



## 1.0 Description

These instructions provide information on removing the large FET board in a ME, RD, MS, MSH or MS-PAE Series inverter/charger, and replacing with a new large FET board.

- Part numbers: TFB-MEXXXX, TFB-RDXXXX, TFB-MSXXXX, TFB-MSHXXXX or TFB-MSXXXXPAE)

**Note:** This document is part of a series of Service Instructions to help qualified personnel replace components that have failed or have been damaged.

## 2.0 Installation Preparation

Before removing or replacing the large FET board, read this entire document and follow all the instructions.

### 2.1 Safety Precautions

Follow all electrical safety precautions and the ESD prevention guidelines below, as well as the *Electrical Safety Precautions and Electrostatic Discharge Prevention: Service Instructions: 64-1000*.



**Warning:** Hazardous voltages are present within the inverter when power is applied. Do not remove the inverter's top cover without first turning off and disconnecting all AC and DC power to the inverter. Always replace the top cover before reconnecting power.



**Warning:** The inverter's inside capacitors store electric energy even after all AC and DC power is removed. After disconnecting all AC and DC power to the inverter, wait 5 minutes for the energy in the capacitors to dissipate before working on the unit.

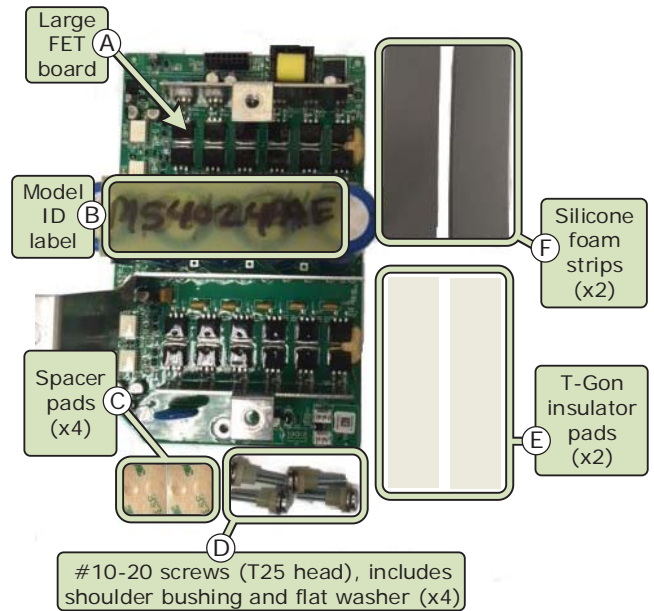


**Caution:** Observe all ESD safety precautions while working with the large FET board and within the inverter. Failure to follow ESD safety precautions could result in damage to internal components and the inverter.

### 2.2 Included Materials

Before dismantling the inverter, open the large FET board kit and inspect the new FET board to ensure there is no obvious physical damage. Verify that the Model ID Label on this new FET board (see Figure 1, Item B) corresponds to the model number of the inverter that is being repaired, and that the large FET board kit contains all the components shown in Figure 1. Contact Sensata if any item appears to be damaged, missing, or incorrect.

**Note:** All removed items must be returned if repair is for warranty consideration. Save the packing material and shipping container to use when returning the removed items.



**Figure 1, Large FET Board Kit**

### 2.3 Required Tools and Equipment

You will need the following tools and equipment:

- T15 Torx head screwdriver ( $\geq 6''$  shaft required) – for #6-32 screws
- T25 Torx head screwdriver – for #10-32 screws
- 7/16" socket, socket wrench and  $\geq 6''$  extension – for 1/4-20 bolts
- Torque wrench (130 in-lbs torque required) – for 1/4-20 bolts with 7/16" head
- Pliers ( $\geq 1''$  jaw opening required)
- Phillips screwdriver (MSH only)

### 2.4 Pre-installation

The inverter's top cover, DC terminal plate, and control board need to be removed before the FET board can be replaced. Follow the service instructions below (for your particular inverter model) to remove these components:

- Top Cover Removal and Replacement with Internal Component Identification*  
ME, RD, MS, or MS-PAE models - use Service Instructions: 64-1001  
MSH models - use Service Instructions: 64-1007
- DC Terminal Plate Removal and Replacement*  
Use Service Instructions: 64-1001
- Control Board Removal and Replacement*  
ME, RD, MS, or MS-PAE models - use Service Instructions: 64-1003  
MSH models - use Service Instructions: 64-1012

With the pre-installation tasks accomplished, proceed to Section 3.0 to remove and replace the large FET board.

