



## Section 1.0

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## ■ Warnings



The MCD 201 & MCD 202 contain dangerous voltages when connected to line voltage. Only a competent electrician should carry out the electrical installation. Improper installation of the motor or the MCD 201 & MCD 202 may cause equipment failure, serious injury or death. Follow this manual and National Electrical Codes (NEC®) and local safety codes.

## Safety regulations

1. The soft starter must be disconnected from the mains if repair work is to be carried out.
2. Stopping the soft starter of the does not disconnect the equipment from the mains and leaves one phase connected to the motor. Thus the soft starter is not to be used as a safety switch.



It is the responsibility of the user or the person installing the MCD 201 & MCD 202 to provide proper grounding and branch circuit protection according to the National Electric Code (NEC®) and local codes.

## Symbols used in this manual

The following symbols indicate items that require special attention:



Indicates a general warning.



Indicates a high voltage warning.

## Avoiding soft starter damage

Please read and follow all instructions in this manual. Additionally, take special note of the following:

1. Do not connect power factor correction capacitors to the soft starter output. Static power factor correction, if used, must be connected on the mains side of the soft starter.



Electrostatic Precaution: Electrostatic discharge (ESD). Many electronic components are sensitive to static electricity. Voltages so low that they cannot be felt, seen or heard, can reduce the life, affect performance, or completely destroy sensitive electronic components. When performing service, proper ESD equipment should be used to prevent possible damage from occurring.

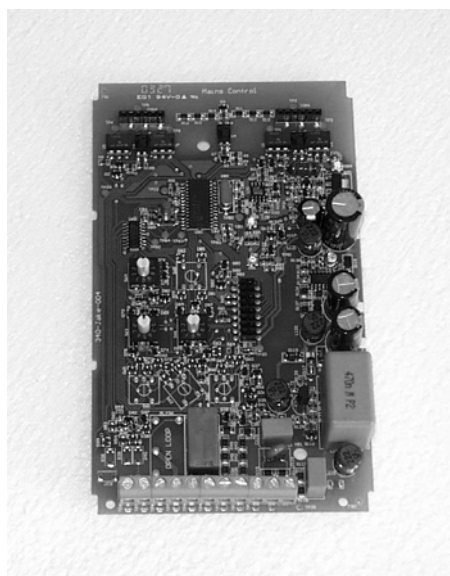
■ Spare Parts

Main Control PCB		T4 Models												T6 Models												
Kit Part Number (Item ID)																										
CV3 Models	CV1 Models	(number per unit)																								
175G9010 (990-02380-00)	175G9011 (990-02381-00)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
175G9012 (990-02378-00)	175G9013 (990-02379-00)													1	1	1	1	1	1	1	1	1	1	1	1	1

Main Control PCB		T6 Models												T6 Models												
Kit Part Number (Item ID)																										
CV3 Models	CV1 Models	(number per unit)																								
175G9014 (990-02384-00)	175G9015 (990-02385-00)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
175G9016 (990-02382-00)	175G9017 (990-02383-00)													1	1	1	1	1	1	1	1	1	1	1	1	1

175G9010 (990-02380-00)  
 175G9011 (990-02381-00)  
 175G9014 (990-02384-00)  
 175G9015 (990-02385-00)

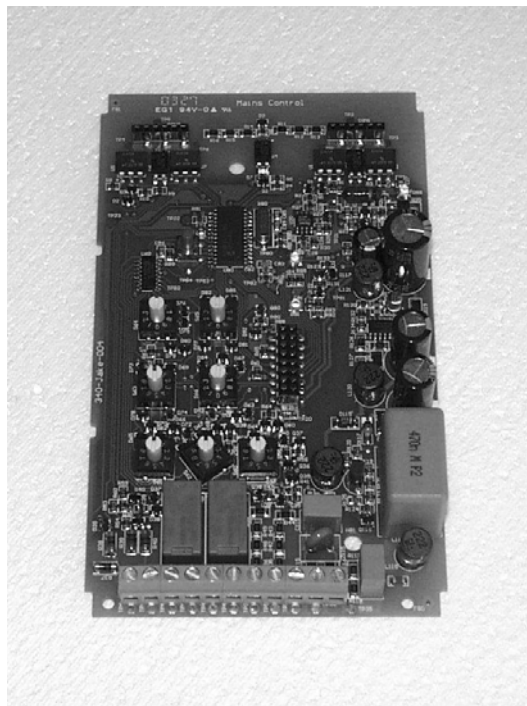


175G9012 (990-02378-00)

175G9013 (990-02379-00)

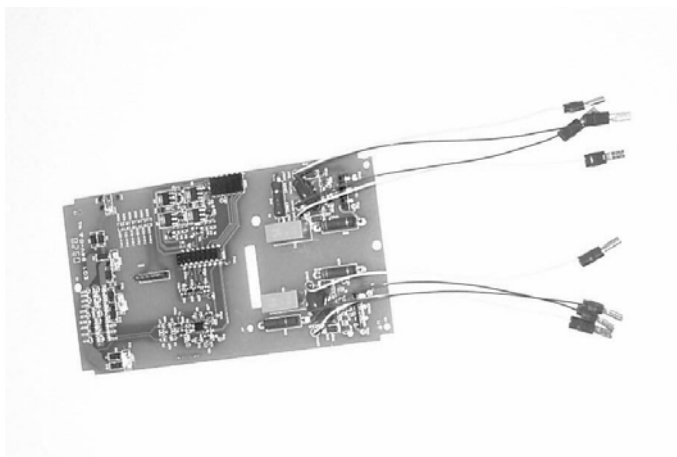
175G9016 (990-02382-00)

175G9017 (990-02383-00)



Interface PCB  Kit Part Number (Item ID)	MCD 201-007	MCD 201-015	MCD 201-018	MCD 201-022	MCD 201-030	MCD 201-037	MCD 201-045	MCD 201-055	MCD 201-075	MCD 201-090	MCD 201-110	MCD 202-007	MCD 202-015	MCD 202-018	MCD 202-022	MCD 202-030	MCD 202-037	MCD 202-045	MCD 202-055	MCD 202-075	MCD 202-090	MCD 202-110	
	(number per unit)																						
175G9018 (990-02386-00)	1	1	1	1	1																		
175G9019 (990-02394-00)						1	1	1															
175G9020 (990-02398-00)										1	1	1											
175G9021 (990-02387-00)												1											
175G9022 (990-02389-00)													1										
175G9023 (990-02390-00)														1									
175G9024 (990-02391-00)															1								
175G9025 (990-02392-00)																1							
175G9026 (990-02395-00)																	1						
175G9027 (990-02396-00)																		1					
175G9028 (990-02397-00)																			1				
175G9029 (990-02399-00)																				1			
175G9030 (990-02400-00)																					1		
175G9031 (990-02401-00)																						1	

175G9018 (990-02386-00)  
 175G9021 (990-02387-00)  
 175G9022 (990-02389-00)  
 175G9023 (990-02390-00)  
 175G9024 (990-02391-00)  
 175G9025 (990-02392-00)

