POWEREFFICIENCY
CORPORATION

E-SAVE TECHNOLOGY

PRODUCT MANUAL

Escalators and Moving Walkways

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1. TOOLS REQUIRED

- Phillips Screw Driver
- Standard Screw Driver
- Small Standard Screw Driver
- Channel Locks
- Allen Wrench set
- Wire Strippers
- Digital Volt/Ohm meter
- ¼ inch Drill Bit
- 3/8 inch Drill Motor
- 7/16 inch Open-end or Box Wrench
- 2 - ¼ inch-20 Pan-Head Bolts
- 4 - ¼ inch-20 hex nuts
- 6 - ¼ inch Tie Wraps

2. PRE-INSTALLATION PRODUCT EXAMINATION

2.1 INSPECTION PROCESS

2.1.1 Receiving, Inspecting, and Storing

- Thoroughly inspect the controller before accepting the shipment. If any items are damaged, it is the user's responsibility to not accept delivery until the freight agent has noted the damage on the freight bill. Should the user discover any concealed damage during unpacking, it is the responsibility of the user to notify the freight agent of the damage.

- The controller should remain in its shipping packaging prior to installation. Prior to installation, the controller should be stored in a dry and clean location and within an ambient temperature range of –20°C to +70°C (–4°F to +158°F).

NOTE: Before proceeding installers must be aware of company safety policies and use proper "Lockout / Tag-out" procedure. Failure to follow these procedures may cause serious injury or death.

NOTE: Failure to follow recommended directions in installation and wiring may cause a void in the product warranty.

2.2 GENERAL INFORMATION

2.2.1 Important User Information

- Due to the vast applications that this equipment can be used, it is the user's responsibility for the application and use of this control equipment. The user should validate that the equipment meets all performance and safety requirements, including any applicable laws, regulations, codes and standards.
- Power Efficiency Corporation is not responsible or liable for indirect or consequential damages resulting from the use of this equipment.
- Reproduction of the contents of this manual, in whole or in part, without written permission of Power Efficiency Corporation is prohibited.

2.2.2 Safety Guidelines

- To avoid an electric shock hazard, verify that all power sources have been disconnected and that no voltage exists on the motor terminals.
- When the Power LED is off, this is not an indication that capacitors have discharged to safe voltage levels.
- Only qualified personnel familiar with solid state starters and associated machinery should perform installation, commissioning and maintenance. Failure to comply may result in personal injury and/or equipment damage.
- Do not install power factor correction capacitors between the product and the motor.
- This product contains ESD (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing or servicing.
- An incorrectly installed Motor Efficiency Controller can result in component damage or a reduction in product life. Wiring or application errors, such as, under-sizing the motor, incorrect or inadequate power supply, or excessive ambient temperatures may result in malfunction of the system.

NOTE: This product has been designed for environment A. Use of this product In environment B may cause unwanted electromagnetic disturbances in which the user may be required to take adequate mitigation measures.

NOTE: This product is tested to meet CSA C22.2 / B44.1, UL 508 and IEC/EN 60947-4-2. It is classified under the IEC standard as a Form 2 device.

3. PRODUCT OVERVIEW

3.1 Reference Material

A) Quick Start - Publication MEC-AC-QS007-E
B) Product Overview – Publication MEC-AC-POV007-E

3.2 Catalog Reference Number

MEC - A C 034 N C
a b c d e

a

Control Type	
Code	**Description**
A	Solid-State Motor Controller

b

Input Line Voltage	
Code	**Description**
C	200 - 600V AC Three Phase

c

Amp Ratings	
Code	**Description**
022	22 A
034	34 A
052	52 A
080	80 A

d

Enclosure Type	
Code	**Description**
C	IP 00 (Open Style)
N	IP 21 / NEMA 1
F	IP 65 / NEMA 4

e

Code	**Description**
C	20-50V DC, 120-250V AC

			Voltage				
Catalog Number	**Frame**	**AMPs**	**200V**	**230V**	**400V**	**460V**	**575V**
MEC-AC022...	A	22	5 hp	3.7 kw	7.5 kw	15 hp	20 hp
MEC-AC034...	A	34	10 hp	7.5 kw	15 kw	25 hp	30 hp
MEC-AC052...	B	52	15 hp	11 kw	22 kw	40 hp	50 hp
MEC-AC080...	B	80	25 hp	18.5 kw	37 kw	60 hp	75 hp

3. PRODUCT OVERVIEW

3.3 Description

(a) Greatly Improve Motor Efficiency

- The Motor Efficiency Controller is a solid state motor controller that is designed to dynamically optimize the efficiency of a 3-phase AC electric motor.
- In constant-speed-variable-load applications, the patented E-Save Technology™ provides precisely the right amount of power to meet the demands of your application.
- In numerous tests, performed by independent third parties, the Motor Efficiency Controller has proven to save up to 40% of the energy normally used in appropriate applications.

(b) Soft Start and Electronic Protection

- The Motor Efficiency Controller integrates soft start functionality to provide a smooth acceleration of the motor to normal operating speed.
- It also incorporates electronic overload protection to protect your valuable assets.

(c) Greatly Prolongs Motor Life

- Since the Motor Efficiency Controller provides only the voltage and current required for the application, it reduces the operating temperature of the motor, thereby extending its useful life.
- Another benefit of the soft start functionality is reduced stresses on the mechanical system which reduces costly maintenance expenses.

(d) Quick Configuration and Installation

- Designed for out of the box installation and operation, the Motor Efficiency Controller is easily configured for your application and can be installed quickly, with no external power required – allowing you more time to focus on other demands.

(e) Product Features:

- Soft Start Ramp Times: 2, 5, 10, and 15 seconds
- Electronic overload protection
- Phase loss and reversal detection
- Over and under voltage detection
- Configured outputs (Fault, Run, Soft Start complete)
- Configurable auto and manual start
- Unit power from line power, no external power required

3. PRODUCT OVERVIEW

3.4 Operation

3.4.1 Timed Soft Start

- The output voltage to the motor is gradually increased during the start time (See Figure 1.). The start time is set via DIP Switches and can be set to 2, 5, 10 and 15 seconds.
- After the motor reaches full speed, the Motor Efficiency Controller will sense the load of the motor and it will then go into energy savings mode if appropriate. The factory default setting is 2 seconds.

