

NOTE

All numerical values are in metric units [with U.S. customary units in brackets]. Dimensions are in millimeters [and inches]. Unless otherwise specified, dimensions have a tolerance of ± 0.13 [.005] 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 the application of AMP* 7400 Series SMT DIP programing switches, .100 Centerline with standard pitch.

The 7400 series SMT DIP switches are designed for logic level switching applications, soldering onto printed circuit (pc) boards, and manual rocker actuation. Switches are available in 2 through 10 positions, and 12-position configurations, in either tape sealed or unsealed versions. Standard profile switches offer rockers that are above the surface of the switch housing and low profile switches offer rockers that are flush with the surface of the switch housing. The terminal leads are available in gull-wing or "J" lead versions. All switches are individual single-pole, single-throw (SPST) and are bottom sealed.

Both the sealed and unsealed switches are designed for direct soldering to pc boards using soldering pads. The sealants used in the sealed versions prevent flux and other contaminants from entering the switch during soldering and cleaning processes.

When corresponding with Tyco 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.

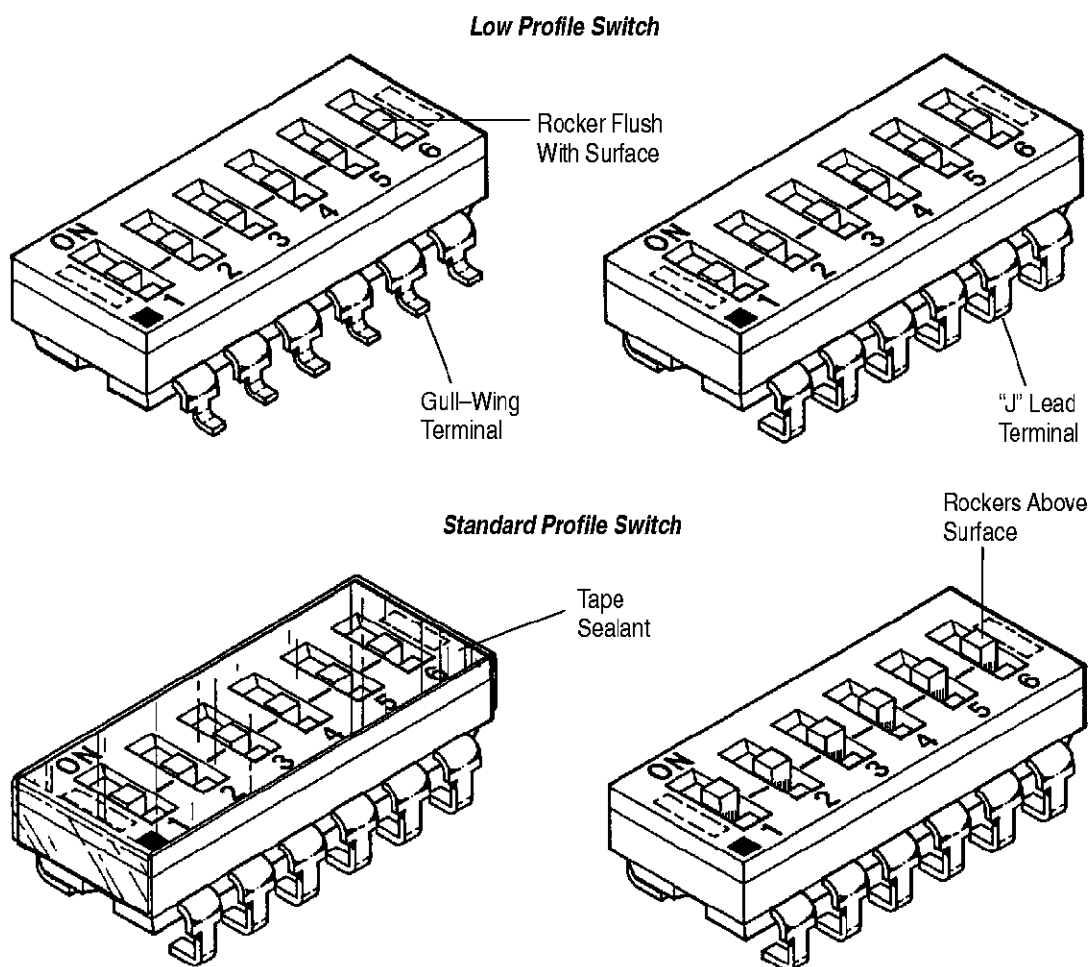


Figure 1

2. REFERENCE MATERIAL

2.1. Revision Summary

Revisions to this application specification per EC 0990–0330–00 include:

- Updated document to corporate requirements
- Revised artwork in Figures 1 and 6

2.2. Customer Assistance

Reference part number 390221 and product code A336 are representative numbers of 7400 Series SMT DIP Switches, .100 Centerline. 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 Representative (Field Service Engineer, Field Applications Engineer, etc.) or, after purchase, by calling the Product Information Center at the number at the bottom of page 1.

