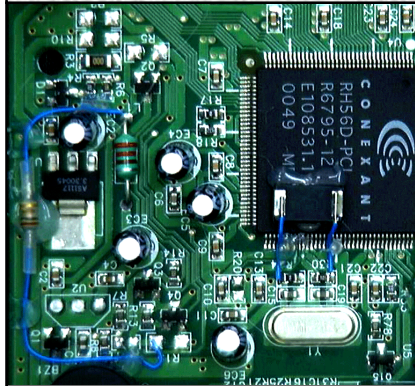


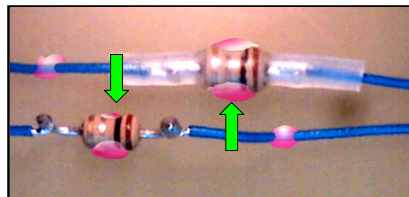
DISCRETE WIRING DEADBUGS



DEADBUGS

The term "Deadbugs" is an industry nickname for the discrete components added and wired into a printed wiring assembly (PWA) to facilitate active circuit modifications, rather than redesign and manufacture a new board. The nickname comes from their general appearance on the board: upside down, with their termination leads (legs) up in the air – like a dead bug.

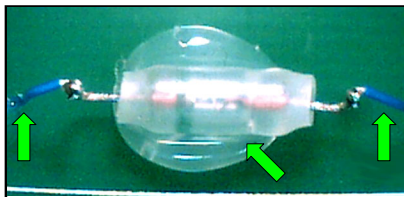
While their use is an accepted practice, the customer must grant approval prior to their use and installation.



PREFERRED AXIAL-LEADED COMPONENT

Component is properly mounted. Lead bends are within limits. Terminations are properly wrapped. The solder joints meet all minimum requirements. Jumper wires have appropriate stress relief.

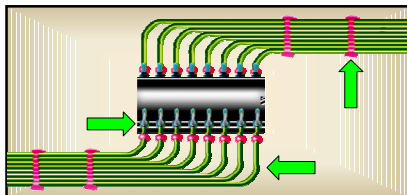
[Best Workmanship Practice](#)



PREFERRED GLASS-BODIED COMPONENT

Component is covered with a transparent resilient sleeving, and properly mounted. Lead bends are within limits. Terminations are properly wrapped. The solder joints meet all minimum requirements. Jumper wires have appropriate stress relief.

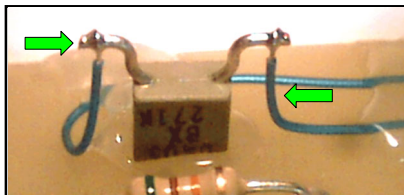
[Best Workmanship Practice](#)



PREFERRED DUAL-INLINE PACKAGE (DIP)

Component is properly mounted and terminated. Jumper wires are properly terminated, with appropriate stress relief. The solder joints meet all minimum requirements.

[Best Workmanship Practice](#)



PREFERRED RADIAL-LEADED COMPONENT

Component is properly mounted and terminated. Lead bends are within limits. Terminations are properly wrapped. The solder joints meet all minimum requirements. Jumper wires have appropriate stress relief.

[Best Workmanship Practice](#)

NASA WORKMANSHIP STANDARDS



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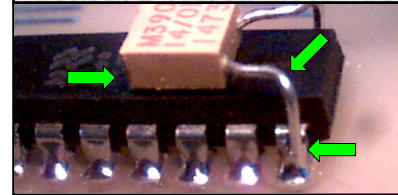
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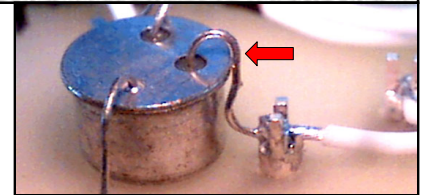
DISCRETE WIRING DEADBUGS (cont.)



ACCEPTABLE PIGGYBACKING / STACKING TO ICs AXIAL / RADIAL / SMT COMPONENTS

IC piggybacking is acceptable when space and/or noise requirements prohibit more traditional placement methods. Component leads / jumper wires shall meet minimum bend requirements.

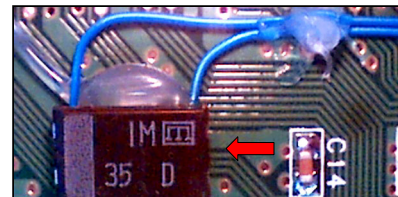
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UNACCEPTABLE IMPROPER LEAD DRESS

Dead-bugged components shall be mounted and dressed in a manner that prevents shorting of the leads to the component case (pictured) or to other conductors.