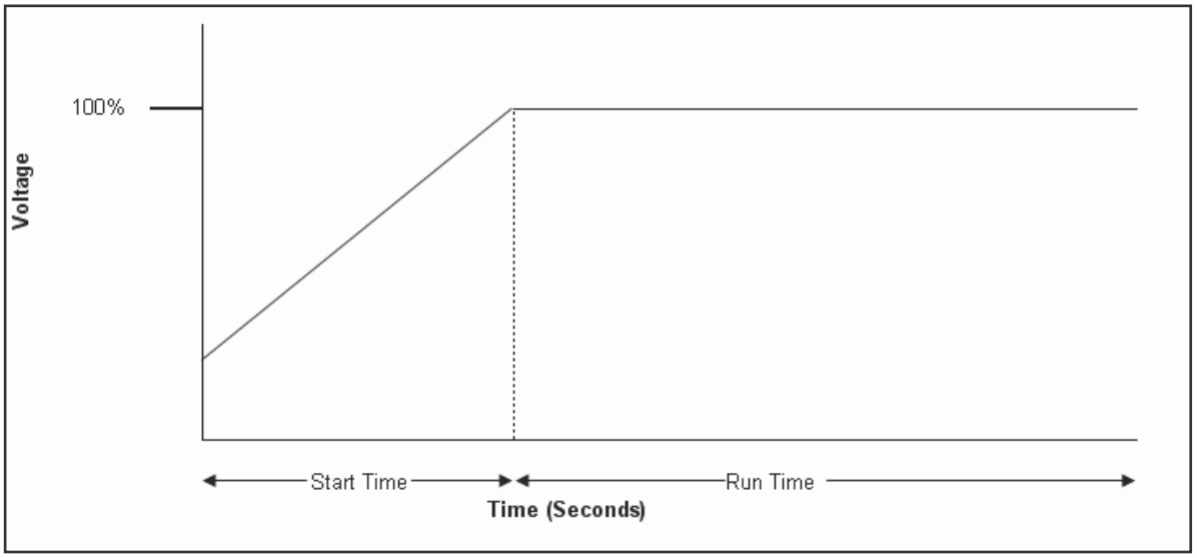


Figure 1.

Frame	Soft Start Times (seconds)			
	T1	T2	T3	T4
A	2	5	10	15
B	5	10	15	30
C	10	20	30	60

Table 1. – Soft Start Times

3.4.2 Start Mode

(a) Start from Input

- In the starting mode, Discrete Input 1 (IN 1) must be energized for the controller to start the motor.
- When IN 1 is de- energized, the controller will shut down power to the motor and it will coast to stop.
- This mode is set via DIP Switches (see section 6.1.2) and is the factory default.

3. PRODUCT OVERVIEW

(b) Auto-Start

- In the starting mode, the controller will start the motor when line power is applied to the product.
- However, since the controller must power-up and run startup diagnostics, it may take up to 5 seconds for the motor to start after power is applied.

3.5. Motor Protection

3.5.1. Over-Current

- The Motor Efficiency Controller meets the IEC 60947-4-2 requirements as a motor overload protective device.
- The controller uses a Class 10 standard, which will fault at:
  - 1.2 times Full Load Current (FLC) in 7,000 seconds,
  - 2 times FLC in 52 seconds,
  - 4 times FLC in 13 seconds and
  - 6 times FLC in 6 seconds.
- The motor's FLC rating must be properly set (see Section 6.1.5) to provide overload protection. See Figure 2 for Trip Curve.

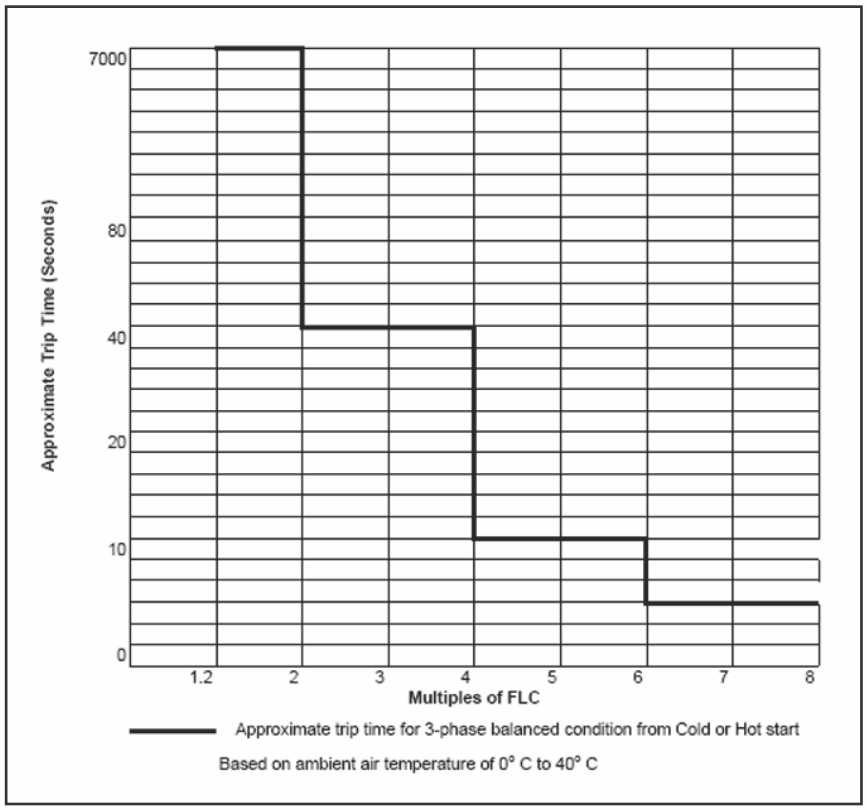


Figure 2 – Trip Curve

3. PRODUCT OVERVIEW

3.5.2. Under-Current

- The Motor Efficiency Controller provides under current protection to the motor.
- Power will be removed from the motor and the controller will fault if the current flowing to the motor is significantly less that the FLC setting.
- To set the FLC on the Motor Efficiency Controller, see Section 6.1.5.
- The controller will fault when it detects current on any of the line side phases (L1, L2 or L3) of less than 5% of the FLC value.

3.5.3. Over-Voltage

- The Motor Efficiency Controller provides overvoltage protection to the motor. Power will be removed from the motor and the controller will fault if a large increase in voltage is detected.
- The controller will fault when it detects a voltage of 125% or more of the nominal voltage.
- The nominal voltage is detected at startup and the controller will select one of the following voltages: (220, 380, 480 and 575).

3.5.4 Under-Voltage

- The Motor Efficiency Controller provides under-voltage protection to the motor.
- Power will be removed from the motor and the controller will fault if a large decrease in voltage is detected.
- The controller will fault when it detects a voltage of 75% or less of the nominal voltage.
- The nominal voltage is detected at startup and the controller will select one of the following voltages: (220, 380, 480 and 575).

3.5.5. Phase Loss

- The Motor Efficiency Controller provides phase loss protection to the motor.
- Power will be removed from the motor and the controller will fault if a single phase has a large decrease in voltage.
- The controller will fault when it detects the loss of current or voltage on any of the line side phases (L1, L2 or L3).

3.5.6. SCR Failure

- The Motor Efficiency Controller provides SCR Failure protection to the motor.
- Power will be removed from the motor and the controller will fault if a large decrease in voltage is detected on the motor side (T1, T2 or T3).

3. PRODUCT OVERVIEW

3.6. Energy Savings

- The Motor Efficiency Controller provides energy savings when it detects the motor has a load of less than 70%.
- When the controller is in energy savings mode, the Energy Savings LED will be ON and the controller will reduce the voltage and current to the motor.
- Energy savings will increase as the motor load decreases and can reach up to 50% when a motor has no load.
- If the motor load is higher than 70% then the motor is running very efficiently and the controller will not be able to reduce the current and voltage to the motor. In this case, the Energy Saving LED will turn off and the controller will exit energy savings mode.

3.7. I/O (input/Output)

3.7.1. Inputs

- The Motor Efficiency Controller has two (2) discrete inputs. The two inputs are controlled at terminals IN 1 and IN 2.
- When the controller is in “Start-from-Input” (See section 3.4.2.):
  - The controller will start the motor when IN 1 is energized and
  - The controller will remove power to the motor when IN 1 is de-energized.

