

PROCEDURE FOR THE REPLACEMENT OF DIODE/THYRISTOR AND FUSES(S) FOR R2000 MODULE

1. INTRODUCTION

This instruction leaflet is limited to the replacement of diode/thyristor and fuses(s). There are many variations of the basic module, but no problems should be encountered if it ever becomes necessary to replace those components not covered by this leaflet.

Figure 1 on sheet two shows a breakdown of the most complex module.

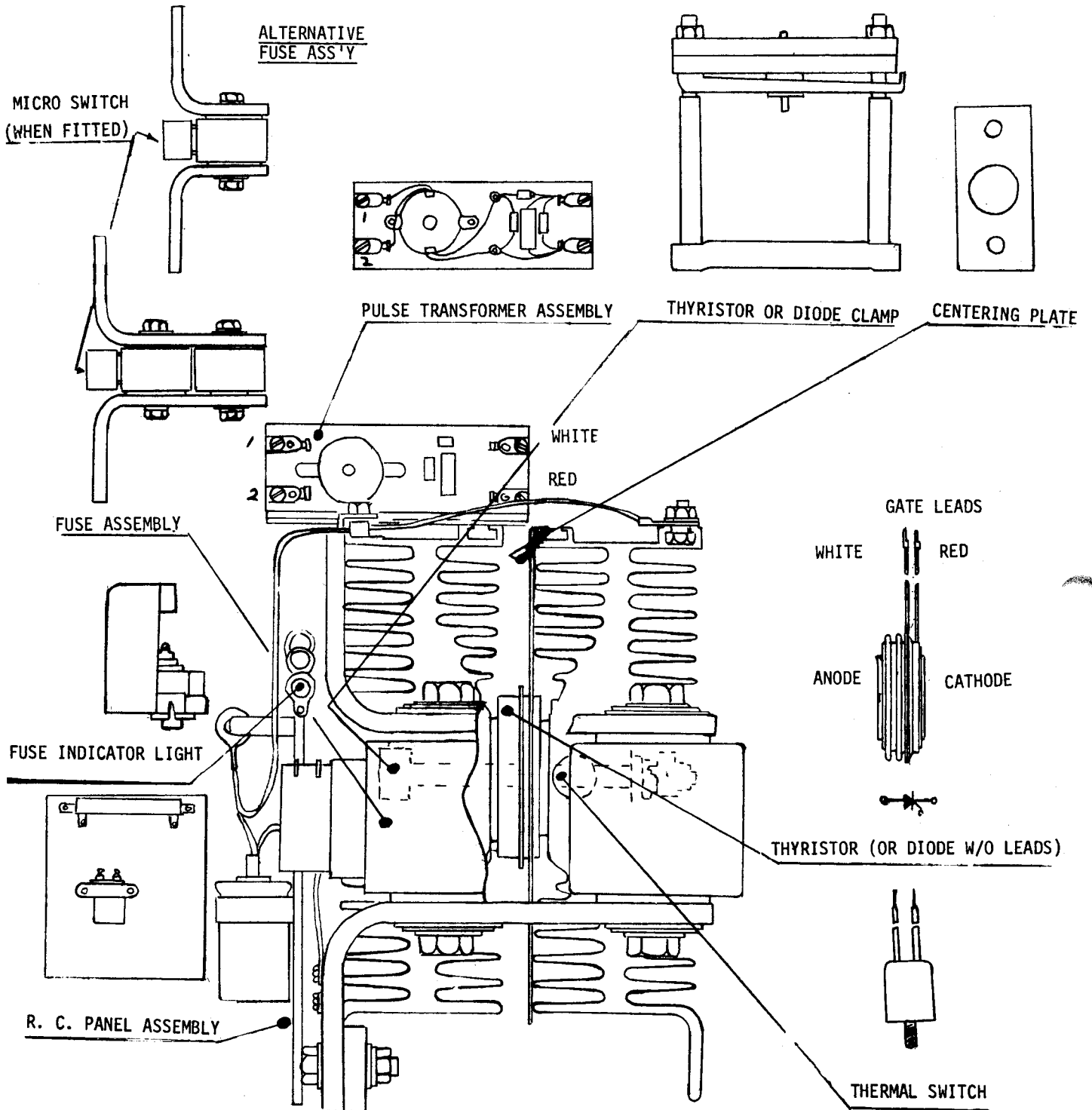
It cannot be overemphasized that to achieve maximum reliability and performance the assembly procedures outlined below must be followed. The module performance is closely related to the manner in which the contact surfaces are prepared.

2. TO REMOVE MODULE

- 2.1 If it is a thyristor module, disconnect leads from terminal 1 and 2 on pulse transformer assembly. These are shown in top left hand corner of module assembly shown in Figure 1.
- 2.2 Disconnect leads from fuse micro switch (if fitted).
- 2.3 Disconnect leads coming from thermo-switch (if fitted).
- 2.4 Remove bolts which clamp fuse bus bar to reactor or bus.
- 2.5 Loosen bolts which clamp heat sink to main assembly and pull module towards you. The module is now free to enable the defective components to be replaced.