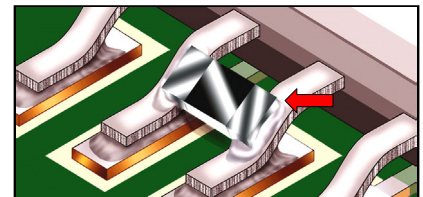
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UNACCEPTABLE IMPROPER MOUNTING ORIENTATION

Components shall be mounted with the leads in an orientation that ensures the terminations meet minimum electrical spacing requirements. As pictured, the component terminals are resting on exposed circuitry and vias.

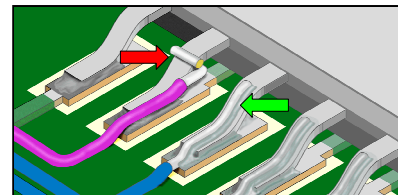
[Best Workmanship Practice](#)



UNACCEPTABLE IMPROPER MOUNTING SMT COMPONENTS MOUNTED ON LEADS

Chip and MELF devices shall not be directly mounted on component leads of integrated circuit (chip) packages.

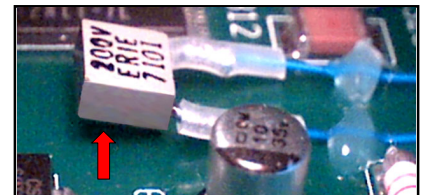
[Best Workmanship Practice](#)



UNACCEPTABLE IMPROPER SOLDER TERMINATION LEADED DEVICES

Jumper wires shall be lap soldered to the device leads. Wrapped terminations place stress on the component lead, and may violate minimum lead-to-lead electrical spacing requirements.

[Best Workmanship Practice](#)



UNACCEPTABLE IMPROPER STAKING

The component shall be secured with an adhesive material, per engineering documentation.

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DISCRETE WIRING
DEADBUGS (cont.)

**UNACCEPTABLE
IMPROPER TERMINATION WRAP**

Jumper wires shall be wrapped at least 180° to 270° around the component lead prior to soldering, and shall not be located closer than one (1) lead diameter to end of the component lead.

[Best Workmanship Practice](#)

**UNACCEPTABLE
PIGGY-BACK / STACKING
CYLINDRICAL / MELF COMPONENTS**

The piggy-backing / stacking of cylindrical / glass-bodied / MELF components is not recommended.

[Best Workmanship Practice](#)

**UNACCEPTABLE
TOMBSTONED TERMINATION**

Deadbugged components shall be mounted parallel to and in contact with the base laminate, or base component (if applicable). Tombstoning places unacceptable stress on the component/solder pad termination.

[Best Workmanship Practice](#)

DISCRETE WIRING
DEADBUGS (cont.)

**PREFERRED
SURFACE MOUNT TECHNOLOGY
CHIP / MELF / METALLIZED TERMINALS**

Component is properly mounted and terminated. Jumper wires are properly terminated, with appropriate stress relief. The solder joints meet all minimum requirements.

[Best Workmanship Practice](#)

**PREFERRED
SURFACE MOUNT TECHNOLOGY
GULL-WING / J-LEAD / LEADED DEVICES**

Component is properly mounted and terminated. Jumper wires are properly terminated, with appropriate stress relief. The solder joints meet all minimum requirements.

[Best Workmanship Practice](#)

**PREFERRED
TO-CAN COMPONENT**

Component is properly mounted and terminated. Lead bends are within limits. Terminations are properly wrapped. The solder joints meet all minimum requirements. Jumper wires have appropriate stress relief.

[Best Workmanship Practice](#)

**ACCEPTABLE
AXIAL COMPONENT PIGGYBACK**

Axial components may be piggybacked to axial components in a vertical or horizontal orientation, but shall be staked. Terminations shall meet minimum lead seal spacing, lead bend, wrap, and solder fillet requirements.

[Best Workmanship Practice](#)

**ACCEPTABLE
CHIP / MELF / METALLIZED TERMINALS
ALTERNATE MOUNT**

Chip component mounting to a single pad is acceptable, provided the component is properly staked to prevent stress to the solder joints or the component body.

[Best Workmanship Practice](#)

**ACCEPTABLE
PIGGYBACKING / STACKING
SMT (3-5 SIDE) CHIP COMPONENTS**

The components are in vertical alignment, with no overhang. The terminations exhibit fully wetted solder fillets and the stack does not exceed two (2) components high.

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