

**NOTE**



*All numerical values are in metric units [with U.S. customary units in brackets]. Dimensions are in millimeters. Unless otherwise specified, dimensions have a tolerance of  $\pm 0.13$  and angles have a tolerance of  $\pm 2^\circ$ . Figures and illustrations are for identification only and are not drawn to scale.*

## 1. INTRODUCTION

This specification covers the requirements for application of a Land Grid Array (LGA) 372-Position Surface Mount Technology (SMT) Socket Assemblies onto printed circuit (pc) boards. The socket features 0.76 mm diameter surface-mount solder balls and may be placed on the pc board by automatic application tooling (typically vacuum pick and place). The pick-and-place cover on the top of the socket is used to facilitate this process. The cover also protects the contacts and must remain on the socket until it is mated with the microprocessor substrate.

When corresponding with Tyco Electronics Personnel, use the terminology provided in this specification to facilitate your inquiries for information. Basic terms and features of this product are provided in Figure 1.

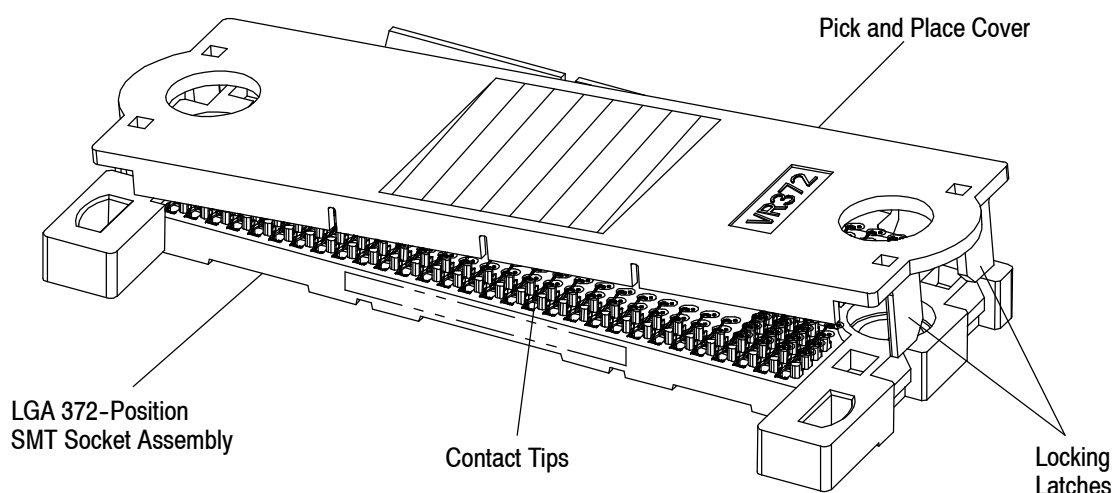


Figure 1

## 2. REFERENCE MATERIAL

### 2.1. Revision Summary

This paragraph is reserved for a revision summary covering the most recent additions and changes made to this specification which include the following:

- Updated document to corporate requirements
- New logos

### 2.2. Customer Assistance

Reference Product Base Part Number 1761347 and Product Code 2961 are representative of LGA 372-Position SMT Socket Assemblies. Use of these numbers will identify the product line and expedite your inquiries through a service network established to help you obtain product and tooling information. Such information can be obtained through a local Tyco Electronics Representative.

## 2.3. Drawings

Customer Drawings for product part numbers are available from the service network. If there is a conflict between the information contained in the Customer Drawings and this specification or with any other technical documentation supplied, contact Tyco Electronics Product Information.

## 2.4. Manuals

Manual 402-40 can be used as a guide to soldering. This manual provides information on various flux types and characteristics with the commercial designation and flux removal procedures. A checklist is included in the manual as a guide for information on soldering problems.

## 2.5. Specifications

Product Specification 108-2170 provides product performance and test information.

# 3. REQUIREMENTS

## 3.1. Safety

Do not stack product packages so high that the shipping containers buckle or deform.