- IN 2 is used to disable energy savings. Please contact technical support for the applications and conditions that would use this functionality.

3.7.2. Outputs

- The Motor Efficiency Controller has two (2) discrete Normally Open relay outputs. The two outputs are controlled at terminals OUT 1 and OUT 2.
  - OUT 1 is configurable to CLOSE on:
    - “Run”
    - Or, “Soft-Start-Complete” and
  - OUT 2 is configurable for:
    - “OPEN-on-Fault”
    - Or, “CLOSE-on-Fault”.

- See figure 3 for the timing diagram for the outputs when configured at the factory defaults of:
  - OUT 1 – CLOSE-on-Run.
  - OUT 2 – CLOSE-on-Fault.

3. PRODUCT OVERVIEW

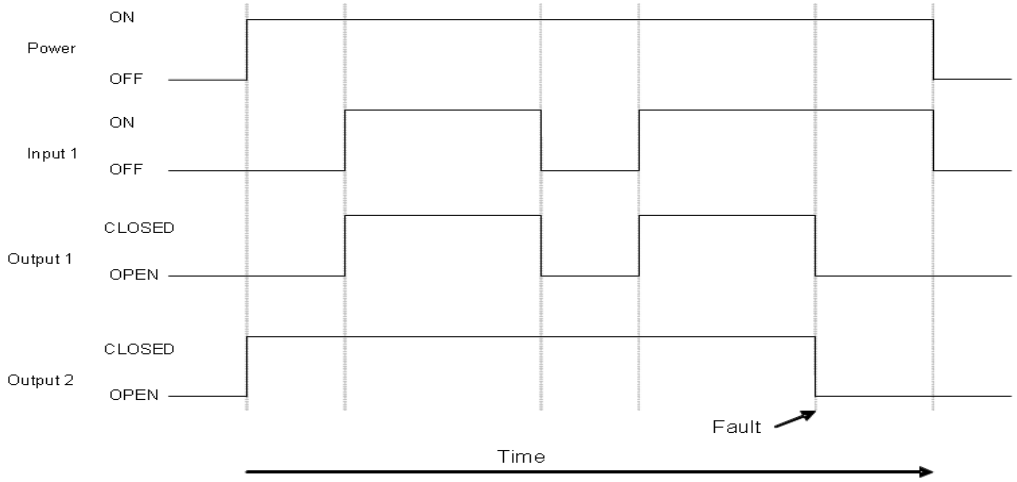


Figure 3 – Timing Chart for (DIP6=OFF/DIP7=ON)

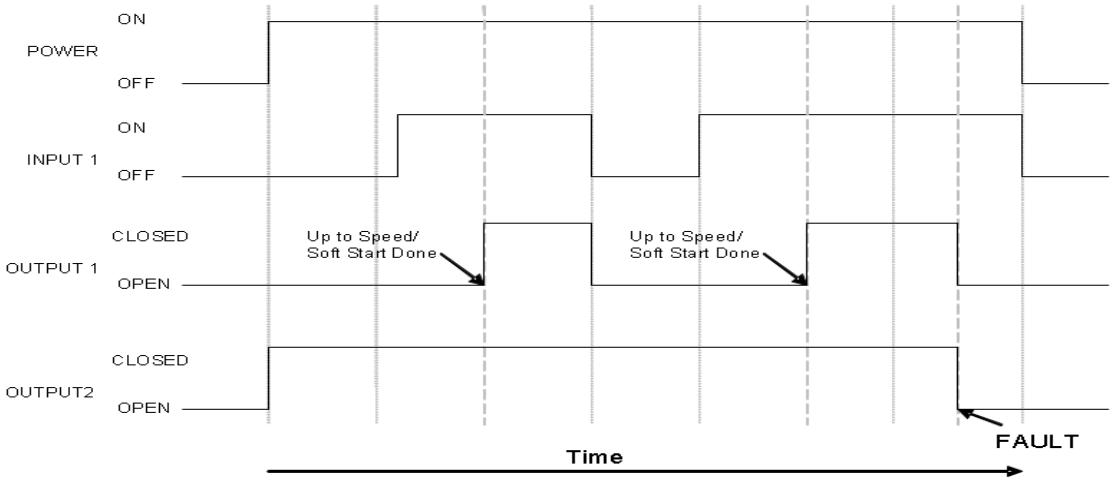


Figure 4 – Timing Chart for (DIP6 = ON/DIP7 = ON)

4. HOW TO REQUEST AN RMA

4.1 CUSTOMER REQUEST TO RETURN MERCHANDISE

(a) Application for Return Material Authorization (RMA)

- Customer must first discuss problem or reason for return with Field Engineering support at Power Efficiency.
- Once it is determined an RMA can be issued, the Field Engineer will:
  - Collect all information needed and
    - Then Email RMA instructions to the customer office in which it was sold.

NOTE: The Customer Office must also obtain from Power Efficiency a Return Material Authorization Number for any returned goods.

(b) Return of Defective Unit

- In most cases, the RMA Unit must be Returned First (Before a New or Refurbished Unit is Sent).
- RMA instructions will include shipping instructions of the unit in question.
- Units must be properly packaged against damage and weather for consideration for RMA.

NOTE: For any improperly packaged unit that is damaged in shipment:
- **Pictures will be taken to note the damage, and**
- **the RMA-Will-Be-Rejected.**

(c) Advance Replacement (of Damaged Unit Prior To Its Return)

- In order for Replacement to occur Before the RMA Unit is Returned, the following must take place:
  - Approval must be gained from Power Efficiency's VP of Product Management,
  - OR, if He is not available, the CFO or CEO.
- Advance Replacement Will Require a Purchase Order that Will-be-Credited:
  - Once the RMA unit is Properly-Returned, and
  - Once the returned-RMA unit is diagnosed with a component failure.

5. INSTALLATION

5.1 Mounting

(a) Locate an area with in the pit area that is easy accessibility for wiring and servicing. See Diagram 1 for unit size.

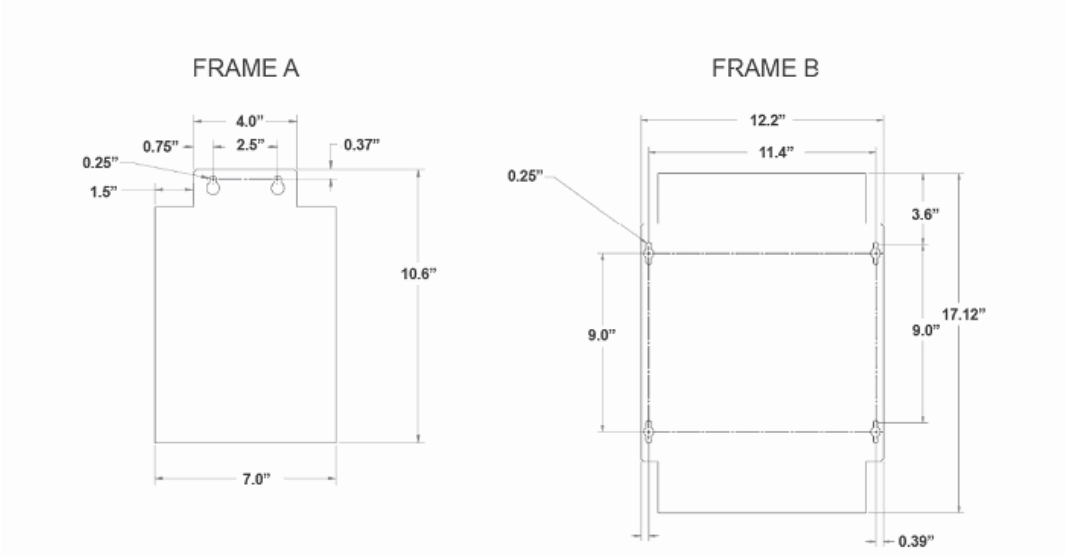


Diagram 1

(b) Drill two ¼ inch holes for frame A and four for frame B at the mounting distances shown in Diagram 1.

