MAGNUM ENERGY
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a product brand of:

Sensata Technologies

1.0 Description

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

- Part numbers: TCB-MEXXXX, TCB-RDXXXX, TCB-MSXXXX or TCB-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 control board, read this entire document and follow all instructions.

2.1 Safety Precautions

Follow all electrical safety precautions and the ESD prevention guidelines below, and in 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 capacitors inside the inverter 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 when working with the control and FET boards, 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, inspect the new control board to ensure there is no obvious physical damage. Look at the Model ID label on the new control board (see Figure 1 or 2, Item A)***** and verify that the model number on this label corresponds to the model number of the inverter that is being repaired. Contact Sensata if any item appears to be damaged, missing or incorrect.

****** - The Model ID label for each inverter/charger may appear anywhere on top of the board's RJ connectors.*

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.*

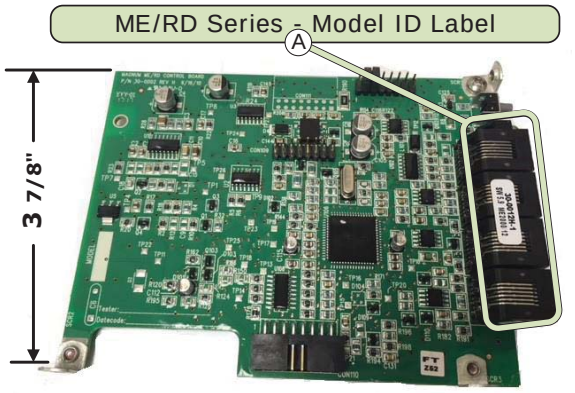

Figure 1, ME or RD Series Control Board

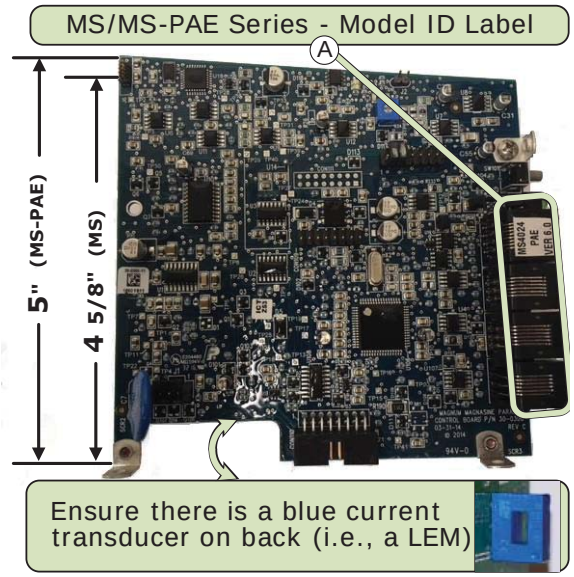

Figure 2, MS/MS-PAE Series Control Board

2.3 Required Tools and Equipment

Before disassembling the inverter, ensure you have the following tools and equipment to remove and replace the control board:

- T15 Torx head screwdriver (≥6" shaft required) – for #6-32 screws

MS/MS-PAE Series Inverter/Chargers also require:

- T25 Torx head screwdriver – for #10-32 screws
- 7/16" socket, socket wrench and ≥6" extension – for ¼-20 bolts
- Torque wrench (130 in-lbs torque required) – for ¼-20 bolts with 7/16" head
- Pliers (≥1" jaw opening required)

3.0 Removing & Replacing ME/RD Series Control Boards

This section provides information on removing and replacing the control board in a ME or RD Series inverter.

If you are replacing a control board in a MS or MS-PAE Series inverter, proceed to Section 4.0.

3.1 Removing ME/RD Series Control Boards

1. Remove the inverter's top cover and review the internal components as described in the *Top Cover Removal and Replacement with Internal Component Identification, Service Instructions: 64-1001*.
2. Locate the ME/RD Series control board in the inverter (Figure 6, Item A), and then remove the two #6-32 screws securing it to the inverter base. See Figure 3, Item B.