3. REPLACEMENT OF FUSE OR FUSES

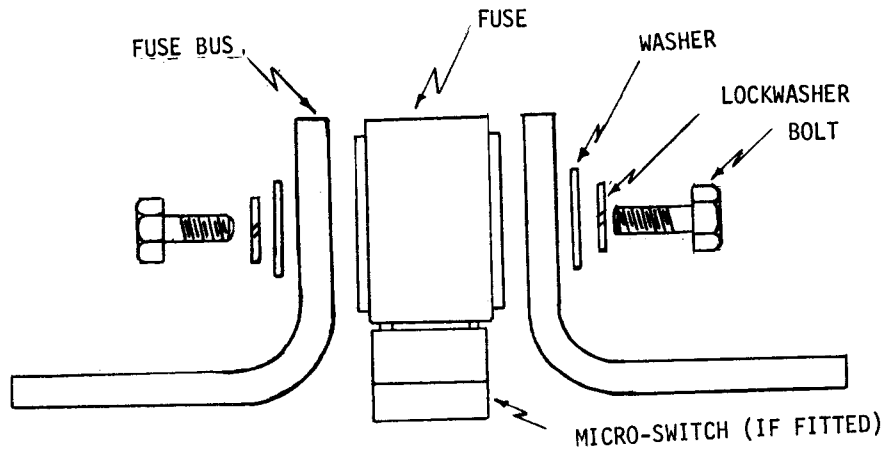
- 3.1 The fuse or fuses can be replaced without removing any other components from the module.
- 3.2 There are two versions of the fuse assembly shown in Figures 2 and 3. A similar procedure can be followed in both cases.
- 3.3 Remove bolts shown in Figures 2 and 3, and remove fuses(s).
- 3.4 Wipe bus where fuse(s) make contact, with clean cloth saturated with methyl chlorform. Permit thorough drying.
- 3.5 Abrade contact surfaces with "scotch brite". (Scotch brite 3M part #7447 size approximately 6" x 9"). Abrade only long enough to thoroughly scratch and brighten the surface. After cleaning wipe surface with clean cloth to remove any loose powder.
- 3.6 Apply joint compound Alcoa No. 2 (53535B4) to surfaces immediately after operation 3.5. The joint compound comes in 8 oz. plastic tubes. Squeeze some of the compound onto the cleaned surfaces and spread it out with a brush or sponge. Brushes and sponges used for applying the compound should be protected from contamination by dirt and foreign material during usage.
- 3.7 Obtain fuses, ensure that these are the correct rating as specified by the style number. If micro-switch is used ensure that fuse has this. If a twin fuse assembly is used with micro switch only one fuse has this fitted.
- 3.8 Clean fuse contact surfaces with clean cloth.
- 3.9 Mount fuse(s) by bolting to fuse bus bars ensuring that if micro switches are fitted that these are toward the tee portion of fuse bus bar.



FRONT VIEW OF MODULE HAVING TWO FUSES
PART OF FUSE CUTAWAY TO SHOW THRISTOR

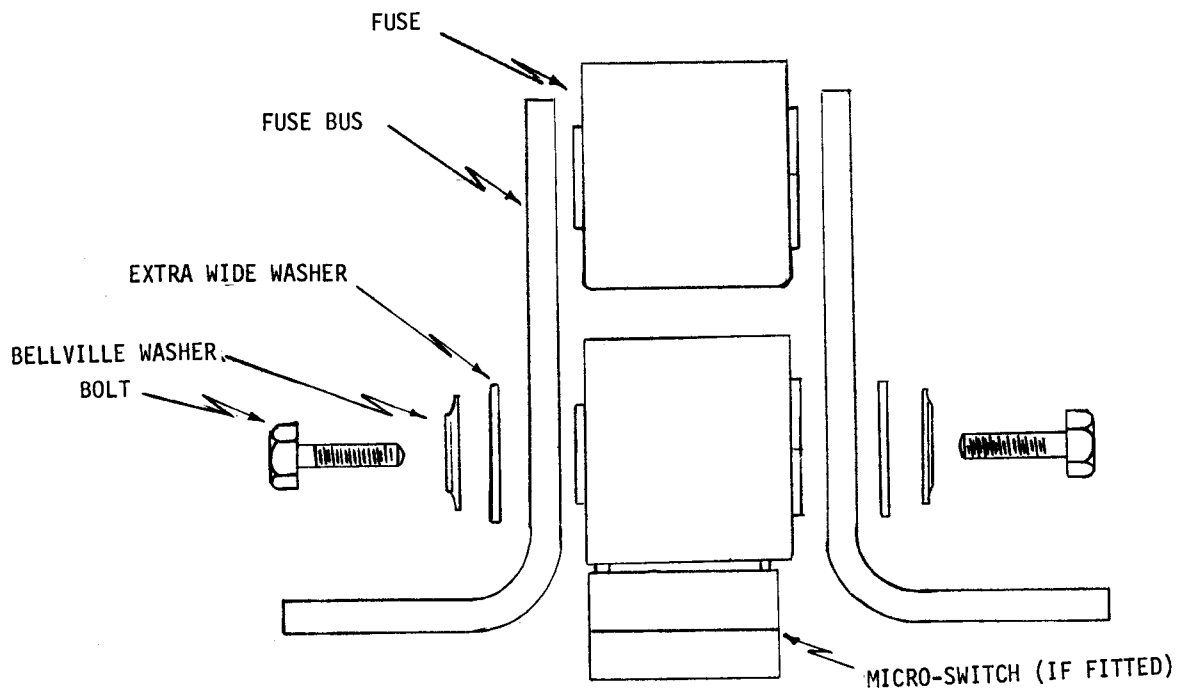
FIGURE 1

3.10 It is important that the correct hardware is used to mount the fuses. For single fuse assembly standard lock washers and washers are used. The bolts must be torqued to 600 ins.lbs.