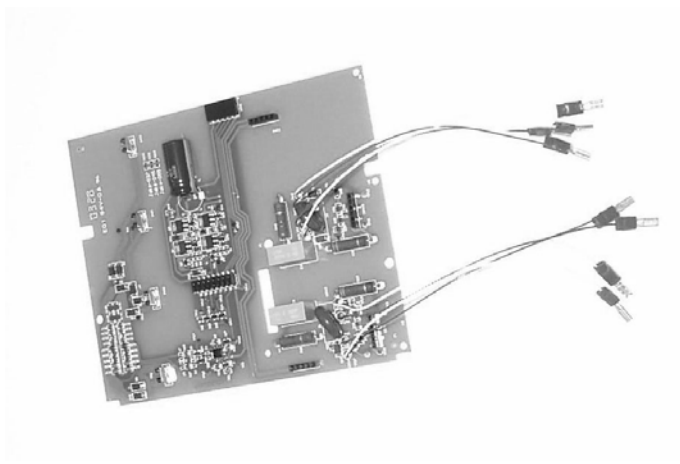


175G9019 (990-02394-00)

175G9026 (990-02395-00)

175G9027 (990-02396-00)

175G9028 (990-02397-00)

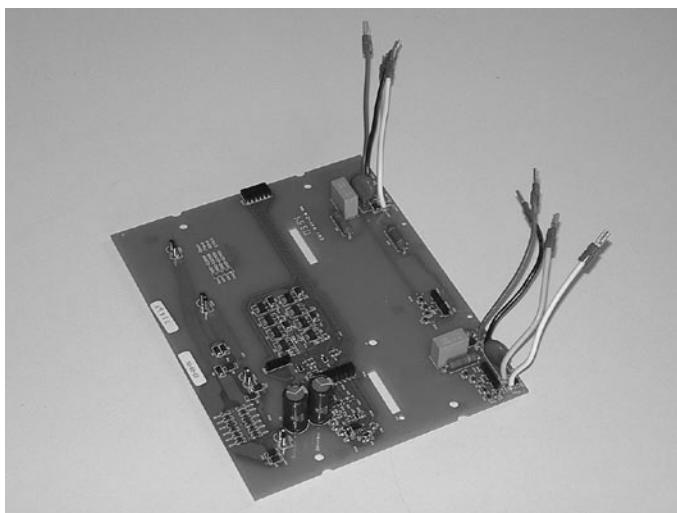


175G9020 (990-02398-00)

175G9029 (990-02399-00)

175G9030 (990-02400-00)

175G9031 (990-02401-00)

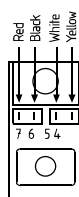
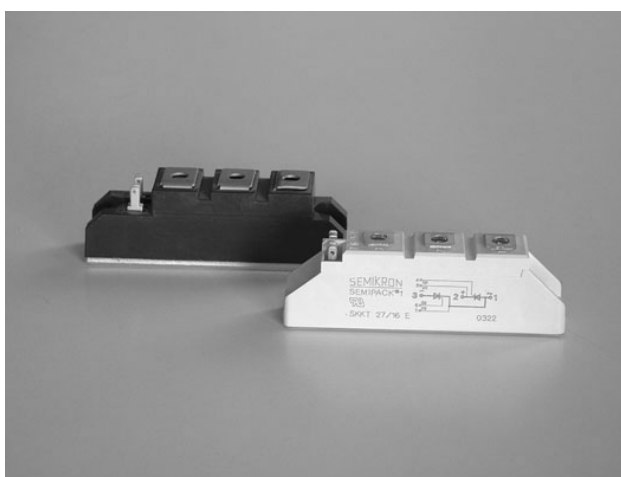


SCRs		MCD 201-007	MCD 201-015	MCD 201-018	MCD 201-022	MCD 201-030	MCD 201-037	MCD 201-045	MCD 201-055	MCD 201-075	MCD 201-090	MCD 201-110	MCD 202-007	MCD 202-015	MCD 202-018	MCD 202-022	MCD 202-030	MCD 202-037	MCD 202-045	MCD 202-055	MCD 202-075	MCD 202-090	MCD 202-110
Kit Part Number		(number per unit)																					
175G9032	175G9032	2											2										
	175G9033		2											2									
	175G9034			2											2								
	175G9035				2											2							
	175G9036					2											2						
175G9037	175G9037						2											2					
	175G9038							2											2				
	175G9039								2											2			
175G9040	175G9040									2											2		
	175G9041										2											2	
	175G9042											2											2

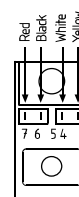


- MCD 200 Soft starters may be fitted with Semikron or Eupec SCRs.
- The MCD 200 SCR spare part kits may include either Semikron or Eupec SCRs
- The Semikron and Eupec SCRs are fully interchangeable and can be mixed within the same soft starter.
- Connect the firing looms according to the diagrams below.

175G9032  
175G9033  
175G9034  
175G9035  
175G9036



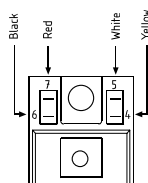
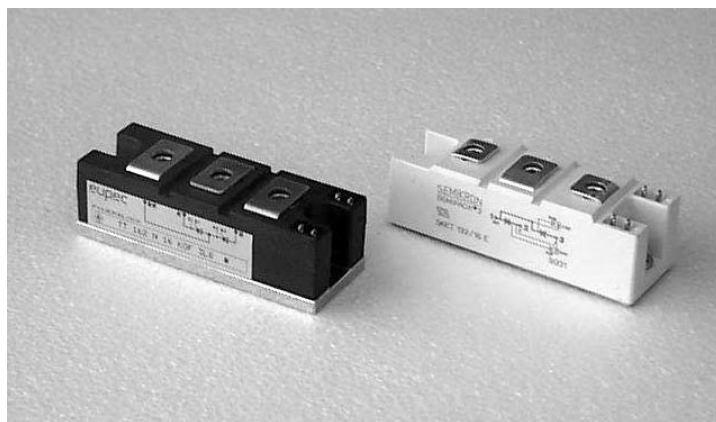
SEMIKRON