(c) Secure unit in place by using ¼-20 1-1/4 inch long pan head bolts and nuts.

(d) Double nut the bolts so the unit can easily slip into and out of place Without having to remove bolts.

NOTE: The controller must be mounted vertically and in a position that allows air to flow from the bottom to the top of the controller. In addition, the controller must be mounted to have a minimum of 6 inches (15 cm) free space above and below the controller.

WARNING: Metal surfaces on the Motor Efficient Controller can become hot and it should be mounted to reduce the risk of harmful burns from personnel that may come in contact with any metal surface.

WARNING: All wiring of the Motor Efficiency Controller must follow NEC, ANSI A17 and local Electrical code.

5. INSTALLATION

5.2 3-Phase Power Wiring

(a) Verify all items shown below are included in the wiring kit if supplied.

22 / 34 Amp MEC (FRAME A)		MEC-KWA
P/N	**Item**	**QTY**
TBD	4 / 12 AWG SO Cable	20’ (2@10’)
930	Cable grip	2
921	3/4” Conduit jam nut	2
581	2 position multi-tap connector	3
B-1105	8 / 22 AWG Control cable	10’
A-1103	Grommet, Exp.(.094-.359)	1
54 / 80 Amp MEC (FRAME B)		MEC-KWB
P/N	**Item**	**QTY**
623	4 / 6 AWG SO Cable	20’ (2@10’)
940	Cable grip	2
921	3/4” Conduit jam nut	2
581	2 position multi-tap connector	3
B-1105	8 / 22 AWG Control cable	10’
A-1103	Grommet, Exp.(.094-.359)	1

5. INSTALLATION

(b) Run the power wiring in such a manner that the MEC unit can easily be removed without removing the controller or the controller can be removed without removing the MEC unit.

(c) The power wiring running outside an enclosure should be run in shielded/armor cable or conduit if code requires.

NOTE: If conduit is being used the power wiring should never run in the same conduit as the I/O control wiring.

(d) Using the connectors provided make the necessary holes on the bottom of the controller and mount fittings.

(e) **I**nsert just enough cable to make the wiring easy of the 3 phase power.

(f) Make the necessary wiring changes to connect the 3 phase cable for L1, L2 and L3 as shown on the supplied PEC print for this model escalator.

NOTE: Though Model numbers may be the same, there are some wiring variations. Refer to the manufacturers wiring diagrams for this particular escalator when making wiring connections.

NOTE: Any transformers or power supplies that are originally connected to the line side must remain connected to the line side.

(g) Connect the other end of the cable to the Line side of the MEC unit keep the same phasing: L1 to L1, L2 to L2, and L3 to L3.

(h) Using the other power cable connect the load side of the MEC unit to the required connections shown on the supplied PEC print.

(i) Connect the grounds wires to the ground lugs on the MEC unit as well as on the controller.

NOTE: This product has been designed for Class A equipment. The use of this product in domestic environments may cause radio interference. When installing the product, make sure both line and motor ground wires are connected in the controller. The Motor Efficiency Controller and shielded cables should always be connected to a Safety Ground (PE). Grounding points must comply with national or local safety regulations and electric codes.

(j) Using the control cable (if provided) route the cable in the same fashion as was the power cables.

5. INSTALLATION

(k) Designate pairs of wires to be used for Input 1+ and Input 1-; Output 1+ and Output 1-; Output 2+; and Output 2-.

(l) Connect input 1+ and Input 1- according to the wiring diagrams and PEC print.

(m) Make the necessary wiring changes to connect Output 1+ and Output 1- (if req.).

(n) Turn Dip Switch 6 to the “ON’ position.

(o) Make the necessary wiring changes to connect Output 2+ and Output 2-.

(p) Turn Dip Switch 7 to the “ON” position.

WARNING: Failure to wire output 1 (if req.) and output 2 can lead to serious accident. No public use should be allowed until those outputs are connected.

Functionality	Settings
T1 Second Start	DIP Switch 1 = OFF, DIP Switch 2 = OFF
T2 Second Start	DIP Switch 1 = ON, DIP Switch 2 = OFF
T3 Second Start	DIP Switch 1 = OFF, DIP Switch 2 = ON
T4 Second Start	DIP Switch 1 = ON, DIP Switch 2 = ON
Reserved	DIP Switch 3
Reserved	DIP Switch 4
Start/Stop from Input 1	DIP Switch 5 = OFF
Auto-Start	DIP Switch 5 = ON
Up to Speed/Soft-Start Done	DIP Switch 6 = ON
Output 1 Normally Open	DIP Switch 6 = OFF
Output 2 Normally Closed	DIP Switch 7 = ON
Output 2 Normally Open	DIP Switch 7 = OFF
Soft-Start Enabled	DIP Switch 8 = OFF
Soft-Start Disabled	DIP Switch 8 = ON

Dip Switch Settings

(q) Set FLA potentiometer to the motor name plate full load amps.

NOTE: This scales the energy efficiency unit for savings and overload settings and must be set at name plate full load running amps!