EXPLODED VIEW OF SINGLE FUSE ASSEMBLY

FIGURE 2



EXPLODED VIEW OF DOUBLE FUSE ASSEMBLY

FIGURE 3

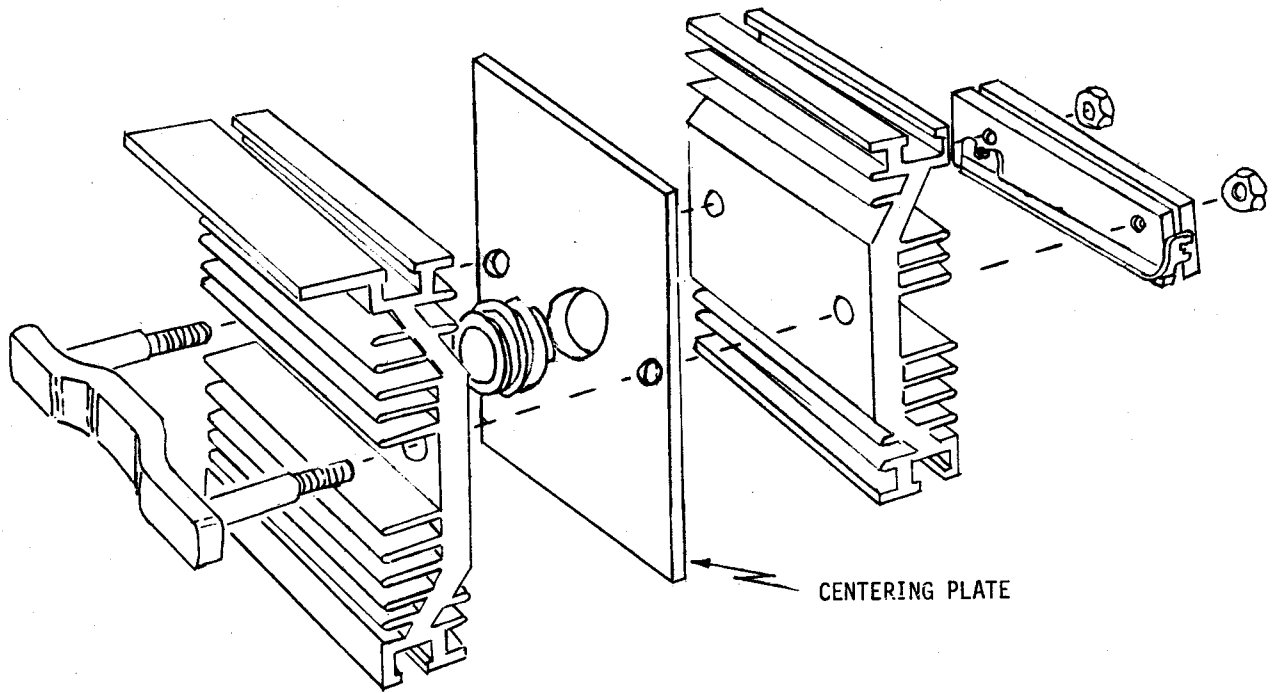
- 3.11 Where double fuses are used a Bellville washer together with extra wide washer are used. The bolts must be torqued to 600 ins.lbs.
- 3.12 If there is no requirement to replace any other components replace module as outlined in Section 6.

4. REPLACEMENT OF THYRISTOR

- 4.1 Disconnect gate leads from pulse transformer assembly.
- 4.2 Disconnect indicator light lead from heat sink (when fitted). This is shown in Figure 1 top right hand corner of module assembly.
- 4.3 Remove the two nuts on semiconductor clamp.
- 4.4 Remove semiconductor clamp, heat sink, centering plate and thyristor.
- 4.5 Clean surface of heat sinks which come in contact with thyristor with clean cloth saturated with methyl chloroform. Permit thorough drying.
- 4.6 Abrade heat sink contact surfaces with "scotch brite". (Scotch brite 3M part #7447 size approximately 6" x 9"). Abrade only long enough to thoroughly scratch and brighten the surface. After cleaning wipe surfaces with clean cloth to remove any loose powder.
- 4.7 Apply joint compound Alcoa No. 2 (53535B4) to heat sink surfaces immediately after operation 4.6. The joint compound comes in 8 oz. plastic tubes. Squeeze some of the compound onto the cleaned surfaces and spread it out with a brush or sponge. Brushes and sponges used for applying the compound should be protected from contamination by dirt and foreign material during usage.
- 4.8 Obtain thyristor, ensure that this has the correct rating as specified by the style number.
- 4.9 Clean contact surfaces with clean cloth and ensure surfaces are free from deep scratches and indentations, if so, reject.
- 4.10 Place thyristor centrally on heat sink from which clamp bolts are protruding. Slip centering plate over clamp bolts and locate device in center hole (see Figure 4). It is important that this thyristor is correctly oriented with regard to polarity of cathode and anode.
- 4.11 Replace top portion of heat sink. Ensure that the two heat sink halves are parallel and perpendicular to each other along the complete lengths and width of the heat sinks.
- 4.12 Slip top halve of clamp over protruding bolts and tighten the clamp nuts alternatively half a turn at a time until indicator reads 2 as shown in Figure 5. This corresponds to a clamping force of 4000 lbs.
- 4.13 Connect gate leads of thyristor with white lead going to the top terminal of pulse transformer assembly and the red lead to the lower terminal as shown in Figure 1.
- 4.14 Connect indicator light lead (if fitted).
- 4.15 If there is no other requirement to replace any other components, replace the module as outlined in Section 6.