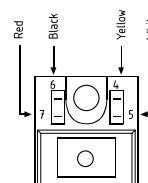
EUPEC

177HA328 10

175G9037  
175G9038  
175G9039



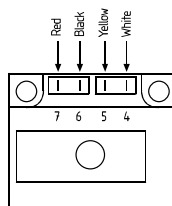
SEMIKRON



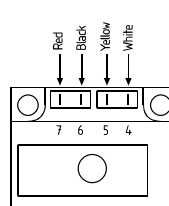
EUPEC

177HA329/10

175G9040  
175G9041  
175G9042



SEMIKRON



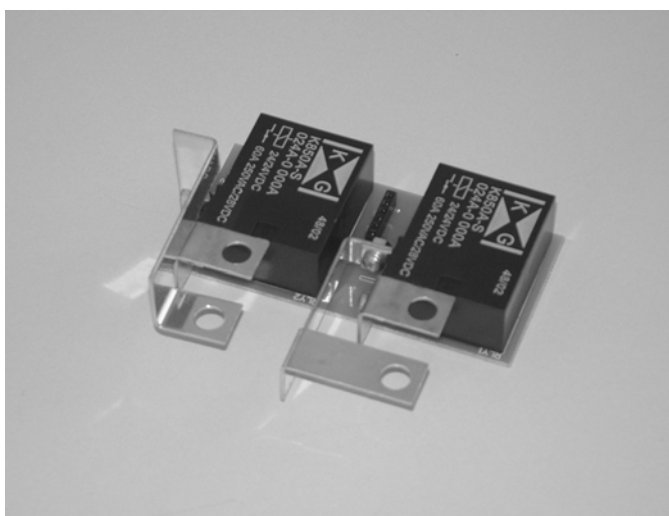
EUPEC

177HA330/10



Bypass Contactors	Kit Part Number (Item ID)															
	MCD 201-007	MCD 201-015	MCD 201-018	MCD 201-022	MCD 201-030	MCD 201-037	MCD 201-045	MCD 201-055	MCD 201-075	MCD 201-090	MCD 201-110	MCD 202-007	MCD 202-015	MCD 202-018	MCD 202-022	MCD 202-030
	(number per unit)															
175G9043 (990-02393-00)	1	1	1	1	1							1	1	1	1	1
175G9044 (350-02375-00)						2	2	2							2	2
175G9045 (350-02367-00)									1	1	1					1

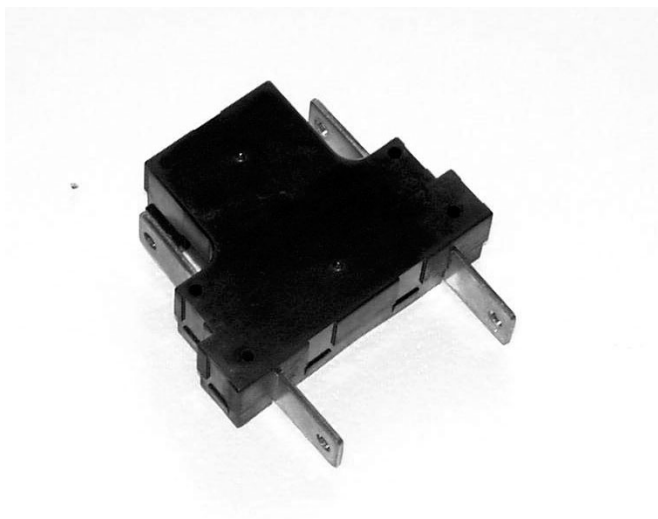
175G9043 (990-02393-00)



175G9044 (350-02375-00)

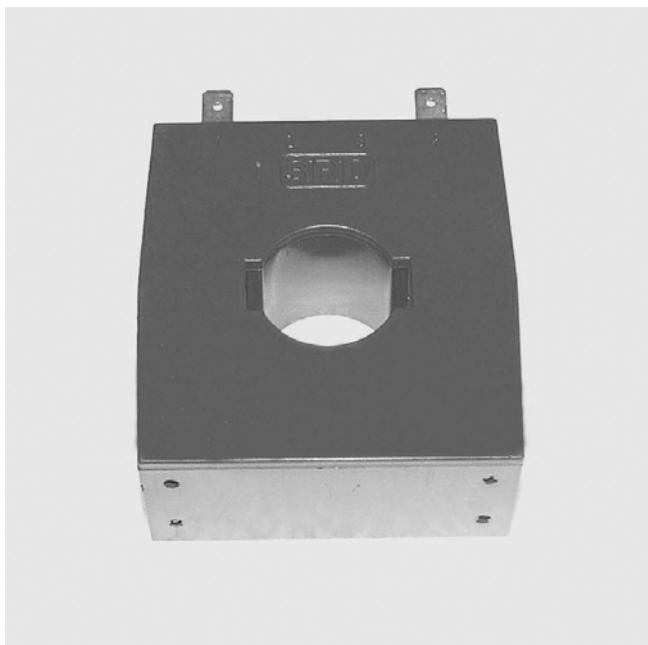


175G9045 (350-02367-00)



Current Transformers	MCD 201-007 MCD 201-015 MCD 201-018 MCD 201-022 MCD 201-030 MCD 201-037 MCD 201-045 MCD 201-055 MCD 201-075 MCD 201-090 MCD 201-110 MCD 202-007 MCD 202-015 MCD 202-018 MCD 202-022 MCD 202-030 MCD 202-037 MCD 202-045 MCD 202-055 MCD 202-075 MCD 202-090 MCD 202-110															
	(number per unit)															
175G9046									2	2	2	2	2			
175G9047														2	2	2
175G9048															2	2

175G9046  
175G9047  
175G9048



- **Tests**

The following tests and measurements can be used to verify soft starter condition and operation.

**MCD 201 Start Performance Test**

This procedure tests for correct operation of the MCD 201 during start. Start mode is indicated by a flashing Run LED (Green). This test is performed using an AC voltage meter.

**Test:**

- Before commanding the MCD 201 to start, measure the voltage across each controlled phase (L1-T1 and L3-T3). This should be close to the system line voltage.
- When the MCD 201 is commanded to start, measure the voltage across each controlled phase (L1-T1 and L3-T3). This voltage should start close to the system line voltage and ramp down to less than 2VAC just before the MCD 201 reaches Run mode.

**Action:**

**1. If measurement shows voltage across the SCR to be equivalent to line voltage before start, dropping to <2 VAC at run, and motor starting problems are still experienced:**

The cause of the motor starting problem is not the MCD 201. Look for outside causes to the problem.

**2. If zero voltage is measured across the SCR before, or at the commencement of a start:**

The SCR may have failed. Perform the Power Circuit Test described later in this section.

**3. If the voltage across the SCR remains at system line voltage:**

This indicates that the SCR on that phase is not firing. The Main Control PCB, Interface PCB or connection between them items may be faulty.

- Verify plug connections between the Main Control PCB and Interface PCB by
  - Removing and refitting the Main Control PCB
  - Check for correct operation.
- If correct operation is not restored
  - Replace the Main Control PCB
  - Check for correct operation.
- If correct operation is not restored
  - Refit the original Main Control PCB.
  - Replace the Interface PCB.
  - Check for correct operation.
- If correct operation is still not restored
  - Replace both the Main Control PCB and the Interface PCB.

### **MCD 202 Start Performance Test**

This procedure tests for correct operation of the MCD 202 during start. Start mode is indicated by a flashing Run LED (Green). This test is performed using an AC ammeter (clip on or similar).

#### **Test:**

- Calculate the expected motor start current by multiplying the *MCD 202 current rating* by the *Motor FLC setting* (Motor FLC pot) and the *Current Limit setting* (Current Limit pot).
- Initiate a start and measure the actual motor start current on phase 1 (L1/T1) and phase 3 (L3/T3).

#### **Action:**

#### **1. If the measured start current is as expected and motor starting problems are still experienced:**

The cause of the motor starting problem is not the MCD 202. Check the MCD 202 settings are appropriate and look for outside causes to the problem.

#### **2. If the start current is not as expected:**

The SCR may have failed. Perform the Power Circuit Test described later in this section.

The Main Control PCB, Interface PCB or connection between them items may be faulty.

- Verify plug connections between the Main Control PCB and Interface PCB by
  - Removing and refitting the Main Control PCB
  - Check for correct operation.
- If correct operation is not restored
  - Replace the Main Control PCB
  - Check for correct operation.
- If correct operation is not restored
  - Refit the original Main Control PCB.
  - Replace the Interface PCB.
  - Check for correct operation.
- If correct operation is still not restored
  - Replace both the Main Control PCB and the Interface PCB.

