INSTALLATION OF STUD-MOUNTED SEMICONDUCTOR DEVICES

This instruction leaflet provides a guide to the installation of stud-mounted semiconductor devices on heat sinks.

Since current handling capacities of semiconductors are influenced by the maximum permissible junction temperature, heat sinks are used to help control the temperature of the device. Unless the device is mounted on the heat sink with sufficient clamping force for good thermal and electrical contact, the maximum capacity of the device will not be realized.

The recommendations outlined below should be followed when installing stud-mounted semiconductors.

MOUNTING SURFACE

The heat sink and the semiconductor contact surfaces must be flat, clean, without burrs or ridges, and with a good finish. Contact surfaces must not be painted.

JOINT COMPOUND

Clean thermal joint compound is to be applied to the mounting surface. Compound should not be allowed on the stud threads as this will distort the torque readings. Apply with a small stiff brush or with finger-tip just before mounting the semiconductor. Do not leave the coated mounting surface exposed to shop dirt for any length of time. Acceptable thermal joint compounds are Alcoa No. 2, Alcoa No. 3, Dow Corning No. 340, and Wakefield Type 120. A tube-type dispenser is recommended.

MOUNTING HARDWARE

An integral, conical washer-nut assembly (Belleville)is to be used as the standard mounting hardware (Figure 2).

The old type of hardware (Figure 1) should be used only when absolutely necessary.

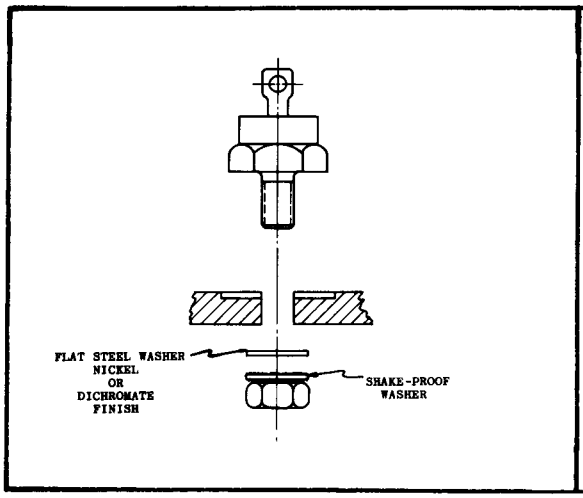

FIGURE 1
OBSOLETE HARDWARE

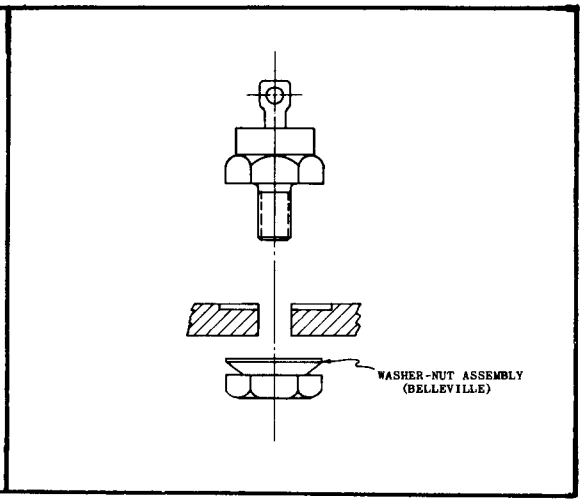

FIGURE 2
STANDARD HARDWARE

TORQUE

Torque requirements have been tabulated as a function of thread size in the table below, Figure 3. When applying torque, the torque wrench should be used on the nut with the semiconductor held firmly with another wrench.

TORQUE TABLE	
Thread Size	Torque Lb. In.
.190 - 32	15
1/4 - 28	25
1/2 - 20	125
3/4 - 16	240
1 - 12	500
1/2 - 20	150*

FIGURE 3

NOTE: * TYPE 222 OR 223 THYRISTOR
BUS BOLT TORQUE

The torque ratings of Figure 3 should not be exceeded. The mounting studs of semiconductors are made of soft copper and excessive torque may strip threads or deform the semiconductor junction. However, the lower the torque, the lower the thermal conductivity of the contact surface (between the heat sink and device) resulting in higher semiconductor temperature, lower device life, and possible failure. Therefore, torque devices according to the values given in Figure 3.

MOUNTING DIRECTLY INTO THREADED HEAT SINKS

1. Inspect device for thread defects prior to starting into hole.
2. Burnish spotface using wire brush made by Osborn, Cleveland, Ohio, No. 99-HKS-48 or equivalent in a drill press or hand drill to remove oxide film within four hours of step #3.
3. Coat spotface with heat transfer compound such as Alcoa #3, Dow Corning No. 340, or Wakefield Type 120. Do not get any on threads.
4. Using a torque wrench, seat the device according to the torque ratings given in Figure 3. All values of torque must be read during a smooth steady pull while the device is moving.
5. Wipe off excessive compound.

HANDLING

Semiconductors must be handled with care. Any device which has been dropped should not be installed, but should be sent back for test.

ELECTRICAL CONNECTIONS

All electrical connections to semiconductor devices are to be made after they have been mounted to their heat sinks.