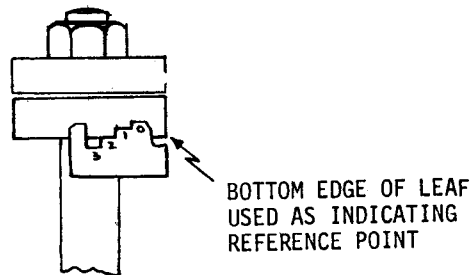
5. REPLACEMENT OF DIODE

- 5.1 The procedure given for replacement of thyristor can be used to replace a diode. Paragraphs 4.1 and 4.13 are omitted and "Diode" is substituted for "Thyristor".



EXPLODED VIEW OF HEAT SINK ASSEMBLY

FIGURE 4



SECTION OF SEMICONDUCTOR CLAMP SHOWING FORCE INDICATOR

FIGURE 5

6. ASSEMBLY OF MODULE INTO MAIN ASSEMBLY
- 6.1 Clean the clamping surfaces of heatsink and fuse bus with a clean cloth saturated with methyl chloroform and permit thorough drying.
- 6.2 Abrade both sides of heat sink contact surfaces and the fuse bus contact surface with "Scotch Brite" pad. Abrade only long enough to thoroughly scratch and brighten the surfaces. After cleaning, wipe surfaces with clean cloth to remove any loose powder.
- 6.3 Apply joint compound Alcoa No. 2 (53535B4) to both sides of the heat sink contact surfaces and the fuse bus contact surface immediately after operation 6.2. Squeeze some of the compound onto the cleaned surfaces and spread it out with brush or sponge. Brushes and sponges used for applying the compound should be protected from contamination by dirt and foreign material during usage.
- 6.4 Abrade the clamping surfaces of the main assembly with "Scotch Brite" pad. Abrade only long enough to thoroughly scratch and brighten the surfaces. After cleaning wipe surface with clean cloth to remove any loose powder.
- 6.5 Slide module into main assembly until holes line up on fuse bus bar with those holes on the main assembly. Replace bolts ensuring that there is two washers under the head of this bolt. At the nut end there should be a lockwasher plus two flat washers.
- 6.6 Torque bolts to 250 in.lbs.
- 6.7 Torque slide bolts to 600 in.lbs.
- 6.8 Reconnect loads to pulse transformer assembly panel (when fitted). This only applies to a thyristor module. Shown in top left hand corner of module Figure 1.
- 6.9 Reconnect thermal switch leads (when fitted).
- 6.10 Reconnect fuse micro switch leads (when fitted).



PROCEDURE FOR THE REPLACEMENT OF DIODE/THYRISTOR AND FUSES(S) FOR R2000 MODULE

1. INTRODUCTION

This instruction leaflet is limited to the replacement of diode/thyristor and fuses(s). There are many variations of the basic module, but no problems should be encountered if it ever becomes necessary to replace those components not covered by this leaflet.

Figure 1 on sheet two shows a breakdown of the most complex module.

There is a section on replacing diodes which have heatsink to diode temperatures exceeding 90°C. This applies to a limited number of applications and will be specifically referred to in the overall installation manual supplied with the equipment.