5. INSTALLATION

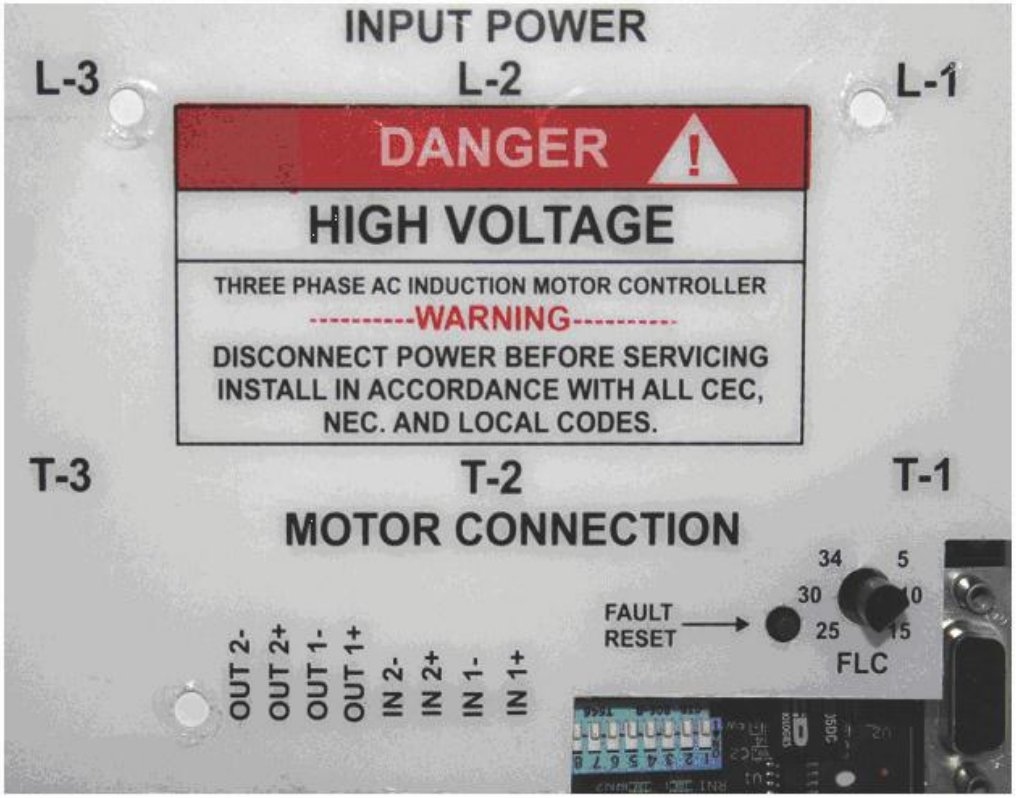


Figure 5 - FLA Potentiometer

6. PROGRAMMING

6.1 DIP Switch Settings

- The Motor Efficiency Controller has a set of eight DIP switches that are used to setup the functionality of the controller.
- See Figure 6 for a picture of the location and numbering of these DIP switches.

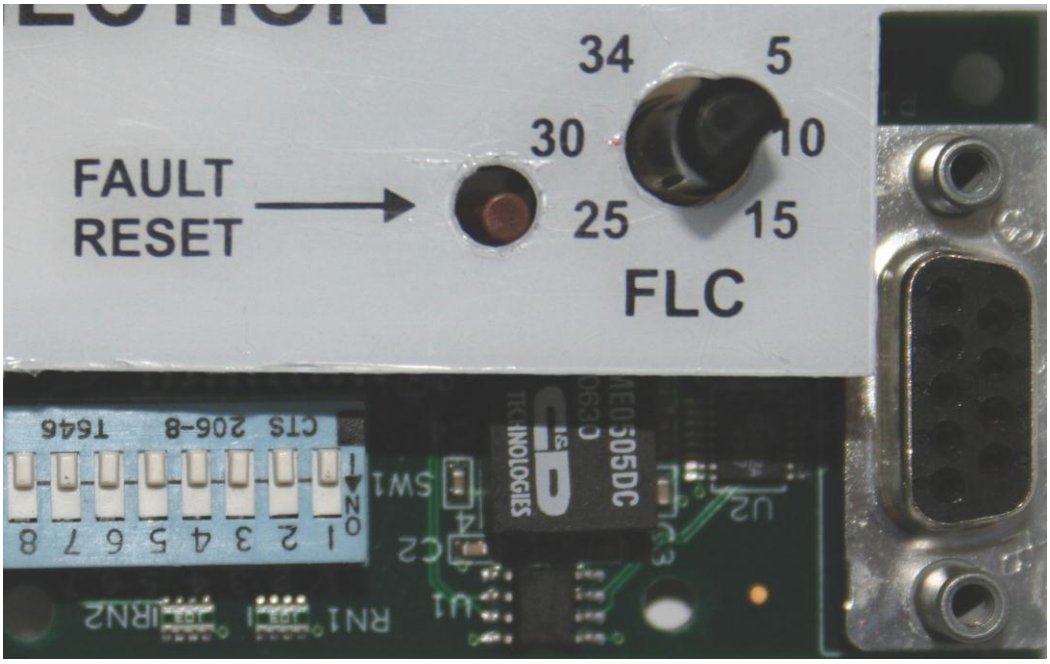


Figure 6 – Dip Switches

- **THE FOLLOWINGS SETTINGS ARE CONFIGURABLE WITH DIP SWITCHES:**

(a) Soft Start Time Ramped

- DIP Switches 1 and 2 are used to change the duration of the soft start.
  - The minimum and factory default is 2 seconds.
  - Settings of 5, 10 and 15 seconds are also available.
  - See section 3.4.1 and Table 1 for more information.

(b) Start-Mode

- DIP Switch 5 is used to set the Start-Mode for either:
  - **Start-from-Input**, or
  - **Auto-Start**.
- During **Start-from-Input** mode:
  - When IN1 is energized, it will start the motor.
  - When IN1 is de-energized, it will remove power from the motor.
- For more information see section 3.4.2.

6. PROGRAMMING

(c) Output Contact Behavior

- DIP Switches 6 and 7 are used to change the behavior of the two output contacts.
- The output contacts are Normally OPEN, but they can be configured as follows:
  - **Close-On-Run:**
    - ❖ When DIP Switch 6 is OFF:
      - ➢ OUT1 CLOSES on Run, or when IN1 is energized; and
      - ➢ OUT1 OPENS when IN1 is de-energized and no power is being supplied to the motor.
  - **Close-On-Soft-Start-Done:**
    - ❖ When Dip Switch 6 is ON;
      - ➢ OUT1 CLOSES, when the Soft-Start-is-Done; and
      - ➢ OUT1 OPENS, when IN1 is de-energized and no power is being supplies to the motor.
  - **OPEN-on-Fault:**
    - ❖ When DIP Switch 7 is ON;
      - ➢ OUT2 is normally CLOSED, and it OPENS-On-Fault.
  - **CLOSE-on-Fault:**
    - ❖ When DIP Switch 7 is OFF;
      - ➢ OUT2 is normally OPEN, and it CLOSES-On-Fault.

(d) Soft-Start

- DIP Switch 8 is used to enable or disable the Soft-Start feature.
- By default the Soft-Start is enabled, but in applications that require a full voltage start this can be disabled.
- When shipped from the factory, all DIP switches are set to OFF.

Functionality	Settings
T1 Second Start	DIP Switch 1 = OFF, DIP Switch 2 = OFF
T2 Second Start	DIP Switch 1 = ON, DIP Switch 2 = OFF
T3 Second Start	DIP Switch 1 = OFF, DIP Switch 2 = ON
T4 Second Start	DIP Switch 1 = ON, DIP Switch 2 = ON
Reserved	DIP Switch 3
Reserved	DIP Switch 4
Start/Stop from Input 1	DIP Switch 5 = OFF
Auto-Start	DIP Switch 5 = ON
Up to Speed/Soft-Start Done	DIP Switch 6 = ON
Output 1 Normally Open	DIP Switch 6 = OFF
Output 2 Normally Closed	DIP Switch 7 = ON
Output 2 Normally Open	DIP Switch 7 = OFF
Soft-Start Enabled	DIP Switch 8 = OFF
Soft-Start Disabled	DIP Switch 8 = ON

DIP Switch Settings

6. PROGRAMMING

6.2 Full Load Current (FLC) Setting

- The Motor Efficiency Controller provides electronic motor overload protection to guard the motor from damage from improper voltage and current levels.
- In order for this functionality to work correctly, the FLC pot, shown in Figure 6, must be set to the correct motor nameplate Full Load Amp (FLA).
- The FLA value will be found on the motor.
- To adjust the FLC value on the Motor Efficiency Controller, turn the dial counter clockwise until the desired current is aligned with the pointer.
- By default the FLC value is set to the max value.