## 3.2. Limitations

The sockets are designed to operate in a temperature range of -55° to 125°C [-67° to 257°F].

## 3.3. Material

The housing and cover are made of glass-filled liquid crystal polymer (LCP) plastic. The solder balls are made of eutectic 63/37 tin lead solder or (lead free) tin-silver-copper solder.

## 3.4. Storage

### A. Ultraviolet Light

Prolonged exposure to ultraviolet light may deteriorate the chemical composition used in the socket material.

### B. Shelf Life

The sockets should remain in the shipping containers until ready for use to prevent deformation or oxidation to the solder balls. The sockets should be used on a first in, first out basis to avoid storage contamination that could adversely affect performance.

### C. Chemical Exposure

Do not store sockets near any chemical listed below as they may cause stress corrosion cracking in the solder balls.

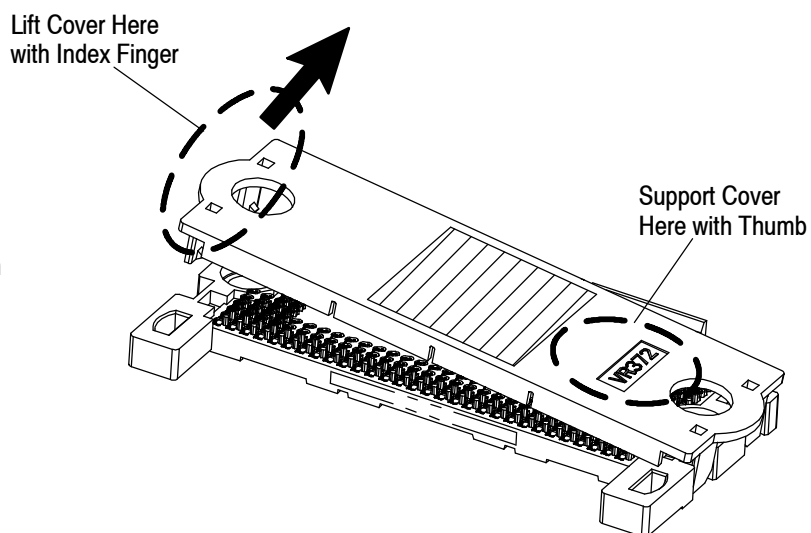
Alkalies	Ammonia	Citrates	Phosphates	Citrates	Sulfur Compounds
Amines	Carbonates	Nitrites	Sulfur	Nitrites	Tartrates

## 3.5. Special Assembly Considerations

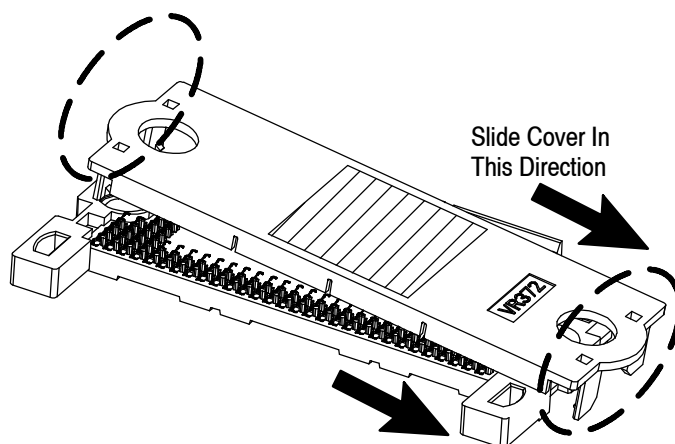
The following assembly procedures should be followed when assembling this product. See Figure 2. If other components are required for the system into which the socket assembly is installed, the socket and those components must be assembled in the following sequence:

- The LGA 372-Position SMT Socket Assembly is soldered to the VRM board.
- The pick and place cover is removed as illustrated in Figure 2 prior to installation to the mating LGA card. The cover must be installed at all times when the connector is in the unmated condition. The cover should not come into contact with the LGA springs (contact tips) during cover removal and installation.
- The snap-on alignment plugs are installed in the socket assembly. These plugs are rated for 3 removals and 4 installation cycles.

