



1. GENERAL

1.01 This specification provides general requirements applicable to the recovery or repair for reissue (class C) of circuit packs and printed wiring board assemblies. Each requirement shall be applied to all board assemblies of such design as to be affected by that requirement, unless specifically excluded in the individual BSRS.

2. MECHANICAL

2.01 Components shall be mounted in a manner which shall assure both satisfactory solder connections and mechanical integrity of the assembly. On resin coated boards, it is required that the component leads be clinched to the opposite side of the board or that the component be secured mechanically. Components on rigid etched foil type boards may be placed against the board surface and soldered, or they may be connected as in 2.03A. The connection, including solder, shall not extend more than 1/16 inch from the board surface of ESS profile boards or more than 1/8 inch for other types of boards.

2.02 Component lead wires shall not be fractured, but the diameter may be reduced up to 20% because of nicks.

2.02A When circuit changes require the removal of a pigtail component, pigtail leads through holes which will not be reused need not be unsoldered and completely removed, but may be clipped off close to the board surface.

2.03 There shall be no apparent stress imposed on the lead wire or the component body at the point where the lead joins the body.

Bends in pigtail leads of replacement components shall start not less than 1/16 inch from the point of emergence from sealed glass bodies or tubulations (portions extending beyond the main body of the component where leads are crimped inside tubes) or from the point of attachment to component lead-outs.

Tubulations shall not be bent or stressed.

2.03A Pigtail components may be replaced without disturbing soldered connections to land areas by using the severed leads of the removed component as tie-points for straight or end splicing to the new components.

2.04 Repairs to open conductor paths shall meet the following requirements:

- (a) If repair is made by bridging the gap on the conductor side, the bridge shall consist of a No. 24 or 26 ga. bare tinned wire soldered at least 1/8 inch along the undamaged conductor path on each side of the gap.
- (b) If repair is made by bridging the gap on the side opposite the conductor path, the bridge shall be a length of a No. 24 or 26 ga. bare tinned wire passed through holes drilled through or adjacent to the conductor paths at each end of the gap, formed against and soldered to each path for at least 1/16 inch, or surface wiring run as in 2.05. On resin-coated metal boards, holes shall meet the requirements of 2.18.

2.05 When circuit changes necessitate the addition of surface wiring, insulated wire shall be run in the shortest path practicable. Short, bare wire may be used where there is no possibility of contacting any conducting surface, and provided that spacing between movable conductors and fixed, bare conductors is at least 1/8 inch. ←

2.06 If it is necessary to open circuit a conductor path, the portion of conductor removed shall be a minimum of 1/8 inch long when possible. When this is not possible, it shall be as long as is practical, but in no case less than the minimum conductor spacing. ←

2.07 Omitted on Issue 3 of this page.

2.08 Repairs to lifted conductor paths shall be made by removing the lifted section and bridging the gap as in 2.04.

2.09 Land areas lifted less than 50 per cent around their periphery against which leads or hardware are crimped are acceptable. Those lifted more than 50 per cent shall be secured to the board as in 2.10.

2.10 In the case of missing or torn land areas, a length (or lengths) of tinned conductor shall be secured and soldered to the component leads at the board surface, laid at least 1/4 inch along and soldered to the undamaged surface of the associated conductor path. If the component lead is long enough to be crimped so as to lay at least 1/4 inch along an undamaged section of one of its associated conductor paths, it may be used as a tinned conductor to complete the circuit to that path.

2.11 Repaired cracks in etched foil boards shall be terminated at each end with an approximately 0.043-inch diameter hole, and if extending under two or more conductor paths, shall have additional approximately 0.043-inch diameter holes on the center of the crack midway between each conductor path. Cracks which terminate at the edge of the board or at a mounting hole need not be drilled at that termination. All holes shall be filled with and all cracks covered with a thin layer of epoxy compound. A tinned conductor extending at least 1/8 inch on each side of crack shall be soldered to each conductor path where it bridges a crack. Conductor paths damaged by holes terminating a crack shall be repaired to meet requirements specified in 2.04. When it is impracticable to drill a hole (due to a component, etc. mounted against the opposite surface of the board), a layer of epoxy shall be applied to the accessible board surface to terminate the crack. The epoxy shall overlap the termination of the crack by at least 1/8 inch.

2.12 On etched foil boards, chipped areas at the edges of holes or at edges or corners of boards are acceptable provided that: cracks do not radiate from the edges of any chipped area, a chipped area does not extend under a conductor path or land, and on each side of the board, the surface around each mounting hole (including holes used to mount components) shall provide at least a 180-degree bearing for the fastener.