## Large FET Board Removal & Replacement

### 3.0 Removing & Replacing the Large FET Board

**Note:** The inverters referenced in this document may include options that you do not have. Therefore, the following illustrations may not exactly match the inverter being repaired.

#### 3.1 Removing the Large FET Board

1. After removing the inverter's top cover, DC terminal plate and control board, locate and familiarize yourself with the components in the FET board compartment. See Figure 8.
2. Remove the two ¼-20 bolts\* (7/16" head) that connect the FET bus cables to the FET busbars on the large FET board (Figure 8, Items B<sup>1</sup> & G). Use a pair of pliers to hold the FET busbar in place to prevent it from twisting while these bolts are being removed. See Figure 2.

**Note:** If repairing an MS or MS-PAE Series inverter, one of the ¼-20 bolts (Figure 8, Item B<sup>1</sup>) was previously disconnected when the control board was removed, and will be reconnected when the control board is replaced.

**Note:** If repairing an MSH Series inverter, one of the ¼-20 bolts (Figure 8, Item B<sup>1</sup>) and the Phillips screw right next to it (Figure 8, Item B<sup>2</sup>) were previously disconnected when the control board was removed. Both will be reconnected when the control board is replaced.



**Caution:** Record how this hardware is removed, it will need to be reconnected in exactly the same way or inverter performance will be affected.

\* – These ¼-20 bolts screw into captive nuts attached to the bottom of the busbar, which means an additional wrench is not needed to hold the nuts in place while tightening the bolts.

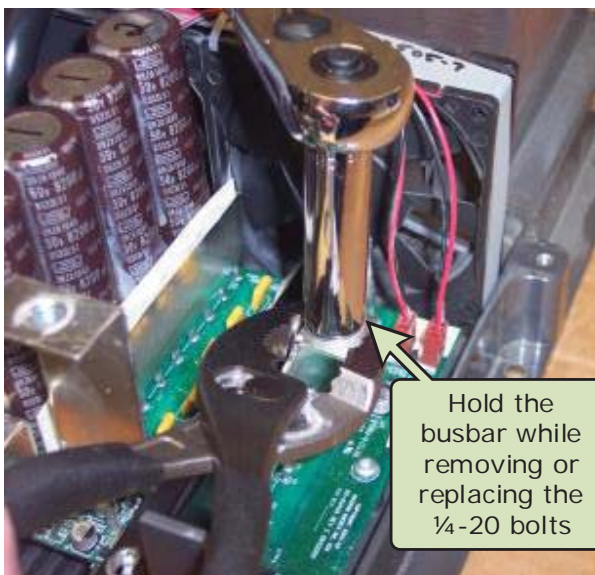


Figure 2, Preventing Busbars from Twisting

3. Disconnect the two fan supply connectors (Figure 8, Item F).
4. Remove the #6-32 screw (T15 head) on the right side of the FET board (Figure 8, Item H).
5. Remove the four #10-32 screws (T25 head) holding the FET clamps (Figure 8, Item D). These four screws with flat washers and shoulder bushings will be reused.
6. Remove the two FET clamps (Figure 8, Item C).
7. Using ESD precautions, remove the FET board. If it is for warranty consideration, place the FET board component-side up on a grounded, static-free surface until it can be placed in an antistatic bag to be returned; otherwise, it can be discarded.
8. After the FET board has been removed, remove any material (T-Gon™ insulator pads, tape, any metal particles, etc.) under the FET board or on the inverter base. The inverter FET baseplate should be clean. See Figure 3.