6.3 Status Indicators

- The Motor Efficiency Controller provides three LED status indicators to provide the user with the status of the controller.
- The location of these status indicators is shown in Figure 7.

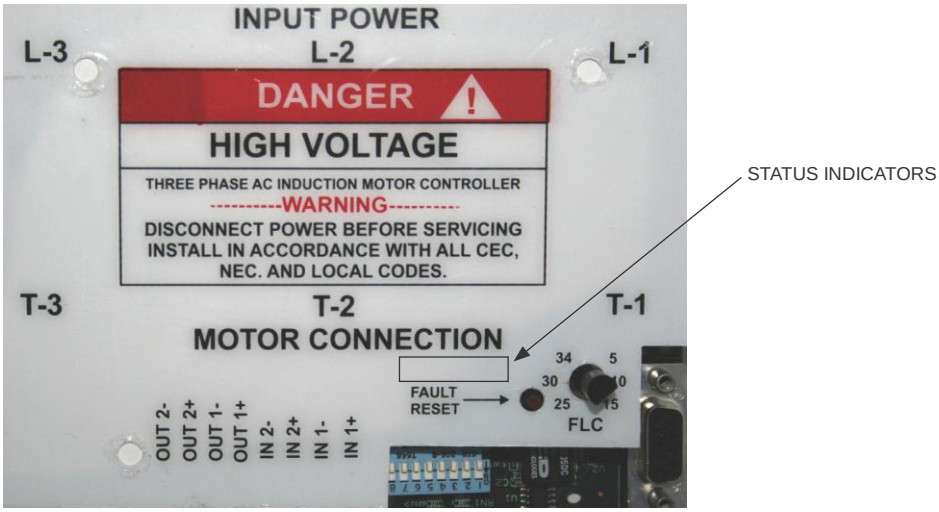


Figure 7 - Location of Status Indicators

(a) Power-Status-LED

- The Power-Status-LED is GREEN and is the LED furthest to the right.
  - This LED will be solid GREEN when 3 phase power is supplied to the controller
  - This LED will be off when the controller has no 3 phase power being supplied.

WARNING: Do not use this LED as an indication of no voltage present in the controller. Before performing any maintenance on the controller make sure all power sources are disconnected or off.

6. PROGRAMMING

(b) Fault-LED

- The Fault-LED is RED and is the middle LED.
  - This LED will be blinking RED when the controller detects a fault
  - This LED will be off when the controller is running under normal conditions.
- The Fault-LED-blinking-patterns provide the user with a visual indication of the type of fault.
- The blinking cycle last 3 seconds and will continue to repeat until:
  - 3 phase power is turned off
  - Or the fault button is pressed to reset the Motor Efficiency Controller.
- See the table below for fault condition and blinking patterns.

Fault	Number of blinks per cycle
Overload / Over Current	1
Phase Loss	2
Under Current	3
Under Voltage	4
Over Voltage	5
SCR Failure	7

Fault Codes

(c) Energy-Savings-LED

- The Energy-Savings-LED is RED and is the LED furthest to the left.
  - This LED will be solid RED when the controller is in energy savings mode
  - This LED will be off when the controller is running across the line.
- The controller will be in energy savings mode when the motor is approximately 70% loaded or less.
- When a motor is running at over 70% load the motor is running very efficiently and the controller will not be able to reduce power consumption.

(d) Fault Reset

- After the controller detects a fault the Fault-LED will turn red and power to the motor will be removed.
- In order to clear the fault and have the controller reset, the user can either:
  - Cycle power to the unit
  - Or press the Fault Reset button for 1 second.
- The controller will fault under the circumstances outlined in section 2.4.3.

7. START UP

7.1 Start-Up Sequence

(a) Verify Incoming Power connections are securely connected per wiring diagrams and PEC print.

(b) Verify Motor connections are securely connected.

(c) Verify incoming and motor ground connections are securely connected.

(d) Verify required I/O wiring is connected to the I/O plug and that this plug is inserted into the mating connection plug on the PCB.

(e) Verify DIP switch settings are setup for required operation.

(f) Verify FLC pot matches the nameplate Full Load Amperes (FLA) of the motor.

(g) Verify enclosure top has been secured to the base.

(h) Start the escalator/walk with the key switch and verify the escalator/walk is traveling the correct direction according to the key direction turned.

NOTE: If direction is not correct, verify that the load wiring T1, T2 and T3 wiring to the controller is correct.

(i) Release the Key after the unit is running in the correct direction, and verify that the unit stays running.

NOTE: If unit fails to keep running check the wiring for Output 1 as well as the position of Dip Switch 6.

8. TESTING

8.1 Testing Sequence

INPUT 1 TEST:

a. With escalator running, remove controller wiring that feeds Input 1+:
   - The Escalator should stop and the brake set!

. b. Does unit start from the key switch? If yes check wiring.

c. Replace controller wiring

OUTPUT 1 TEST:

a. Turn Dip Switch 6 ON and cycle the mainline off then back on.

b. Does the unit start from the key switch? If no check wiring.

c. Release the key switch does the escalator stop. If o check wiring.

d. Return Dip switch to desired setting and cycle the mainline off and on..

OUTPUT 2 TEST:

a. Turn dip switch 7 OFF, and cycle the mainline off then back on.

b. The unit should not start and the controller should show open safety circuit. If not check wiring.

c. Return Dip switch to desired setting and cycle the mainline off and on.

9. TROUBLESHOOTING

NOTE: For the safety of all maintenance personnel, please follow the local safety related work practices (for example, the NFPA 70E, Part II in the United States). Maintenance personnel must be trained in the safety practices, procedures, and requirements that pertain to solid state motor controllers.

9.1 Symptoms:

9.1.1 Power LED is not Green

- Check for open line and verify Voltage at L1
- Check wiring
- Contact Technical Support

9.1.2 Fault LED is Blinking

(a) Overload / Over Current (1 blink)

- Verify motor or equipment is not jammed
- Verify motor FLA matches the Motor Efficiency Controller FLC pot setting

(b) Phase Loss (2 blinks)

- Check for open line and verify voltage at L1, L2 and L3
- Verify line balance on L1, L2 and L3
- Verify motor lines T1, T2 and T3 are connected

(c) Under Current (3 blinks)

- Verify FLC setting matches motor FLA
- Verify motor lines T1, T2 and T3 are connected
- Verify motor or equipment is not damaged

(d) Under-Voltage (4 blinks)

- Verify voltage at L1, L2 and L3
- Verify power system
- Verify soft start time is sufficient for motor load and increase soft start time if necessary.