**STEP 1:** The index finger grips the tab while the thumb supports the cover in the approximate area shown producing a flex in the plane of the cover allowing the end latches to rock free of the socket detents.



**STEP 2:** The cover is then slid away in the plane of the socket freeing the last two latches from the detents.



**STEP 3:** The cover can now be freely lifted away from the socket in the vertical direction.

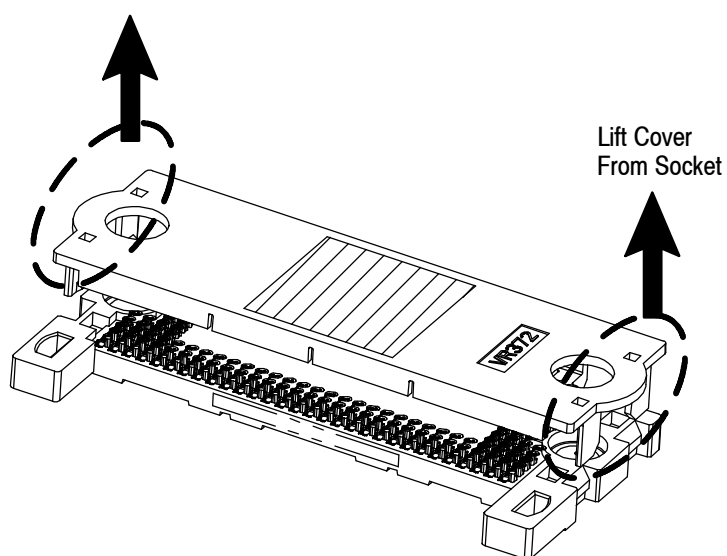


Figure 2

**NOTE**

The PEMS on the Bolster Plate act as standoffs and should be machined to a height facilitating a connector compressed height off the VR board of 3.4–3.75 defined as the working range of the connector.

**3.6. PC Board****A. Material and Thickness**

The pc board material shall be glass epoxy (FR-4 or G-10). There is no required thickness for the pc board.

**B. Tolerance**

Maximum allowable bow of the pc board shall be 0.13 mm per 25.4 mm over the length of the socket grid area.

**C. Pads**

The pc board circuit pads must be solderable in accordance with Test Specification 109-11.

**D. Layout**

The circuit pads on the pc board must be precisely located to ensure proper placement and optimum performance of the socket. The pc board layout must be designed using the recommended dimensions provided in Customer Drawing 1761347.

**3.7. Solder Paste Characteristics**

1. For sockets with tin lead solder balls, alloy type shall be 63 Sn/37 Pb. For sockets with lead free solder balls, alloy type shall be Sn/Ag/Cu (this type of alloy has a melting point between 217° and 220°C [423° and 428°F]).
2. Recommended flux incorporated in the paste should be “no clean” type. Other fluxes, such as rosin, mildly active (RMA) type, are acceptable.
3. Paste will be at least 80% solids by volume.
4. Mesh designation –200 to +325 (74 to 44 square micron openings, respectively).
5. Minimum viscosity of screen print shall be  $5 \times 10^4$  cp (centipoise).
6. Minimum viscosity of stencil print shall be  $7.5 \times 10^4$  cp (centipoise).

**3.8. Solder Paste Thickness**

Solder paste thickness for the solder balls shall be 0.15 mm.

**3.9. Screen**

Recommended screen thickness is 0.15 mm with 0.51 mm aperture hole diameter.

**3.10. Solder Volume**

Minimum solder volume (V) (before curing) for each circuit pad is calculated by multiplying the area of the pad (A) by the stencil thickness (T):

$$\pi \times (0.51 \text{ mm})^2 / 4 = 0.204 \text{ mm}^2 \text{ (A)}$$

$$0.204 \text{ mm}^2 \text{ (A)} \times 0.15 \text{ mm (T)} = 0.031 \text{ mm}^3 \text{ (V)}$$

Solder volume for each socket must be 0.031 mm<sup>3</sup> per solder ball.

