

# ChipCHECK

**ONLY BY GASTOPS**

## ChipCHECK Model CC120 User Information Manual (Operator Manual)



**LONG LIVE EQUIPMENT**



**Head Office**  
1011 Polytek Street  
Ottawa ON K1J 9J3  
Canada

**Halifax Office**  
65 John Savage Avenue, Unit 5  
Dartmouth NS B3B 2C9  
Canada

**St. John's Office**  
146a Glencoe Drive  
Mount Pearl NL A1N 4S9  
Canada

Worldwide  
**+1 613 744 3530**  
North America  
**1 800 363 8658**

[gastops.com](http://gastops.com)

ChipCHECK® (P/N: B166500) IS ONLY INTENDED TO BE OPERATED BY THE USER IN ACCORDANCE WITH THE PRODUCT'S INSTRUCTIONS AS OUTLINED IN THIS MANUAL AND NOT IN ANY MANNER THAT EXCEEDS THE PRODUCT'S SPECIFICATIONS. THE USER SHALL INDEMNIFY AND HOLD HARMLESS GASTOPS, LTD., INCLUDING ITS DIRECTORS, OFFICERS, EMPLOYEES AND CONTRACTORS AND THOSE OF ITS SUBSIDIARIES (COLLECTIVELY "GASTOPS") FROM AND AGAINST ANY AND ALL LIABILITY INCLUDING WITHOUT LIMITATION, ALL COSTS, EXPENSES, LIABILITIES, CLAIMS, DAMAGES, PROFITS, REASONABLE LEGAL FEES AND OTHER AMOUNTS INCURRED BY THE USER ON ACCOUNT OF INJURIES, INCLUDING DEATH, TO ANY PERSON, OR DAMAGE TO PROPERTY TO THE EXTENT CAUSED BY FAULT OR NEGLIGENCE OF THE USER IN CONNECTION WITH ANY USE OF THE PRODUCT. IN NO EVENT SHALL GASTOPS BE LIABLE TO THE USER OR ANY THIRD PARTY FOR ANY SPECIAL, CONSEQUENTIAL, INCIDENTAL, EXEMPLARY, OR INDIRECT COSTS OR DAMAGES, INCLUDING WITHOUT LIMITATION LITIGATION COSTS, LOSS OF DATA OR SERVICES, LOSS OF PROPERTY OR ASSOCIATED EQUIPMENT, COST OF CAPITAL, FACILITIES OR REPLACEMENT POWER, LOSS OF PROFIT OR REVENUE OR ANY OTHER COMMERCIAL OR ECONOMIC LOSS OF ANY KIND (INCLUDING WITHOUT LIMITATION BUSINESS INTERRUPTION, DOWN TIME OR LOSS OF BUSINESS) ARISING FROM ANY CAUSE WHATSOEVER, REGARDLESS OF THE FORM OF ACTION, INCLUDING WITHOUT LIMITATION IN TORT (INCLUDING NEGLIGENCE), STRICT LIABILITY OR OTHERWISE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH COSTS OR DAMAGES OR SAME WERE REASONABLY FORESEEABLE.

## **Notices:**

This ChipCHECK Model CC120 User information Manual ("Manual") contains general safety and operating information applicable to the ChipCHECK CC120 general-purpose analytical laboratory equipment. The information in this Manual is provided for reference purposes only and is not designed to replace or limit appropriate or common sense safety measures applicable to work performed by user or personnel. The information contained in this Manual is subject to change at any time without notice. The ChipCHECK CC120 general-purpose analytical laboratory equipment may be used to enhance existing OEM prescribed maintenance procedures, however, any changes to existing OEM prescribed maintenance procedures involving the use of this equipment must be undertaken solely at the discretion of the User.

Gastops, Ltd. shall have neither liability nor responsibility to any person or entity with respect to any direct or indirect loss or damage arising from use of the equipment or any defect in the equipment that Gastops, Ltd. cannot predict in advance. Gastops disclaims any and all liability for damage or injury which might result from the use of the information obtained from a ChipCHECK unit, and nothing resulting or obtained from a ChipCHECK analysis shall constitute a guarantee, warranty on representation by Gastops with respect to the accuracy of the information, the sample, product or item described, or its suitability for use for any specific purpose.

The equipment is protected by a standard limited 12 month warranty against faulty manufacturing of goods, subject to that no modifications have been made to the equipment. This warranty will not cover misuse or misadventure by the User. Users are reminded that the general-purpose analytical laboratory equipment employs a technique that while suitable for many alloy samples may not work for all. Gastops, Ltd. takes no responsibility for unsuccessful use or application of the equipment.

This publication may contain or reference information and products protected by intellectual property rights and does not convey any license to Gastops, Ltd. intellectual property or proprietary rights, nor the rights of others.

Gastops, Ltd. has taken the utmost care in the preparation of this document, however, Gastops, Ltd. makes no representations that this document is complete, accurate or error-free. Except as specifically set forth in its terms and conditions of sale, Gastops, Ltd. makes no warranty of any kind with regard to this document, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Gastops, Ltd. shall not be liable for incidental, consequential or indirect damages in connection with furnishing, performance or use of this Manual.

## **Copyright Information**

This document contains proprietary information and is protected by copyright. All rights reserved. No part of the Manual may be reproduced or transmitted in any form whatsoever, or translated into any language without the prior written permission or consent of Gastops, Ltd.

Copyrights © 2017 by Gastops, Ltd. All rights reserved. Printed in Canada

## Trademarks

Registered names, trademarks, etc. used in this document, even when not specifically marked as such, are protected by law.

**ChipCHECK** is a registered trademark of Gastops, Ltd.

**Gastops** is a registered trademark of Gastops, Ltd.

All other trademarks are the property of the respective owners.

## Software

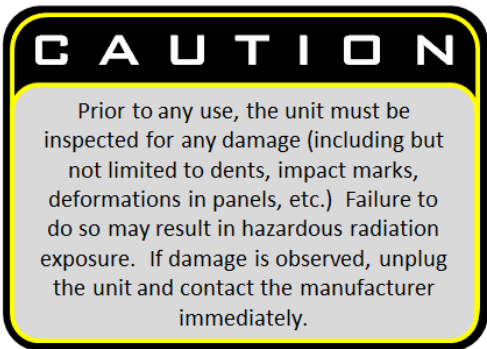
By using the software (and its components) installed on this ChipCHECK (the “Software”), you hereby agree and accept the standard terms and conditions of the Gastops software license agreement (the “License”) available at [www.gastops.com](http://www.gastops.com). Please note that additional terms and conditions of third party licensors of components of the Software may be applicable to the use of the Software, as amended from time by such licensors.

Subject to the terms and condition of this License, you are granted a limited, personal, non-transferable, and non-exclusive right to install, run and use one copy of the Software on this ChipCHECK, but only if you comply with all the terms of the License agreement. Our License is permanently assigned to this ChipCHECK. The Software and it's components are licensed as a single unit.

In particular, this License does not give you any right to, and you are strictly prohibited to: (a) use or virtualize features of the Software separately, publish, copy, rent, lease, make available or lend the Software; (b) attempt to circumvent technical protection measures in the Software, reverse engineer, decompile, or disassemble the Software; (c) separate or virtualize the components and install them on different computers or equipment; and/or (d) transfer, translate or convert the Software to another unauthorized equipment.

Please refer to the additional Terms and Conditions of the standard Gastops software license agreement available at [www.gastops.com](http://www.gastops.com).

ChipCHECK Specifications



ChipCHECK Model Number  
Gastops Part Number

CC120  
B166500

**Laser Data**

Product Laser Classification  
Wavelength  
Laser Power/Peak Power  
Pulse Energy

Class 1  
1064nm  
12mW/ 600kW  
1.2mj  
Pulsed

**Input Power Requirements**

Voltage  
Power  
Live Fuse  
Neutral Fuse

100-240 VAC, 50-60 Hz  
100W  
T3.15AH250V  
T3.15AH250V

**Operating Conditions**

Minimum temperature  
Maximum temperature  
Humidity

60°F (15°C)  
86°F (30°C)  
0 to 80% non-condensing

**Physical Dimensions**

Total Weight  
Approximate Dimensions

40 lbs (18 kg) approx..  
14" Height (360mm)  
14" Width (360mm)  
18" Depth (470mm)

**Performance Specifications**

(for default unit configuration only)

Area

For particles sized  $\leq 0.04 \text{ mm}^2$  :  $\pm 20\%$   
For particles sized  $> 0.04 \text{ mm}^2$  :  $\pm 10\%$

Alloy Classification

$\geq 97\%$  for M50 and M50NiL

*(applies only for units configured with the Default Material Library and are subject to the Material Analysis Cautions defined below):*

$\geq 95\%$  for all other alloys included in the default library

Default Material Library:

M50 Steel  
M50 NiL Steel  
1010 Carbon Steel  
17-4PH Stainless Steel  
300 Series Stainless Steel (316, 321, 347)  
400 Series Stainless Steel (416, 410)  
52100/4130 Alloy Steel  
9310/4340 Alloy Steel  
A286 Stainless Steel  
Aluminum 2024  
Aluminum 6061  
Aluminum 7075  
Brass  
Copper  
Inconel (Ni)  
Silver  
Titanium 6Al-2Sn-4Zr-6Mo  
Titanium 6Al-4V

### Normal Environmental Conditions

This equipment is designed to be safe under the following conditions:

- a) Indoor Use;
- b) Altitude up to zoom;
- c) Temperature 5°C to 40°C;
- d) Maximum relative humidity 80% for temperature up to 31°C decreasing linearly to 50% relative humidity at 40°C
- e) Mains supply voltage fluctuated up to the levels of overvoltage category II;
- f) Temporary overvoltage occurring on the mains supply;
- g) Applicable pollution degree of the intended environment (pollution degree 2 in most cases).

 **CAUTION** – USE OF CONTROLS OR ADJUSTMENTS OR PERFORMANCE OF PROCEDURES OTHER THAN THOSE SPECIFIED HEREIN MAY RESULT IN HAZARDOUS RADIATION EXPOSURE.

### FCC Compliance Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential, commercial or industrial installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help. Strict compliance with the safety procedures described in this Manual and using extreme caution when using the equipment are essential for avoiding and reducing the possibility of personal injury or damage to the equipment, and to ensure proper functioning of the equipment.

### CE Compliance Statement

This equipment has been tested and found to comply with the CE Certification requirements for use in a typical laboratory environment as detailed in document C009729.

### Safety and Operation

Read the following safety instructions carefully before operating the equipment and keep this Manual for further reference available at all times. Always observe the instructions described in this Manual to ensure User safety and to avoid property damage. Improper use or failure to follow these safety instructions can result in serious injuries and/or property damage, or incorrect performance of the equipment. Any non-observance use of the equipment as set out in the Manual will affect the correct performance of the equipment. The sole intended use of this equipment is as a general-purpose analytical laboratory equipment for industrial machinery and equipment and no other use is intended for this equipment. In no event will Gastops, Ltd. assume any liability regarding any of the above occurrences.

It is the User's duty to plan and implement all necessary safety measures and to supervise their observance. No person shall operate the equipment without the proper training and instructions as

recommended by Gastops, Ltd. Moreover, the User must ensure that the equipment is in proper functioning condition. A safe and faultless operation can only be ensured if the equipment is properly transported, stored, installed, operated and maintained according to the procedures described in this Manual.

Refer to section 7.1 for safety instructions regarding the transport and shipment of the unit.

When operating or maintaining the unit do not use a detachable mains supply chord with a rating less than 10A.

### **Maintenance of Performance**

The performance of the equipment is dependent upon the compliance with the Gastops' defined requirements set out in this Manual. In order to maintain optimum performance of the unit all Gastops defined requirement shall be complied to, including:

- The equipment shall be continuously operated, maintained and serviced in accordance with the defined requirements as set out in this Manual ("Gastops Defined Requirements").
- In order to constitute a valid analysis, all related activity must be performed in accordance with the Gastops Defined Requirements, including:
  - Sample Preparation;
  - Standardization; and
  - Calibration.
- Gastops in-service support package is maintained throughout the life of the equipment.

### **Material Analysis Cautions**

The equipment is configured by Gastops with a finite set of material alloys in the ChipCHECK Material Library as delivered to the user/operator. Its intended use is to only analyze alloy particles of such alloy materials as included in the configured Material Library that comply with the alloy specifications used in the Training Set of the original equipment configuration. The intended use of the ChipCHECK equipment does not include the analysis of other alloy materials which are not included in the as delivered Material Library. Particles not compliant to the equipment's Training Set alloy specifications, or whose analysis does not comply with a valid analysis, shall be considered to fall outside of the intended use of this equipment.

It is the sole responsibility of the user/operator to notify Gastops of the requirement to include additional alloy materials that are not within the as delivered Material Library. Any additional alloy materials must be installed and configured by Gastops to ensure the performance pedigree of the equipment.

The alloy classification performance of the ChipCHECK equipment is directly related to the Training Set and Material Library used to configure the ChipCHECK unit. The specific alloy classification performance



shall be in accordance with the Technical Product Specification document released for the given application and library.

Any resulting classification output from the equipment should be interpreted as nearest matches. It may be that a ChipCHECK unit can give a clear indication that the machinery or equipment should not be operated, however, this does not necessarily mean that in the absence of such cautionary indications, that flight operations are safe/airworthy or that the machinery being tested is safe for use.

Analyzed wear debris are reported by ChipCHECK by their size and alloy classification (ex: M50) or base element (ex: Fe). Any analyzed wear debris that could not be classified by ChipCHECK is reported as "Unclassified". Note that a classification result of base element or unclassification does not necessarily constitute that the sample is in absence of the materials included the configured Material Library. A base element or unclassified result may also result from inadequate spectra collected from particles, which can be minimized by following the cautions and procedures as outlined herein.

### **General Notes on the Manual**

- Each user should be provided a copy of this manual for convenient reference.
- Each user must read this manual thoroughly before using the equipment.
- The purpose of the Manual is not to warrant that the product is well suited to any particular purpose but rather to describe the functional details and operation of the equipment.
- If you have any questions, or you find mistakes or omissions in the Manual, please contact our Gastops Customer support (see Section 8.0) or your local distributor.

## Table of Contents

	page
1.0 Introduction .....	1
1.1 Definitions.....	2
2.0 Health and Safety.....	4
2.1 Operational Safety .....	4
2.2 Safety Features.....	5
2.2.1 Safety Labels .....	6
2.2.2 Interlocks .....	8
3.0 Hardware Description.....	10
3.1 Basic Overview.....	10
3.2 Indicators.....	12
3.3 Mechanical Setup .....	12
4.0 Operation.....	14
4.1 Standardization .....	14
4.2 Calibration .....	15
4.3 Sample Preparation .....	16
4.4 Sample Patch Loading – Insertion into the ChipCHECK Unit .....	18
4.5 Running an Analysis .....	21
4.6 Sample Reports .....	25
4.7 System Shutdown .....	28
5.0 Software Interface .....	30
5.1 Welcome Screen .....	31
5.2 Options Screen.....	32
5.3 Standardization Screen .....	34
5.4 Calibration Screen .....	35
5.5 Analysis Screen.....	36
5.6 Reports Screen (Results Viewer) .....	36
5.7 Data Exports Screen .....	37
5.8 Copy to USB Screen .....	38
6.0 Maintenance & Service.....	42
6.1 Allowable User Maintenance .....	42
6.1.1 Replacement of the Containment Window.....	43
6.1.2 Cleaning the Containment Window.....	44
6.1.3 Replacing the Fuse .....	45
6.2 Unit Service (No Allowable Service) .....	46
6.3 Basic Trouble-Shooting .....	47
7.0 Transport/Shipping and Storage.....	50
7.1 Transport/Shipping.....	50
7.2 Storage .....	53
8.0 Customer Support.....	54

## List of Figures

Figure 1-1: ChipCHECK System .....	1
Figure 2-1: Location of all ChipCHECK Safety Features .....	6
Figure 2-2: Explanatory Label (1) – Not Found On Unit .....	6
Figure 2-3: Explanatory, Manufacturer's Identification, and Certification Label (2) .....	7
Figure 2-4: Protective Housing, Non-Interlocked Label (3).....	7
Figure 2-5: Laser ChipCHECK Label Placement Schematic .....	8
Figure 2-6: Sample Access Panel Interlock (Location) .....	9
Figure 3-1: ChipCHECK Equipment Interfaces (Transport Case & Accessories Not Shown) .....	10
Figure 3-2: Unit Status Indicator Lights .....	12
Figure 4-1: Chip Analysis Process .....	14
Figure 4-2: Sample Patch Liner Removal .....	17
Figure 4-3: Sample Loading – Sample Receptacle Ejected and Sample Access Panel Open .....	19
Figure 4-4: Sample Tray Removal from Equipment.....	19
Figure 4-5: Placement of Sample Patch onto Sample Tray .....	20
Figure 4-6: Sample Loading – Insertion of Chip Sample Tray into Equipment .....	20
Figure 4-7: Chip Analysis Screen.....	21
Figure 4-8: Chip Analysis Data Entry Screen .....	22
Figure 4-9: Chip Analysis Screen – Chip Analysis Running.....	23
Figure 4-10: Chip Analysis Screen – Chip Analysis Complete .....	24
Figure 4-11: Reports Viewer Access .....	26
Figure 4-12: Reports Viewer Screen – Last Analysis .....	27
Figure 4-13: Reports Viewer Screen –Search & Filter.....	28
Figure 4-14: ChipCHECK Power Button .....	29
Figure 4-15: ChipCHECK Power Down – Remove the Sample Tray.....	29
Figure 5-1: Generic Screen Layout.....	30
Figure 5-2: Welcome Screen.....	31
Figure 5-3: Options Screen .....	32
Figure 5-4: Confirm Skip Standardization Screen.....	33
Figure 5-5: Standardization Screen.....	34
Figure 5-6: Calibration Screen.....	35
Figure 5-7: Analysis Screen .....	36
Figure 5-8: Data Exports Screen .....	37
Figure 5-9: ChipCHECK USB Port Location.....	39
Figure 5-10: Copy to USB Screen.....	40
Figure 5-11: Copy to USB Screen: Delete Files .....	41
Figure 6-1: Containment Window Location.....	43
Figure 6-2: Maintenance – Holder Receptacle Position (Left) Containment Window Assembly (Right)...	44
Figure 6-3: Power Entry Module and Main Power Switch.....	46
Figure 7-1: ChipCHECK Transport Case .....	50
Figure 7-2: ChipCHECK Transport Case Interior .....	50
Figure 7-3: Transport Case Storage Locations (Foam insert removed).....	52

Figure 7-4: Foam Insert Storage Locations .....52

List of Tables

Table 6-1: Basic Trouble-Shooting Procedures .....47

## 1.0 Introduction

Gastops has developed the ChipCHECK CC120, a field deployable general-purpose analytical laboratory tool, as a means of addressing many long outstanding issues regarding maintenance of machinery and equipment in a number of markets and industries. ChipCHECK employs innovative material identification laser spectroscopy coupled with digital imaging technology to provide at-line equipment condition assessment through the analysis of wear debris.