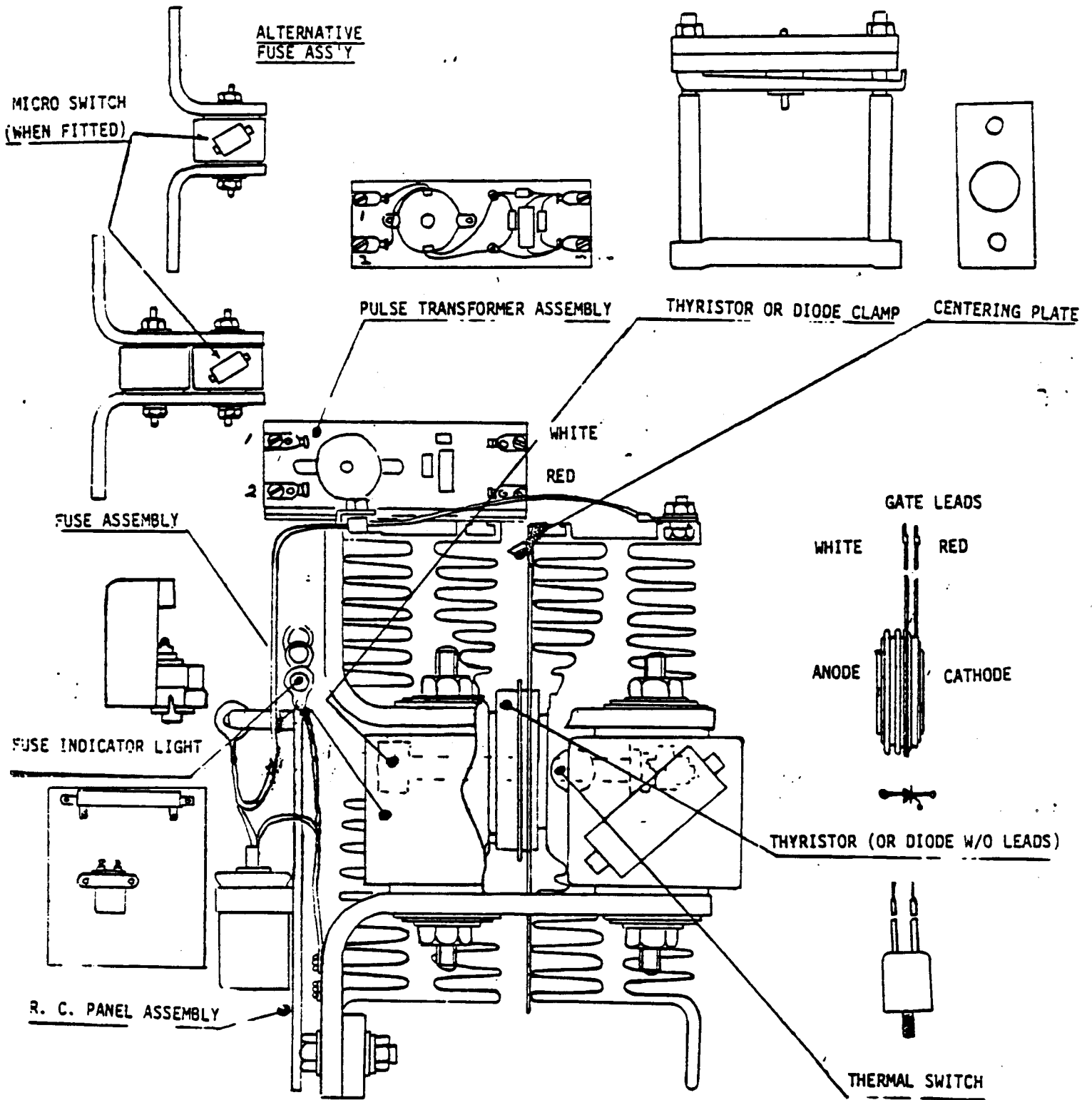
It cannot be overemphasized that to achieve maximum reliability and performance the assembly procedures outlined below must be followed. The module performance is closely related to the manner in which the contact surfaces are prepared.

2. TO REMOVE MODULE

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- 2.2 Disconnect leads from fuse micro switch (if fitted).
- 2.3 Disconnect leads coming from thermo-switch (if fitted).
- 2.4 Remove bolts which clamp fuse bar to reactor or bus.
- 2.4 Loosen bolts which clamp heat sink to main assembly and pull module towards you. The module is now free to enable the defective components to be replaced.

3. REPLACEMENT OF FUSE OR FUSES

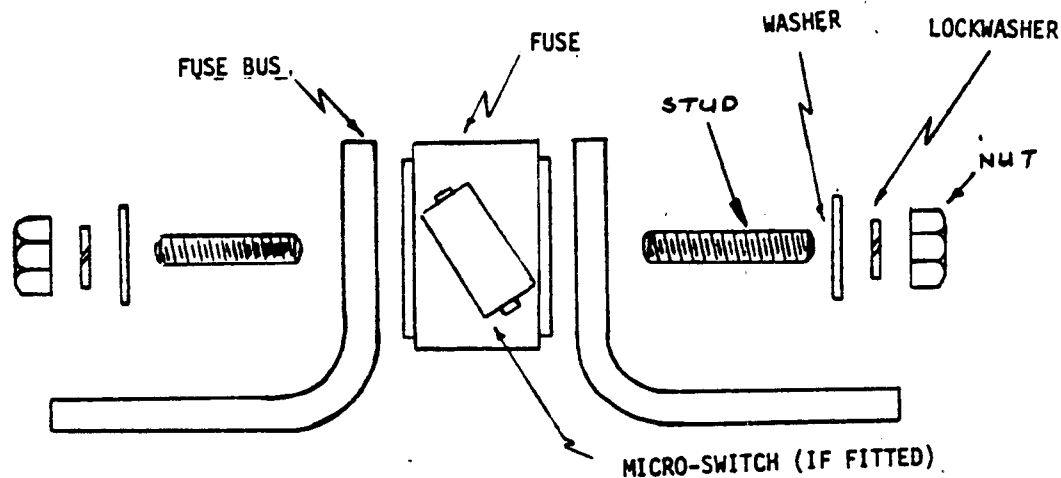
- 3.1 The fuse or fuses can be replaced without removing any other components from the module.
- 3.2 There are two versions of the fuse assembly shown in Figures 2 and 3. A similar procedure can be followed in both cases.
- 3.3 Remove studs shown in Figures 2 and 3, and remove fuse(s). If studs are damaged when removed it may be necessary to get new ones.
- 3.4 Wipe bus where fuse(s) make contact, with clean cloth saturated with methyl chlorform. Permit thorough drying.
- 3.5 Abrade contact surfaces with "scotch brite". (Scotch brite 3M part #7447 size approximately 6" x 9"). Abrade only long enough to thoroughly scratch and brighten the surface. After cleaning wipe surface with clean cloth to remove any loose powder.
- 3.6 Apply joint compound Alcoa No. 2 (53535BU) to surfaces immediately after operation 3.5. The joint compound comes in 8 oz. plastic tubes. Squeeze some of the compound onto the cleaned surfaces and spread it out with a brush or sponge. Brushes and sponges used for applying the compound should be protected from contamination by dirt and foreign material during usage.
- 3.7 Obtain fuses, ensure that these are the correct rating as specified by the style number. If micro-switch is used ensure that fuse has this. If a twin fuse assembly is used with micro-switch only one fuse has this fitted.
- 3.8 Clean fuse contact surfaces with clean cloth.
- 3.9 Fit studs 1742A99H01 into fuse until it bottoms.
- 3.10 Mount fuse(s) by placing studs (ensuring that if micro switches are fitted that these are away from the tee portion of fuse bus bar) through holes in bus bars.