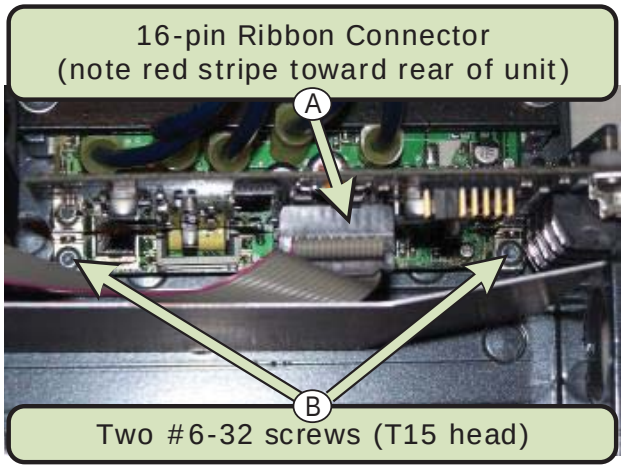

Figure 3, Top View of the Control Board

3. Grasp the control board by its top edge (or upper corners) and firmly pull up to remove it from the bottom 16-pin FET board connector.
4. Locate and pull off the 16-pin ribbon connector. See Figure 3, Item A.
5. The control board is now removed. Using ESD precautions, place it component-side up on a grounded, static-free surface until it can be placed in an antistatic bag to be returned with any other replaced components.

3.2 Replacing ME/RD Series Control Boards

Note: *If the FET board also needs to be replaced, follow the information described in either the* Small FET Board Removal and Replacement, Service Instructions: 64-1004*; or the* Large FET Board Removal and Replacement, Service Instructions: 64-1005*; depending on your particular FET board—before replacing the control board.*

1. Remove the new control board from its antistatic bag, and then reconnect the 16–pin ribbon cable connector. Before pushing in the connector, ensure it is seated with the red stripe on the ribbon cable facing toward the rear of the inverter (Figure 3, Item A) and the connector pins are aligned correctly.
2. Insert the new control board into the bottom 16-pin connector located on the FET board. Ensure the connector pins are aligned correctly before pushing in.
3. Replace the two #6-32 screws (T15 head) to secure the new control board to the FET board. See Figure 3, Item B.
4. The new control board is now installed, review all the connections a final time and ensure they are correct.
5. If there are no other internal components to replace, reinstall the top cover as described in the *Top Cover Removal and Replacement with Internal Component Identification, Service Instructions: 64-1001*.

4.0 Removing & Replacing MS/MS-PAE Series Control Boards

4.1 Removing the MS/MS-PAE Series Control Board

1. Remove the inverter's top cover and review the inverter's internal components as described in the *Top Cover Removal and Replacement with Internal Component Identification, Service Instructions: 64-1001*.
2. Locate the MS/MS-PAE Series control board (Figure 7, Item A) in the inverter. Verify that it has a blue DC current transducer (referred to hereafter as the "LEM") on the back. See Figure 7, Item C.

   Note: *The MS Series inverter was made with two types of control boards; the earlier "non-LEM" type and the current "LEM" type. This document provides instructions only on replacing the LEM type control board. If repairing a MS Series inverter that does not have a LEM type control board, contact Sensata for assistance.*
3. Locate and remove the two #6-32 screws (T15 head) securing the control board. See Figure 3, Item B.
4. Firmly pull up on the control board by its top edge (or upper corners) to remove it from the bottom 16-pin connector on the FET board. The current sense wire (Figure 7, Item B) will still be attached through the LEM on the back.
5. Look on the front of the control board and pull on the 16-pin ribbon connector to remove. See Figure 3, Item A.
6. Move the control board aside to provide access to the ¼-20 bolt (7/16" head) screwed into the negative FET busbar—see Figure 7, Item F. Remove this ¼-20 bolt, and at the same time use a pair of pliers to hold the negative FET busbar in place. This will prevent the busbar from twisting while this bolt is being removed. See Figure 4.

   Note: *Record how this hardware is removed, it will need to be reconnected in the same way.*
7. After removing the bolt, pull the loose side of the current sense wire (Figure 7, Item B) out of the LEM.
8. The control board is now removed. Using ESD precautions, place this control board aside until it can be placed in an antistatic bag to be returned with any other replaced components.