**Note:** Ensure the baseplate area under the FET board is clean and smooth to the touch. If it is not clean, use a lint free cloth to clean and remove any particles. If there is any tape attached to the inverter FET base, it should be removed.

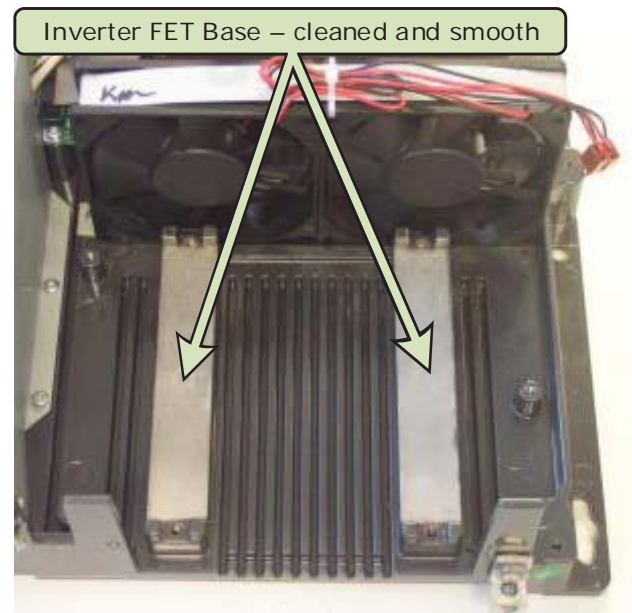
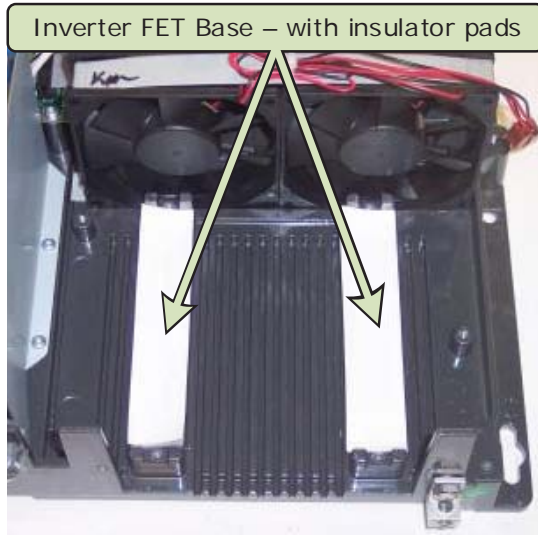


Figure 3, Inverter FET Base

## Large FET Board Removal & Replacement

### 3.2 Replacing the Large FET Board

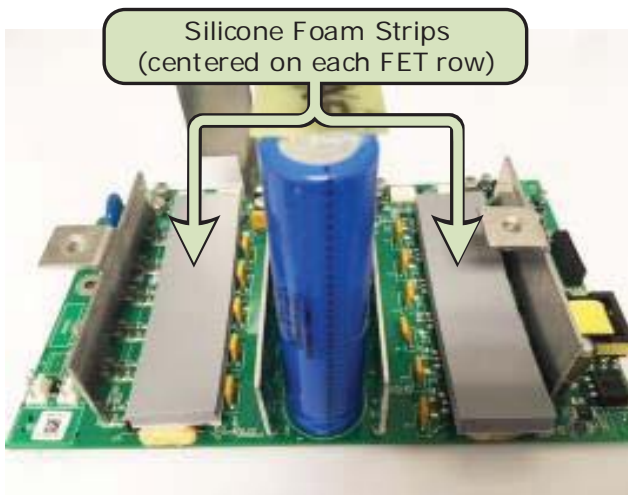
1. Place the two new T-Gon™ insulator pads on the inverter FET baseplate. See Figure 4 below.