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 by Tyco Electronics, call product information at the number at the bottom of page 1.

2.4. Specifications

Product Specification 108–1850 provides applicable performance requirements.

Qualification Test Report 501–443 provide an independent corporate test report to showing the switch conforms to product specification 108–1850.

Specification 109–11 provides information pertaining to the solderability.

Workmanship Specification 101–21 provides information on solder fillets of surface mounted switches.

2.5. Manuals

Manual 402–40 is available upon request and can be used as a guide in soldering. This manual provides information on various flux types and characteristics along with commercial designation and flux removal procedures. A checklist is attached to the bulletin as a guide for information on soldering problems.

3. REQUIREMENTS

3.1. PC Board

A. Tolerances

1. Maximum allowable bow of the pc board will be 0.13 [.005].
2. Coplanarity of plated pads on the pc board will be 0.03 [.001].
3. If a solder mask is used, it must allow full clearance around the pads as defined in Figure 2.

B. Material

1. Board material will be glass epoxy (FR–4, G–10). Consult Tyco Engineering for suitability of other board materials.
2. Minimum board thickness shall be 0.81 [.032] nominal. For suitability with other board thicknesses, contact Tyco Engineering.

C. Layout

Recommended pattern and dimensions are shown in Figure 2.

Recommended PC Board Layouts

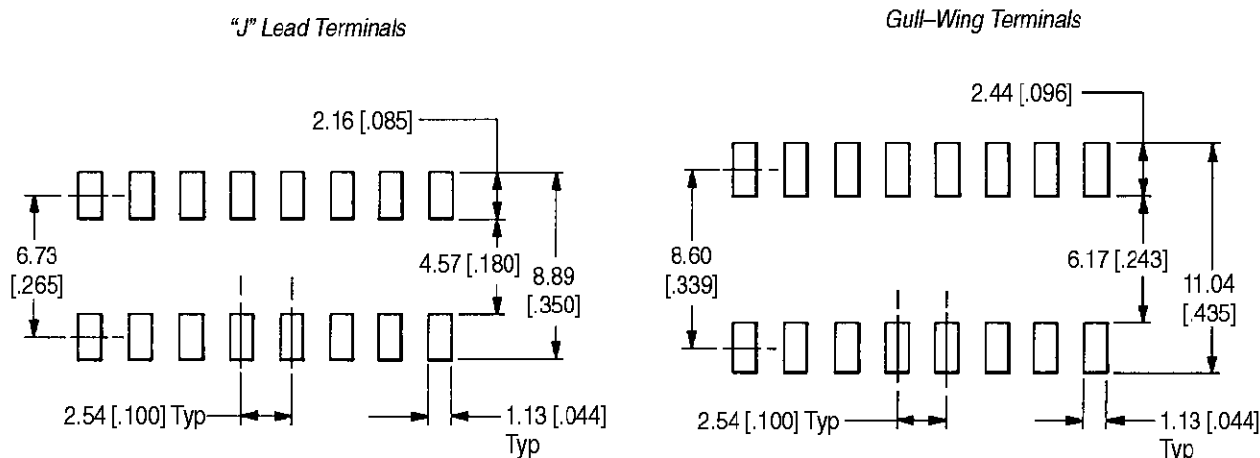


Figure 2

D. Solderability

Plated pads on the pc board will be solderable as defined in Specification 109-11-2. Additional information on solderability and soldering variables can be found in Manual 402-40.

3.2. Solder Paste

A. Composition

1. Alloy type shall be 63 Sn/37 Pb, 60 Sn/40 Pb, or 62 Sn/36 Pb/2 Ag
2. Flux incorporated in the paste shall be rosin, mildly active (RMA) type.
3. Paste will be 45% to 55% solids by volume.

B. Volume Requirements

Recommended solder paste volume on each pad before curing is $(2.89 \times 10^{-2})^3 [(4.48 \times 10^{-5})^3]$. An outgassing factor (usually measured to be around 50%) will reduce the paste volume after curing. Since solder paste can be deposited with a stencil or screen, the following calculations should serve as a guideline in varying deposition parameters.