Typical industry practices determine the condition of a given piece of equipment based on the metallic content found in the oil – referred to as wear debris. This practice often relies on visual inspection or laboratory analysis of the wear debris extracted from the engine. As a result, maintenance decisions are either subjective, not reliable or require a long turnaround time. ChipCHECK may reduce the impact of all of these issues. The ChipCHECK CC120 unit has the capacity to automatically determine the size, shape and alloy type of the individual particles found in the wear debris sample; therefore providing quick, reliable and conclusive machinery and equipment health information to the user or operator.

This is the User Information Manual (**Operator Manual**), which describes the functional details and operation of the ChipCHECK equipment in full detail.



Figure 1-1: ChipCHECK System

## 1.1 Definitions

### Ablation

Ablation is the process used by ChipCHECK to classify a given particle or sample. In the application of ChipCHECK, ablation is the process of irradiating a sample with a high energy focused laser to convert a finite amount into a hot plasma. This ablation process consumes a volume of material approximately equal to 50 µm in diameter by 0.1 to 0.3 µm deep. The light emitted from this hot plasma is collected and analyzed in order to determine the type and amounts of elements present within the sample.

### Alloy Classification

Alloy classification is the automated ChipCHECK process that determines a specific alloy type or grouping for a given sample. A resulting alloy classification can be one of three types, and are subject to the Material Analysis Cautions defined at the beginning of this document:

- 1) Classified – The resulting ChipCHECK classification for a given particle was correctly classified (e.g. the analysis of an M50 particle results in an M50 classification).
- 2) Unclassified – The resulting ChipCHECK classification for a given particle did not result in a specific classification (i.e. the displayed result is “unclassified”). This occurs if the particle under test is of an alloy that was not part of the unit’s training set, if the particle is contaminated or if the particle is of a certain nature that did not produce an adequate ablation.
- 3) Misclassified – The resulting ChipCHECK classification for a given particle was for a different alloy type within the material library but does not correspond with the actual alloy type of the particle being analyzed (e.g. the analysis of a 52100 particle results in an 4130 classification).

### Alloy Groupings

Within a given training set, when two or more alloys are significantly similar in elemental composition ChipCHECK may not be able to distinguish them as separate or individual alloys. When this occurs, such alloys are combined in the unit’s Material Library under a more general classification referred to as an “Alloy Grouping” (e.g.: 52100 and 4130 maybe combined within a single alloy grouping of “52100/4130”).

### Area

The particle area that is output from a ChipCHECK analysis is the particle size measured from a back-lit silhouetted image of the sample patch. The analyzed image is binarized prior to the area measurement being taken.

### Binarized Image

The binarized image is the resulting image that is used by ChipCHECK to measure particle area and location. A binarized image is the result of a binarization process where each pixel of a greyscale image is converted to either a white pixel or a black pixel based upon a calibrated binarization threshold.

### **Laser**

The term LASER is an acronym standing for Light Amplification by Stimulated Emissions of Radiation. In the context of ChipCHECK, a laser is used in order to create an ablation point on a given sample resulting in an alloy classification.

### **Material Library**

The ChipCHECK Material library is the collection of alloy classification outputs provided to the operator. The Material library is a subset of the training set and may contain individual alloys or alloy groupings as results.

### **Material Library Training**

Training of a ChipCHECK Material Library is the process where many, typically thousands, of spectra are collected from an established training set, and are then used to develop an Artificial Neural Network (ANN) resulting in a final Material Library.

### **Particle(s)**

A fragment of a larger component consisting of a single alloy type in the shape format of a chip, flake, splinter, or wear debris.

### **Particle Set**

A collection of particles consisting of a single alloy type or a collection of multiple alloys. Typically used for alloy classification testing and/or alloy type reference.

### **Sample(s)**

A small part or representation of a larger whole. In the context of ChipCHECK, samples are in the form of material coupons, particles, or particle sets placed upon a sample patch.

### **Sample Patch**

Customized plastic insert used for ChipCHECK analysis. A given sample patch contains a 0.5"x0.5" clear window with semi-permanent adhesive for particle retention. Sample patches are populated with samples and then inserted into the ChipCHECK unit for analysis.


### **Training Set**

The ChipCHECK training set is the collection of all alloys and collection of spectra taken from these alloys which are used to define and configure the ChipCHECK Material Library. The number of alloys within the training set may be larger than that found in the resulting Material Library (ex: Alloy Groupings). The alloy training set consists of certified material coupons. For fully optimized performance, it is imperative that all alloys in service be trained to the unit. Otherwise, analysis with the unit may result in unclassification and misclassification results. Unless otherwise customized, each ChipCHECK unit is delivered with the default material library.

**NOTE:** The terms "unit", "equipment" and "instrument" may be used interchangeably throughout this document. Within the appropriate context, they shall be interpreted as referring to the ChipCHECK device.

## 2.0 Health and Safety

### 2.1 Operational Safety

 **CAUTION** – USE OF CONTROLS OR ADJUSTMENTS OR PERFORMANCE OF PROCEDURES OTHER THAN THOSE SPECIFIED HEREIN MAY RESULT IN HAZARDOUS RADIATION EXPOSURE.

 **CAUTION** – PRIOR TO ANY USE, THE EQUIPMENT MUST BE INSPECTED FOR ANY DAMAGE (INCLUDING BUT NOT LIMITED TO DENTS, IMPACT MARKS, DEFORMATIONS IN PANELS, ETC.) FAILURE TO DO SO MAY RESULT IN HAZARDOUS RADIATION EXPOSURE. IF DAMAGE IS OBSERVED, UNPLUG THE EQUIPMENT AND CONTACT THE MANUFACTURER IMMEDIATELY.

To ensure safe and proper use of the ChipCHECK system, Users of ChipCHECK must be aware of and adhere to all safety precautions and procedures as discussed herein. Users shall use this section to become acquainted with the specific safety features included with ChipCHECK system.

#### Laser Parameters:

Product Laser Classification	Class 1
Wavelength	1064nm
Laser Power / Peak Power	12mW / 600kW
Pulse Energy	1.2mj
Emission Type	Pulsed
Optical Pulse Width	2ns
Beam Diameter (at aperture)	4.5mm
Divergence	< 0.8mRad

#### NOTE:

- Never use or operate the equipment without full understanding and compliance with this Operator Manual.
- This Laser Product is designated as Class 1 during all procedures of operation.
- There is no scheduled maintenance required to keep the product in compliance.
- Refer to Section 6.0 for the allowable User maintenance.
- There is absolutely NO SERVICE ALLOWED by the User. There are no User serviceable parts.
- This equipment is to be serviced or repaired only by Gastops authorized technicians.
- The User is not allowed to attempt to alter, interfere, modify, remove, circumvent, defeat or de-active any safety features or interlocks (see Section 2.2.2 and Figure 2-1 & 2-6).
- The User is strictly forbidden from reverse-engineering, altering, interfering, modifying, removing, circumventing, or de-activating any part of the equipment.
- Never remove any labels or remove any covers.



- Objects and/or material not required for operation must not be kept near the equipment operating area.
- Keep the equipment dry at all times and avoid spilling liquid into the equipment. If any liquids or spills enter the interior of the equipment, switch off power and contact Gastops Customer Support (Section 8.0).
- Do not use flammable gases around the equipment or volatile gas or liquids inside the equipment. Fire or explosions could result.
- Never use or operate the equipment if the equipment:
  - Is defective, shows visible signs of damage, or was subject to events (including weather) that could have damaged the equipment (non-visible damages)
  - If any safety system feature or seal is damaged
  - Fails to perform the intended measurement
  - Has been subject to prolonged storage in unfavorable conditions
  - Has been subject to severe transport stresses

If any of the above has occurred, then switch off the power and contact Gastops Customer Support (Section 8.0).

## 2.2 Safety Features

This section describes the integrated safety features that ensure the User's safety throughout the operation of the equipment. It is these safety features that render the classification of this product as Class 1. As a result, the User is strictly forbidden to alter, interfere, modify, remove, circumvent, defeat or de-active any of these features. Refer to Figures 2-1 through Figures 2-5 below for a schematic describing all of the integrated safety features. It is critical that the User becomes familiar with the location and purpose of each safety feature in order to ensure safe use of the equipment.



Figure 2-1: Location of all ChipCHECK Safety Features

## 2.2.1 Safety Labels

This section reviews all of the labelling information associated with the equipment. It is imperative that the User becomes familiar with the labels, their location, and their meaning.

The following images depict all of the labels found on the equipment and within this document. Each figure below has been assigned a number which corresponds to the label placement schematic below. Refer to Figure 2-2 through Figure 2-5 below to become familiar with the specific location of each label.



Figure 2-2: Explanatory Label (1) – Not Found On Unit



Figure 2-3: Explanatory, Manufacturer's Identification, and Certification Label (2)  
(Note that only one of the two shown above will be applied to the unit.)

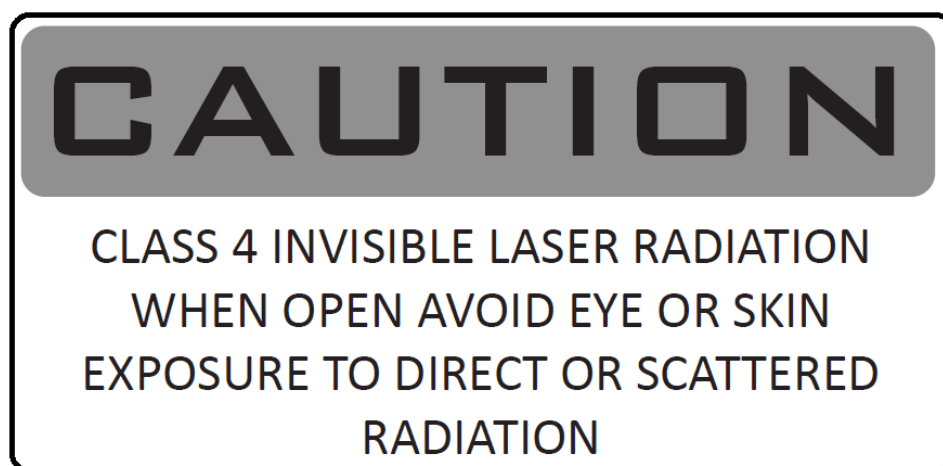


Figure 2-4: Protective Housing, Non-Interlocked Label (3)



Figure 2-5: Laser ChipCHECK Label Placement Schematic  
(Numbers shown correspond to the label titles above)

## 2.2.2 Interlocks

The equipment is equipped with a forced contact redundant interlock system that provides the User with the required level of safety when operating the equipment. The two interlocks in this system are placed on the Sample Access Panel and ensure that power to the laser is severed prior to any opening being made in the equipment during operation (i.e.: opening the Sample Door). Having these interlocks ensures that the User is never exposed to laser radiation above a Class I classification. As a result, this panel shall not be modified in any fashion, and the User is strictly forbidden from attempting to alter, interfere, modify, remove, circumvent, defeat or de-active these safety interlocks.

Figure 2-6 indicates the location of the Sample Access Panel safety interlocks.

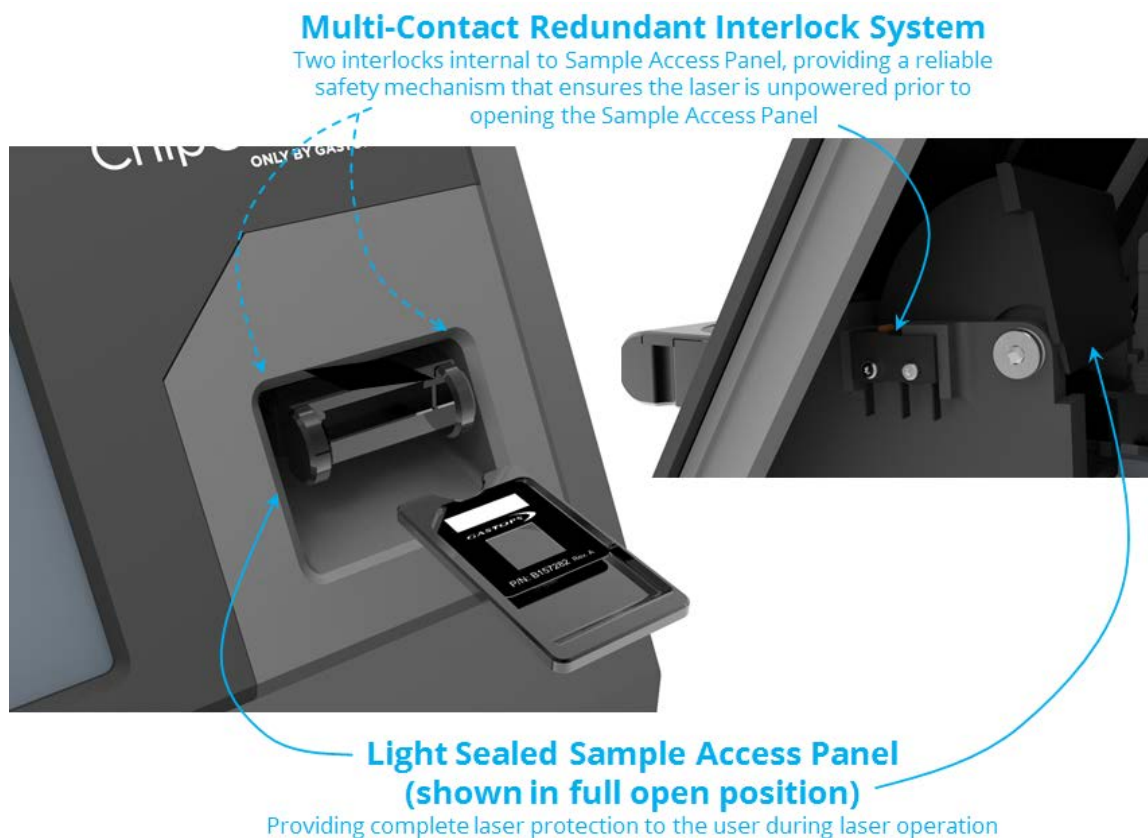


Figure 2-6: Sample Access Panel Interlock (Location)

## 3.0 Hardware Description

This section will describe the main components of the ChipCHECK hardware and provide an overview of the instrumentation that is required to properly and safely operate the ChipCHECK equipment.

### 3.1 Basic Overview

Figure 3-1 below provides an overview of the main User interfaces involved in the operation and maintenance of the ChipCHECK equipment.