(e) Over-Voltage (5 blinks)

- Verify voltage at L1, L2 and L3
- Verify power system

9.1.3 SCR Failure (7 blinks)

- Contact Technical Support

9.1.4 Motor Will Not Start

- Check motor wiring
- Check control wiring
- Verify start mode and Voltage to Input 1
- Verify motor or equipment is not jammed

9. TROUBLESHOOTING

9.1.5 Motor Stops

- Check control and power wiring
- Verify motor FLA matches the Motor Efficiency Controller FLC pot setting

9.1.6 Motor Doesn't Reach Full Speed Within Soft Start Time

The time it takes for the motor to come up to speed may be more or less than the time programmed, depending on the size of the connected load. Therefore, the soft start time may need to be increased

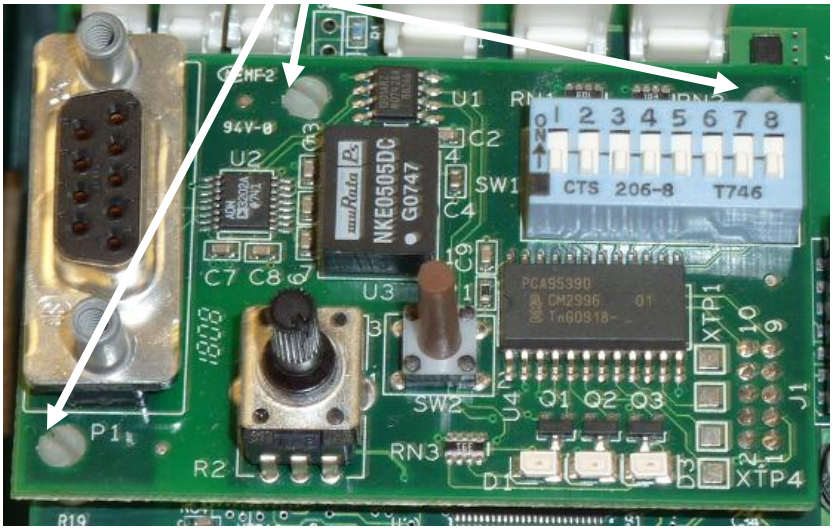
10. PART REPLACEMENT PROCEDURE

10.1 Daughter Board

CAUTION: Before replacing any parts, make sure all power is turned off and locked out.

a. Carefully pull off the Daughter Board from the Main PCB

✓ Use pliers to pinch the **standoffs** for easier removal



b. Install the new Daughter Board by firmly pressing the new board onto the black connector and 3 standoffs.

10. PART REPLACEMENT PROCEDURE

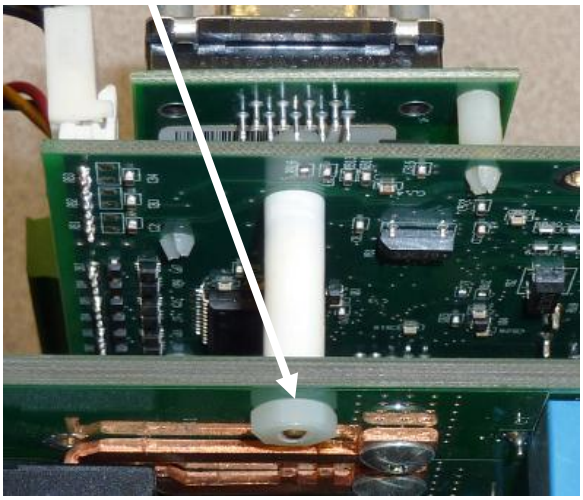
10.2 Main PCB

a. Remove **3 hex nuts** and take off plastic cover

Note wiring for CTs and SCRs

b. Remove 3 standoffs on top of the main PCB where the hex nuts from the cover were from.

✓ Remove **hex nut** from the bottom right of the Power Board below the Daughter Board



c. Remove all 6 SCR wires, all 3 CT wires and all 3 relay wires (if applicable)

✓ Take off main PCB board

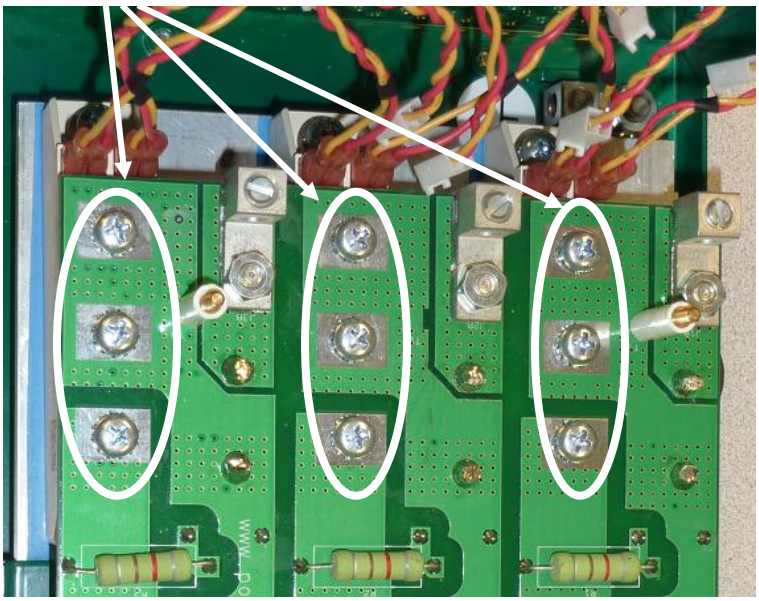
10. PART REPLACEMENT PROCEDURE

d. Put on replacement main PCB in the same orientation as the old PCB
   - ✓ Wire up the 6 SCR wires, 3 CT wires and 3 relay wires (if applicable)
     - ➢ Make sure the wiring is in the same placement as the old PCB
     - ➢ The SCR wires plug in as pairs and are crossed
   - ✓ Put back the hex on the bottom right of the Power Board
   - ✓ Put back the 3 standoffs on top of the main PCB
   - ✓ Put back the plastic cover and the 4 hex nuts on top of the cover

10.3 Power Board

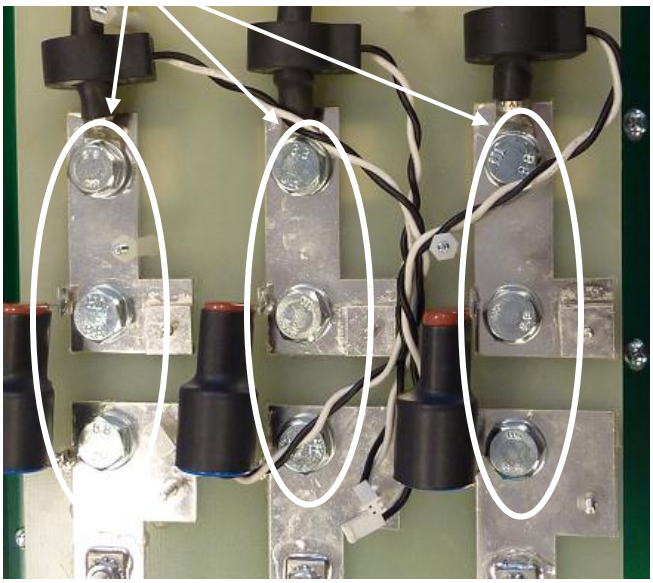
a. Continuing from removing the main PCB
   - ✓ Disconnect the line and load side power wiring from the Power Board

b. Remove all 9 screws holding the Power Board to the SCRs
   - ✓ **Frame A**



10. PART REPLACEMENT PROCEDURE

✓ **Frame B**



c. Take off Power Board
   - ✓ Remove the 3-4 standoffs from the Power Board and replace on the new Power Board

d. Place the new Power Board in the same orientation as the old one
   - ✓ Put back the 9 screws that hold the board onto the SCRs
   - ✓ Continue instructions above to put back the main PCB