1. Stencils

Let: V_i = Solder paste volume before curing

a = Aperture dimension corresponding to pad width

b = Aperture dimension corresponding to pad length

T_p = Thickness of stencil (or deposited solder paste)

If the aperture dimensions on the stencil are the same as the nominal pad dimensions shown in Figure 2, stencil thickness can be calculated with the following relation:

$$\begin{aligned} T_p &= V_i / (a \times b) \\ &= (2.89 \times 10^{-5})^3 / (1.42 \times .57) [(4.48 \times 10^{-5})^3 / (0.56 \times .101)] \\ &= 0.20 [.008] \end{aligned}$$

Varying aperture dimensions will change the required stencil thickness needed to deposit the recommended solder paste volume.

2. Screens

Let: T_e = Screen emulsion thickness

T_w = Screen weave thickness

A_o = Decimal equivalent of percent open area

T_p = Thickness of deposited solder paste

Weave thickness and percent open area are dependent on the mesh count of the solder screen. For example, an 80-mesh screen has a 49.5% open area and nominal weave thickness of 0.20 [.008]. The amount of paste deposited through a solder screen is dependent on aperture dimensions, the wire mesh, and applied emulsion.

For an 80-mesh screen with the same aperture dimensions as used in the stencil example above, the emulsion can be calculated by:

$$T_e = T_p - (T_w \times A_o) = 0.20 - (0.20 \times 12.57) = 0.10 \text{ [.008 - (.008} \times .495) = .004]$$

Varying aperture dimensions and mesh count will change the required emulsion thickness needed to deposit the recommended solder paste volume.

NOTE

Using paste volume in excess of those recommended could result in excessive wicking of reflowed solder up the solder lead, resulting in reduction of compliance and potential solder joint failure.

Use recommended vendor specifications for paste processing. Additional information on soldering processes and variables can be found in Manual 402–40.

3.3. Soldering

A. Process

The switches should be soldered using vapor phase, non-focused infrared (IR) reflow, wave, or equivalent soldering technique. For suitability of other techniques, contact Product Information Center at the number at the bottom of page 1. The temperature and time to which the switch can be subjected is specified in Figure 3.

SOLDERING PROCESS	TEMPERATURE (Max)	TIME (Max)
Vapor Phase	260°C [500°F]	60 Seconds
Infrared Reflow (IR)		
Wave	260°C [500°F]	6 Seconds

Figure 3

B. Cleaning

Fluxes, residues, and activators must be removed. Cleaning procedures depend on the type of flux used on the solder line. The following is a list of common cleaning solvents that will not affect these switches for the time and temperature specified. See Figure 4.

CAUTION

Excessive temperature may cause housing degradation or plating deterioration.

CLEANER		TIME (Minutes)	TEMPERATURES (Maximum)	
NAME	TYPE		CELSIUS	FAHRENHEIT
Alpha 2110■	Aqueous	1	132	270
Bioact EC-7◆	Solvent	5	100	212
Butyl Carbitol●	Solvent	1	Room Ambience	
Isopropyl Alcohol	Solvent	5	100	212
Kester 5778⌘	Aqueous	5	100	212
Kester 5779⌘	Aqueous	5	100	212
Loncoterge 520●	Aqueous	5	100	212
Loncoterge 530●	Aqueous	5	100	212
Terpene Solvent	Solvent	5	100	212

■ Product of Fry's Metals, Inc. ◆ Product of Petroferm, Inc. ● Product of Union Carbide Corp. ⌘ Product of Litton Systems, Inc.

Figure 4

DANGER

Consideration must be given to toxicity and safety requirements recommended on the Material Safety Data Sheet furnished by the solvent manufacturer.

NOTE

If you have a particular solvent that is not listed, consult a Tyco representative before using it on these switches.

C. Drying

When drying cleaned assemblies and pc boards, make certain that temperature limitations are not exceeded: -55° to 105°C [-68° to 221°F]. Excessive temperatures may cause housing degradation.

3.4. Inspection

1. All solder joints should comply with Workmanship Specification 101-21.
2. Switch shall be firmly attached to the pc board. There shall be no evidence of looseness or switch movement.
3. There shall be no evidence of any damage to the switch as a result of application tooling.

4. QUALIFICATION

7400 Series SMT DIP switches are not required to be listed or recognized by Underwriters Laboratories Inc. (UL) or Canadian Standards Association (CSA).

5. TOOLING (See Figure 5)

The robotic equipment must have a true position accuracy tolerance of ± 0.13 [.005] to properly locate the switch for insertion. This includes gripper and fixture tolerances as well as equipment repeatability. Insertion location will be programmed by a pantograph/template system or software package. The equipment must use the switch datum surfaces detailed on the specific customer drawing to ensure reliable switch placement.