2.12A Cracks or chipped areas in the resin coating of resin-coated metal boards shall be repaired by bridging the crack or filling the cavity with epoxy compound. When chipped areas or cracks extend under conductor paths a tinned conductor extending at least 1/8 inch on each side of the crack or cavity shall be soldered to the conductor path before applying the epoxy compound. The spacing between the tinned conductor and the metal substrate shall not be less than that between the conductor path and the metal substrate.

2.13 Repairs shall not reduce the spacing between conductor paths, land areas, or any conductor and metallic nonconductor areas to less than the minimum conductor spacing.

2.14 The epoxy compound used in repair shall be per Material Specification 58456, type 5A, or equivalent. Repaired areas shall not be coated, cleaned, handled, or otherwise disturbed until the epoxy compound has cured.

Note: Curing time at room temperature (70°F) is approximately twenty-four hours, at 120°F approximately two hours.

2.15 Eyelets which do not provide good electrical connection shall be repaired by means of a tinned conductor inserted thru the eyelet, clinched against and soldered to conductor paths at least 1/16 inch beyond the periphery of the eyelet. If eyelet is missing, the conductor inserted thru the hole shall be clinched against and soldered to the conductor paths for at least 1/8 inch. Plated through holes shall be repaired in the manner specified for missing eyelets.

2.16 Charred areas are not acceptable. Such areas may be repaired by removing the charred material and filling the cavity with epoxy compound.

Note: Areas in which the board surface is unchanged except for discoloration due to heating are acceptable.

2.17 When installation of miniature tubular snap-in terminals such as Malco type 13009 or 13041 is required the split end of each terminal shall be mechanically secured against compression.

2.18 When repairs or circuit changes necessitate new holes drilled through epoxy-coated metal boards, an insulating bushing of approximately the length of outside diameter of the overall board thickness and hole diameter, respectively, shall be secured in the hole with epoxy compound. The inside diameter of the bushing shall be approximately the size specified for finished holes on the board under repair having a similar application.

### 3. SOLDERING

- 3.01 Rosin core solder having a nominal tin content of at least 45 percent shall be used in repair.
- 3.02 Solder joints shall show visual evidence of good wetting of the joined members.
- 3.03 Spines, bumps or droplets of solder are permissible if they are not likely to cause shorting if deformed.
- 3.04 If a lead is clinched, at least 1/16 inch of the clinch shall be soldered.
- 3.05 If a lead is not clinched, the fillet of solder should extend a total of at least 180 degrees around the joint. If two fillets of solder hold a lead to a land, the two fillets shall extend a total of at least 180 degrees around the periphery of the wire.

### 4. FINISHING

- 4.01 Omitted on issue 1 of this page.
- 4.02 When manufacturing information specifies a coating of 642A finish, type 3, on the conductor side of sides of board assemblies, this coating shall be present and unbroken, except for those areas used for plug-in external connections, testing, bridging, or ground planes. Bare areas, if present, may be covered by touch-up or by applying one coat to the entire surface.

### 5. GOLD PLATED CONTACT AREAS

- 5.01 The following requirements are applicable to gold plated contact fingers formed as part of the printed wiring pattern:

- (a) Contact to gold plated areas shall be made and broken with no voltage applied.

Note: It is recommended that connection be made with nonwiping connectors.

- (b) There shall be no evidence of corrosion on any gold plated area.

- (c) When visually inspected, gold-plated fingers connected at circuitry shall meet the conditions of 1, 2, 3, and 5 and those fingers not connected to circuitry shall meet the conditions of 4 and 5. (Visual requirements do not apply in the region 0.005 inch from the edges.)\*

1. Area B Acceptable Conditions

- 1.1 Indentations, pits, nodules, gold scratches, and copper scratches that do not expose base metal.
- 1.2 Holes through the copper fingers and exposed base metal other than those defined as unacceptable in Section 2 below.

2. Area B Unacceptable Conditions

- 2.1 A hole through the copper to the substrate large enough to inscribe a .015 inch circle not touching the gold.
- 2.2 Holes in the copper that reduce current carrying width to less than one-half the finger width.
- 2.3 More than 5 percent of the B Area is exposed to the base metal (nickle underplate or copper) because of missing or scratched gold plating or a large enough region of exposed base metal allowing a 0.005 inch circle to be inscribed; touching only base metal.

3. Areas A and C shall be gold plated. However, flaws in the gold or base metal, or solder mask are acceptable provided the flaws affect no more than 25 percent of Area A, and in Area C the current width is at least one-half of the finger width.