### **Run Performance Test**

MCD 200 soft starter incorporate internal bypass contactors. This procedure tests the operation of the internal bypass contactors. If the internal bypass contactor does not operate, SCRs will eventually fail due to thermal stress. This test is performed using an AC voltage meter.

#### **Test:**

- While the MCD 200 is in the Off mode, measure the voltage across each controlled phase (L1 to T1 and L3 to T3). Line voltage should be measured.
- Start the soft starter and listen for the bypass relay closing. This should occur when the Run LED (Green) changes state from flashing to on.
- Measure the voltage across each controlled phase (L1 to T1 and L3 to T3). This should be less than 0.5 V AC.
- When a stop command is given, listen for the bypass relay opening. If soft stop is being used, this should occur when the Run LED (Green) changes state from on to flashing. If no soft stop is being used, this should occur when the Run LED (Green) changes state from on to off.

#### **Action:**

#### **1. If the line voltage is not measured across the MCD 200 when in the off mode:**

The Bypass Contactor is likely to be damaged and should be replaced.



#### **ATTENTION**

The Bypass Contactors used in the MCD 200 are latching. The MCD 200 control circuits are designed to open the Bypass Contactors even in the event of removal or loss of control voltage. However it is still possible that the Bypass Contactor may be closed when there is no control supply to the MCD 200. On application of control voltage the MCD 200 will open the Bypass Contactors.

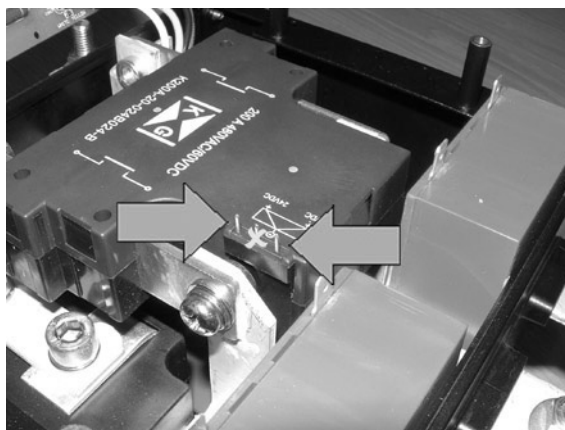
#### **2. If Bypass Relay does not operate:**

The Bypass Contactor, Main Control PCB, Interface PCB or connection between these items may be faulty.

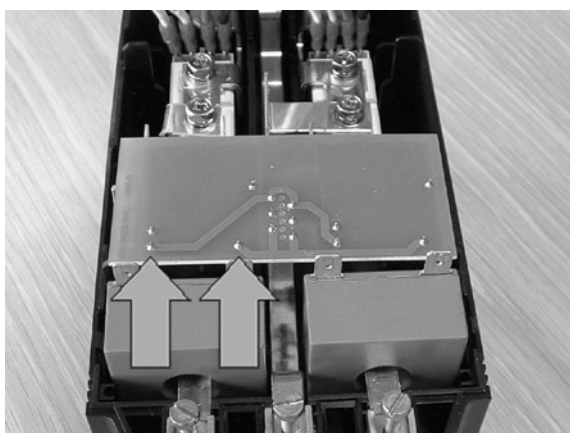
- Verify plug connections between the Main Control Module, Interface PCB and Bypass Relay using the following method.
  - Unplug the Main Control PCB from the Interface PCB.
  - Unplug the Interface PCB from the Bypass Contactors.

**Tests**

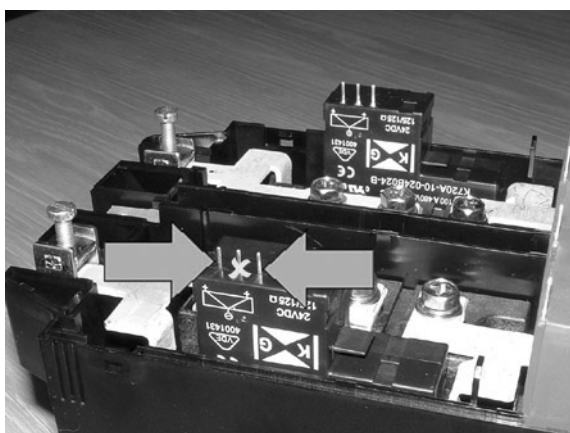
- Refit the Interface and Main Control PCBs.
- Check for correct operation
- Verify Bypass Contactor operation using the following procedure
  - Remove the Main Control PCB and Interface PCBs.
  - Using a 24 VDC source, momentarily apply voltage to the Bypass Contactor control pins as shown in the pictures below. The Bypass Contactors are latching, so voltage needs to be applied in both directions to fully check operational integrity.



Bypass Control Pins : MCD 200 075, 090, 110



Bypass Control Pins : MCD 200 007, 015, 018, 022, 030



Bypass Control Pins : MCD 200 037, 045, 055

- If the Bypass Contactor does not operate it must be replaced.
- Verify Main Control PCB and Interface PCB operation using the following procedure.
  - Replace the Main Control PCB.
  - If correct operation is not restored, refit the original Main Control PCB and replace the Interface PCB.
  - If correct operation is not restored replace both the Main Control PCB and the Interface PCB.

## Power Circuit Test

This procedure tests the soft starter power circuit including the SCR, Interface PCB and Main Control PCB. The soft starter must be disconnected from all power sources. This test is performed using a 500 V DC insulation tester. Low voltage ohm meters or multimeters are not adequate.

### Test:

- Disconnect the incoming supply (L1, L2, L3) and control voltage (A1, A2, A3) from the starter.
- Disconnect the motor cables (T1, T2, T3) from the starter.
- Measure the resistance across each controlled phase in both directions (L1-T1, L3-T3, T1-L1, T3-L3). The resistance should be between 30 k $\Omega$  and 500 k $\Omega$  and equal across both phases.

### Action

#### 1: If the resistance measured across any of the two controlled phases is less than 30 k $\Omega$ :

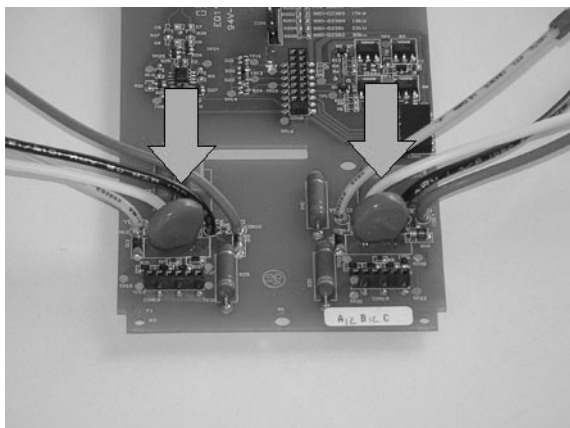
The SCR should be replaced.