FRONT VIEW OF MODULE HAVING TWO FUSES
PART OF FUSE CUTAWAY TO SHOW THYRISTOR

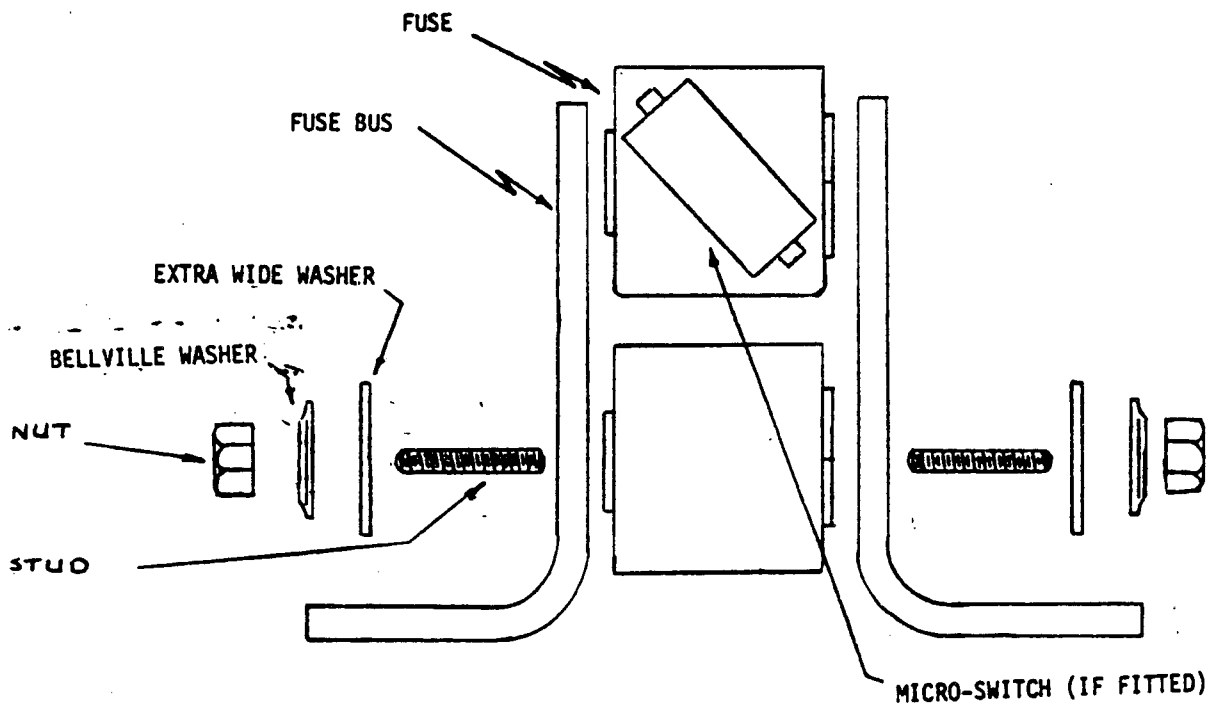
FIGURE 1

3.10 It is important that the correct hardware is used to mount the fuses. For single fuse assembly standard lock washers and washers are used. The bolts must be torqued to 600 ins.lbs.



