probe Head.
Needle	A small metal shaft which is hollow used with a syringe to aspirate and dispense liquids.
Node	Used along the CAN Bus system to identify a device with a specific address.
OD	See Optical Density.
Offset	The amount by which one value is out of alignment with another.
Optical Density	The resulting measurement of absorption of a specific wavelength of light passing through a substance.
Orbit	(Rotation Distance) Defined as the peak to peak distance in one direction, e.g. distance between position in the Y-Direction of the Plate or Shaker Verification Tool, measured in millimeter [mm].
P/N	See Part Number
Packaging List	A listing of items that will be included in a package.
Part Number	The number assigned to an item or device.
Pause	Interruption of processing. The current processing steps are completed. The processing can be continued.
PC	Personal Computer
PDF	Postscript Data File.

Term	Definition
PDFcamp Printer Pro Application	A software application which can produce PDF Files.
Photometer	A device using light at a fixed wave-length through a liquid to measure the amount of absorption of that light.
Pipetting	Transfer of liquids from one container to another.
Pipetting Arm	Assembly consisting of Pipetting Channels, as well as the common X-drive and Arm housing.
Pipetting Channel	A hardware component of the X-Arm used to position the Pipetting Head in the Y and Z Directions for aspiration and dispensing of liquids.
Pipetting Head	Pipetting device on the Pipetting Channel.
Plate	See Microtiter Plate.
Plate Bar	A separate hardware device needed on the Reader384 when reading 96 well Microtiter Plates.
Platform Ring	A Plate placed on the top of the Balance Weighing Platform for positioning the 9ml Glass Measuring Vial.
PM	See Preventive Maintenance.
Port	See COM Port.
Position Verification	A procedure that is performed for all pipetting devices that utilizes the Capacitance LLD Function to verify if the pipetting devices are correctly adjusted in the X-Y-Z Directions.
Positions	Equally divided locations (slots) on the Deck.
Power Cable	A cable which connects the device to a Mains Power outlet.
Power Supply	An electronic device which is used to convert Mains Power to provide appropriate voltages for other electronic devices.
Power Supply Adapter	Usually a small external device which converts Mains Power to an output voltage for use in an electronic device.
Power Supply Mettler Balance SAG285	An external power source which converts Mains Power to an output voltage for the Mettler Balance SAG285.
Power Supply Mettler Balance WXS	An external power source which converts Mains Power to an output voltage for the Mettler Balance WXS.
Power Supply Reader384	An external power source which converts Mains Power to an output voltage for the Reader384.

Term	Definition
Precision	The ability of a measurement to be reproduced consistently.
Pre-Defined Deck Layouts	A pre-determined configuration for a Labware on the Microlab® STAR Instrument.
Preventive Maintenance	The care and servicing by personnel for the purpose of maintaining equipment, performed specifically to prevent faults from occurring.
Rack	A rack is a template describing a discrete number of positions for the containment of containers or tips. Examples of racks include a Tube Rack, a Microtiter Plate, a Microtiter Strip, a Deep-Well Plate, and Tip Racks.
Rack Identification	Barcode for Rack Identification.
Rack Labware Name	A specific name format for a Labware Device.
Range	The difference between the highest and lowest value in a set of values.
Reader Check Plate	A special plate with gradient mirrors for light absorption used to check the operation of the Reader384.
Reader384	A device used to measure the optical density at a specific light wavelength of a substance specifically in a 96 well or 384 well Microtiter Plates.
Reagent Carrier	A Labware Devices used to contain Reagent Containers.
Reagent Container	A plastic container used to contain Reagents for pipetting.
Re-Calibration Requirements	See Calibration Requirements.
RS232	Standard of serial communication between electronic devices.
SAG285 Mettler Balance	A type of balance manufactured by Mettler Toledo.
Serial Number	A number assigned to a part or device.
Set Temperature	A designated temperature setting.
SH10	A type of Shaker Heater device.
Shaker	A mechanical device used to shake (mix) the contents of a Microtiter Plate.
Shaker Verification	A procedure that checks the operation of each Shaker Device for the Field Verification 2.
Shaker Verification Tool	A tool used to help measure the operation of a Shaker during Shaker Verification.

Term	Definition
Site	A Deck location which can be designated to a particular device.
Slot	Also referred to as Tracks, the equal divisions of the Deck where labware is placed onto the Deck.
Specifications	An explicit set or requirement to be satisfied by a material, produce or service.
Standard Deviation	A measure of how varied the values are around a mean value.
STAR	Sequential Transfer and Aliquoting Robot.
STARLine Instrument	A group of instruments manufactured by HAMILTON Bonaduz based on a single principle.
Starstedt	A company which manufacturers laboratory consumables.
Surface Temperature	The temperature measured at the surface of a device.
Tacceptance	The temperature value which is defined as the acceptable value for the temperature tolerance.
Target Temperature	The temperature value a device is suppose to reach.
Tbd	To Be Determined
TCC	See Temperature Controlled Carrier
Tdeviation	The temperature measured value relative to the target temperature.
Teaching Needle	A metal CO-RE needle used for alignment of the Pipetting Devices.
Temperature Controlled Carrier	A device which can cool and heat up to four Microtiter Plates.
Temperature Offset	A value used to correct a reading to compensate for external environmental conditions.
Temperature Setting	An adjustment of a control device to make a defined temperature.
Temperature Verification	A procedure that is performed for all temperature controlled devices in the Field Verification 2 process.
Testo	A manufacturer of test equipment.
Thermo Tape	A black thermal conductive tape used during temperature measurement of a device which has a shiny surface.
Tip	Disposable plastic Tip for aspriating and dispensing.

Term	Definition
Tip Carrier	Labware that holds Disposable Tips on the Deck.
Tip Plate Carrier	Labware that holds Disposable Tips and Microtiter Plates on the Deck.
Tip Rack	Frame that holds tips together; used to store a set of tips for access by pipetting channel.
Tmeasured	The Measured Temperature value with a device specific emissivity factor of 1 [°C].
Track	Also referred to as Slots, the equal divisions of the Deck where labware is placed onto the Deck.
Trueness	Refer to Coefficient of Variation.
Ttarget	The Target Temperature of a device.
Tube	A tube is a narrow container for liquid, usually showing a circular cross-section, and a cylindrical length-section.
User	The user actually operating the Microlab® STAR instrument and the Microlab® STAR software.
Variomag Teleshake	A device used to shake Microtiter Plates to perform mixing.
Variomag Thermoshake	A device used to shake Microtiter Plates to perform mixing with the addition of incubation.
VENUS Software	A user software package provided by HAMILTON Bonaduz to operate the Microlab® STARLine Instruments.
Verification Procedure	A set of steps to perform during the Field Verification 2.
Volume Verification	A procedure to check the pipetting performance with colorimetric or volumetric measurements of the Pipetting Channels or Multi-Probe Heads during the Field Verification 2 process.
Waste Container	The Waste Container is a device on the to collect used Disposable Tips.
Waste Station	An opening in the Deck to direct used Disposable Tips via a plastic chute into a laboratory-supplied Waste Container below the working area.
Windshield	A shield which surrounds the Glass Measuring Vial on the Balance to prevent air current inteference from the environment.
WXS Mettler Balance	A type of balance manufactured by Mettler Toledo.
Zertifikats-Nr	The German equivalent of Certificate Number.

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