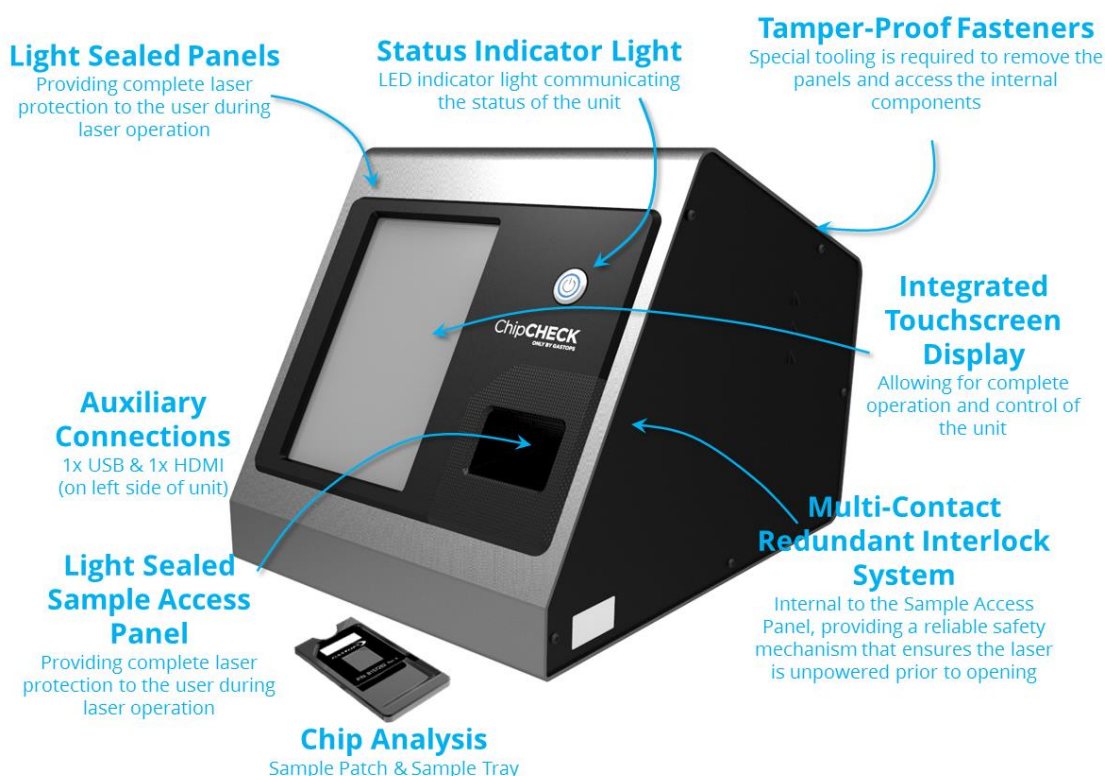


Figure 3-1: ChipCHECK Equipment Interfaces (Transport Case & Accessories Not Shown)

The main User interfaces for the operation of the ChipCHECK equipment are as follows:

1. **User Interface and Control Mechanism (Integrated Touchscreen Display):**

This is the control mechanism for the equipment and includes the required software and software interface to operate the equipment. This display is integrated into the front of the ChipCHECK equipment and cannot be removed by the User.

2. **Interfaces (1x USB, 1x HDMI):**

The ChipCHECK equipment is equipped with one USB interface and one HDMI interface which are found on the left side panel. These connections provide the ability to connect the ChipCHECK to USB peripherals such as flash drives, keyboard and a mouse. The connections are ruggedized and sand proof. Note that the User shall only use/access the USB connection. The HDMI connection is intended for expert users only (troubleshooting), and should not be used during normal operation.

3. **Unit Power Button:**

Located on front of the unit, this button allows for ease of Power Up and Power Down of the unit. This button is also lit up to allow for a simple visualization of the power status of the unit (red – powered down / blue – powered up / flashing blue – powering up or powering down). Note that this is not the master power switch of the unit. The unit's master power switch is located on the back side of the unit.

4. **Fuse, Main Power Switch and Power Input Interface:**

The back face of the unit provides the unit's main fuse, power switch and power input interface. Electrical safety is provided to the User/Operator through the use of proper grounding of the three-pronged power plug and 3A slow blow fuse. Furthermore, the main power switch provides the Operator with the kill switch to the entire unit. Note that the power supply internal to the unit is both 110VAC and 240VAC compatible.

5. **Sample Patch:**

Samples Patches allow for the unit to complete a Chip Analysis. The Sample Patches are plastic sheets equipped with a 0.5in x 0.5in (1.27cm x 1.27cm) clear window with adhesive, allowing for semi-permanent retention of the debris during an analysis. The Sample Patches are also equipped with an adhesive strip on the back allowing for retention of the Sample Patch on the Sample Tray during an analysis. Note that this is a consumable item.

6. **Sample Tray:**

The Sample Tray is the mechanical device that accepts the Sample Patches, and ensures a repeatable and reliable insertion. The Sample Tray is equipped with keying features and magnetic alignment assemblies to ensure specific orientation and insertion of the Sample Patches.

7. **Sample Access Panel:**

The Sample Access Panel provides the User with access to the Sample Receptacle and protection from the internal laser radiation. The panel is equipped with a force contact redundant laser safety interlock system in order to provide the required protection for safe and proper use. See below and refer to Section 2.2.2 for more detail.



## 3.2 Indicators

The front of the unit is equipped with one status indicator light which notifies the User of the unit status at any given time. Note that this indicator light also acts as the power button that powers up all of the unit's internal components. At any given time the unit will be in one of the states shown and described in the Figure below.

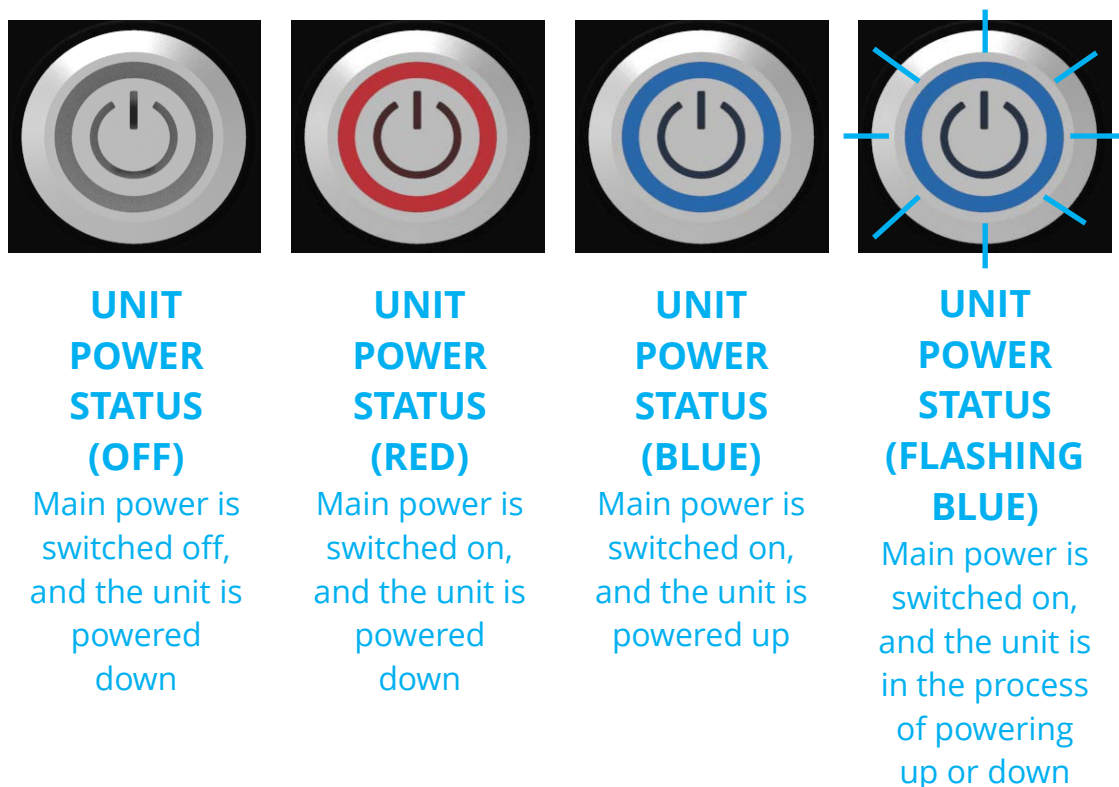


Figure 3-2: Unit Status Indicator Lights

## 3.3 Mechanical Setup

Before beginning the setup of the unit, ensure the following components have been provided (all of which will be included in the Transport Case):

<u>Quantity</u>	<u>Description</u>
1x	ChipCHECK Model CC120
1x	Unit Power Cable
1x	Sample Tray (Chip)
200x	Sample Patches
1x	Standardization Standard
1x	Calibration Standard
20X	Sample Patch Cases



The ChipCHECK unit is shipped fully assembled and setting up the unit for operation requires only the following steps.

1. **Placing/Positioning the ChipCHECK Unit:**

- a) Remove the unit from the transport case. During transport, it is highly recommended that the unit remains in its vertical orientation.
- b) Place the unit on a relatively flat work surface, capable of supporting the mass of the unit (40 lbs/18kg). Place the unit so that the Sample Access Panel faces the User. It is recommended the unit is positioned ensuring sufficient space to access both the front and the back of the unit. Note that the unit must also be provided adequate air flow underneath and around the unit for proper ventilation.

2. **Connecting Power:**

- a) Plug the AC power cable into the AC Power Input port located on the backside of the unit. Connect the other end of the AC Power cable into a 100-120 VAC Wall socket. Note that this unit is also 240VAC compatible.

**NOTE:** The unit is grounded via the AC Power cable. It is the User's responsibility to assure that the cable and the wall plug have adequate grounding.

3. **Powering up the Unit:**

- a) Power up the ChipCHECK unit by turning on the Main Power Switch located on the Back Panel of the unit and then pressing the Power Button on the front of the unit. The ChipCHECK software will initiate automatically.

## 4.0 Operation

This section will go over the procedures required in order to successfully complete an automated analysis using the ChipCHECK device. Note that the operation of the equipment shall follow the order to the defined sections below. Prior to completing the operational procedures below, it is recommended that the operator reference Section 5.0 to become familiar with navigating through the equipment's software interface.

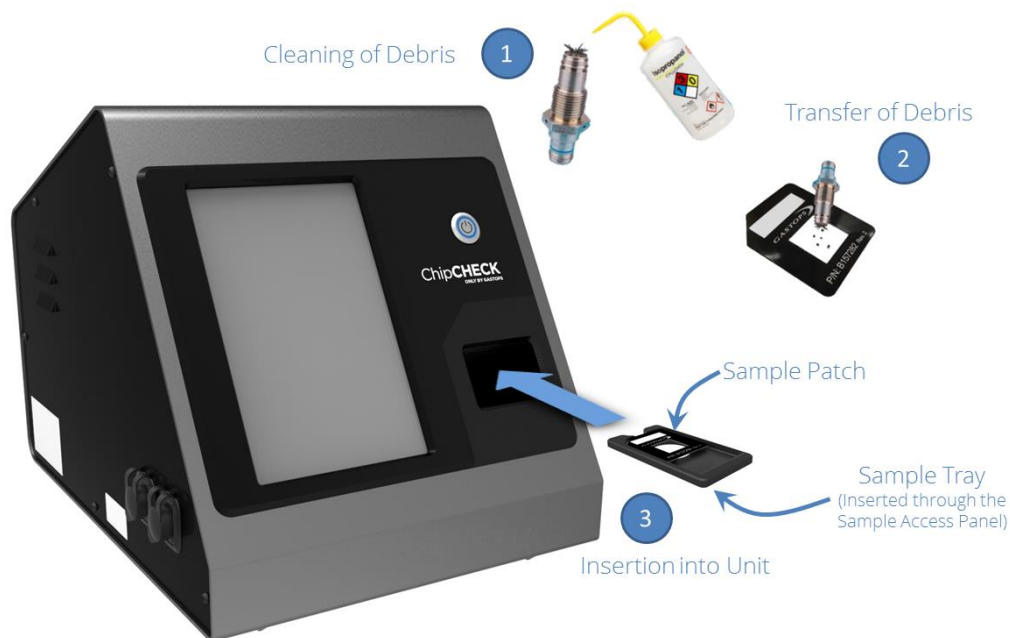


Figure 4-1: Chip Analysis Process

### 4.1 Standardization

A Standardization of the unit is recommended to be completed once each day prior to the use of the equipment. Prior to beginning the procedure below, navigate to the Standardization Screen (refer to Section 5.0 as required).

#### Standardization Procedure:

##### Select "Start"

Near the top left of the screen, select the "Start" button. Note that selecting the "Cancel" button will bring the User back to the "Options Screen".

##### Insert the indicated Standard

Near the top right of the screen the software interface will define the specific Standardization standard that must be inserted into the system. The unit will also automatically eject the Sample Receptacle for User access. Insert the indicated Standardization standard into

the Sample Receptacle.

**Select "OK"**

Near the top right of the screen, select the "OK" button. The unit will now automatically run the Standardization sequence.

**If 'Result of Standardization' is "PASS"**

At the end of the Standardization, if the result shown under "Result of Standardization" is "PASS", then the unit is calibrated, performing properly and is ready to be used for analysis (skip to Section 4.3). Select the "OK" button near the bottom right of the screen. The User will be returned to the "Options Screen" and the corresponding "Standardization" info will be updated.

**If 'Result of Standardization' is "FAIL"**

At the end of the Standardization, if the result shown under "Result of Standardization" is "FAIL", complete a power cycle on the unit (complete power down and complete power up) and repeat the Standardization procedure. If three (3) subsequent Standardization sequences fail, then a re-calibration is required prior to the unit being used for any further analyses. The software interface will also provide the User with a reason for failure and a recommendation of what to do. Select the "OK" button near the bottom right of the screen. The User will be automatically directed to the "Calibration" screen. If not automatically redirected, navigate to the Calibration screen through the Options screen.

## 4.2 Calibration

The Calibration sequence is an automated sequence and should only be run when the "Standardization" sequence results in three (3) subsequent failures. Prior to beginning the procedure below, navigate to the Calibration Screen (refer to Section 5.0 as required).

**Calibration Procedure:**

**Select "Start"**

Near the top left of the screen, select the "Start" button. Note that selecting the "Cancel" button will bring the User back to the "Options Screen".

**Insert the indicated Standard**

Near the top right of the screen the software interface will define the specific Calibration standard that must be inserted into the system. The unit will also automatically eject the Sample Receptacle for User access. Insert the indicated Calibration standard into the Sample Receptacle.

<b>Select "OK"</b>	Near the top right of the screen, select the "OK" button. The unit will now automatically run the first part of the Calibration sequence.
<b>Second Part of Calibration Sequence</b>	Once the unit finishes the first phase of the calibration sequence, it will prompt the user to insert a second calibration standard. Do so as described below.
<b>Select "OK"</b>	Near the bottom right of the screen, select the "OK" button. The unit will now automatically run the second phase of the calibration sequence.
<b>If the result of Calibration is "PASS"</b>	At the end of the Calibration, if the result is a "PASS" then the unit has been successfully re-calibrated. Select the "OK" button near the left of the screen. The User will be returned to the "Options Screen" and the corresponding "Calibration" info will be updated. It is recommended that the "Standardization" be repeated following a successful calibration.
<b>If the result of Calibration is "FAIL"</b>	At the end of the Calibration, if the result is a "FAIL", complete a power cycle on the unit (complete power down and complete power up) and repeat the Calibration procedure. If three (3) subsequent Calibration sequences fail, then the unit will require maintenance or service. Refer to Section 6.0. Post successful maintenance (as per Section 6.0), repeat the Calibration and Standardization sequences.

## 4.3 Sample Preparation

There are several potential sources of wear debris. To prepare a sample for this instrument it is recommended that the following items and tools are used at a minimum: the provided Sample Patches for the instrument, laboratory grade tweezers, laboratory grade probes, Isopropyl Alcohol and a wash fluid receptacle.

The process of transferring wear debris from the collection source to the Sample Patch largely depends on how the debris was collected from the equipment. The following procedure defines the recommended process of transferring wear debris from a chip detector, chip collector or mag plug – while considering the cautions outlined in the cautionary notes that follow below:

1. Remove the collection device from the equipment, and submerge the portion of the device that contains the wear debris in an alcohol bath. Keep the wear debris submerged and continuously rotate the collection device within the alcohol bath for no less than 10 seconds. If an alcohol bath is not available, then vigorously spray the wear debris and the collection device with Isopropyl alcohol for no less than 10 seconds.

2. Transfer all wear debris from the collection device and alcohol bath to an intermediate receptacle (such as a petri dish).
3. If oil residue remains on the wear debris, complete an additional alcohol rinse on the wear debris and allow the wear debris to fully dry. Repeat this step until no oil residue remains on the wear debris.
4. Once the wear debris has been fully dried, take one of the Sample Patches provided with the instrument and peel/remove the protective liner from the top surface of the patch (as shown in Figure 4-2). This will expose the transparent adhesive used to retain the wear debris. Take all precautions to limit the amount of contamination (dust, dirt, etc.) that can now adhere itself to this exposed area.