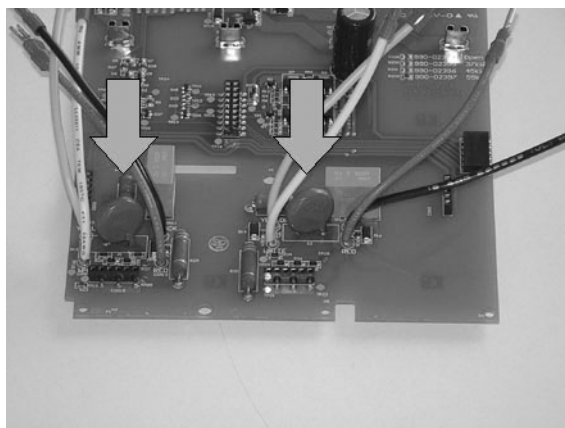
#### ATTENTION

There is no need to replace the MCD 200 Interface or Main Control PCBs just because an SCR has been damaged. Consider replacement of these parts only after having first replaced the damaged SCR(s) and checked for correct operation.

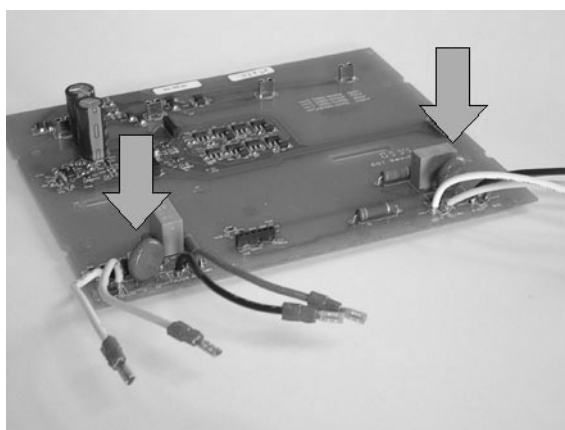
The likely cause of SCR damage should also be determined to prevent a repeat SCR failure. Analysis of the MOVs situated on the MCD 200 Interface PCB and connected across each controlled phase (L1-T1 and L3-T3) can provide a good indication of the mode of SCR failure.



MOV Location : MCD 200 007, 015, 018, 022, 030



MOV Location : MCD 200 047, 045, 055



MOV Location : MCD 200 075, 090, 110

Overvoltage is the cause of SCR failure if the MOVs and/or surrounding circuitry on the Interface PCB show signs of physical damage.

Overcurrent is the likely cause of SCR failure if the MOVs and/or surrounding circuitry on the Interface PCB show no signs of physical damage.

Having determined the mode of the SCR failure the cause of the damage should be considered to ensure the damage does not reoccur.

Reliability of the modern SCRs used in the MCD 200 soft starters is such that failures attributable to faulty manufacture are almost nil. SCR damage is almost always caused by external influences. Often these influences can be identified but in other cases the identification may prove difficult or impossible because the damaging event was temporary in nature. Refer to 4.1 of this manual for information of Typical Causes Of SCR Damage.

#### 2: If the resistance measured across any of the two controlled phases is greater than 500 k $\Omega$ :

The Main Control PCB, Interface PCB or connection between them items may be faulty.

**Tests**

- Verify plug connections between the Main Control PCB and Interface PCB by
  - Removing and refitting the Main Control PCB
  - Check for correct operation.
- If correct operation is not restored
  - Replace the Main Control PCB
  - Check for correct operation.
- If correct operation is not restored
  - Refit the original Main Control PCB.
  - Replace the Interface PCB.
  - Check for correct operation.
- If correct operation is still not restored
  - Replace both the Main Control PCB and the Interface PCB.

**Control Input Test**

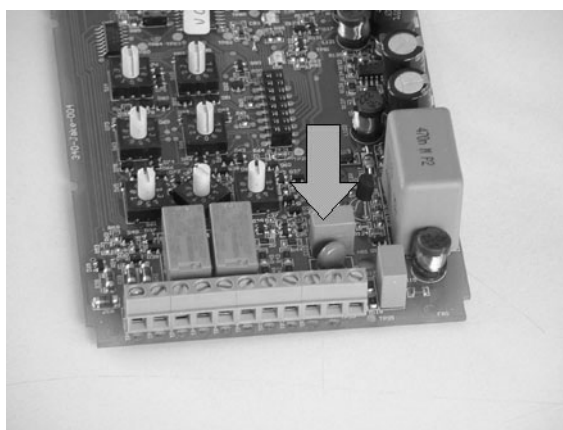
This procedure tests the condition of the soft starter control inputs. This test is performed using a voltage meter.

- Remove any external wiring from the soft starter control inputs (N1, N2).
- Control voltage must still be connected to the soft starter (A1 to A2 or A2 to A3).
- Measure the voltage from terminal A1 to each control input terminal (A1 to N1 and A1 to N2).

**Action:**

**1. If no voltage is present, the control input is damaged. The Main Control PCB must be replaced.**

Damage to control inputs is most commonly caused by application of incorrect control voltage by the user. Application of incorrect control voltage is evidenced by damage to the MOV located on the Main Control PCB.



MOV Location : Control PCB



**Power Voltage Supply Test**

There is no specific test procedure to check the condition of the soft starter control voltage supply.

- If the Ready LED (Red) is off, verify that correct control voltage is connected to the correct control voltage input terminals.  
On CV1 models, A1 to A2 voltage must be 24 V AC or DC (+20%/-20%). On CV3 models A1 to A2 voltage must be 110 V AC to 240 V AC (+10%/-15%) or A2 to A3 voltage must be 380 V AC to 440 V AC (+10%/-15%).
- If the Ready LED (Red) remains off, the Main PCB is damaged and must be replaced.

## ■ Disassembly Sequence 007~030

**Step 1.** Remove plastic lid (complete with door) from the body of the starter using the following procedure.

- With the MCD 200 unit on its side, locate the blade of a small flat bladed screw driver in one of the four slots (2 each side) on the side of the lid.
- While ensuring the screw driver blade is pushed into the deepest part of the slot (the edge nearest the front face of the MCD 200) tap the screw driver so that it is driven into the starter 5-10mm. This will release the clip securing the lid the upper body moulding.
- Repeat the above procedure for each of the four clips.

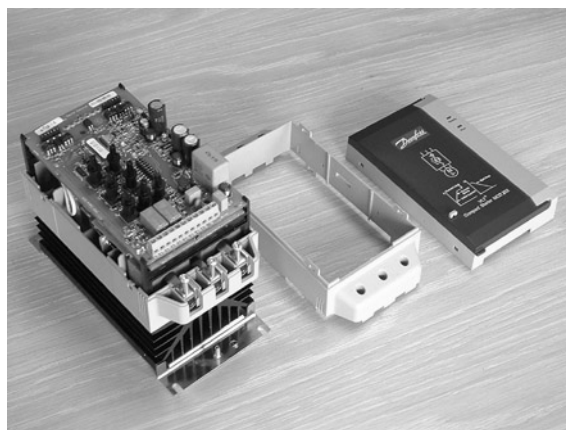


**Step 2.** Remove upper body moulding using the following procedure.

- With the MCD 200 unit on its side, locate the blade of a small flat bladed screw driver in one of the four slots (2 each side) on the side of the upper body moulding.
- While ensuring the screw driver blade is pushed into the deepest part of the slot (the edge nearest the heatsink of the MCD 200) tap the screw driver so that it is driven into the starter 5-10mm. This will release the clip securing the upper body moulding to the lower body moulding.
- Repeat the above procedure for each of the four clips.