**NOTE**

Solder volume may vary depending on solder paste composition.

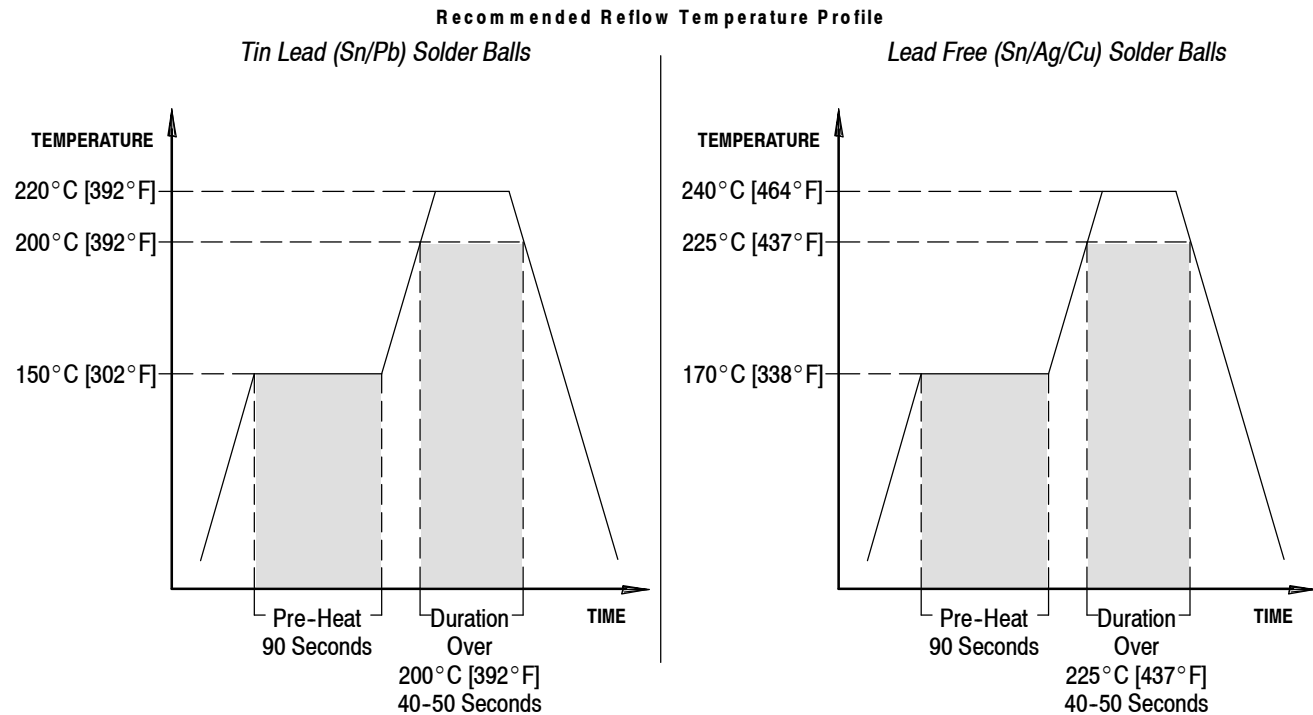
**3.11. Soldering****A. Process**

The pc board pads must be solderable in accordance with Test Specification 109-11. The sockets should be soldered using hot air convection oven with a minimum of five chambers (zones). The solder paste should be applied using an automatic screening process.

**CAUTION**

Even when using “no clean” solder paste, it is imperative that the solder ball interface be kept clean of residue, since it acts as an insulator.

Due to many variables involved with the reflow process (i.e., board size and thickness, component density, count, and orientation), it is recommended that trial runs be conducted under actual manufacturing conditions to ensure product and process compatibility. Recommended reflow temperature profiles are shown in Figure 3.



