STANDARD OVERHAUL PRACTICES MANUAL

REPLACEMENT OF BALL GRID ARRAY (BGA) PARTS

PART NUMBER NONE

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STANDARD OVERHAUL PRACTICES MANUAL

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To: All holders of REPLACEMENT OF BALL GRID ARRAY (BGA) PARTS 20-11-10.

Attached is the current revision to this STANDARD OVERHAUL PRACTICES MANUAL

The STANDARD OVERHAUL PRACTICES MANUAL is furnished either as a printed manual, on microfilm, or digital products, or any combination of the three. This revision replaces all previous microfilm cartridges or digital products. All microfilm and digital products are reissued with all obsolete data deleted and all updated pages added.

For printed manuals, changes are indicated on the List of Effective Pages (LEP). The pages which are revised will be identified on the LEP by an R (Revised), A (Added), O (Overflow, i.e. changes to the document structure and/or page layout), or D (Deleted). Each page in the LEP is identified by Chapter-Section-Subject number, page number and page date.

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Location of Change	Description of Change
	NO HIGHLIGHTS

STANDARD OVERHAUL PRACTICES MANUAL

A = Added, R = Revised, D = Deleted, O = Overflow

TABLE OF CONTENTS

STANDARD OVERHAUL PRACTICES MANUAL

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Revision		Filed	
Number	Date	Date	Initials

Revision		Filed	
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Number	Date	Date	Initials	Date	Initials

Temporary Revision		Inserted		Removed	
Date	Initials	Number	Date	Date	Initials

Temporary Revision		Inserted		Removed	
Number	Date	Date	Initials	Date	Initials

Temporary Revision		Inserted		Removed	
Date	Initials	Number	Date	Date	Initials

INTRODUCTION

1. General

A. The instructions in this manual tell how to do standard shop procedures during maintenance functions from simple checks and replacement to complete shop-type repair.

B. This manual is divided into separate sections:

(1) Title Page

(2) Transmittal Letter

(3) Highlights

(4) Effective Pages

(5) Contents

(6) Revision Record

(7) Record of Temporary Revisions

(8) Introduction

(9) Procedures

C. Refer to SOPM 20-00-00 for a definition of standard industry practices, vendor names and addresses, and an explanation of the True Position Dimensioning symbols used.

D. The data is general. It is not about all situations or specific installations. Use it as a guide to help you write minimum standards.

E. If the component overhaul instructions are different from the data in this subject, use the component overhaul instructions.

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STANDARD OVERHAUL PRACTICES MANUAL

REPLACEMENT OF BALL GRID ARRAY (BGA) PARTS

1. INTRODUCTION

A. The data in this subject comes from Boeing Document D906-00016.

B. The data is general. It is not about all situations or specific installations. Use this data to help you write minimum requirements.

C. Refer to SOPM 20-00-00 for a list of all the vendor names and addresses.

2. BACKGROUND

A. The repair of ball grid array components uses an automated rework system, which is a special machine to do the replacement work, because the components are too small for the usual hand procedures. The machine makes, stores and uses special programs, called profiles, for removal of the old parts and installation of the replacement parts.

B. Removal and replacement profiles (temperature vs. time) are necessary for each combination of part type and printed wiring assembly (PWA).

(1) To make a profile, the part is given a sequence of temperature cycles, each cycle hotter than the last, until the part can be removed with a minimum of force. This removal profile is then also used during the part replacement and soldering procedure.

(2) The rework system automatically makes and records (learns) the profiles with user-specified process parameters.

(3) The rework system can start with the baseline profile data parameters (Table 1), or with a profile it already knows to make new profiles.

Table 1: Example Profile Parameters and Baseline Values

PARAMETER	VALUE
Device Top temperature	230°C max.
Device Joints	
Target temperature	205°C *[1]
Soak temperature limits	140-180°C
Soak time limits	60-90 sec.
Ramp rate	5°/sec. max.
Reflow time limits	20-120 sec.
Cool down temperature	170°C
Board Control	
Target temperature	85-95°C
Start temperature	55-65°C *[2]
Max. temperature	130°C

*[1] Minimum ball joint reflow temperature. Limited by device temperature limit

*[2] Temperature at start of preheat cycle. Board must cool down to 60°C before process will start

C. Site cleaning processes are used to remove unwanted remaining solder from the location on the PWA where the old part was removed.

(1) It is best to clean the location immediately after the part was removed, before the solder can cool. You can clean the location later, but then the solder will be less easy to remove.

(2) The cleaning procedure can be part of an automatic system function. As an alternative, you can use the usual hand procedures, such as a soldering iron and desoldering braid, to remove the unwanted solder.

(3) The recommended rework system gives automatic site cleaning processes.

(a) A special cleaning nozzle gives a controlled vacuum to remove the unwanted solder.