**Step 3.** Access is now available to all sections of the MCD 200. Component parts can now be removed and replaced as required.

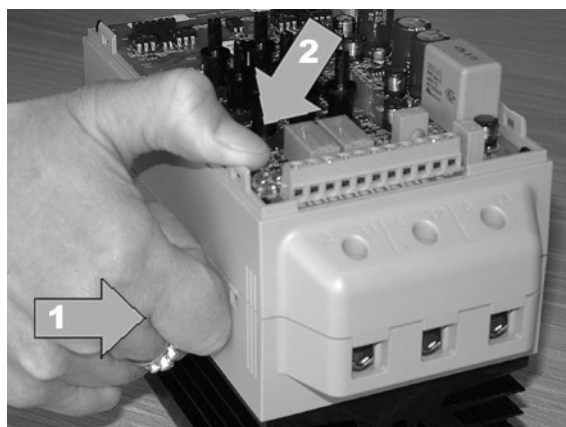


**Step 4.** Reassemble the MCD 200 is reverse order.

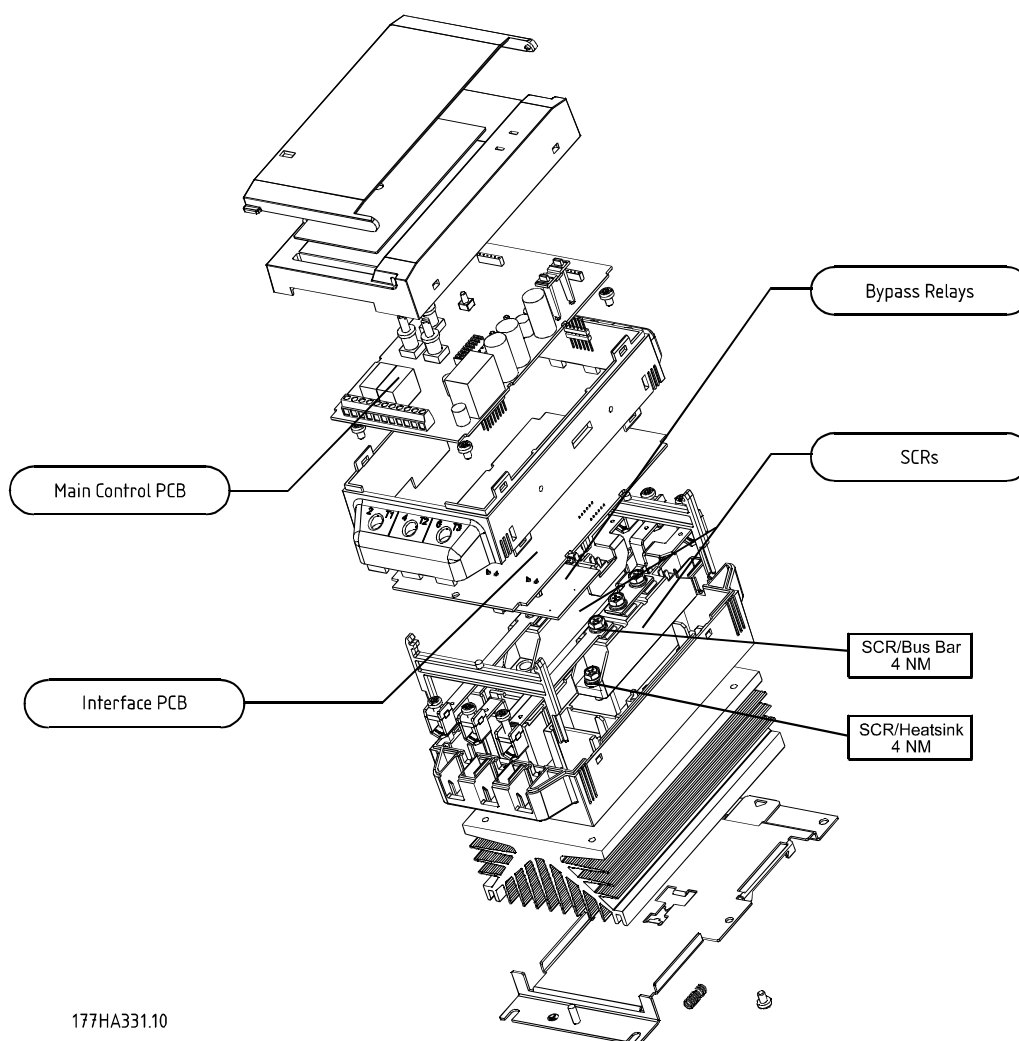


### ATTENTION

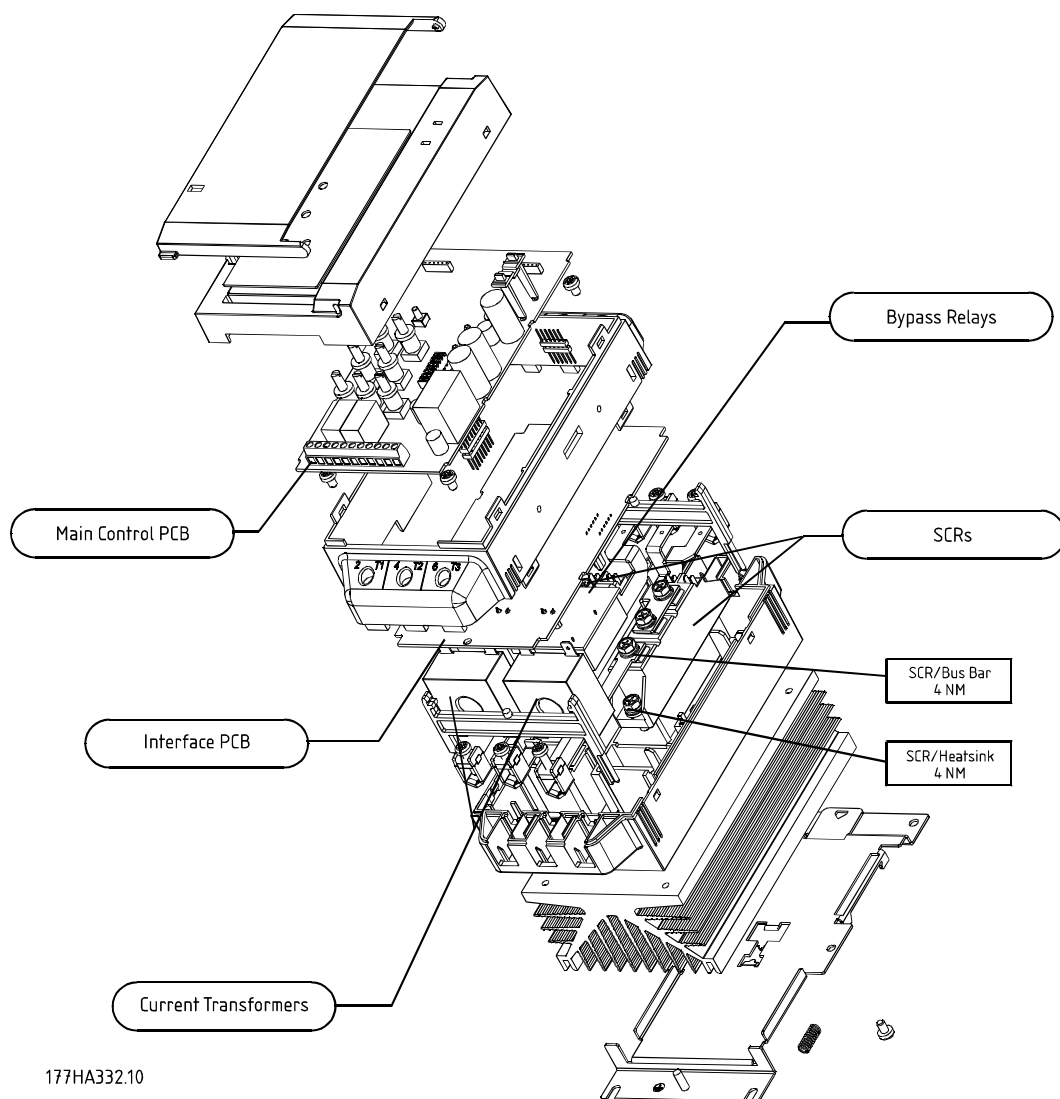
When refitting the upper body plastic removed in Step 2 the following technique is useful. Push in on the lower body cover at a point next to the clip being located (1), while at the same time pressing out and down on the upper body cover at a point directly above the clip being secured (2).