SOLDERING PROCESS	TEMPERATURE (Max.)		TIME (At Max. Temperature)
	Tin Lead Solder Balls	Lead Free Solder Balls	
Hot Air Convection	220°C [392°F]	240°C [464°F]	5 Minutes

Figure 3

**B. Cleaning**

When using “no clean” type solder paste, cleaning is not necessary, nor recommended. When using other types of solder paste, removal of residues and activators is necessary after soldering. Consult with the supplier of the solder for recommended cleaning solvents. Cleaners must be free of contaminants. The following is a list of common cleaning solvents that will not affect the sockets for the time and temperature specified. See Figure 4.

**CAUTION**

When using solder paste other than “no clean” type, it is imperative that the contact interface be cleaned effectively. Since it acts as an insulator, flux and residue must be removed thoroughly.

**DANGER**

Consideration must be given to toxicity and other safety requirements recommended by the solvent manufacturer. Refer to the manufacturer's Material Safety Data Sheet (MSDS) for characteristics and handling of cleaners. It is recommended to not use Trichloroethylene and Methylene Chloride because of harmful occupational and environmental effects. Both are carcinogenic (cancer-causing).

CLEANER		TIME (Minutes)	TEMPERATURE (Maximum)
NAME	TYPE		
ALPHA ♦ 2110	Aqueous	1	132°C [270°F]
BIOACT ♦ EC-7	Solvent	5	100°C [212°F]
Butyl CARBITOL ♦	Solvent	1	Ambient Room
Isopropyl Alcohol	Solvent	5	100°C [212°F]
KESTER ♦ 5778	Aqueous	5	100°C [212°F]
KESTER 5779	Aqueous	5	100°C [212°F]
LONCOTERGE ♦ 520	Aqueous	5	100°C [212°F]
LONCOTERGE 530	Aqueous	5	100°C [212°F]
Terpene Solvent	Solvent	5	100°C [212°F]

♦ALPHA, BIOACT, CARBITOL, KESTER, AND LONCOTERGE are trademarks.

Figure 4

**NOTE**



*If you have a particular solvent that is not listed, contact Tyco Electronics Product Information.*

**C. Drying**

When drying cleaned assemblies, make certain that temperature limitations are not exceeded: -55° to 105°C [-67° to 221°F]. Excessive temperatures may cause housing degradation.

**NOTE**



*To obtain optimum insulation resistance or capacitance, it is recommended that the assembly be allowed to stabilize for 24 hours after drying.*

**3.12. Socket Spacing**

There is no required spacing between sockets, however, when determining location of sockets, space allowance for hardware and other components must be taken into consideration.

**3.13. Socket Placement**

The socket number one position must be aligned with the number one position pc board circuit pad. When placing the socket on the board, make sure that the solder balls are aligned with the matching pads before seating the socket onto the board.

**CAUTION**



*The socket must be handled only by the outer perimeter of the cover or housing to avoid deformation, contamination, or damage to the solder balls.*

**A. Seating**

The socket solder balls must be seated flush on the pc board.

**B. Position**

Optimally, the solder balls should be centered on the pc board pads. However, slight misalignment is permissible as shown in Figure 5.