(b) Stored site cleaning profiles control the vacuum, the temperature of the PWA, and the hot air that flows through the cleaning nozzle.

(c) The site cleaning profiles are made from baseline profiles supplied with the rework system.

3. EQUIPMENT

NOTE: Equivalent substitutes can be used.

A. Rework system – Air Vac DR24C.2D, V18887

The rework system must:

(1) Put parts in position with a minimum of 0.001-inch alignment precision.

(2) Learn (record) removal and replacement profiles.

(3) Clean and remove unwanted solder from the PWA, if hand methods will not be used.

(4) Save (store) removal and replacement profile data.

B. Inspection system – Ersascope 3000, VD5370

The inspection system must show the outer set of ball grid array bonds with sufficient resolution to let you find out the quality of the bonds made during the repair procedure.

4. MATERIALS

A. Acetone (SOPM 20-60-01).

B. Isopropyl alcohol (SOPM 20-60-01)

C. Flux paste – Kester TSF 6522, V75297

D. Tape – Scotch 5413, V76381

5. REMOVAL OF BGA PARTS

A. Remove conformal coating from the top surface of the component body.

B. Remove the parts with the rework system by this procedure:

(1) Run the warm-up profile if the machine's heaters were off more than one hour.

(2) Select the removal profile for the type of part to be removed.

(3) Load the nozzle specified for the part to be replaced.

(4) Adjust the board rails and load the printed wiring assembly.

(5) If your system uses a site cleaning profile, prepare it to operate immediately after the part removal is complete (next step). Make sure the cleaning nozzle is available, the solder screen is clear, and the vacuum is on. If you do not use an automatic cleaning profile, go to Paragraph 5.B.(8).

(6) Run the removal profile by the instructions supplied with the system.

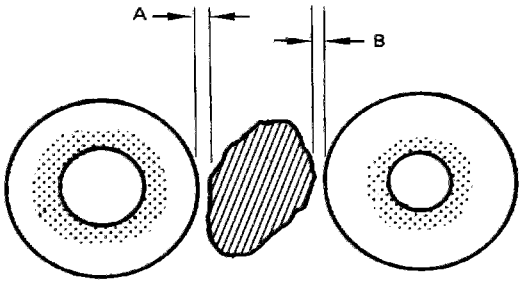
(7) Remove the part nozzle. Install the cleaning nozzle. Select the site cleaning profile.

CAUTION: BE CAREFUL NOT TO LIFT THE SOLDER PADS DURING THE CLEANING PROCEDURE.

(8) Run the site cleaning profile, or use an equivalent hand method, to remove the unwanted solder from the pads.

(9) Examine the circuit board for defects. The circuit board or pads must not be damaged. Reject a damaged or melted board that exposes glass fibers and decreases the spacing between conductors to less than 0.010 inch (Figure 1). Reject a board with lifted circuit pads.

(10) Clean the pads with isopropyl alcohol. Acetone is not necessary for acrylic conformal coatings, which are the only coatings used on Boeing units with BGA devices. Acetone is necessary only if the boards had polyurethane conformal coating.



A+B MUST NOT BE LESS
THAN 0.010 INCH

Acceptable Surface Damage Limits
Figure 1

6. REPLACEMENT OF BGA PARTS

A. Select the replacement (soldering) profile for the type part to be replaced.

B. Load the nozzle specified for the type of part to be replaced.

C. Adjust the board rails and load the printed wiring assembly.

D. Load the replacement part and align the part over the location on the circuit board. The part is sufficiently aligned when the position error is less than approximately 25% of the pad center. The part will usually align itself when released from the nozzle as the bonds become solid.

E. Run the replacement (soldering) profile by the instructions supplied with the system.

F. Remove the assembly. Be careful, because the unit and its components will be hot.

G. Examine the part installation.

(1) Make sure the part is correctly aligned.

(2) With the inspection tool, examine the outer rows of bonds to make sure the solder bonds were made correctly. The solder bond must:

(a) Be shiny, not dull.

(b) Show sings of good wetting (flow) between the solder, the pads, and the PWA.

(3) If the bonds are not OK, then remove this part and install a new part. Do not use the removed part again.

(4) When you remove a part, record a new replacement profile. Refer to the vendor's instructions to make the machine learn new profiles.

(5) Compare the new profile with the last one used, to see how the replacement profile must be adjusted to correct the problem.

(6) Examine the removal location on the PWA. Make sure it is clean.

(7) As necessary, revise the site cleaning profile or the replacement profile, or both, as indicated by the analysis of the unsatisfactory bond. Refer to the vendor's instructions to make the machine learn new profiles. Then do the replacement procedure again with the revised site cleaning and replacement profiles.

(8) Make a note, in the repair records for the unit, of the number of BGA part replacements made before the repair was satisfactory.