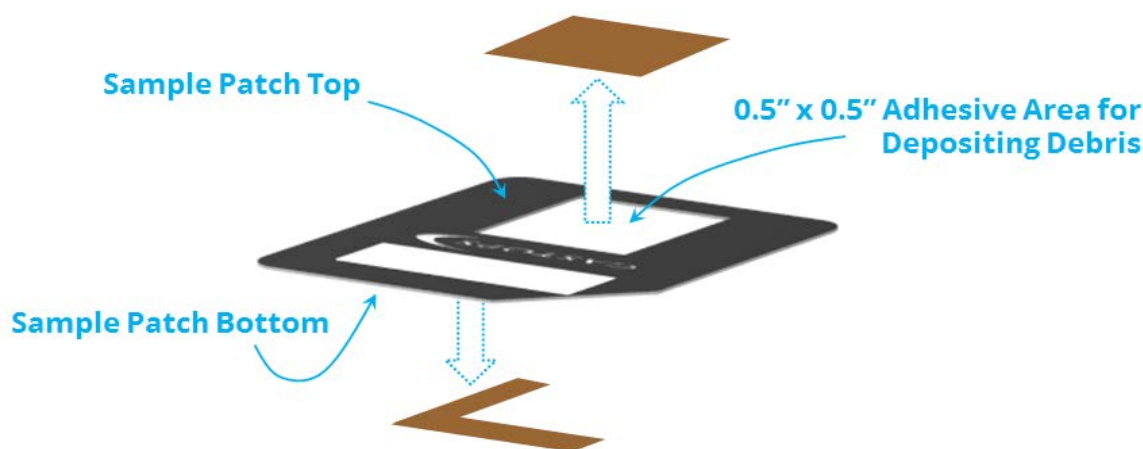


Figure 4-2: Sample Patch Liner Removal

5. Transfer the clean and dry wear debris from the intermediate receptacle to the Sample Patch. Laboratory grade tweezers and probes should be used for this process and each piece of wear debris must be placed on the Sample Patch following the cautions outlined in cautions outlined the notes below. It is recommended that wear debris is transferred to the Sample Patch one at a time. Note that, as required, multiple Sample Patches can be used for this step.
6. Once all of the wear debris has been transferred onto the Sample Patch, replace the protective liner ovetop of the wear debris and transparent adhesive of the Sample Patch. This will protect the sample from further contamination until when the analysis is to be completed. Ensure the protective liner is once again removed prior to running an analysis in the instrument

**NOTE:** Always keep the Sample Patch facing up and avoid exposure to contaminants. It is possible for the dirt or unwanted contamination to adhere to the exposed adhesive area at this point in the patch preparation.

**NOTE:** For optimal wear debris classification and instrument performance, the following guidelines shall be followed and will reduce interferences. The published performance specifications for the unit are dependent upon the strict adherence to these guidelines:

- Ensure all particles are retained from the collection device.
- Residual oil on the wear debris may weaken the signal intensity. An isopropyl alcohol rinse of the debris is recommended prior to applying the wear debris to the Sample Patch. This also applies to any form of contamination on the wear debris. Steps 1 through 3 in Section 4.3 is the recommended procedure.
- When preparing the Sample Patch for analysis, concentrated 'clumps' of wear debris must be avoided. If needed, excessive debris from one source can be placed on multiple patches. Ensure the particles are separated on the sample patch (preferably near the center).
- When preparing the Sample Patch for analysis, wear debris must lay flat on the Sample Patch.
- Avoid placing wear debris thicker than 0.5 mm on a Sample Patch. Wear debris thicker than 0.5mm must be broken into smaller pieces and should be placed on an independent Sample Patch.
- Only use the instrument to analyze wear debris that is equal to or larger than 6,400  $\mu\text{m}^2$  and whose minimum dimension is larger than 70  $\mu\text{m}$ .
- Avoid analyzing wear debris that consists of alloys that are not included in the instrument's Material Library, or ensure that the instrument's Material Library contains all of the required alloys within its Training Set. The instrument's intended use is to analyze wear debris of such alloy materials included in the instrument's Material Library. The intended use does not include other alloys or materials which are not part of the installed Material Library.
- The instrument's standardization procedure must be completed each day prior to use of the instrument.
- The instrument's calibration procedure must be completed when the standardization procedure fails.
- The instrument's manufacturer's in-service support package must be maintained throughout the life of the instrument

## 4.4 Sample Patch Loading – Insertion into the ChipCHECK Unit

Once the Sample Patch is prepared, the following needs to be done in order to properly and safely load it into the ChipCHECK equipment for analysis:

**NOTE:** This section of the document assumes that the User already finds him or herself at the 'Analysis Screen'. Refer to Section 5.0 for more detail regarding the software and its navigation.



Figure 4-3: Sample Loading – Sample Receptacle Ejected and Sample Access Panel Open

#### Loading the Sample Patch:

1. The equipment will automatically position the Sample Receptacle in the ejected position – giving full access to the User.
2. This Sample Insertion Assembly is equipped with a magnetic alignment mechanism which allows for ease of sample insertion and removal from the equipment. To remove the Sample Tray, simply pull lightly on the Sample Tray at the front of the Sample Receptacle.

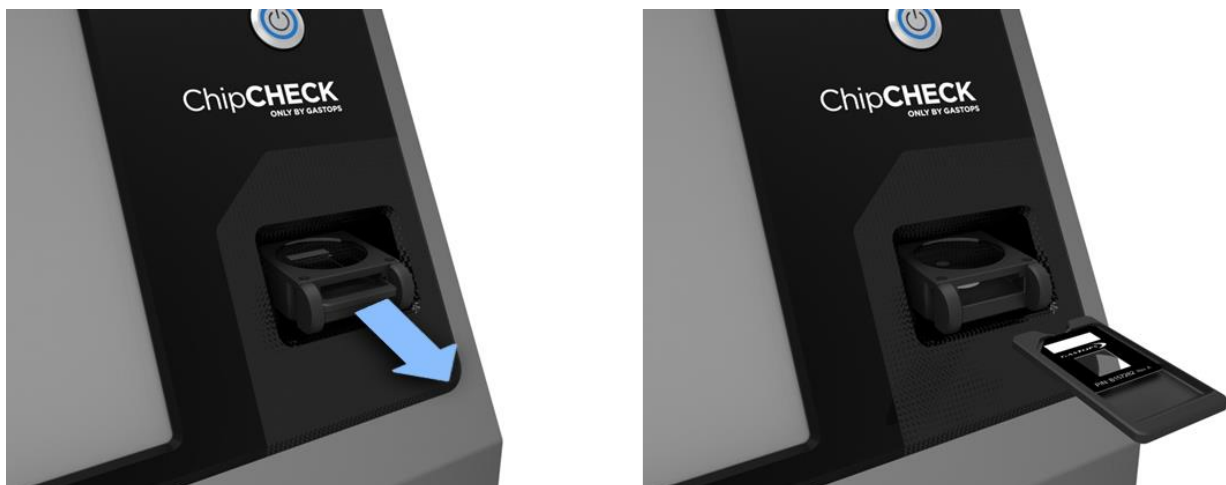


Figure 4-4: Sample Tray Removal from Equipment

3. Take the prepared Sample Patch (refer to Section 4.3) and ensure that the adhesive liner on the back of the Sample Patch has been removed (as shown in Figure 4-2). Position the Sample Patch, face-up, on the Sample Tray ensuring that the left and top edges of the Sample Patch are aligned with the recess on the Sample Tray.

**NOTE:** Both the Sample Patch and the Sample Tray have 'keyed' features that ensure the Sample Patch can only be applied in a single orientation. Once in place, ensure the Sample Patch is securely adhered to the Sample Tray.

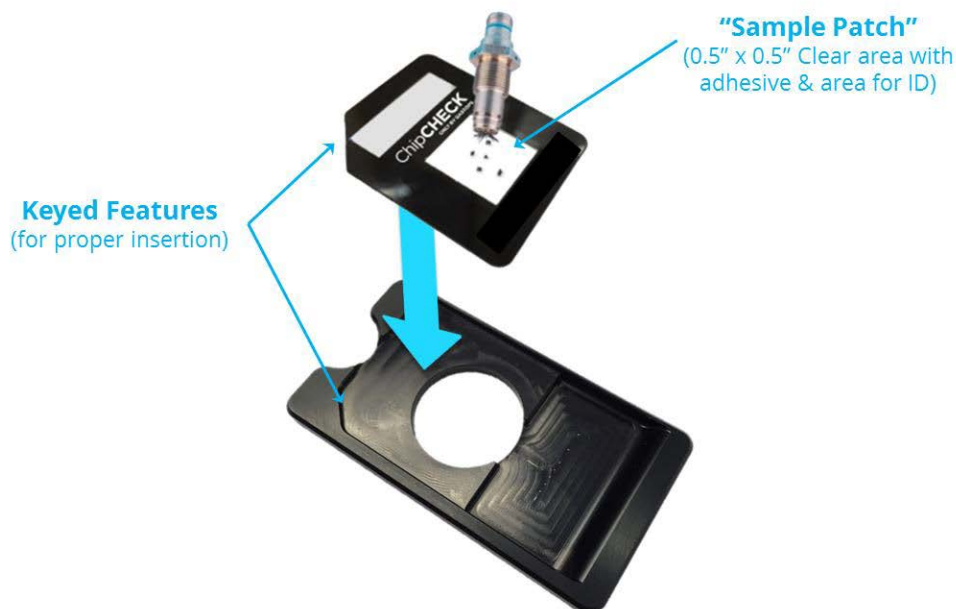


Figure 4-5: Placement of Sample Patch onto Sample Tray

4. Re-insert the Sample Tray into the Sample Receptacle. Simply push the Sample Tray completely into the receptacle. The Sample Tray and Sample Receptacle are designed to self-align. You will hear an audible click when the Sample Tray is fully inserted. No force is required.

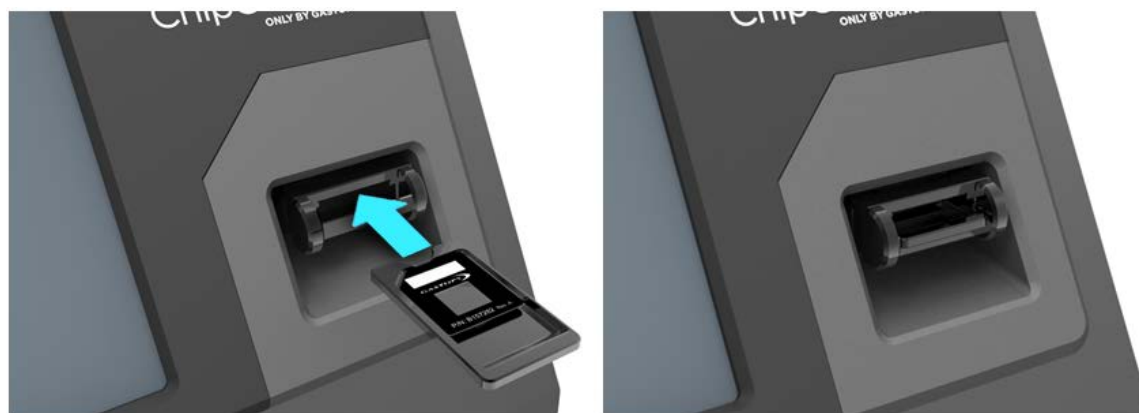


Figure 4-6: Sample Loading – Insertion of Chip Sample Tray into Equipment



The sample is now inserted and ready to be analyzed.

## 4.5 Running an Analysis

This section assumes that the User is already familiar with the software interface and can navigate to the 'Chip Analysis' window. Refer to Section 5.0 for complete procedures on how to use and navigate through the software interface.

1. To run a Chip Analysis, navigate to the 'Chip Analysis' screen of the ChipCHECK software interface (see Figure 4-7).

**NOTE:** Data labels may be configured differently for different applications.

The screenshot shows the 'CHIP ANALYSIS' screen of the 'ChipCHECK' software. The interface includes a 'START' button (circled in green), an 'EJECT' button (circled in blue), and a 'CANCEL' button (circled in red) on the left. A 'Sample ID:' field is at the top center, followed by a large grey rectangular area. To the right are four input fields: 'AC Type - Engine Type', 'Aircraft Type', 'Engine Type', and 'Aircraft Registration/SN'. Below these is a 'Result:' section with a table header: 'MATERIAL', '# IDENTIFIED', 'TOTAL AREA [μm²]', and 'ALARM'. The table body is currently empty. At the bottom left is a 'Condition Status:' field. At the bottom center are three buttons: 'OPTIONS', 'STNDRD', and 'CALIBRATE'. At the very bottom, a status bar shows 'Awaiting Operator Input' and '-( UNIT READY )-'.

Figure 4-7: Chip Analysis Screen

2. If the sample has not been loaded into the equipment, then refer to Section 4.4. If the sample is loaded then proceed to select the 'Start' Button found in the top left corner of the screen.
3. The software interface now prompts the User to enter all required data regarding the debris source. The field names are configurable, and so may differ from the field names shown in Figure 4-8. This source data can either be entered manually or selected from the drop down lists provided. Mandatory entry fields are indicated by asterisks. Proceed until at least all

mandatory fields have been filled. Note that the Data Entry Field titles may differ from the unit in use. These are customized fields. The Figure below is an example only.

Fields that only accept numbers are marked with the number sign (#). These fields will accept numbers, but no spaces or symbols. All other fields accept alphanumeric characters and all symbols except the single quotation character ( ' ), except the date field, which only accepts a date.

**CHIP ANALYSIS** **ChipCHECK**

**\* Mandatory Fields**

<b>AC Type - Engine Type *</b> <input type="text"/>	<b>Collection Device *</b> <input type="text"/>
<b>Aircraft Type *</b> <input type="text"/>	<b>Date of Analysis *</b> 29/03/2017
<b>Aircraft Registration/SN *</b> <input type="text"/>	<b>Reason for Analysis</b> <input type="text"/>
<b>Engine Type *</b> <input type="text"/>	<b>PO/WO Number</b> <input type="text"/>
<b>Location of Collection Device *</b> <input type="text"/>	<b>Analysis Completed By</b> <input type="text"/>
<b>Engine Registration/SN</b> <input type="text"/>	<b>Notes</b> <input type="text"/>
<b>Engine Position (#)</b> <input type="text"/>	

**START** **CANCEL**

Unit Ready - Awaiting Input -( UNIT READY )-

Figure 4-8: Chip Analysis Data Entry Screen

4. Select the 'Start' button to start the analysis. If any mandatory fields are empty, or if an illegal character is used (e.g., the single quotation mark), then the analysis will not be allowed to proceed. The fields that were not filled out properly are highlighted red to assist the operator in locating the incorrectly entered fields.

5. The equipment will now complete the entire analysis automatically. Refer to Figure 4-9 for the layout of where this information can be found on the screen.

**NOTE:** At any time during the analysis, the User can verify the analysis process by referring to the progress bar near the bottom right of the screen or can elect to stop the analysis by selecting the 'Stop' button highlighted in red near the top left of the screen. Selecting 'Stop' will abort the analysis, eject the sample and return the User to the first 'Analysis' screen.

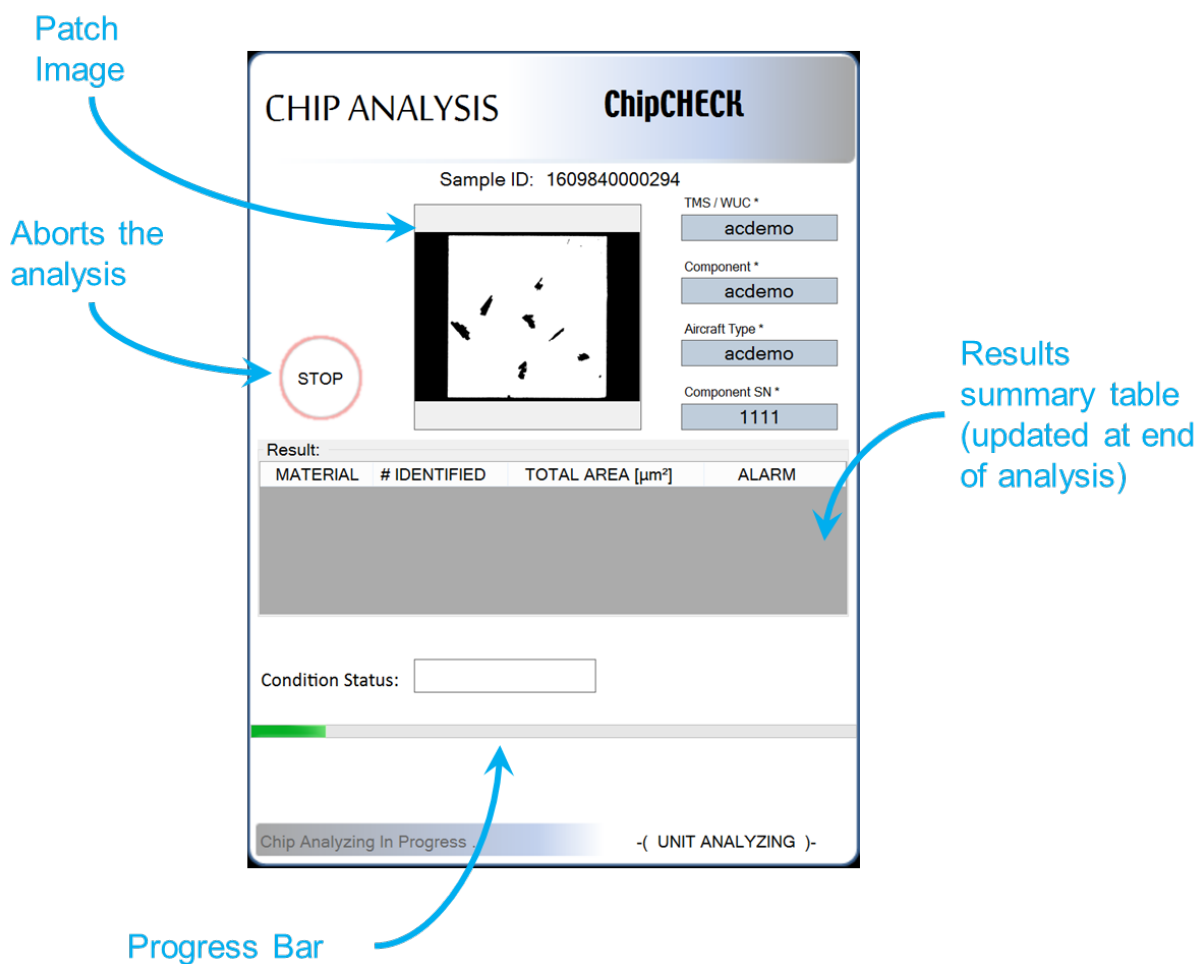


Figure 4-9: Chip Analysis Screen – Chip Analysis Running

6. Once the analysis is complete, a number of things will happen:
- The equipment will automatically eject the Sample.
  - The software interface will provide the User with a complete set of results:
    - Patch image
    - Materials identified
    - Number of particles identified for a given material

- iv. Total area of particles identified for a given material
- c) The 'Reports' and 'Next Sample' button will become selectable once the sample tray is fully ejected from the equipment.