■ Exploded View MCD 201-007 ~ MCD 201-030



■ Exploded View MCD 202-007 ~ MCD 202-030



## ■ Disassembly Sequence 037~055

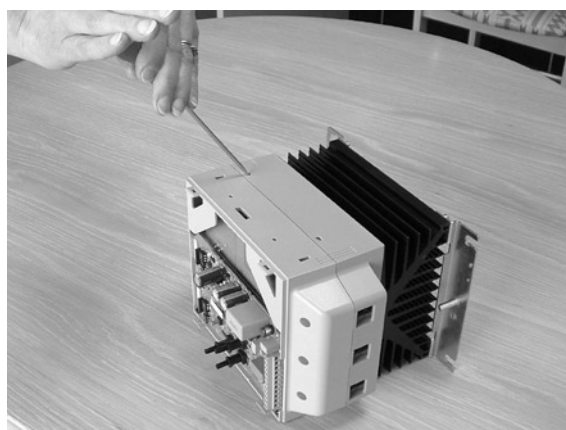
**Step 1.** Remove plastic lid (complete with door) from the body of the starter using the following procedure.

- With the MCD 200 unit on its side, locate the blade of a small flat bladed screw driver in one of the four slots (2 each side) on the side of the lid.
- While ensuring the screw driver blade is pushed into the deepest part of the slot (the edge nearest the front face of the MCD 200) tap the screw driver so that it is driven into the starter 5-10mm. This will release the clip securing the lid the upper body moulding.
- Repeat the above procedure for each of the four clips.

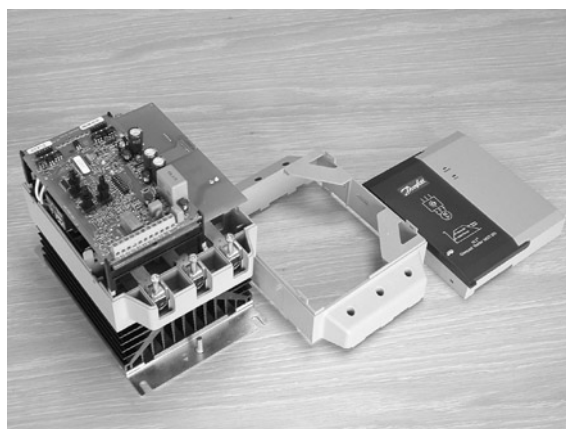


**Step 2.** Remove upper body moulding using the following procedure.

- With the MCD 200 unit on its side, locate the blade of a small flat bladed screw driver in one of the four slots (2 each side) on the side of the upper body moulding.
- While ensuring the screw driver blade is pushed into the deepest part of the slot (the edge nearest the heatsink of the MCD 200) tap the screw driver so that it is driven into the starter 5-10mm. This will release the clip securing the upper body moulding to the lower body moulding.
- Repeat the above procedure for each of the four clips.



**Step 3.** Access is now available to all sections of the MCD 200. Component parts can now be removed and replaced as required.