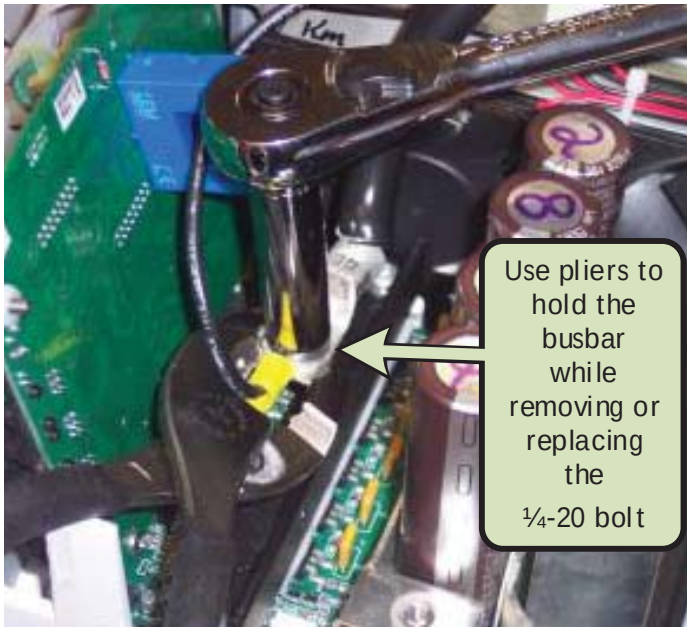

Figure 4, Preventing Busbar from Twisting

4.2 Replacing MS / MS-PAE Series Control Boards

Note: *If the FET board also needs to be replaced, follow the information described in the* Large FET Board Removal and Replacement, Service Instructions: 64-1005*—before replacing the MS/MS-PAE Series control board.*

1. Remove the new control board from its antistatic bag and place the loose side of the current sense wire (Figure 7, Item B) back through the LEM.
2. Reconnect the 16–pin ribbon cable connector to the front of the new control board. Before pushing it in, ensure it is connected with the red stripe on the ribbon cable facing toward the rear of the inverter (refer to Figure 3, Item A for reference) and the connector pins are aligned correctly.
3. Insert the new control board into the bottom 16-pin FET board connector. Ensure the connector pins are aligned correctly before pushing in.
4. Reconnect the negative bus cable and the current sense wire (running through the LEM) to the negative FET busbar using the ¼-20 bolt. This connection must be torqued to 130 in.-lbs. Use a pair of pliers to hold the negative FET busbar in place while this bolt is being tightened to prevent the busbar from twisting or breaking. See Figure 4 for reference.

Caution: Ensure the ¼-20 bolt is reconnected in the same way as it was removed, and is correctly torqued. This connection carries very high DC current, and an improper connection will affect the performance of the inverter and may cause damage. See Figure 5 for reference.

5. Secure the new control board into the bottom 16-pin FET board connector by screwing in the two #6-32 screws (T15 head) to the FET board. See Figure 3, Item B.
6. The new control board is now installed. Review all the connections a final time to ensure they are correct.
7. If there are no other internal components to replace, reinstall the top cover as described in the *Top Cover Removal and Replacement with Internal Component Identification, Service Instructions: 64-1001*.

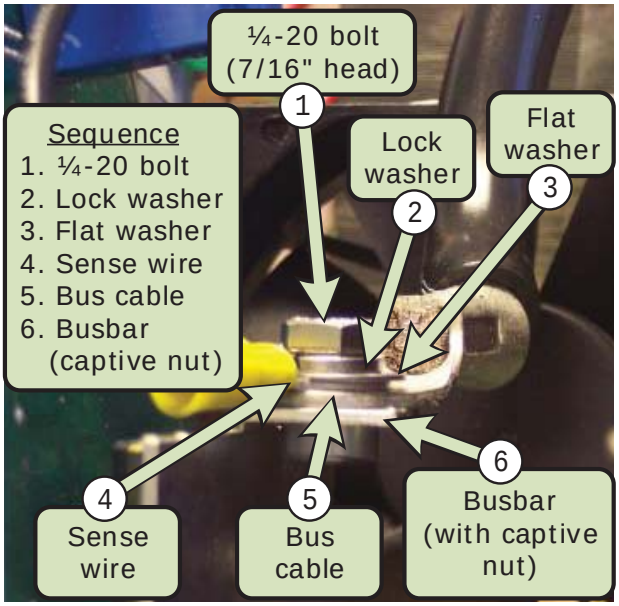

Figure 5, Connections to Busbar

5.0 Identifying Components in the Control Board Compartment

Although Sensata offers multiple Magnum Energy inverter models—and uses a slightly different control board for each model—the location of the control board for each inverter series is identical. Familiarize yourself with the components involved in the removal and replacement of a control board.