EXPLODED VIEW OF SINGLE FUSE ASSEMBLY

FIGURE 2



EXPLODED VIEW OF DOUBLE FUSE ASSEMBLY

FIGURE 3

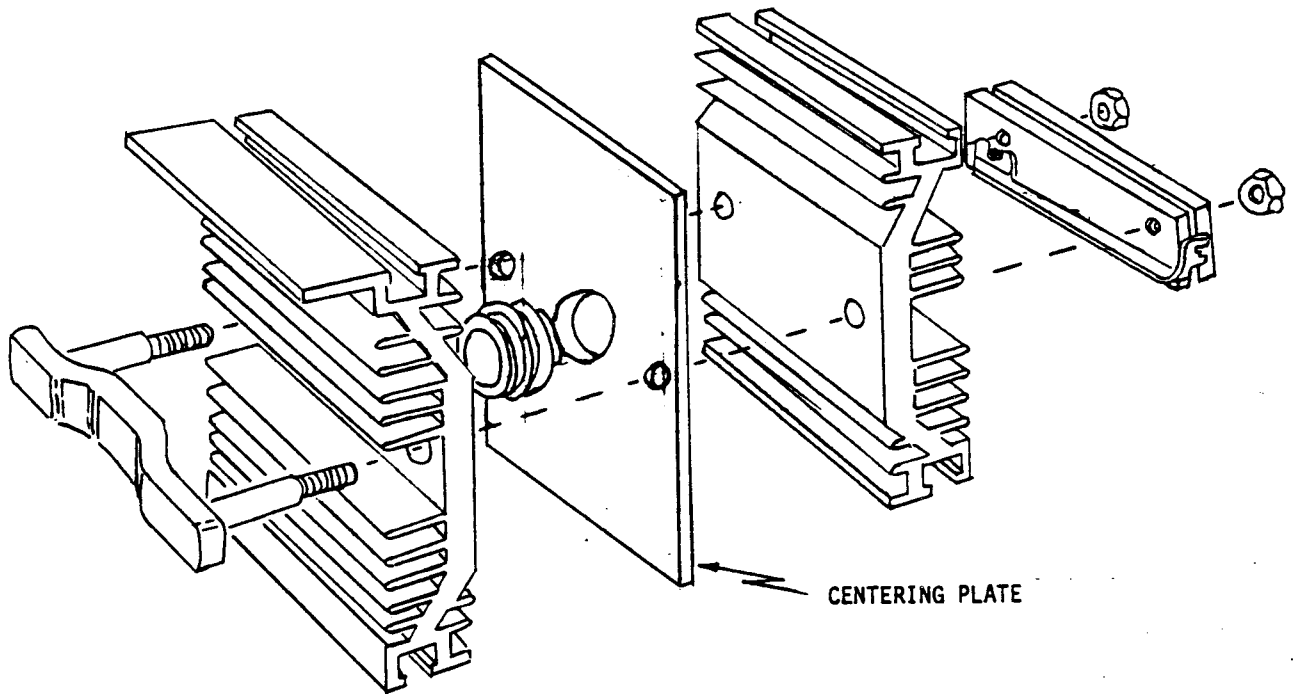
- 3.11 Where double fuses are used a Bellville washer together with extra wide washer are used. The nuts must be torqued to 600 ins.lbs.
- 3.12 If there is no requirement to replace any other components replace module as outlined in Section 6.

4. REPLACEMENT OF THYRISTOR

- 4.1 Disconnect gate leads from pulse transformer assembly.
- 4.2 Disconnect indicator light lead from heat sink (when fitted). This is shown in Figure 1 top right hand corner of module assembly.
- 4.3 Remove the two nuts on semiconductor clamp.
- 4.4 Remove semiconductor clamp, heat sink, centering plate and thyristor.
- 4.5 Clean surface of heat sinks which come in contact with thyristor with clean cloth saturated with methyl chloroform. Permit thorough drying.
- 4.6 Abrade heat sink contact surfaces with "scotch brite". (Scotch brite 3M part #7447 size approximately 6" x 9"). Abrade only long enough to thoroughly scratch and brighten the surface. After cleaning wipe surfaces with clean cloth to remove any loose powder.
- 4.7 Apply joint compound Alcoa No. 2 (5353584) to heat sink surfaces immediately after operation 4.6. The joint compound comes in 8 oz. plastic tubes. Squeeze some of the compound onto the cleaned surfaces and spread it out with a brush or sponge. Brushes and sponges used for applying the compound should be protected from contamination by dirt and foreign material during usage.
- 4.8 Obtain thyristor, ensure that this has the correct rating as specified by the style number.
- 4.9 Clean contact surfaces with clean cloth and ensure surfaces are free from deep scratches and indentations, if so, reject.
- 4.10 Place thyristor centrally on heat sink from which clamp bolts are protruding. Slip centering plate over clamp bolts and locate device in center hole (see Figure 4). It is important that this thyristor is correctly oriented with regard to polarity of cathode and anode.
- 4.11 Replace top portion of heat sink. Ensure that the two heat sink halves are parallel and perpendicular to each other along the complete lengths and width of the heat sinks.
- 4.12 Slip top half of clamp over protruding bolts and tighten the clamp nuts alternatively half a turn at a time until indicator reads the value shown in Table I. This value is dependent upon size of thyristor.
- 4.13 Connect gate leads of thyristor with white lead going to the top terminal of pulse transformer assembly and the red lead to the lower terminal as shown in Figure 1.
- 4.14 Connect indicator light lead (if fitted).
- 4.15 If there is no other requirement to replace any other components, replace the module as outlined in Section 6.