**Figure 4, Inverter FET Base with T-Gon Insulator Pads**

2. Using ESD precautions, remove the new FET board from its antistatic bag and place it over the two new T-Gon™ insulator pads—ensure the insulator pads do not move.
3. While holding the new FET board in place on the insulator pads, replace the #6-32 screw on the board's right side (Figure 8, Item H). This will help hold the FET board and the insulator pads in place until the two FET clamps are re-installed.
4. Place a new silicone foam strip in the center of each row of FETs. See Figure 5.

**Note:** The foam strips may have a plastic covering on one side—inspect and peel the plastic off before using.



**Figure 5, Silicone Foam on FET Rows**

5. Position a spacer pad (Figure 1, Item C) over each FET clamp hole on the inverter base – see Figure 6.

**IMPORTANT:** The spacer pads ensure electrical isolation between the FET clamps and the inverter's base.

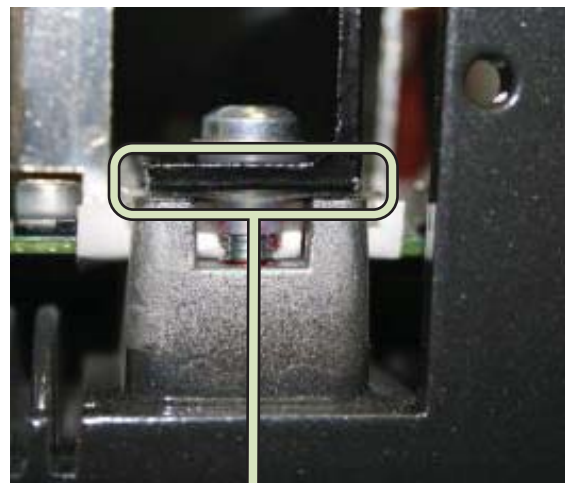
**Step 5:** Place the four spacer pads (Figure 1, Item C) between the FET clamps and the inverter base before inserting the #10-32 screws.



**Figure 6, Positioning the Spacer Pads**

6. Place a FET clamp over each new silicone foam strip. Place the four #10-32 screws (T25 head)—with flat washer and shoulder bushings—into the four holes on the two FET clamps (ensure each spacer pad remains properly positioned between the inverter base and FET clamp per Figure 7).

Alternate tightening the four #10-32 screws until each screw is tight and the FET clamps are flush against the inverter base (with a spacer pad between). Refer to Figure 7.



**Step 6:** Alternate tightening the #10-32 screws until the FET clamp is flush with the inverter FET base (with spacer pad between).

**Figure 7, FET Clamp to Inverter Base Tension**

## Large FET Board Removal & Replacement

- Replace and tighten the two ¼-20 bolts that connect the FET bus cables to the FET busbars on the new FET board (Figure 8, Items B<sup>1</sup> & G).

**Note:** For a MS or MS-PAE Series inverter, do not screw in the ¼-20 bolt on the negative FET side (Figure 8, Item B<sup>1</sup>)—this will be done when the control board is replaced.

**Note:** For a MSH Series inverter, do not screw in the ¼-20 bolt on the negative FET side (Figure 8, Item B<sup>1</sup>) or the Phillips screw next to it (Figure 8, Item B<sup>2</sup>)—this will be done when the control board is replaced.