4. Fingers not connected to the circuitry shall be gold plated and the amount of exposed copper shall not exceed 5 percent of Area B.

5. Solder spots are not permitted on finger Areas A and B used with single point of contact connectors (957 Type and most KS connectors). For connectors with two points of contact, one thin (less than 0.002 inch high) solder spot with a maximum dimension no greater than 0.015 inch is acceptable on Areas A and B combined. Larger solder spots or more than one solder spot are not acceptable.

Defective contact fingers shall be **repaired** by use of "Solder Bonded Foil," "High Energy Bonding System," or other approved methods.

 \*Areas A, B, and C of gold-plated fingers are shown in the sketches which also define engineering requirements for the plug end of PWB connector fingers. (See Paragraph 6.)

(d) Gold plated areas shall be cleaned with petroleum spirits (KS-7860, or equivalent), and a lint-free cloth (KS-2423, or equivalent). Assemblies on which the active area of any gold plated contact finger having a circuit function is contaminated with a foreign substance (such as solder), which cannot be removed by the above means, shall not be repaired. The active areas of the contact fingers are the gold plated areas between the plug edge of the board and a line parallel to this edge 1/16 inch beyond the extreme area normally contacted by the mating connector. Abrasives shall not be used to clean gold plated areas. ... ←

(e) Gold plated contact areas shall be suitably protected against abrasion, contamination, and dust at all times except when exposure is necessary for processing, inspection, or testing.

(f) Gold plated areas on all boards, except epoxy coated metal boards, shall be lubricated with KS-19416, List 2 lubricant, prior to insertion into test connectors. ↵

Note 1: When cleaning, care shall be taken to avoid contaminating the contact area with dissolved 642A finish from other areas.

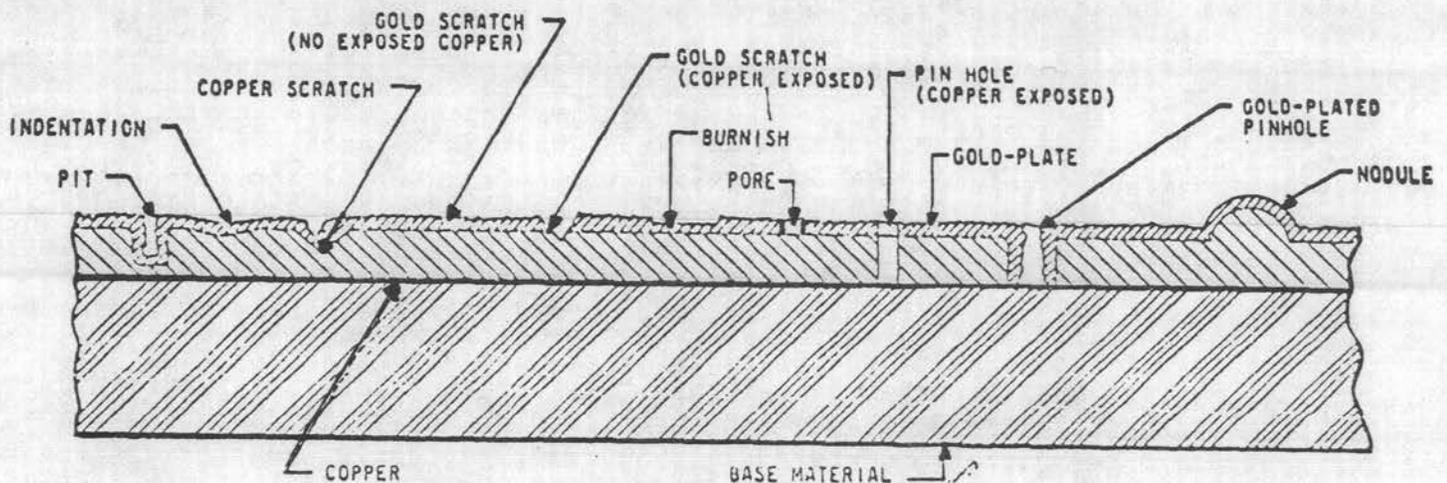
Note 2: Gold plated contact areas shall not be touched with bare fingers after cleaning and lubrication.