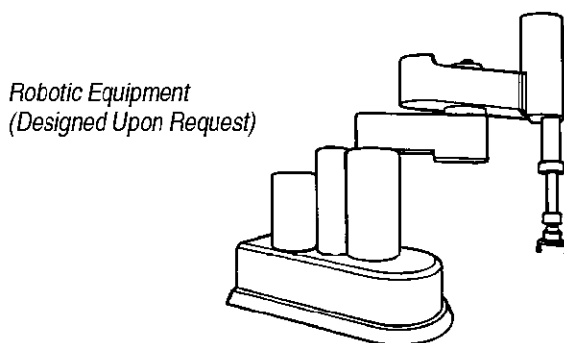


Figure 5

6. VISUAL AID

The illustration below shows a typical application of 7400 Series SMT DIP Switches. 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.

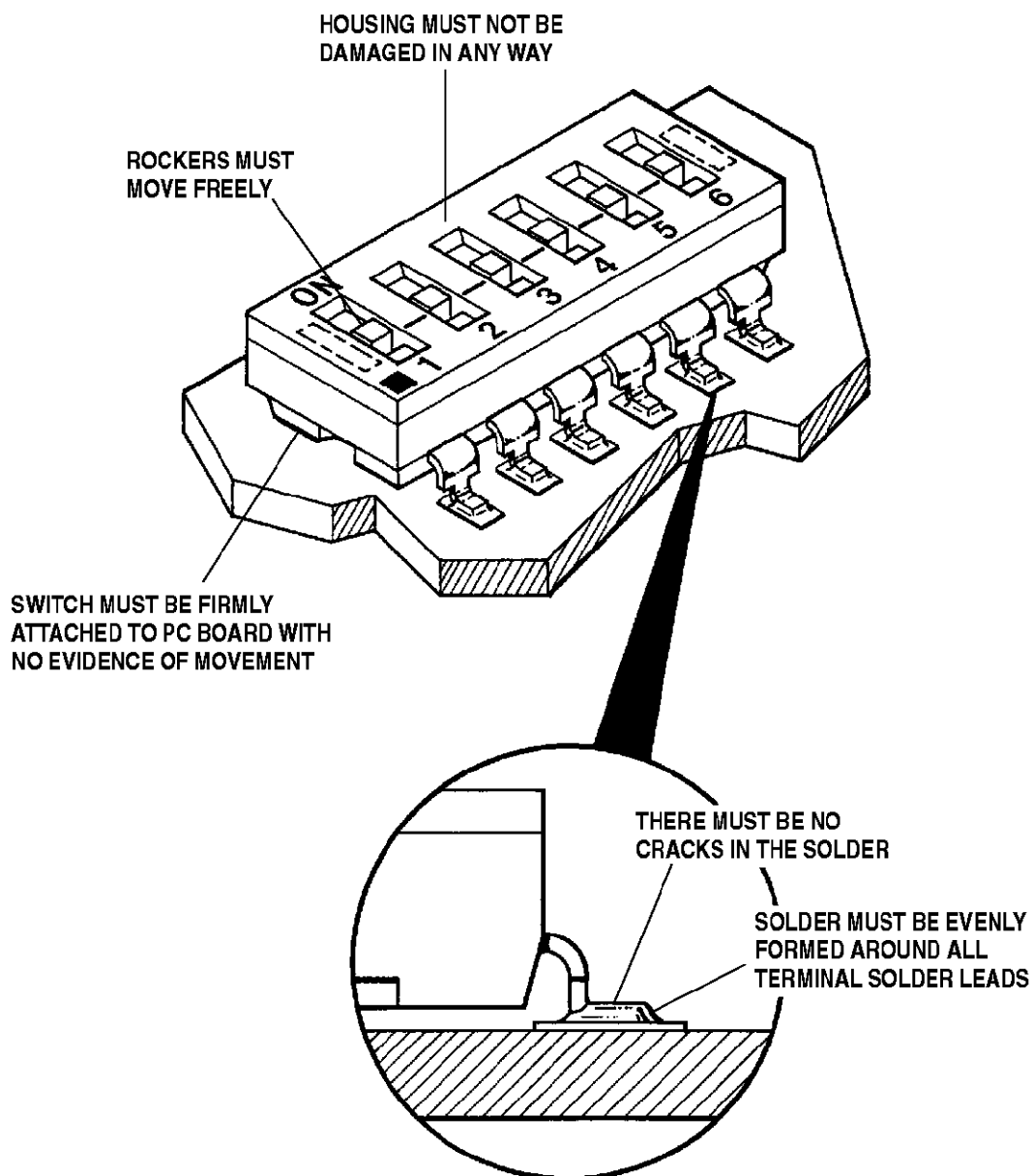


FIGURE 6. VISUAL AID