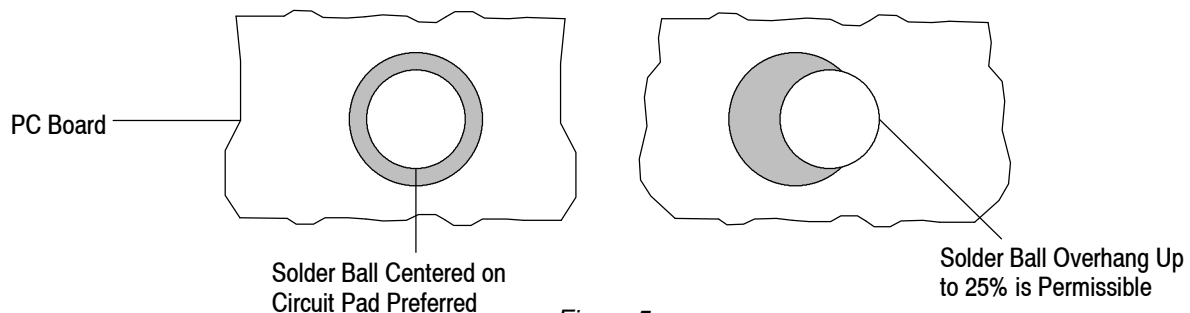


Figure 5

### 3.14. Checking Installed Socket

All solder joints should conform to those specified in IPC (Institute for Interconnecting and Packaging Electronic Circuits) J-STD-013, and all other requirements specified in this document. The housing (not including standoffs) must be seated on the pc board not exceeding the dimension shown in Figure 6.

**NOTE**


*Due to the tight pattern associated with these solder balls, inspection techniques must provide a clear picture of possible areas of shorting. X-ray or electrical test equipment must be used to inspect solder joints.*

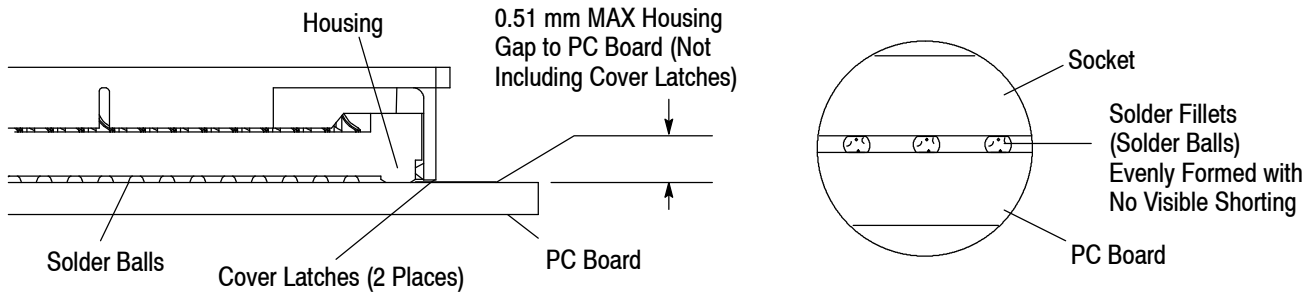


Figure 6

### 3.15. Polarization

The socket contact cavity pattern is an asymmetrical design. The socket is polarized to the pc board by matching pin pattern and contact cavity pattern.

### 3.16. Repair

Damaged sockets must be removed, discarded, and replaced. The solder balls will require desoldering. Methods for removing the sockets from the pc board are covered in IPC J-STD-013. It is highly recommended that the sockets NOT be reworked.

**CAUTION**


*High temperatures necessary to rework sockets could cause housing distortion or damage to internal components, and therefore compromise the integrity of the socket.*

## 4. QUALIFICATION

LGA 372-Position SMT Socket Assemblies have been investigated by Underwriters Laboratories (UL) to both U.S. and Canadian requirements and Recognized by UL under File E28476.

## 5. TOOLING

Robotic equipment must have a true position accuracy tolerance of 0.25 mm to feed, pick up, and place the sockets on the pc board. This includes gripper and fixture tolerances as well as equipment repeatability. See Figure 7.