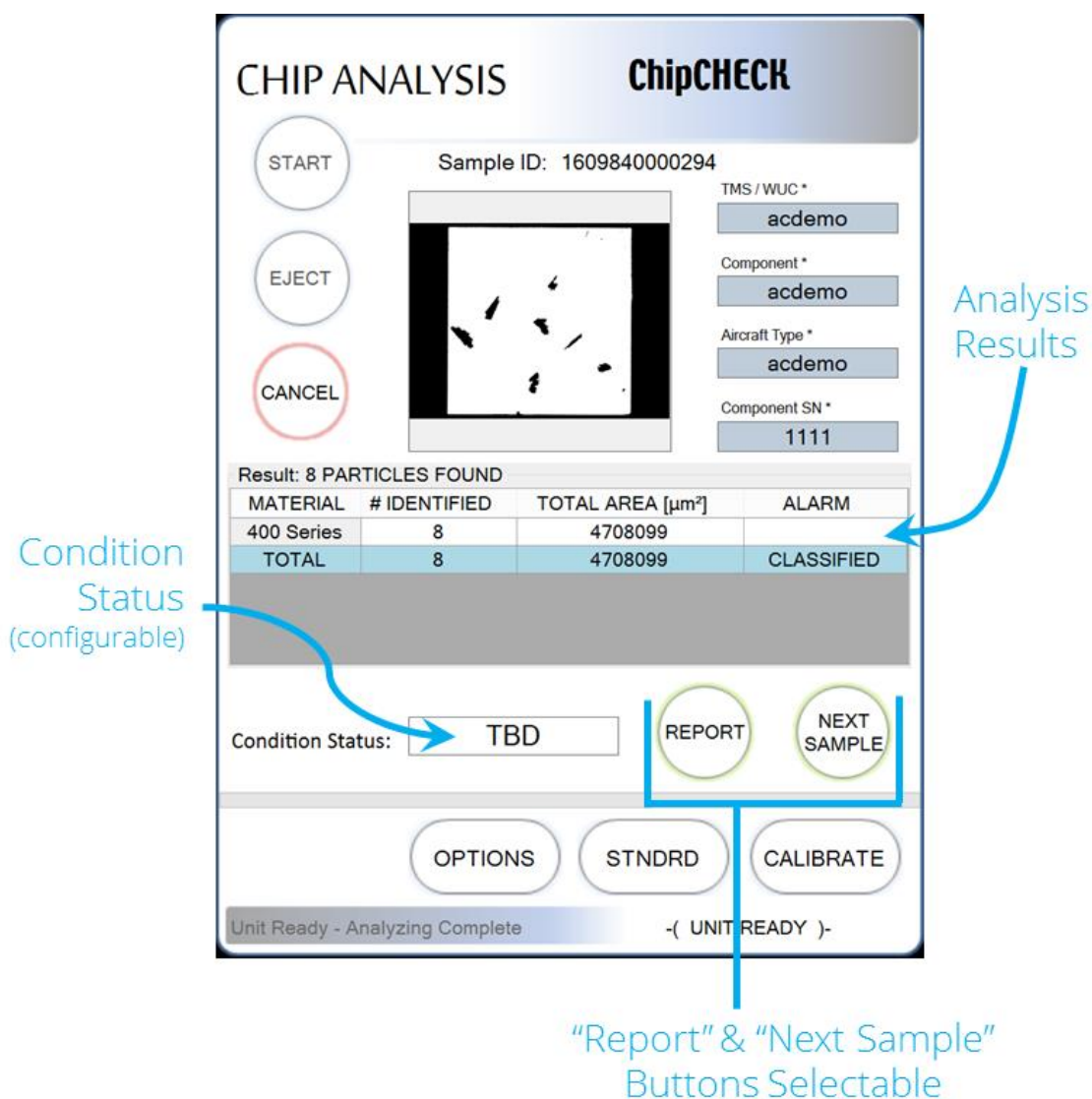


Figure 4-10: Chip Analysis Screen – Chip Analysis Complete

The sample is now fully analyzed and the results data is automatically saved in the database. The User can now do one of two things:

1. Click on the "Next Sample" button found near the bottom right corner of the screen and repeat all steps above for the next sample to be analyzed.
2. Click "Report" to see the results in PDF format (See Section 4.6).

**NOTE:** Any resulting classification output from the equipment should be interpreted as nearest matches. It may be that a ChipCHECK unit can give a clear indication that the equipment should not be operated, however, this does not necessarily mean that in the absence of such cautionary indications, that flight operations are safe/airworthy or that the machinery being tested is safe for use.

**NOTE:** Analyzed wear debris are reported by ChipCHECK by their size and alloy classification (ex: M50) or base element (ex: Fe). Any analyzed wear debris that could not be classified by ChipCHECK is reported as "Unclassified". Note that a classification result of base element or unclassification does not necessarily constitute that the sample is in absence of the materials included the configured Material Library. A base element or unclassified result may also result from inadequate spectra collected from particles, which can be minimized by following the cautions as outlined in the cautionary notes in Section 4.3.

## 4.6 Sample Reports

At any given time the User is able to access the Sample Reports for samples that were historically analyzed. The results from every analysis are stored in the equipment's internal database and are accessible through the "Reports Viewer". The following steps instruct the User on how to access these reports through the Reports Viewer. For more details refer to Software Description, Section 5.0.

1. To bring up the 'Reports Viewer' select the 'Reports' button found in one of the following locations:
  - a) **Options Screen:** near the top right of the screen.
  - b) **Analysis Screen:** near the bottom right of the screen.

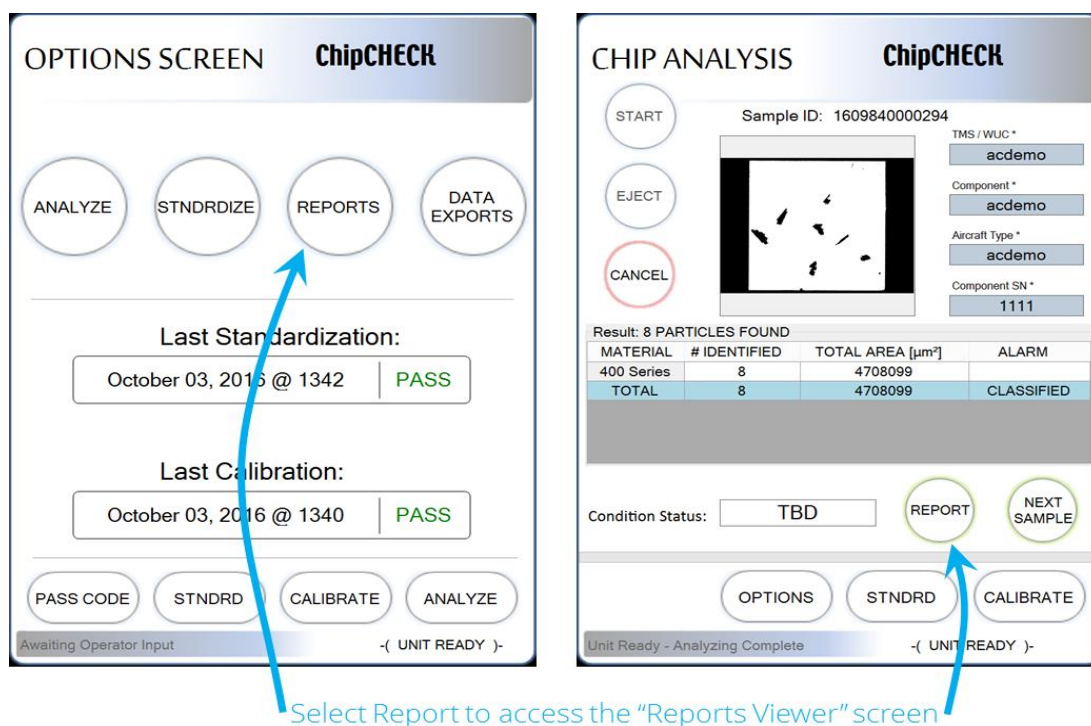


Figure 4-11: Reports Viewer Access

2. If the reports viewer is accessed through the Analysis Screen, then the report from the last analysis is displayed. Various buttons along the bottom of the screen allow the User to “Copy to USB”, “View Others” or “View Latest” reports and data, or return to the analysis screen. Furthermore, the User can scroll up and down for more data regarding the analysis being displayed.

**NOTE:** The reports and data contained in the database are exportable through the “Data Export” Screen. Through this screen, the software interface will prompt the User to define the dates between which the data will be exported. The data is then exported to a .csv file and can be extracted from the system if desired. Refer to Section 5.8 for more detail.

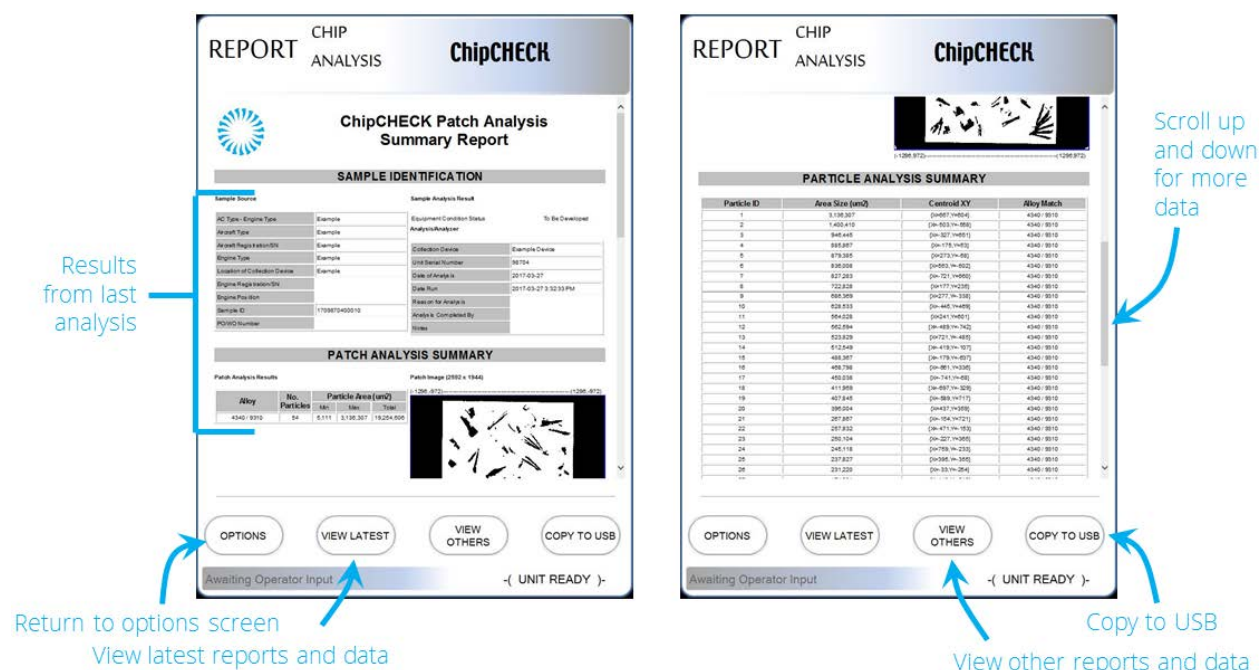


Figure 4-12: Reports Viewer Screen – Last Analysis

- If the reports viewer is accessed through the Option Screen, or if “View Others” is selected from the Report Screen (refer to Figure 4-12), then the reports from previously run analyses can be accessed.

**NOTE:** The data labels may be configured differently for different applications. As can be seen in Figure 4-13 below, the software interface now presents the User with the report search and filter tools. Various source data entry fields and drop down lists are available to the User. Select the desired source data to find the specific report related to a given analysis run. When data has been entered, filtered results will appear in the list below the entry fields. Select a report from this list, and the “View Report” button in the bottom right of the screen will highlight in green. Select the “View Report” button to view the report. The ‘Cancel’ button found in the bottom left of the screen will clear the filters on the first click, and return the User to the previous screen on the second click.



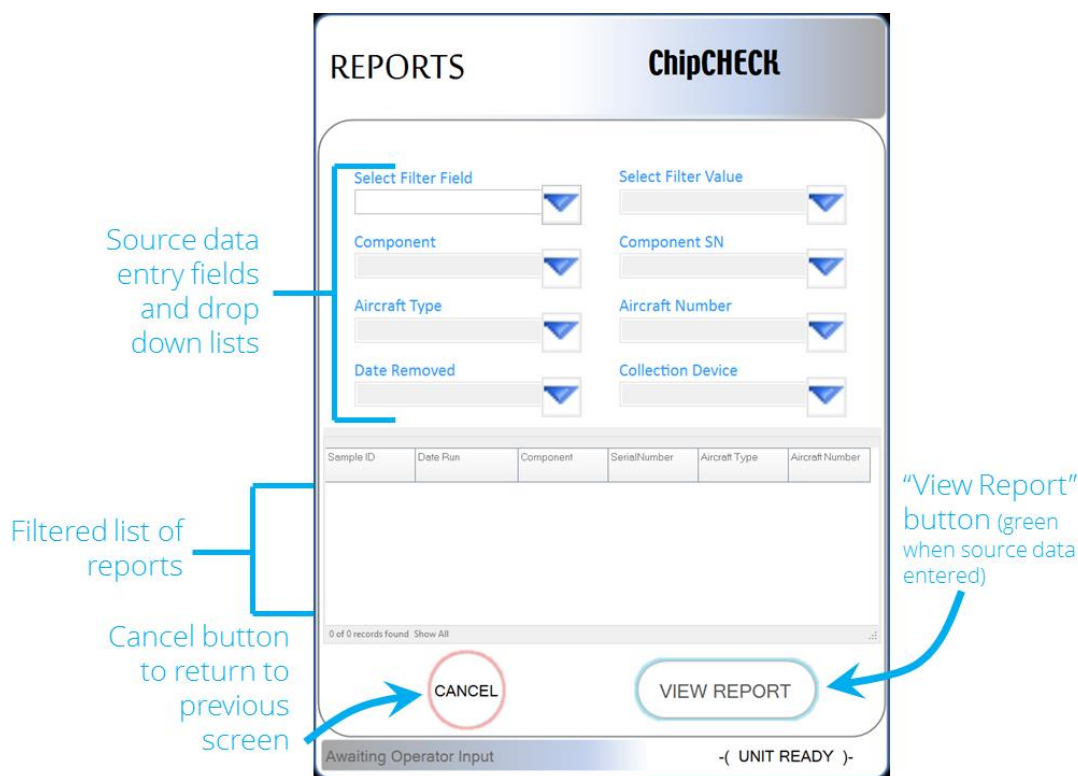


Figure 4-13: Reports Viewer Screen –Search &amp; Filter

The completion of the steps above will display the report and results from the desired analysis as shown in Figure 4-12 above. As described in Step 2, the User will then have the ability to “Copy to USB”, “View Other” or “View Latest” reports and data. Refer to Section 5.8 for information on copying files to an external flash drive via the “Copy to USB” button.

Otherwise, the User can select the “Options” button in the bottom left of the screen to return to the Options screen.

## 4.7 System Shutdown

The system shut down procedure is as follows:

1. Press the unit power button (see Figure 4-14). When the button is pressed, the unit ejects the Sample Receptacle, and a prompt on the touchscreen (see Figure 4-15) directs the user to remove the Sample Tray.
2. Remove the Sample Tray (if desired).
3. Press the OK button on the touchscreen prompt. When the OK button is pressed on the prompt, the unit moves the Sample Receptacle to the home position (internal to the unit), shuts down the software, and then shuts down power to the entire system. The power button on the



front of the unit will start blinking blue once the software is shut down, and will turn solid red once the power is shut down.

