



## **CONTENTS**

### **1. Introduction**

### **2. Required Equipment**

### **3. Cleaning procedure**

#### **3.1. Course cleaning**

#### **3.2. Intermediate cleaning**

#### **3.3. Precision cleaning**

## 1. Introduction

In order to meet project contamination cleanliness requirements, ground support equipment (GSE) used in clean areas at MSSL for flight hardware integration and testing needs to be cleaned at regular intervals. This is to ensure that surface contamination levels are minimised and the possibility of contamination redistribution from the GSE to the flight hardware is significantly reduced.

## 2. Required equipment

- Isopropyl Alcohol (IPA): Analar grade for course and intermediate cleaning and spectro grade for precision cleaning.
- Cleanroom Wipes: Lint-free Polyester
- Vacuum Cleaner: HEPA-filtered for precision cleaning
- Acetone: Analar grade for course and intermediate cleaning and spectro grade for precision cleaning.
- Cleanroom Swabs: Woven Polyester
- Compressed Air or Nitrogen, filtered for particles to 0.5 micron
- White light source (100W)

Before use in a controlled clean area, GSE must be cleaned and inspected for visible cleanliness. GSE cleaning should be performed to visibly clean – sensitive level (VC-S) as defined in MSSL/PA/PS/Q012 “Procedure for verifying surfaces to a visibly clean level”. To achieve this surface cleanliness standard, GSE cleaning should be performed in three stages as defined below:

- Course cleaning

Course cleaning can be performed in non clean areas (workshop, office etc). The idea is to remove the bulk of contaminants from the hardware. Nitrile gloves should be worn during course cleaning

- Intermediate cleaning

Intermediate cleaning should be performed in the anteroom. Particular attention should be paid to surfaces, crevices, corners, vents etc and these should be cleaned using appropriate solvents or detergents. A more thorough inspection of all surfaces is required at this stage. Cleanroom wipes and nitrile gloves should be worn while performing intermediate cleaning.

- Precision cleaning

Precision cleaning should be performed inside the cleanroom but away from flight hardware (ideally at entrance to cleanroom). Spectro grade solvents should be used and polyester cleanroom wipes. Cleanroom dress code of mask, hood, cleanroom bunny suit, overshoes and nitrile gloves should be observed. A methodical and thorough surface inspection should be carried out as defined in MSSL/PA/PS/Q012 “Procedure for verifying surfaces to a visibly clean level” to a VC-S level after cleaning.

### 3. Cleaning procedure

#### 3.1. Course cleaning

- 3.1.1. Determine the surface sensitivity to handling and solvents. If the surface is sensitive to IPA or acetone, use filtered critical neutral detergent. If the surface is sensitive to handling, limit or eliminate vacuum use and handling as necessary to prevent GSE damage.
- 3.1.2. If computing equipment is to be brought into clean areas laptop devices are preferred. If this is not possible desktop computers should be thoroughly cleaned inside and outside the casing paying particular attention to exhaust fans from the power supply.
- 3.1.3. Computer monitors should be thoroughly vacuumed paying particular attention to the monitor vents prior to cleaning procedure below.
- 3.1.4. Computer keyboards should be turned upside down and a jet of clean filtered compressed air or nitrogen directed between the keys prior to cleaning procedure listed below.
- 3.1.5. Remove loose particles from the GSE by thoroughly vacuuming all surfaces, including holes, crevices, and corners, with a vacuum cleaner. This step should not be performed for items sensitive to handling. Minimise direct nozzle contact with GSE surfaces and continue until no particles are visible on GSE surfaces.

#### 3.2. Intermediate cleaning

- 3.2.1. Lightly dampen a cleanroom wipe with IPA (Analar grade or equivalent). Do not saturate the wipe or dip the wipe in the solvent container.
- 3.2.2. Clean the GSE surface with the IPA dampened wipe, wiping the surfaces in a unidirectional manner. Do not overlook crevices, corners, or holes. If necessary, lightly dampen a swab with IPA and use the swab to clean recessed areas. Clean recessed surfaces with the swab by rotating the swab over the surface. During cleaning, fold the wipe to expose a clean surface or replace with a new wipe if the wiping surfaces become contaminated. Replace swabs when visibly contaminated. Lightly dampen each new wipe surface or swab with IPA and continue cleaning. Repeat until GSE surfaces do not display visible contamination.
- 3.2.3. If solvent remains on any GSE surfaces, particularly blind holes or other recesses, dry the surfaces completely with filtered, oil-free GN<sub>2</sub> or air. Regulate the gas flow as necessary to prevent solvent splashing and damage to GSE surfaces. After solvent wiping, inspect surfaces for visible cleanliness as defined in MSSL/PA/PS/Q012.01 "Procedure for Verifying Surfaces to a Visibly Clean Level"
- 3.2.4. If visual inspection reveals surface contaminants, repeat the solvent wiping procedure above and re-inspect. If contamination still remains visible after solvent wiping, repeat the solvent wiping procedure with acetone substituted for IPA. Before using acetone, however, verify that it will not degrade the materials undergoing cleaning. If contaminants remain visible after using acetone, contact the contamination control manager (CCM).

### 3.3. Precision cleaning

- 3.3.1. Lightly dampen a cleanroom wipe with spectro grade IPA. Do not saturate the wipe or dip the wipe in the solvent container.
- 3.3.2. Clean the GSE surface with the spectro grade IPA dampened wipe, wiping the surfaces in a unidirectional manner. Do not overlook crevices, corners, or holes. If necessary, lightly dampen a swab with IPA and use the swab to clean recessed areas. Clean recessed surfaces with the swab by rotating the swab over the surface. During cleaning, fold the wipe to expose a clean surface or replace with a new wipe if the wiping surfaces become contaminated. Replace swabs when visibly contaminated. Lightly dampen each new wipe surface or swab with IPA and continue cleaning.
- 3.3.3. If solvent remains on any GSE surfaces, particularly blind holes or other recesses, dry the surfaces completely with filtered, oil-free GN<sub>2</sub> or air. Regulate the gas flow as necessary to prevent solvent splashing and damage to GSE surfaces.
- 3.3.4. After solvent wiping, inspect surfaces for visible cleanliness as defined in MSSL/PA/PS/Q012 "Procedure for Verifying Surfaces to a Visibly Clean Level". The surface cleanliness level should be VC-S. A white light source (100W) can be used to aid inspection. Repeat above cleaning procedure until GSE surfaces do not display visible contamination.
- 3.3.5. All cleaned GSE cables can then be sleeved in Llumalloy bagging. Sleeve ends should be sealed with clean cable ties or Kapton tape.

Note: Depending on project contamination control requirements certain GSE may require cleaning to a more stringent level such as VC-HS. The above procedure can be adapted to suit this requirement by substituting the appropriate inspection procedure as defined in MSSL/PA/PS/Q012. Cleaning methods will remain the same.