10. PART REPLACEMENT PROCEDURE

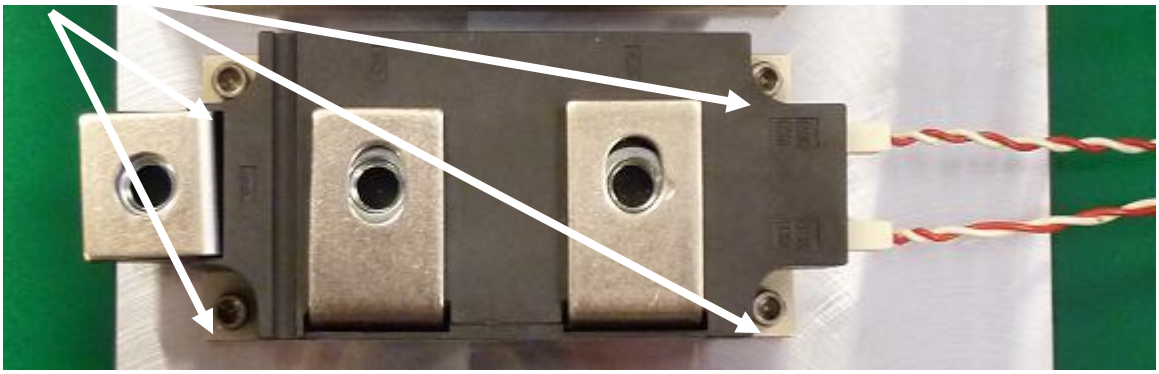
10.4 SCR

a. Continuing from removing the Power Board

b. Remove the screws that hold the bad SCR onto the Heat-sink

- ✓ **Frame A**

- ✓ **Frame B**



c. Replace the bad SCR with the new one
   - ✓ Make sure there is thermal paste or equivalent under the new SCR

d. Screw down the new SCR with screws from the old SCR

e. Continue instructions above to put back the Power Board and Main PCB

11. PARTS LIST

11.1 MEC Parts

11.1.1 MEC-AC0022NC/FC

(a) Frame-A SCR (22 AMP)

(b) Frame-A Main Board

(c) Frame-A Daughter Board

(d) Frame-A Enclosure Cover

(e) Frame-A, 22 amp plastic guard

11.1.2 MEC-AC0034NC/FC

(a) Frame-A SCR (34 AMP)

(b) Frame-A Main Board

(c) Frame-A Daughter Board

(d) Frame-A Enclosure Cover

(e) Frame-A 34 amp plastic guard

11.2.2 MEC-AC0052NC/FC

(a) Frame-B SCR (52 AMP)

(b) Frame-B Main Board

(c) Frame-B Daughter

(d) Frame-B Power Board

(e) Frame-B Enclosure Cover

(f) Frame-A 52 amp plastic guard

11.1.3 MEC-AC0080NC/FC

(a) Frame-B SCR (80 AMP)

(b) Frame-B Main Board

(c) Frame-B Daughter

(d) Frame-B Power Board

(e) Frame-B Enclosure Cover

(f) Frame-A 80 amp plastic guard

11.2 Accessory Wiring Kits

- See section 5.2.1 for description of the following accessory wiring kits:
  - Frame-A 22 / 34 Amp MEC (FRAME A) - MEC-KWA
  - Frame-B 54 / 80 Amp MEC (FRAME B) - MEC-KWB

12. FIELD DATA SHEETS

Elevator Company _____

Building Name _____

Customer Name _____

Address _____

City _____ State _____ Zip _____

Escalator Manufacturer _____ Model Number _____

Escalator/Walk Number _____ Motor H.P./kW _____ Motor Volts _____

MEC FLA Setting _____ DIP Switch Setting _____

MEC Serial Number _____

Motor Voltage under energy savings _____

Installation Date _____

13 SPECIFICATIONS

13.1 Electrical

Power Circuit	
Rated Operational Voltage	200V – 600V (+/- 5%)
Rated Insulation Voltage	600V
Rated Impulse Voltage	4000V
Diaelectric Withstand	2200V
AC Operating Frequency	50/60 Hz
Protection	IP00 NEMA 1/IP21, NEMA 4/IP65
Control Circuit	
Rated Operational Voltage	20 – 50 V DC, 120 – 150 VAC
Rated Insulation Voltage	220 V
Rated Impulse Voltage	4000 V
Rated Operational Current	0.1A @ 24V DC, 0.02A@ 120 VAC
AC Operating Frequency	50/60 Hz
Logic Input On-State Voltage Minimum	20V
Logic Input On-State Current	>10 mA
Logic Input On-State Voltage Maximum	3 V
Logic Input On-State Current	< 3 mA
Short Circuit Withstand	
Frame A	5 KA
Frame B	10 KA
Max Fuse	
Frame A	150 A Class K-5
Frame B	300A Class K-5
Wire Size	
Frame A(L1, L2, L3, T1, T2, T3)	14 to 4 (awg)/ 2.5mm to 25 mm
Frame B(L1, L2, L3, T1, T2, T3)	14 to 1/0 (awg)/2.5mm to 50mm
Frame A and B(IN1, IN2, OUT1, OUT2)	22 to 12 (awg)/0.34mm to 4mm
Max Heat Dissipation	
MEC-AC022	76W
MEC-AC034	110W
MEC-AC052	150W
MEC-AC080	240W

13.2 Environmental

Operating Temperature	0 to 50° C/32 to 122° F (Open) 0 to 40° C/32 to 104° F (Enclosed)
Storage Temperature	-20 to 70° C / -4 to 158° F
Altitude	2000 m / 6560 feet
Humidity	5 to 95% (non-condensing)
Pollution Degree	2
EMC Emissions Levels	
Conducted Radio Frequency Emissions	Class A
Radiated Emissions	Class A
EMC Immunity Levels	
Electrostatic Discharge	8kV Air Discharge, 4kV Contact
Radio Frequency	Per EN/IEC 60947-4-2
Fast Transient	2kV / 5kHz line to line
Surge Transient	2kV line to ground 1kV line to line

13 SPECIFICATIONS

13.3 Dimensions and Weight

Frame	Rating	Height	Width	Depth	Weight
A	IP00	9.5" / 240mm	6.0" / 150mm	4.8" / 120mm	7.1 lbs / 3.2 kg
A	IP21	10.6" / 270mm	7.0" / 180mm	5.6" / 140mm	10 lbs / 4.5 kg
A	IP65	11.4" / 290mm	9.8" / 250mm	7.4" / 190mm	8.6 lbs / 3.9 kg
B	IP00	12.0" / 300mm	11.0" / 280mm	6.5" / 170mm	24 lbs / 11 kg
B	IP21	17.1" / 430mm	12.2" / 310mm	7.3" / 180mm	32 lbs / 14 kg
B	IP65	15.5" / 390mm	12.8" / 330mm	7.6" / 190mm	27 lbs / 12 kg

13.4 Standards Compliance

- CSA B44.1-04/ASME-A17.5-2004
- EN 60947-4-2:1997
- EN 55011:2007
- EN 61000-6-2:2005

13.5 Certifications

- CSA Certified (File No. 210268)
- CE Marked per EMC and Low Voltage Directive

14. TECHNICAL SUPPORT

- For Technical Support issues please use the contact information below:

14.1 Email: techsupport@powerefficiency.com

14.2 Toll Free number: (888) 773-3770

14.3 Local number: (702) 539-9367