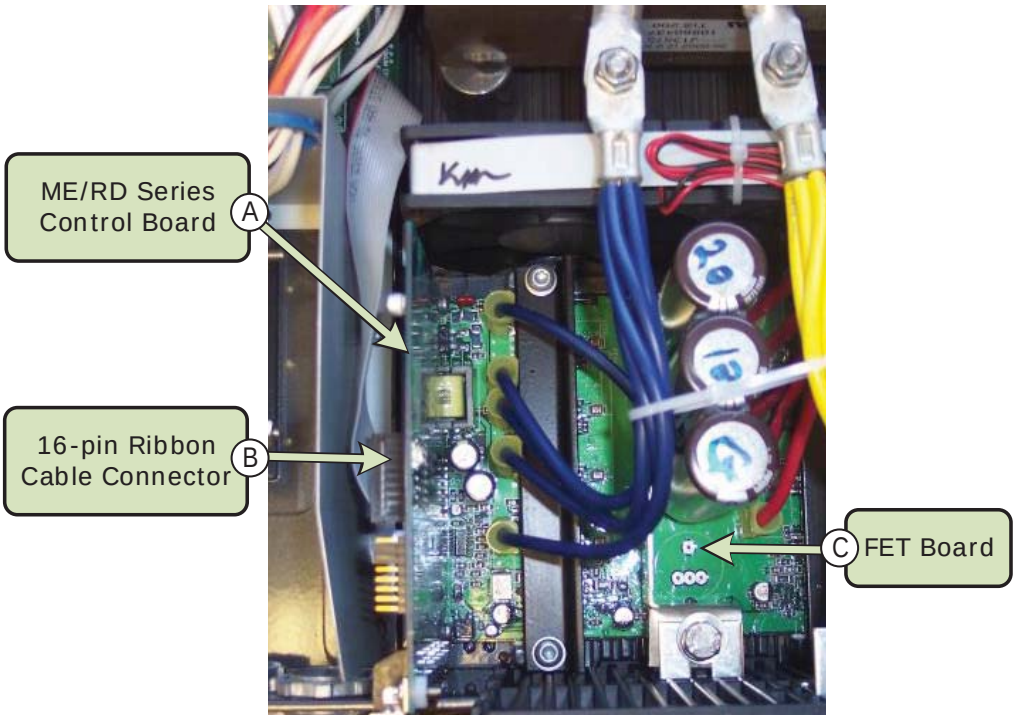

Figure 6, ME/RD Series Control Board Compartment

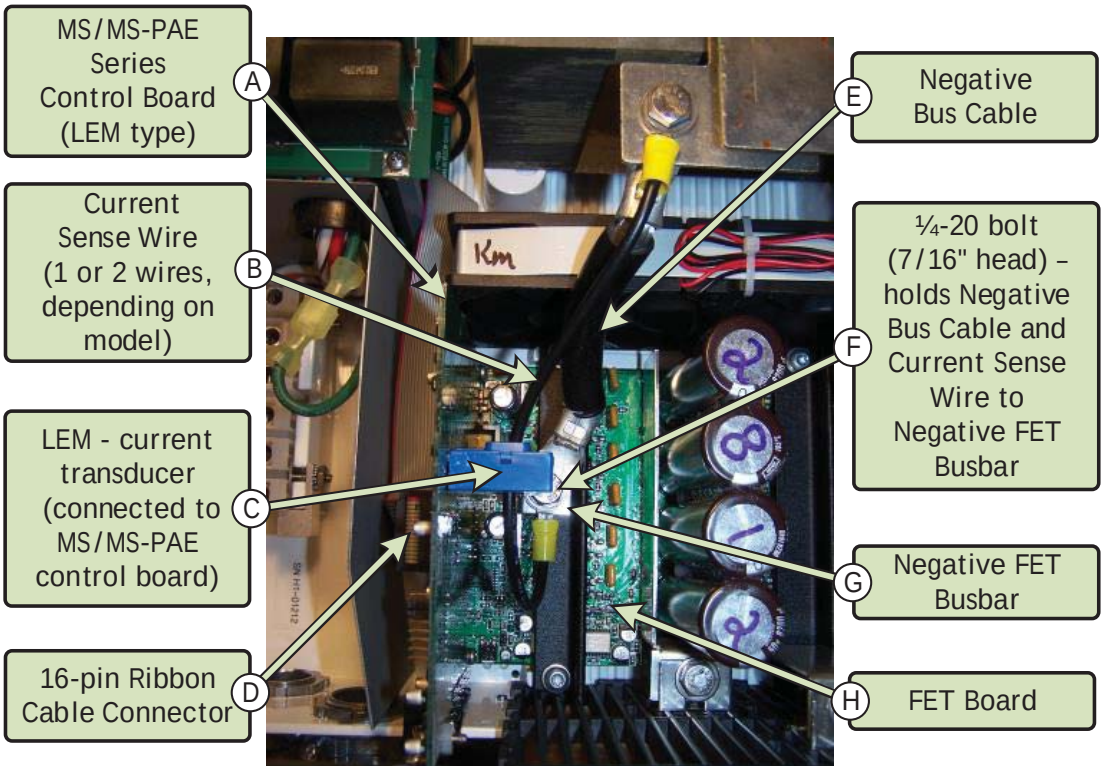

Figure 7, MS/MS-PAE Series Control Board Compartment