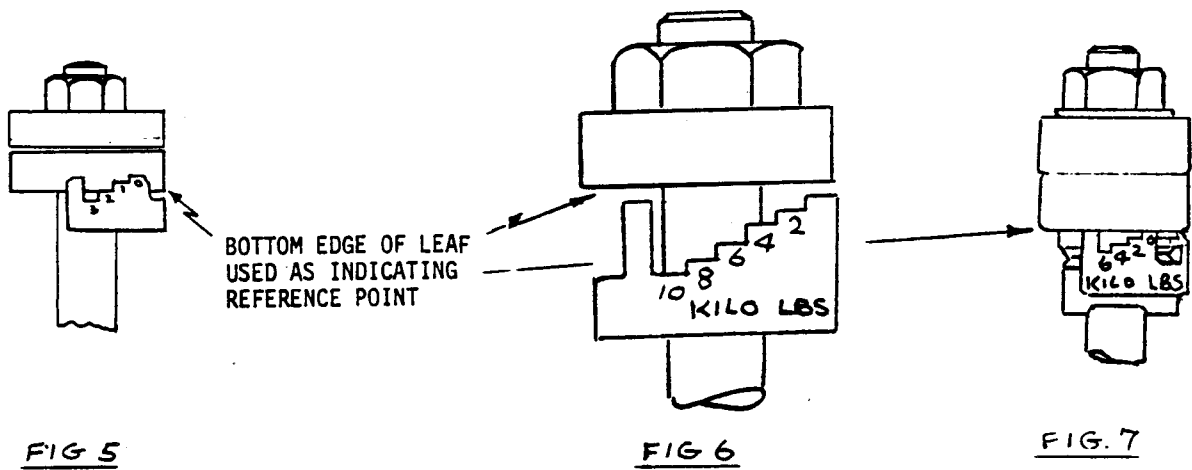
5. REPLACEMENT OF DIODE

- 5.1 The procedure given for replacement of thyristor can be used to replace a diode. Paragraphs 4.1 and 4.13 are omitted and "Diode" is substituted for "Thyristor".



EXPLODED VIEW OF HEAT SINK ASSEMBLY

FIGURE 4



SECTION OF SEMICONDUCTOR CLAMPS SHOWING FORCE INDICATOR

i. ASSEMBLY OF MODULE INTO MAIN ASSEMBLY

- 6.1 Clean the clamping surfaces of heatsink and fuse bus with a clean cloth saturated with methyl chloroform and permit thorough drying.
- 6.2 Abrade both sides of heat sink contact surfaces and the fuse bus contact surface with "Scotch Brite" pad. Abrade only long enough to thoroughly scratch and brighten the surfaces. After cleaning, wipe surfaces with clean cloth to remove any loose powder.
- 6.3 Apply joint compound Alcoa No. 2 (53535B4) to both sides of the heat sink contact surfaces and the fuse bus contact surface immediately after operation 6.2. Squeeze some of the compound onto the cleaned surfaces and spread it out with brush or sponge. Brushes and sponges used for applying the compound should be protected from contamination by dirt and foreign material during usage.
- 6.4 Abrade the clamping surfaces of the main assembly with "Scotch Brite" pad. Abrade only long enough to thoroughly scratch and brighten the surfaces. After cleaning wipe surface with clean cloth to remove any loose powder.
- 6.5 Slide module into main assembly until holes line up on fuse bus bar with those holes on the main assembly. Replace bolts ensuring that there is two washers under the head of this bolt. At the nut end there should be a lockwasher plus two flat washers.
- 6.6 Torque bolts to 250 in.lbs.
- 6.7 Torque slide bolts to 600 in.lbs.
- 6.8 Reconnect loads to pulse transformer assembly panel (when fitted). This only applies to a thyristor module. Shown in top left hand corner of module Figure 1.
- 6.9 Reconnect thermal switch leads (when fitted).
- 6.10 Reconnect fuse micro switch leads (when fitted).

TABLE I

DEVICE IDENTIFICATION	INDICATOR	INDICATOR REFERENCE POINT	ACTUAL FORCE LBS
1538A59	Fig. 6	8000	8000
1538A61	Fig. 7	6	6000
1538A65	Fig. 5	2	4000
1538A91	Fig. 5	2	4000
1870A64	Fig. 5	2½	5000
1912A14	Fig. 6	8000	8000
1926A50	Fig. 5	2½	5000

7. APPLICATION INVOLVING HEATSINK TO DIODE TEMPERATURES EXCEEDING 90°C

- 7.1 The actual removal and replacement of the diode is the same as that stated in section 5. However the preparation of the heatsinks is different.
- 7.2 After the heat sinks have been cleaned as stated in paragraph 4.6 the Alcoa No. 2 (53535B4) is immediately applied to the cleaned surfaces. A thin film of compound is to be applied using a "Printers Ink Roller" or other suitable applicators. The heat sink should be rolled several times until a very thin uniform film of compound is applied. The surface should have no glops or thick brown deposits of compound present when the application is complete.
- 7.3 Allow the compound to work for a minimum of 15 minutes to further remove the remaining aluminum oxide. After 15 minutes, wipe the Alcoa compound off with a clean cloth which will then leave only a thin film on the heat sink.
- 7.4 Obtain the semiconductor device, ensure that this is the correct device as specified by the style number on the assembly drawing.
- 7.5 Lightly burnish the diode mounting surface with Scotch Brite to remove any loose deposits on the nickel surface taking care not to remove the nickel plating.
- 7.6 Apply a thin coating of high temperature silicone oil (Dow Corning DC-200 viscosity 1000 centi-spokes or equivalent) to form a film on the device mounting surfaces. With the aid of an eye dropper place a circle of silicone oil in the center of the diode mounting surfaces.
- 7.7 The procedure stated in paragraphs 4.10 to 4.12 and 4.14 to 4.15 can then be followed with "Diode" substituted for "Thyristor".