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## 6. DEFINITIONS

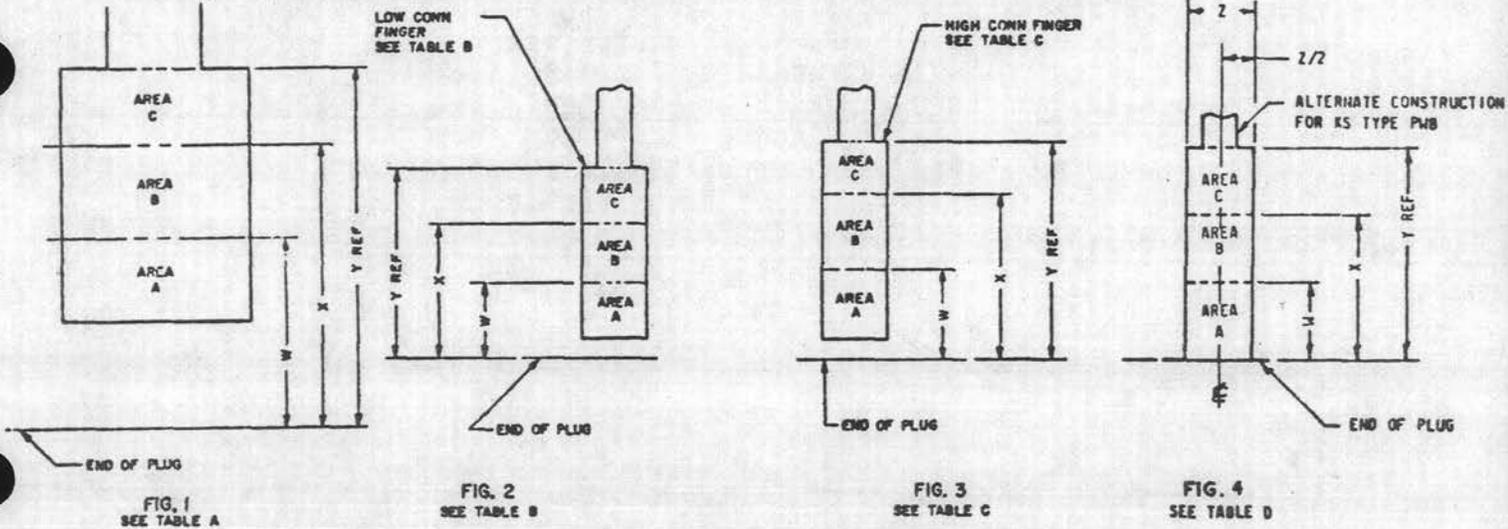
6.01 For purpose of defining defects and surface variations on the gold-plated surface of a connector finger, the following definitions shall apply. (See Figure 1.)

- (a) A pit is a sharply defined depression in the gold-plated surface that does not extend through the underlying copper.
- (b) An indentation is a gradual depression in the gold-plated surface resulting from a shallow imperfection in the underlying material. An indentation has no discernible sharp or jagged edges.
- (c) A gold scratch is an abrasion in the gold-plated surface that alters or removes the gold plate and produces either exposed copper or sharp, jagged edges. However, abrasions that merely mar or polish (burnish) the gold plated surface are not considered scratches.
- (d) A pore is any defect, other than a pit or a scratch in the gold surface, that exposes the underlying copper.
- (e) A pinhole is any defect that extends through the underlying copper to the base material. A pinhole may or may not be gold plated.
- (f) A nodule is a volume of metal, generally round or elongated as a ridge, that projects above the surrounding gold surface. When nodules are very small and numerous they may appear as dark or brownish gold due to their effect on reflectivity.



CROSS-SECTIONED PORTION OF CONNECTOR FINGER  
SHOWING DEFECTS AND SURFACE VARIATIONS  
FIG. 1

6.02 For the purpose of defining the A, B, and C Areas used in Paragraph 5.01C, the connector finger dimensions for Resin-Coated Metal Boards or Copper Clad Laminate Boards are shown in Figures 1 through 4 as used with connectors listed in tables A through D.



RESIN COATED METAL BOARDS AND COPPER CLAD LAMINATE BOARDS

FIGURE-TABLE	BOARDS USED WITH CONNECTOR	DIM	DIM	DIM
		W	X	Y
1-A	906-, 907-, 908-, 909-, 910-, 912-, 913-, 914-, 916-, & 934-Type	.70	.160	.185
	911-, 928-, & 935 Type & 960-Type	.70	.280	.305
	927-, 930-, 931-, 940-, 941-, 948-, & 949-Type			
	KS-21271- and KS-21479-Type	.100	.210	.250
	KS-21244	.090	.210	.300
2-B	927-, 930-, 931-, 940-, 941-, 948-, & 949-Type	.070	.220	.245
3-C	927-, 930-, 931-, 940-, 941-, 948-, & 949-Type	.130	.280	.305
4-D	KS-21271, L13	DIM Z		
		.075	.180	.300
	Alternate Construction for KS Type Connectors	.075	.180	.380
			.300	.406