4. The power switch on the back of the unit can now be switched to the off position.



Figure 4-14: ChipCHECK Power Button

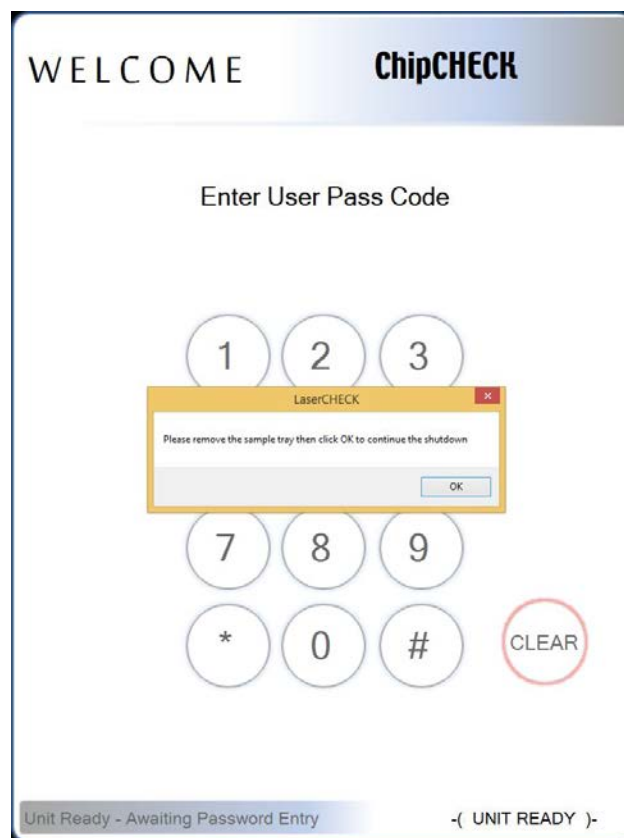


Figure 4-15: ChipCHECK Power Down – Remove the Sample Tray

## 5.0 Software Interface

This section describes in detail the ChipCHECK software interface and how to navigate through it. The interface is comprised of a series of 'screens' allowing the User to accomplish various actions. The following are the 'screens' available to the User:

- Welcome (Pass Code Entry)
- Options
- Standardization
- Calibration
- Analysis
- Reports
- Data Exports

The following subsections go into further detail regarding each of the respective 'screens' listed above. It is important to note that at any given point certain buttons will be available for selection by the User and others will be greyed out (until a certain action is achieved). This is done to guide the User through the appropriate sequence of steps and limit the required training. Each screen is designed to have a standard general layout. Figure 5-1 below defines the general layout of each interface screen.

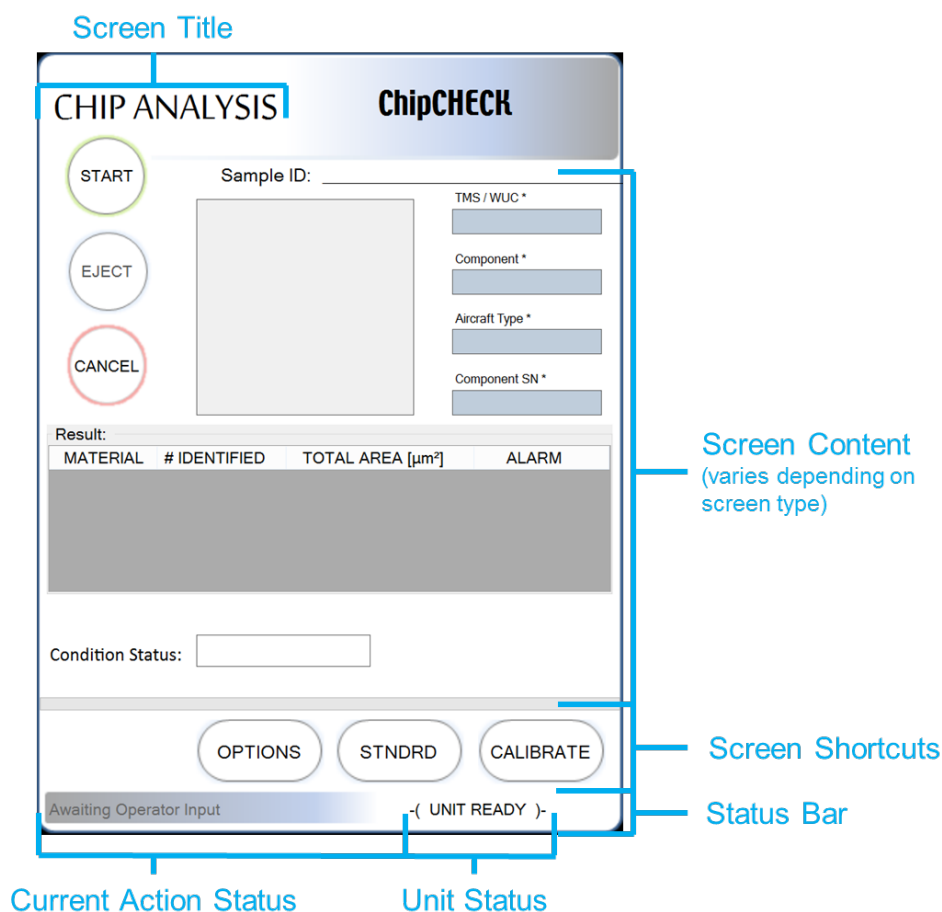


Figure 5-1: Generic Screen Layout

## 5.1 Welcome Screen

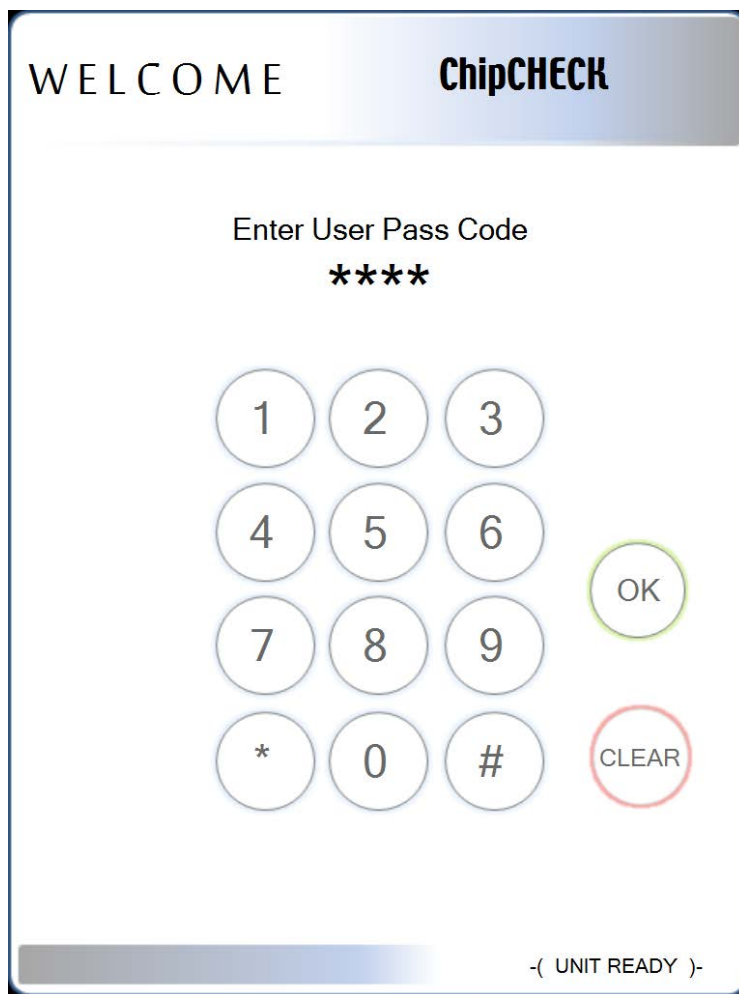


Figure 5-2: Welcome Screen

Once the software is initialized, or after an extended period of no use, the software interface displays the 'Welcome Screen' as shown in Figure 5-2 above. There are multiple types of equipment Users (Operator, Maintenance, Expert). Each are granted different levels of access to a variety of screens and action types. This access is dependent on the pass code entered in the Welcome Screen.

**NOTE:** As seen in Figure 5-2 above, the status bar indicates that the unit is powered and ready, and the User must enter their pass code to proceed.

**Procedure:**

- Enter Passcode** Using the keypad on the screen (or an external keyboard plugged into one of the USB connections on the side of the unit), enter the designated pass code (note that the “OK” button on the right side of the screen will only appear once four digits are entered). Your passcode is confidential and will only show up as a series of asterisks on the screen. The passcodes are provided during training.
- Select “Clear”** If an error is made while entering the pass code, select the “Clear” button to clear all values entered.
- Select “OK”** Once the correct pass code is entered, select the “OK” button to proceed.

## 5.2 Options Screen

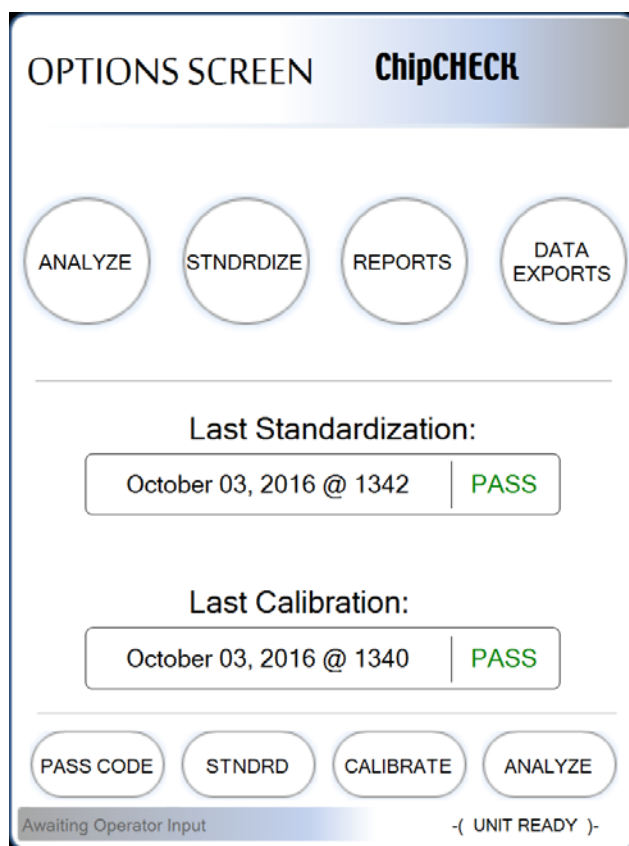


Figure 5-3: Options Screen

The “Options” screen is the main hub for all possible actions allowed to the User. The User can now do one of the following actions:

- Analyze Run an analysis on a prepared sample (see Section 4.0)
- Standardize Ensure that the system is still in calibration and performing properly
- Reports View existing reports on previously run samples
- Data Exports Export the data collected between any two dates to .csv format

The User simply selects the button that corresponds to their desired action. This can be done either in the main screen content or through the screen shortcuts at the bottom of the screen.

This “Options Screen” also provides the User with data regarding the last time the Standardization and Calibration were run – along with their respective results. Note that it is recommended that “Standardization” be completed at a minimum of every 48 hours and after each time the unit is moved.

In the event that the ‘Analyze’ button is selected and:

- It has been at least 48 hours since the last analysis was completed.
- It is the first analysis being completed since the unit was powered up.

The User will be reminded that Standardization should be run. This reminder screen is shown in Figure 5-4. If the User selects “Skip”, then the software interface will continue to the “Chip Analysis” screen (See Section 5.5). If the User selects “Standardize”, then the software interface will continue to the “Standardization” screen (See Section 5.3).

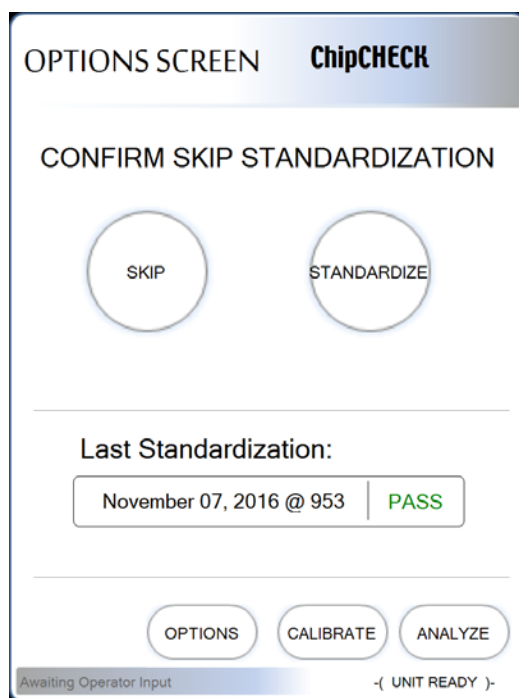


Figure 5-4: Confirm Skip Standardization Screen

## 5.3 Standardization Screen

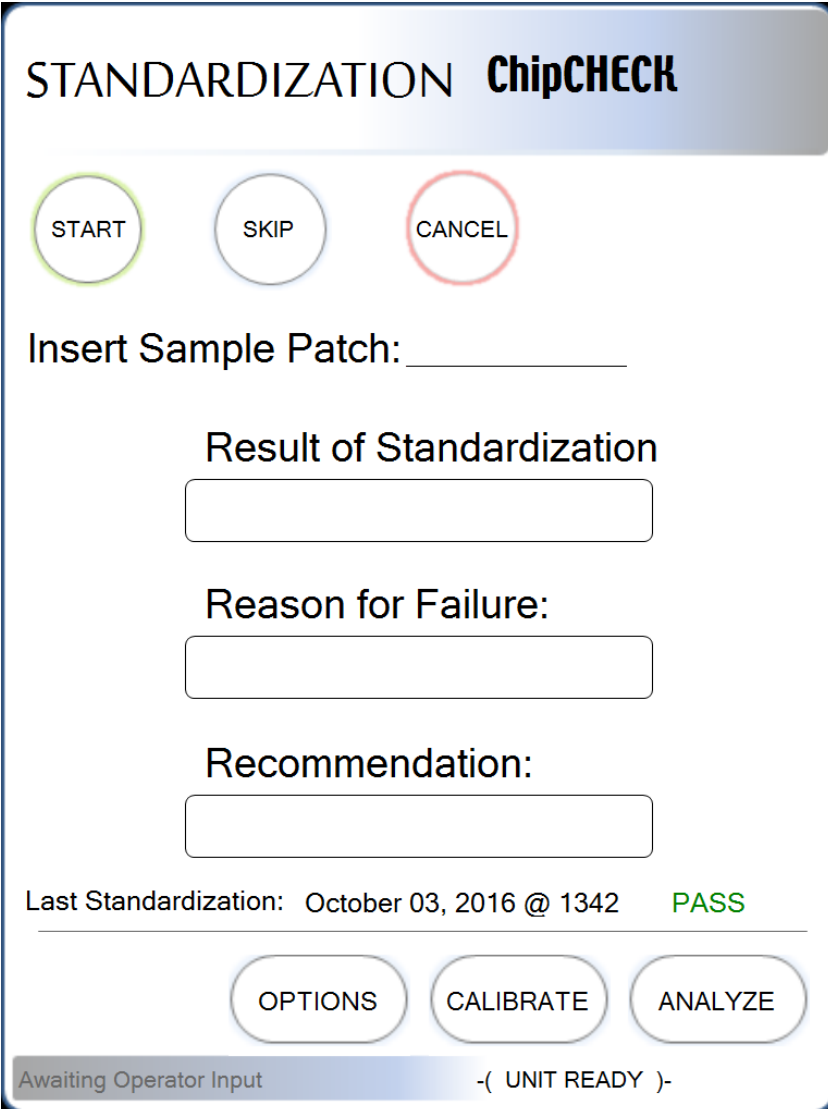
The image shows a digital screen for a 'STANDARDIZATION ChipCHECK' process. At the top, the title 'STANDARDIZATION ChipCHECK' is displayed in a grey header bar. Below the title are three circular buttons: 'START' with a green border, 'SKIP' with a blue border, and 'CANCEL' with a red border. The main area of the screen contains several input fields and labels. First is the label 'Insert Sample Patch:' followed by a horizontal line for text entry. Below this is the label 'Result of Standardization' followed by a rectangular input box. Next is the label 'Reason for Failure:' followed by another rectangular input box. Below that is the label 'Recommendation:' followed by a third rectangular input box. At the bottom of the main area, the text 'Last Standardization: October 03, 2016 @ 1342' is shown, followed by the word 'PASS' in green. At the very bottom of the screen are three rounded rectangular buttons labeled 'OPTIONS', 'CALIBRATE', and 'ANALYZE'. Below these buttons, a status bar contains the text 'Awaiting Operator Input' on the left and '-( UNIT READY )-' on the right.