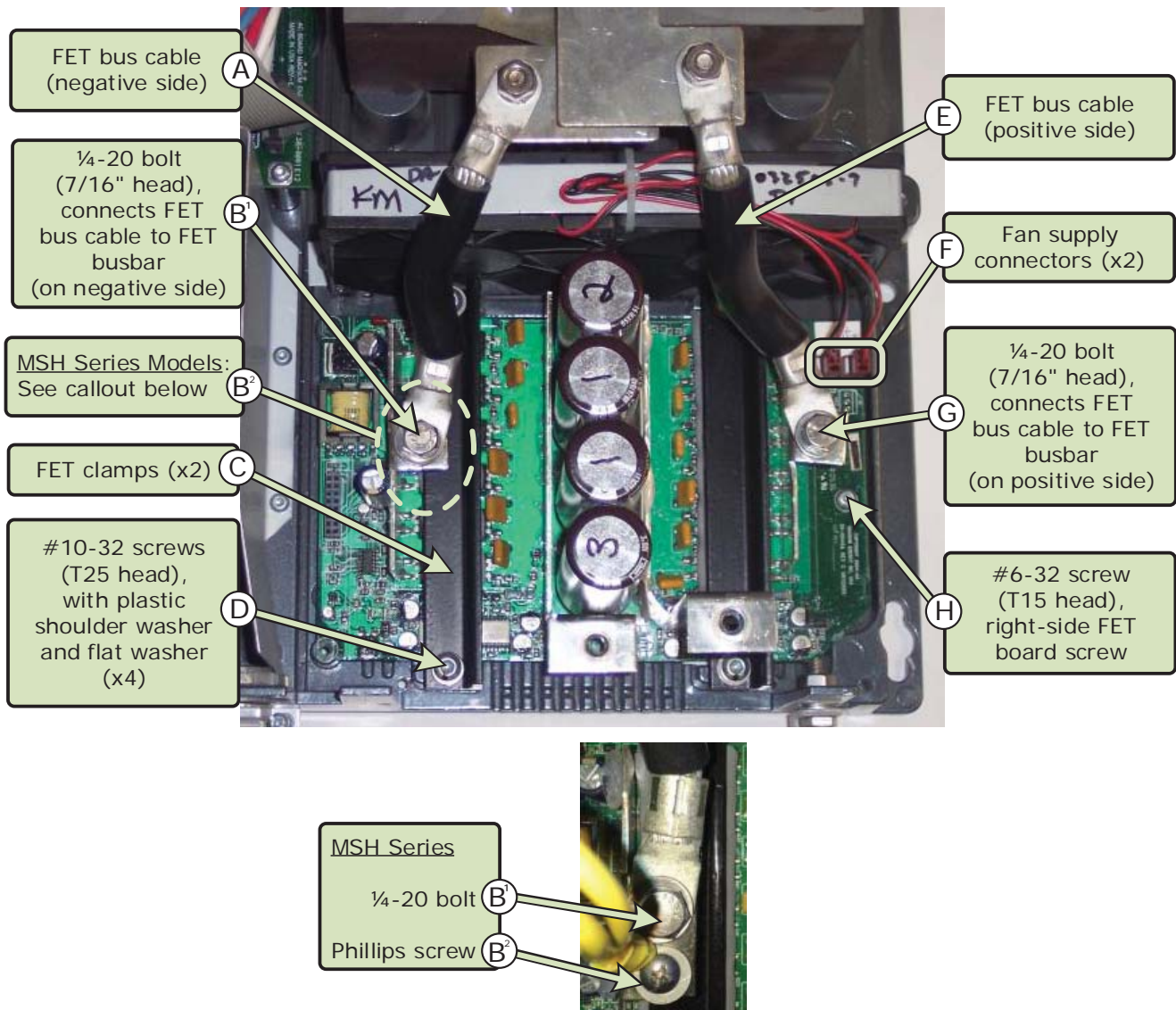
**Caution:** Ensure these ¼-20 bolts are reconnected in the same way as they were removed, and are correctly torqued. These

connections carry very high DC current, and an improper connection will affect the performance of the inverter and may cause damage.

- Reconnect the two fan supply connectors.
- Once the new FET board is installed, review all the connections to ensure they are correct.
- If there are no other internal repairs to perform, replace the control board, the DC terminal plate, and the inverter's top cover using the appropriate service instructions noted in Section 2.4.

### 4.0 Identifying Components in the Large FET Board Compartment

Although Sensata offers multiple Magnum inverter models—and uses a slightly different FET board for each model—the location of the large FET board for each inverter model series is identical.



**Figure 8, Large FET Board Section**