When lead wires are to be bolted to lugs, care must be taken not to bend or stress the lugs. This may fracture the glass-to-metal seal resulting in a defective unit.

When the lead wire is to be attached with solder, the wire should be pretinned and wrapped one turn. Solder should be flowed on quickly and the soldering iron removed as soon as the solder flows into the joint. After soldering, all excess resin should be removed from the joint.

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MOUNTING SURFACE

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JOINT COMPOUND

Clean thermal joint compound is to be applied to the mounting surface. Compound should not be allowed on the stud threads as this will distort the torque readings. Apply with a small stiff brush or with finger-tip just before mounting the semiconductor. Do not leave the coated mounting surface exposed to shop dirt for any length of time. Acceptable thermal joint compounds is given by #M53846DG (Dow Corning No. 340, and Wakefield Type 120.) A tube-type dispenser is recommended.

MOUNTING HARDWARE

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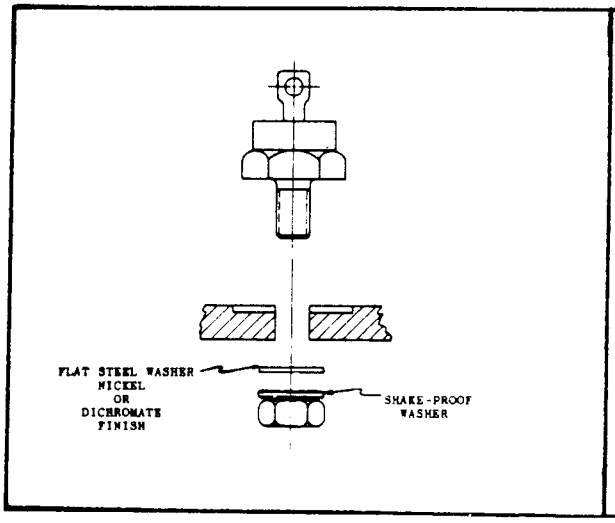

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OBSOLETE HARDWARE

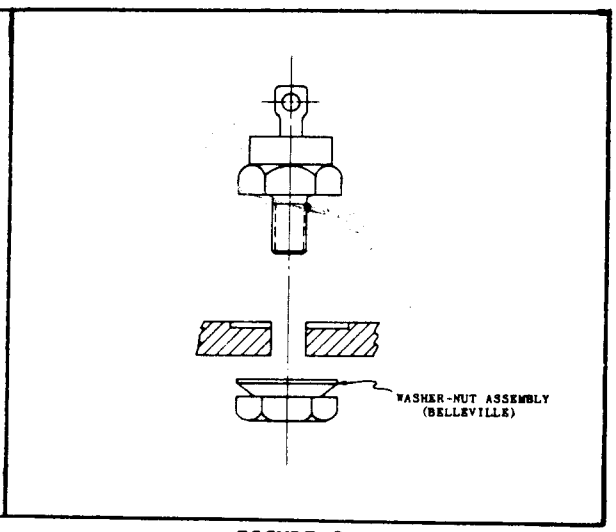

FIGURE 2
STANDARD HARDWARE

TORQUE

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TORQUE TABLE

THREAD SIZE	TORQUE LB. IN.
.190 - 32	15
1/4 - 28	25
3/8 - 24	125
1/2 - 20	125
3/4 - 16	300
1 - 12	500
1/2 - 20	150*

FIGURE 3

NOTE: * TYPE 276 OR 286 INTEGRAL HEAT SINK TYPE THYRISTOR BUS BOLT TORQUE

The torque ratings of Figure 3 should not be exceeded. The mounting studs of semiconductors are made of soft copper and excessive torque may strip threads or deform the semiconductor junction. However, the lower the torque, the lower the thermal conductivity of the contact surface (between the heat sink and device) resulting in higher semiconductor temperature, lower device life, and possible failure. Therefore, torque devices according to the values given in Figure 3.

MOUNTING DIRECTLY INTO THREADED HEAT SINKS

1. Visually inspect each semi-conductor thread for obvious thread defects, prior to starting into hole.

2. Burnish semi-conductor mounting surface of heat sink using wire brush S#1521A45H01 or equivalent to remove oxide film. This brush is made for drill press or hand drill operation. This operation must take place just prior to, but not exceeding, four hours of Procedure #3.

3. Coat semi-conductor mounting surface of heat sink with heat transfer compound spec. #M53846DG.

4. Apply Locktite stud lock to leading threads (2 drops - 3/4 - 16 thds) (1 drop for all smaller sizes). Screw in semi-conductor by hand being careful not to get Locktite on heat sink surface.

5. Using torque wrench, seat semi-conductor. Seating torque per torque table above. All values of torque must be read during a smooth, steady pull while semi-conductor is moving.

6. Wipe off excessive compound.

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When lead wires are to be bolted to lugs, care must be taken not to bend or stress the lugs. This may fracture the glass-to-metal seal resulting in a defective unit.

When the lead wire is to be attached with solder, the wire should be pretinned and wrapped one turn. Solder should be flowed on quickly and the soldering iron removed as soon as the solder flows into the joint. After soldering, all excess resin should be removed from the joint.