Figure 5-5: Standardization Screen

A Standardization of the unit is recommended to be completed once each day prior to the use of the instrument. When the Standardization procedure is run, the system runs a test standard whose results are compared against expected criteria to confirm that the system is performing properly. As a result, this test standard is unique and should be monitored and kept in a safe place.

The “Standardization” screen shows when the last Standardization was completed and what the result was. The unit should not be used if the “Last Result” of the Standardization is “FAIL”. If the “Last Result” of Standardization is “FAIL” then run the Calibration Sequence (refer to Section 5.4).

## 5.4 Calibration Screen

**CALIBRATION** **ChipCHECK**

**START** **CANCEL**

Insert Sample Patch: \_\_\_\_\_

Image Calibration (µm : pixel):

\_\_\_\_\_

Camera to Table Calibration:

\_\_\_\_\_

---

Insert Sample Patch \_\_\_\_\_

Camera to Laser Calibration:

\_\_\_\_\_

**OPTIONS** **STNDRD** **ANALYZE**

Awaiting Operator Input -( UNIT READY )-

Figure 5-6: Calibration Screen

In order for the unit to perform properly and provide the required results it must be in Calibration. The 'Calibration' of the unit is the optical alignment of all components interior to the unit that, when used together, provide the results and analysis capabilities to the operator. The Calibration sequence is an automated sequence and should only be run when the "Standardization" sequence results in three (3) subsequent failures. As with the Standardization, the Calibration sequence is completed using a specific standard that must be monitored and kept in a safe place.

## 5.5 Analysis Screen

**CHIP ANALYSIS** **ChipCHECK**

START EJECT CANCEL

Sample ID:

TMS / WUC \*

Component \*

Aircraft Type \*

Component SN \*

Result:

MATERIAL	# IDENTIFIED	TOTAL AREA [μm²]	ALARM
----------	--------------	------------------	-------

Condition Status:

OPTIONS STNDRD CALIBRATE

Awaiting Operator Input -( UNIT READY )-

Figure 5-7: Analysis Screen

Once the unit is both Calibrated and Standardized, analyses can be run on prepared samples. Refer to Sections 4.1.1 and 4.1.2 for instructions on how to prepare and insert the sample into the unit.

Refer to Section 4.5 for the procedure on how to run an analysis.

## 5.6 Reports Screen (Results Viewer)

The results from every analysis run on the unit are saved to the database and can be viewed at a later date or exported to PDF.

Refer to Section 4.6 for the procedure to access all analysis reports.



## 5.7 Data Exports Screen

The screenshot shows the 'DATA EXPORTS' screen of the 'ChipCHECK' device. The screen has a header bar with 'DATA EXPORTS' on the left and 'ChipCHECK' on the right. Below the header, there is a section titled 'Filter Results through the following:'. This section contains two options: 'All Samples' (which is selected with a checked checkbox) and 'Samples with dates from' (which is unselected). Below the 'Samples with dates from' option, there are two date input fields, both showing '14- Oct -2016', separated by the word 'to'. At the bottom of the filter section, there are three buttons: 'CANCEL' (circled in red), 'EXPORT' (highlighted with a blue border), and 'COPY TO USB' (highlighted with a blue border). At the very bottom of the screen, there is a status bar with 'Awaiting Operator Input' on the left and '-( UNIT READY )-' on the right.

Figure 5-8: Data Exports Screen

The results from each analysis are stored in the unit's internal database. Through the 'Data Exports' screen the User is able to export results collected from some, or all, previously run analyses. This export capability renders the results to be extracted from the database and stored in a single .csv file. The User has the option to export either all samples collected and stored in the database or samples that were collected between specific dates.

**NOTE:** That exported results are purged from the database.

### Data Export Procedure:

<b>Select the samples to be exported:</b> "All Samples"	If it is desired to export all samples in the database, select the checkbox adjacent to "All Samples".
<b>Select the samples to be exported:</b> "Samples with dates from"	If it is desired to export samples in the database between two specific dates, select the checkbox adjacent to "Sample with dates from", and then select the range of dates from the two date fields provided. Select the small calendar icon next to the date fields in order to bring up a calendar that will aide in the selection of the desired date.
<b>Select "Export"</b> <b>Select "Copy to USB"</b>	Clicking "Export" will save the .csv file to the ChipCHECK hard drive. Clicking "Copy to USB" will allow exported .csv files to be moved from the ChipCHECK hard drive to an external USB flash drive (the file is not accessible to the user otherwise). Note that the external flash drive must be installed in the USB port on the left side of the ChipCHECK unit prior to selecting this function. Refer to Section 5.8 for instructions on using the "Copy to USB" functionality.

## 5.8 Copy to USB Screen

Reports and data that are exported to .csv files are saved to the ChipCHECK's hard drive. The Copy To USB screen allows a User to copy these files to an external USB flash drive. This screen also allows a user to delete reports or .csv files from the ChipCHECK hard drive. This screen is accessed when required from either the "Data Exports" screen (for .csv data export files), or from the "Chip Analysis" or "Report" screen (for .pdf report files).

The file naming convention for data export files is "EXP\_yymmdd\_hhmmss.csv". The "yyymmdd" portion of the name identifies the date that the file was created in a year/month/date format (each 2 digits). The "hhmmss" portion identifies the time that the file was created in an hour/minute/second format (each 2 digits).

The file naming convention for report files is "RPT\_ysnsnsncccc.pdf". The "YY" portion of the name identifies the year the file was created (2 digits). The "snsnsn" portion of the name identifies the serial number of the ChipCHECK unit (six digits). The "cccc" portion of the name is a counter that increments for each report generated on the unit, starting at 1 (this number restarts at the start of a new year).

**Copy To USB Procedure:**

- |                                   |   |
|-----------------------------------|---|
| <b>Insert a USB flash drive</b>   | Insert a USB flash drive into the ChipCHECK USB port (see Figure 5-9).  |
| <b>Select "Copy To USB"</b>       | From the "Data Exports" screen (for .csv data export files), or from the "Report" screen (for .pdf report files), press the "Copy To USB" button.                                       |
| <b>Select the files to copy</b>   | In the "Copy To USB" screen, there are two boxes, labelled "FROM" (on the left) and "TO" (on the right) (see Figure 5-10). In the "FROM" box, select the file(s) that are to be copied. |
| <b>Press the copy button</b>      | Press the copy button (the blue arrow between the "FROM" and "TO" boxes). The files will appear in the "TO" box.  |
| <b>Remove the USB flash drive</b> | Remove the USB flash drive from the ChipCHECK USB port.   |
| <b>Select "CLOSE"</b>             | Press the "CLOSE" button to return to the previous screen.  |



Figure 5-9: ChipCHECK USB Port Location

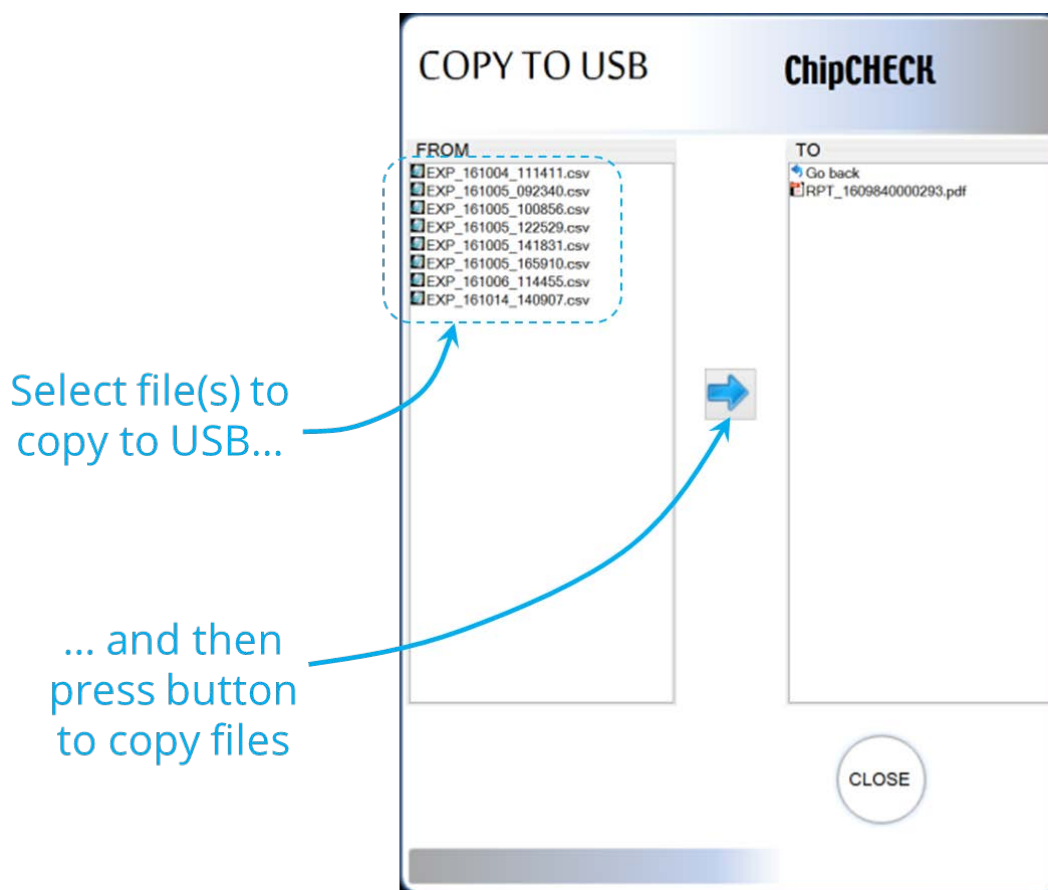


Figure 5-10: Copy to USB Screen

**File Delete Procedure:**

<b>Insert a USB flash drive (optional)</b>	Insert a USB flash drive into the ChipCHECK USB port (see Figure 5-9). Note that this step is optional. Inserting a USB flash drive will allow a User to delete files from the USB flash drive.
<b>Select "Copy To USB"</b>	From the "Data Exports" screen (for .csv data export files), or from the "Report" screen (for .pdf report files), press the "Copy To USB" button.
<b>Select the files to delete.</b>	In the "Copy To USB" screen, there are two boxes, labelled "FROM" (on the left) and "TO" (on the right) (see Figure 5-10). Select the file(s) that are to be deleted from the "FROM" box.
<b>Press the delete button</b>	Press the delete button (the red "x" between the "FROM" and "TO" boxes). After pressing the button, the selected files will be deleted (see Figure 5-11).
<b>Remove the USB flash drive</b>	If a USB flash drive was inserted, then remove it from the ChipCHECK USB port.
<b>Select "CLOSE"</b>	Press the "CLOSE" button to return to the previous screen.

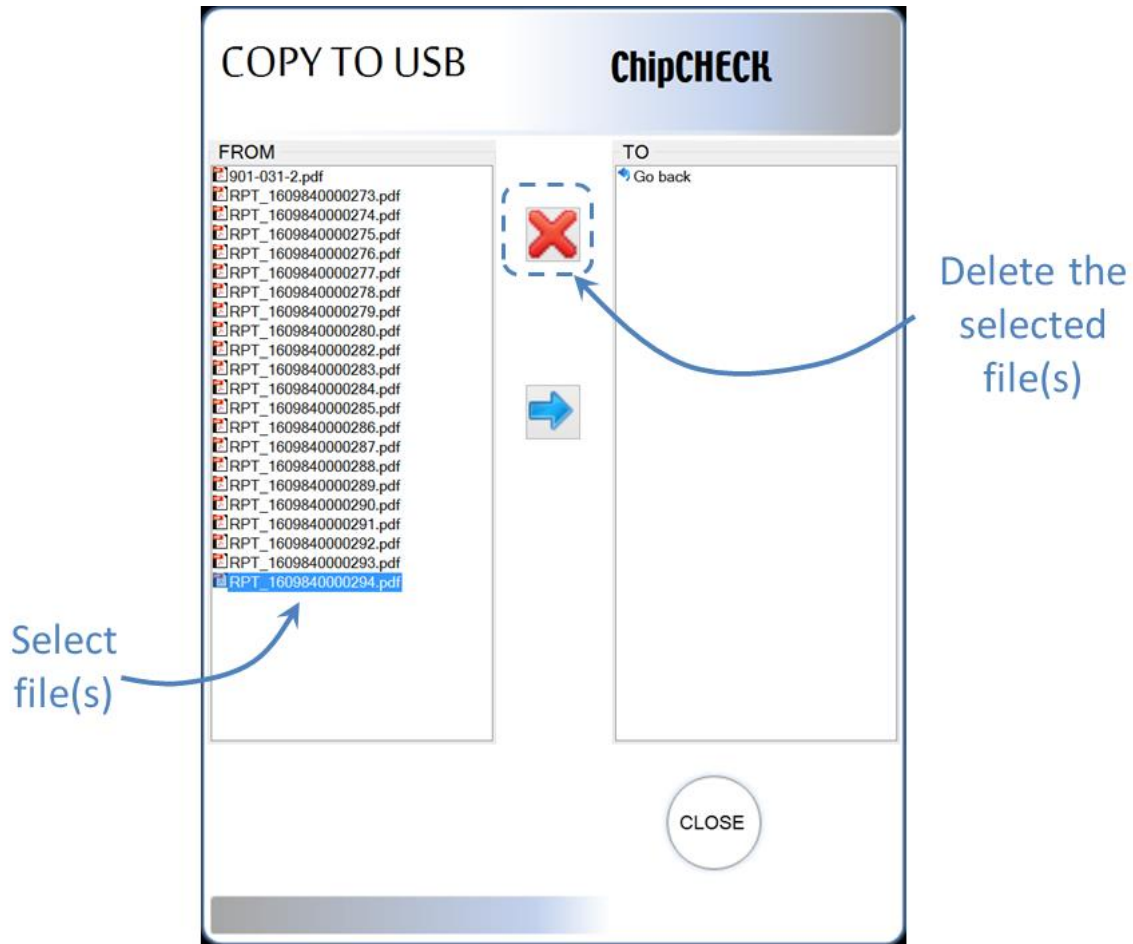


Figure 5-11: Copy to USB Screen: Delete Files

## 6.0 Maintenance & Service

The ChipCHECK unit is designed to require a minimum amount of maintenance. The sub-sections below provide the regular maintenance procedures required for the ChipCHECK unit. In the event of any equipment failure, Users are strictly forbidden to perform any kind of service. Service activities are restricted to Gastops authorized technicians who have the appropriate laser safety training.

### 6.1 Allowable User Maintenance

The ChipCHECK system is contained within an enclosure that acts as protective shielding preventing all laser radiation above Class 1 to the Operator. This section reviews the recommended, although infrequent, maintenance that will ensure the longevity and performance of the unit.

It is important to note that this section covers only recommended maintenance and there is absolutely NO SERVICE ALLOWED by the User where “service” is defined as any action requiring the removal or opening of an enclosure panel. In the event that the unit requires service, then it shall only be serviced or repaired by Gastops authorized technicians.

For the maintenance procedures discussed herein, there is no need to remove any covers or modify the unit. The User is strictly forbidden from modifying the unit, removing any covers, or to alter, interfere, modify, remove, circumvent, defeat or de-active any safety system or interlocks (refer to Section 2.2.2).

Both the Standardization and Calibration Patches are consumable and will require replacement every year. When the Standardization patch is replaced, it is recommended that the Containment Window (refer to Figure 6-1) either be cleaned or replaced. This is due to the slow accumulation of Laser Generated Air Contaminants (LGACs) that may occur after an extensive number of analyses. Over time, if these containments become excessive, the overall performance of the unit may be affected.

Figure 6-1 shows all of the components that are accessible during the maintenance of the unit.

Finally, if the fuse blows, then the User is permitted to replace the fuse with the proper part. To ensure the integrity of the unit, it is recommended that this fuse be sourced directly from Gastops.

Note that, to ensure optimum performance and longevity of the equipment the Gastops in-service support package must be maintained throughout the life of the equipment.



Figure 6-1: Containment Window Location

### 6.1.1 Replacement of the Containment Window

If the Containment Window is to be completely replaced, then the following procedure must be followed. Note that gloves are required to complete this procedure and the User must refer to Figures 6-1, 6-2 and 6-3 to supplement the procedure below.

- In the software interface, navigate to the 'Welcome' screen and enter the assigned 'Maintainer' pass code (refer to Section 5.1, the Maintainer pass code is provided during training).
- Once in 'Maintenance' mode, press the 'Conduct Maintenance' button near the middle of the screen.
- The Sample Receptacle will automatically displace further outside of the unit providing the required access to the Containment Window Assembly.
- Remove the Sample Tray, and set it aside.
- Remove the Containment Window from its housing by carefully lifting the metallic cover located on top of the Sample Receptacle. This cover is held in place by magnets. As a result, a vertical lift shall remove the lid from the assembly. Be sure to not apply much force to the Receptacle assembly.
- During this process ensure to not touch the surface of the Containment Window with bare fingers. Gloves are required.
- Take the replacement Containment Window and place it onto the Sample Receptacle ensuring that the Containment Window is properly seated on the centering features of the Receptacle.