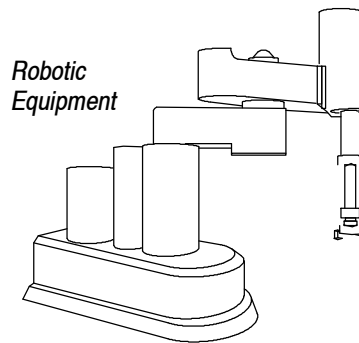
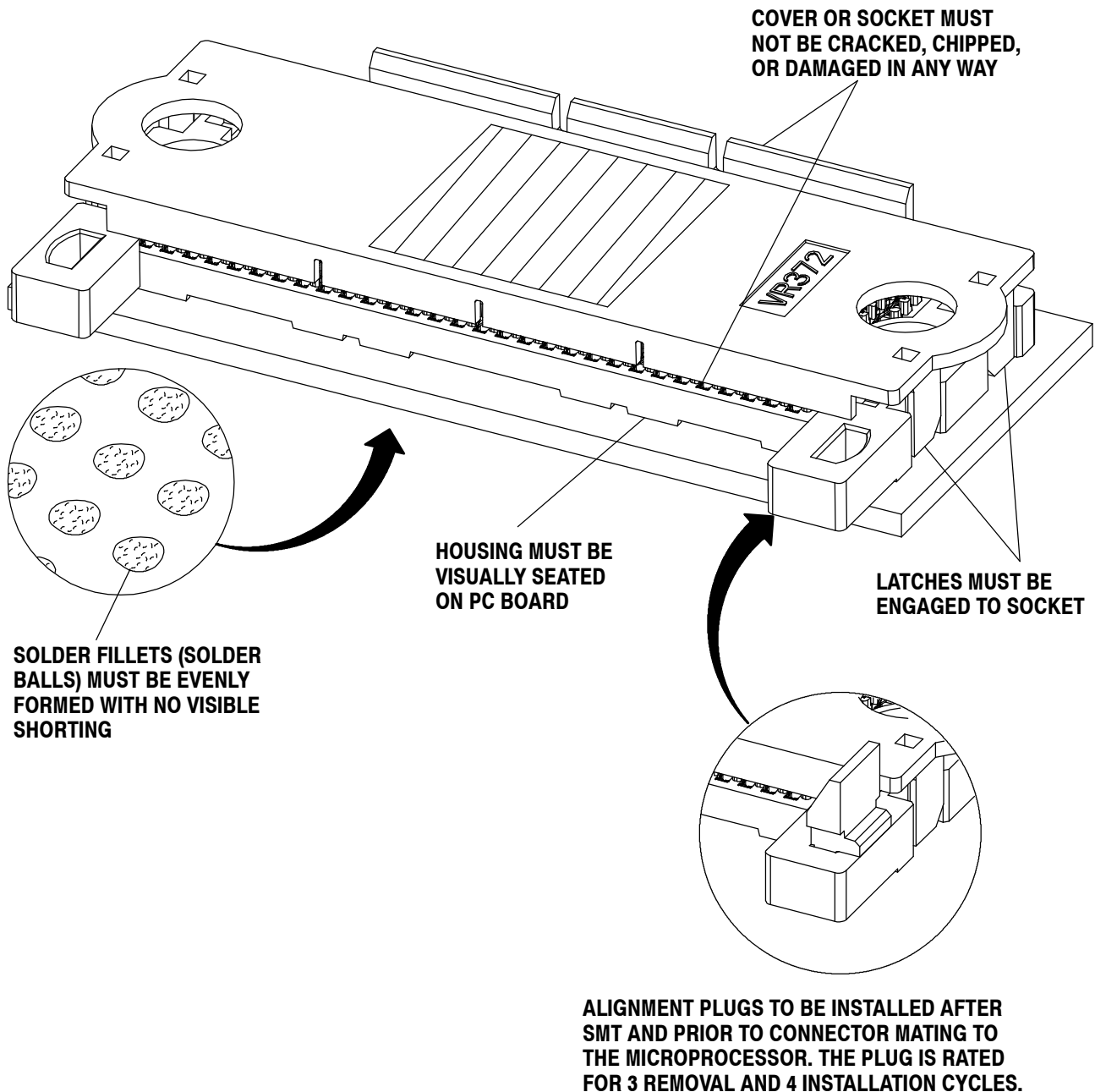


Figure 7

## 6. VISUAL AID

Figure 8 shows a typical application of the LGA 372-Position SMT Socket Assembly. This illustration should be used by production personnel to ensure a correctly applied product. Applications which DO NOT appear correct should be inspected using the information in the preceding pages of this specification and in the instructional material shipped with the product or tooling.



**FIGURE 8. VISUAL AID**