- Carefully place the metallic cover back over the seated Containment Window – ensure that the cover is fully seated (note that the Containment Window metallic cover can only be assembled in one orientation).
- Lastly, return to the software interface and press the ‘Maintenance Complete’ button.
- The full Sample Receptacle will automatically re-insert itself back into the ejection position.
- Replace the Sample Tray, and return to the ‘Welcome’ screen for normal operation.



Figure 6-2: Maintenance – Holder Receptacle Position (Left) Containment Window Assembly (Right)

### 6.1.2 Cleaning the Containment Window

If the Containment Window is to be cleaned (not replaced), then the following procedure must be followed. Note that gloves are required to complete this procedure and the User must refer to Figures 6-1, 6-2 and 6-3 to supplement the procedure below.

- In the software interface, navigate to the ‘Welcome’ screen and enter the assigned ‘Maintainer’ pass code (refer to Section 5.1, the Maintainer pass code is provided during training).
- Once in ‘Maintenance’ mode, press the ‘Conduct Maintenance’ button near the middle of the screen.
- The Sample Receptacle will automatically displace further outside of the unit providing the required access to the Containment Window Assembly.
- Remove the Sample Tray, and set it aside.



- Remove the Containment Window from its housing by carefully lifting the metallic cover located on top of the Sample Receptacle. This cover is held in place by magnets. As a result, a vertical lift shall remove the lid from the assembly. Be sure to not apply much force to the Receptacle assembly.
- Place the Containment Window on a non-abrasive, lint free cloth/paper, with its bottom face pointing upwards (i.e.: the face of the Containment Window that is exposed to the contaminants placed in a manner that will allow for it to be cleaned).
- During this process ensure to not touch the surface of the Containment Window with bare fingers. Gloves are required.
- Place one or two drops of Isopropyl Alcohol on the exposed face of the Containment Window.
- Gently place the non-abrasive, lint free cloth/paper onto the Isopropyl Alcohol and allow for a few seconds for the Isopropyl to propagate through the cloth.
- Carefully and slowly drag the Isopropyl soaked cloth over the surface of the Containment Window (pulling parallel to the exposed surface of the Containment Window ensuring no pressure is applied to the window itself).
- Repeat these steps as required.
- Once the Containment Window is clean, place it back onto the Sample Receptacle ensuring that the Containment Window is properly seated on the centering features of the Receptacle.
- During this process ensure to not touch the surface of the Containment Window with bare fingers. Gloves are required.
- Carefully place the metallic cover back over the seated Containment Window – ensure that the cover is fully seated against the (note that the Containment Window metallic cover can only be assembled in one orientation).
- Lastly, return to the software interface and press the ‘Maintenance Complete’ button.
- The full Sample Receptacle will automatically re-insert itself back into the ejection position.
- Replace the Sample Tray, and return to the ‘Welcome’ screen for normal operation.

### 6.1.3 Replacing the Fuse

In the event that a fuse requires replacement, then the following procedure must be followed.

**WARNING:** Disconnect supply before servicing (note that service/servicing can only be completed by Gastops authorized technicians).

Disconnect supply before replacing fuse.

- Power down the ChipCHECK unit by pressing the Power Button on the front of the unit (Refer to Figure 3-3).
- Switch the Main Power Switch on the Power Entry Module to the off position (Refer to Figure 3-3).
- Disconnect the ChipCHECK unit's power cord from the ChipCHECK unit.
- Remove the Fuse Holder and extract the Fuse (see Figure 6-3).
- Insert the new Fuse and then reinsert the Fuse Holder into the Power Entry Module.
- Follow the set up instructions as described in Section 3.3.



Figure 6-3: Power Entry Module and Main Power Switch

## 6.2 Unit Service (No Allowable Service)

In the event of any equipment failure or component replacement, Users are strictly forbidden to perform any kind of service. There is absolutely NO SERVICE ALLOWED by the User.

Service activities are restricted to only Gastops authorized technicians who have the appropriate laser safety training. There are no User serviceable parts. This unit is to be serviced or repaired only by Gastops authorized technicians.

During servicing all precautions must be taken to avoid possible exposure to laser and collateral radiation above Class 1. This is a Class 1 laser product that contains a Class 4 laser. Removal of any

panels may allow for exposure to Class 4 laser radiation. Such panels include the unit's side panels, back panel, and main aluminum wrap. Tamper proof fasteners have been used for your protection. Only Gastops authorized technicians may remove these fasteners. Users are strictly forbidden from removing any fastener external to the unit.



### 6.3 Basic Trouble-Shooting

If you run into any problems with the operation of ChipCHECK, use the trouble-shooting procedures below in Table 6-1. Should any problem persist, contact your designated customer support representative (Refer to Section 8.0).

Table 6-1: Basic Trouble-Shooting Procedures

Symptom	Possible Remedy
Software interface does not respond to user input	<ul style="list-style-type: none"> <li>Conduct a complete unit shutdown and power down. Then power up and restart the unit as per Section 3.3.</li> <li>If this does not work, then contact Gastops Customer Support (See Section 8.0).</li> </ul>
Error occurs in software that ceases use of unit	<ul style="list-style-type: none"> <li>Conduct a complete unit shutdown and power down. Then power up and restart the unit as per Section 3.3.</li> <li>If this does not work, then contact Gastops Customer Support (See Section 8.0).</li> </ul>
The unit will not power up	<ul style="list-style-type: none"> <li>Ensure the unit is plugged into an appropriate 100-240 VAC socket and conduct the typical power up sequence according to Section 3.3.</li> <li>Check and replace the fuse, if necessary (See Section 6.1.3).</li> <li>If that does not work, then contact Gastops Customer Support (See Section 8.0).</li> </ul>

Symptom	Possible Remedy
Software interface does not respond to user input	<ul style="list-style-type: none"> <li>Conduct a complete unit shutdown and power down. Then power up and restart the unit as per Section 3.3.</li> <li>If this does not work, then contact Gastops Customer Support (See Section 8.0).</li> </ul>
The unit lost connection to one or more of its internal devices	<ul style="list-style-type: none"> <li>Conduct a complete unit shutdown and power down. Then power up and restart the unit as per Section 3.3.</li> <li>If this does not work, then contact Gastops Customer Support (See Section 8.0).</li> </ul>
The unit fails Standardization	<ul style="list-style-type: none"> <li>Power cycle the unit.</li> <li>Repeat Standardization.</li> <li>If Standardization fails three times in a row, conduct Calibration (See Section 5.4).</li> </ul>
The unit fails both Standardization and Calibration	<ul style="list-style-type: none"> <li>Power cycle the unit.</li> <li>Perform the maintenance sequences defined in Section 6.0.</li> <li>Repeat Calibration and the complete Standardization.</li> <li>If the unit still fails Calibration, then contact Gastops Customer Support (See Section 8.0).</li> </ul>
Chip Analysis – “No Particles Found” result after analysis	<ul style="list-style-type: none"> <li>Verify that the correct Sample Patch was inserted into the unit for analysis.</li> <li>Ensure that the sample under analysis contains particles larger than 80µm x 80µm.</li> <li>Rerun the analysis.</li> <li>If the issue persists, then contact Gastops Customer Support (See Section 8.0).</li> </ul>
Chip Analysis – “Analysis Failed” result after analysis	<ul style="list-style-type: none"> <li>Power cycle the unit.</li> <li>Rerun the analysis.</li> <li>If the issue persists, then contact Gastops Customer Support (See Section 8.0).</li> </ul>
Chip Analysis – “Particles Unclassified” result after analysis	<ul style="list-style-type: none"> <li>Clean the particles on the patch using a drop or two (only) of Isopropyl Alcohol then rerun the analysis.</li> <li>If the results are unclassified again, then the particle alloys are not in the material library.</li> </ul>

Symptom	Possible Remedy
Software interface does not respond to user input	<ul style="list-style-type: none"><li>• Conduct a complete unit shutdown and power down. Then power up and restart the unit as per Section 3.3.</li><li>• If this does not work, then contact Gastops Customer Support (See Section 8.0).</li></ul>
"Door Interlock fault condition exists. Servicing is required. Please call customer support"	<ul style="list-style-type: none"><li>• Conduct a complete unit shutdown and power down. Then power up and restart the unit as per Section 3.3.</li><li>• If this does not work, then contact Gastops Customer Support (See Section 8.0).</li></ul>
"Sequence contains no matching element" "Object reference not set to instance of an object" "Out of memory" "A generic error occurred in GDI+"	<ul style="list-style-type: none"><li>• Conduct a complete unit shutdown and power down. Then power up and restart the unit as per Section 3.3.</li><li>• If this does not work, then contact Gastops Customer Support (See Section 8.0).</li></ul>
Unexpected unit shut down	<ul style="list-style-type: none"><li>• Restart the system.</li><li>• If unit continues to shut down unexpectedly, then contact Gastops Customer Support (see Section 8.0).</li></ul>

## 7.0 Transport/Shipping and Storage

### 7.1 Transport/Shipping

The ChipCHECK unit comes packaged in MIL-STD-810 compliant case for field deployability (see Figure 7-1). Within the transport case, a removable foam insert protects the front face of the ChipCHECK unit. When unboxing the unit, this insert must be removed before the ChipCHECK can be removed from the transport case. To remove the unit from its transport case, simply open the case lid, lift out the foam insert, and then lift the unit out of the box (see Figure 7-2).

**NOTE:** Slots for storing accessories can be found in the foam insert, and in the foam lining of the case underneath the foam insert see Figure 7-3 and 7-4.



Figure 7-1: ChipCHECK Transport Case



Figure 7-2: ChipCHECK Transport Case Interior

The unit itself weighs approximately 40 lbs (18 kg). The Transport Case that was provided with the instrument must be used any time the instrument is moved positions or locations. Where possible, two people shall transport the unit and the instrument shall be kept in its vertical orientation at all times. The following procedure must be followed when transporting the instrument:

1. Complete an instrument shutdown in accordance with Section 4.7.
2. Unplug the AC power cable from both the unit and the wall power socket.
3. Open the provided Transport Case by undoing all latches and removing the top cover.
4. Remove the instrument's accessory foam insert from the Transport Case.
5. Carefully lift the instrument and place it into the Transport Case, within its dedicated custom foam cut out. Note that there is only one proper orientation for the unit to be placed, otherwise the Transport Case will not close properly.
6. Replace the instrument's accessory foam insert, and place all of the instrument's accessories and power cable into their respective custom foam cut outs.
7. Replace the Transport Case cover and re-fasten all latches.
8. Lock or fasten each latch (where possible).
9. Where possible, two people shall move the unit (in its transport case) to its new location. The Transport Case is also equipped with a retractable handle and wheels for single person transport.

**NOTE:** Relocation within the same room is acceptable to be completed without using the transport case; however, the transport case must be used otherwise. Prior to shipment/relocation, ensure that the lid is fully and firmly attached to the main body of the case with all latches fastened or locked. All parts, components and accessories required to operate the unit are must be included in the transport case.

**NOTE:** The Sample Tray must be removed from the unit and placed in its proper location within the foam insert prior to transport.

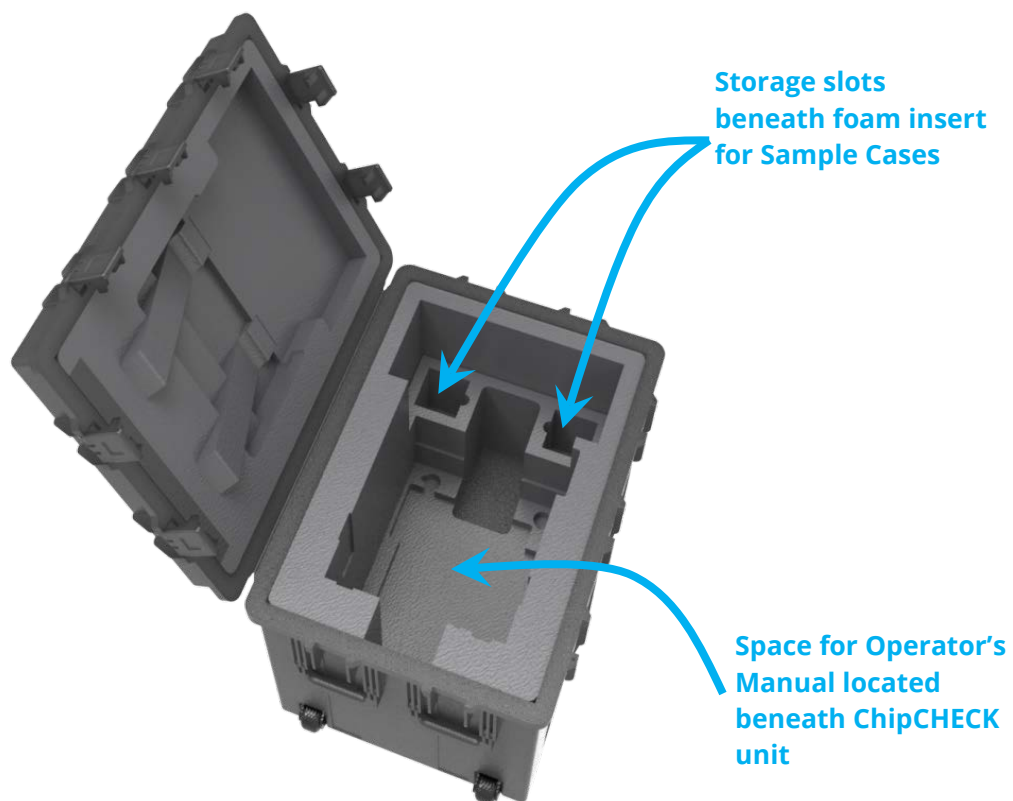


Figure 7-3: Transport Case Storage Locations (Foam insert removed)

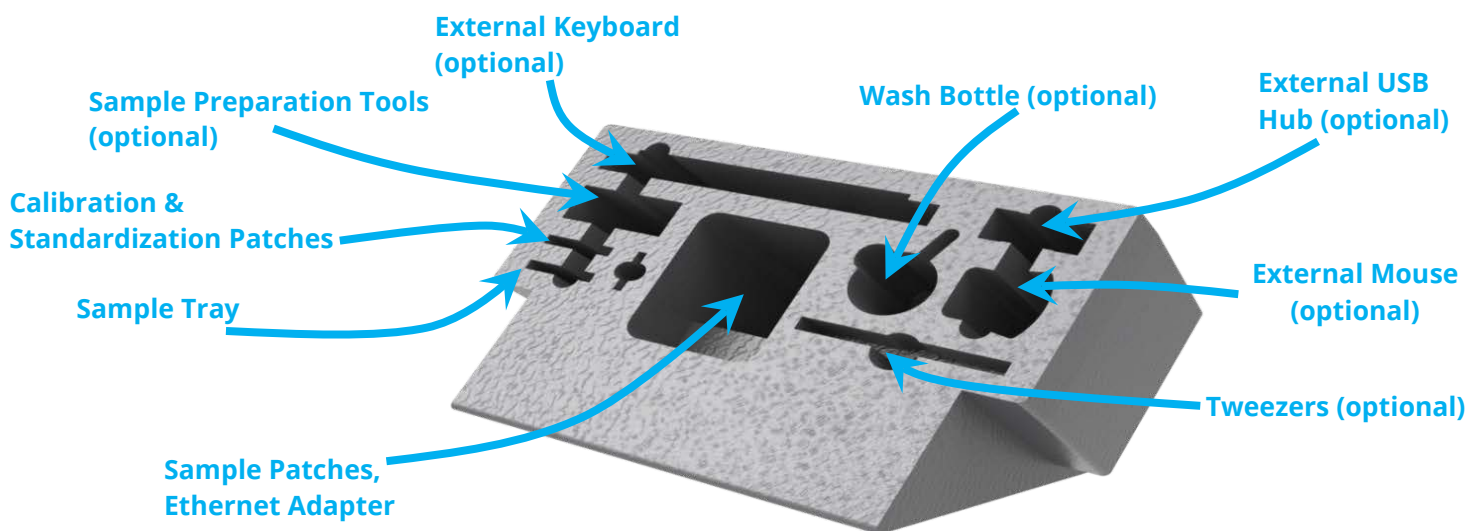


Figure 7-4: Foam Insert Storage Locations



Included in the Transport Case:

<u>Quantity</u>	<u>Description</u>
1x	ChipCHECK Unit
1x	Unit Power Cable
1x	Sample Tray (Chip)
200x	Sample Patches
1x	Standardization Standard
1x	Calibration Standard
20X	Sample Patch Cases
1x	USB Ethernet Adapter

Additional optional accessories may include the following:

- External keyboard
- External mouse
- External USB hub
- Sample preparation tools (tweezers, probe set, wash bottle)

## 7.2 Storage

When storing the unit temporarily, take note of the environmental limitations defined at the beginning of the manual and all shipping procedures must be followed (Refer to Section 7.1).

## 8.0 Customer Support

Gastops technical support representatives for ChipCHECK can be reached at:

Phone: 1-613-744-3530

Fax: 1-613-744-8846

Toll Free: 1-800-363-8658

Email: [support@gastops.com](mailto:support@gastops.com)

Gastops Limited  
1011 Polytek Street  
Ottawa, ON  
K1J 9J3  
Canada