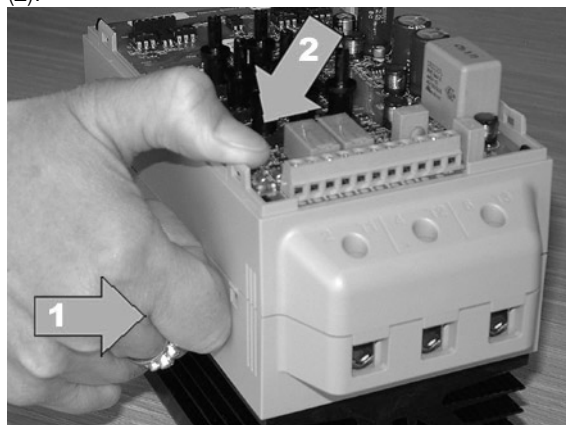


**Step 4.** Reassemble the MCD 200 is reverse order.

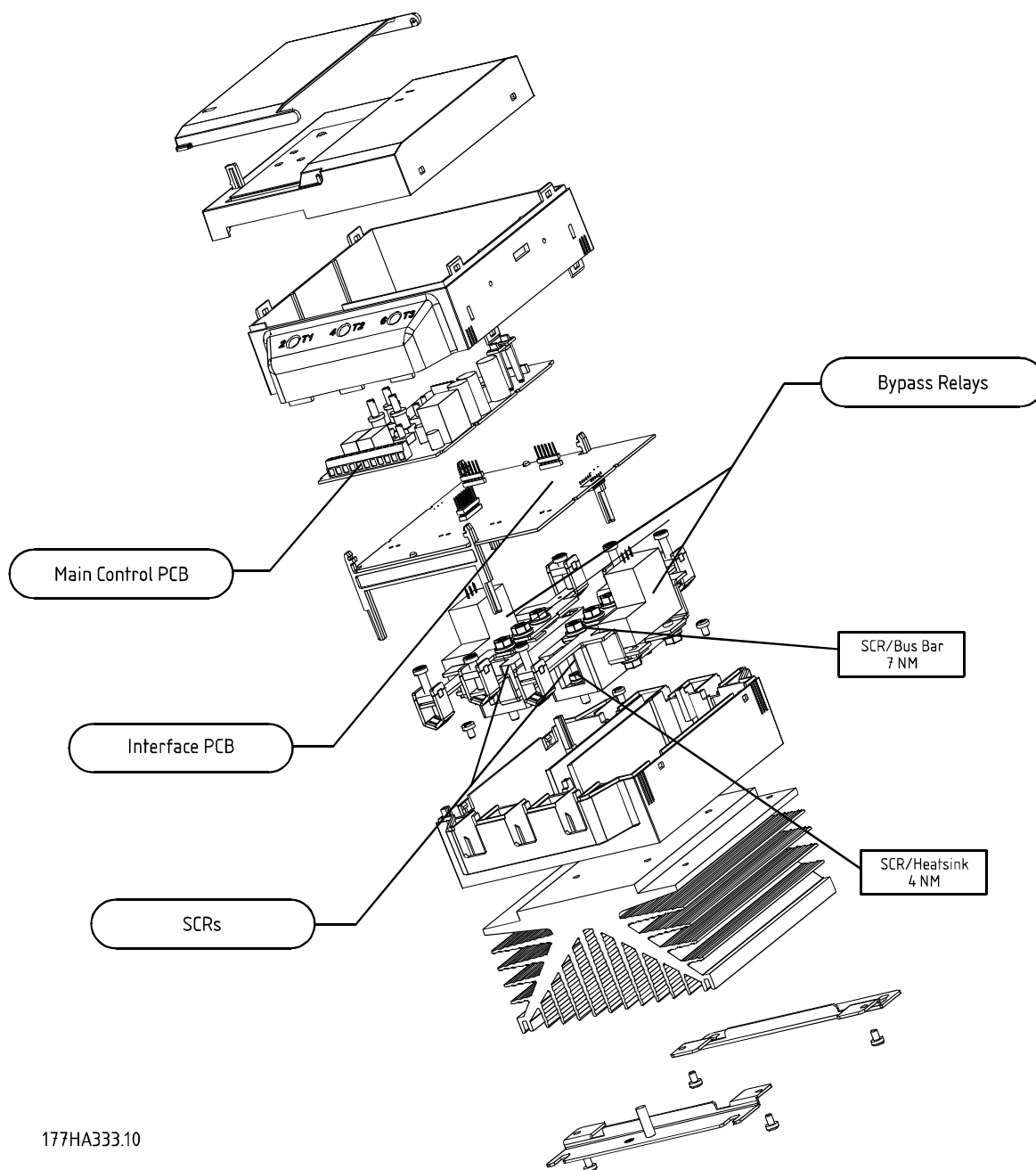


### ATTENTION

When refitting the upper body plastic removed in Step 2 the following technique is useful. Push in on the lower body cover at a point next to the clip being located (1), while at the same time pressing out and down on the upper body cover at a point directly above the clip being secured (2).

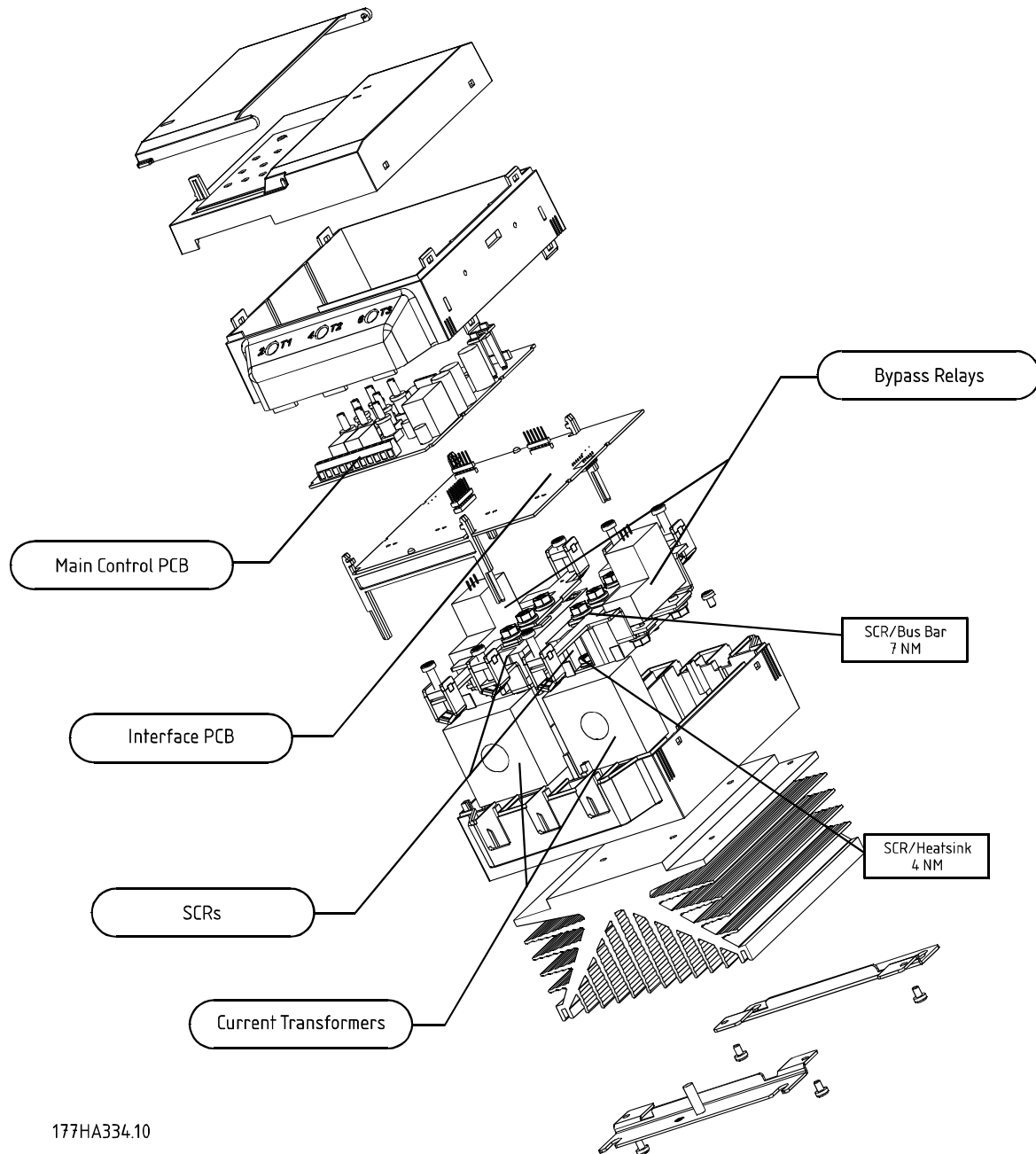


■ Exploded View MCD 201-037 ~ MCD 201-055



177HA333.10

■ Exploded View MCD 202-037 ~ MCD 202-055

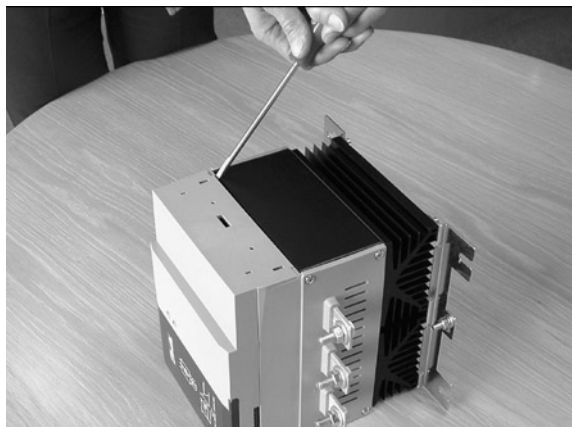


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# ■ Disassembly Sequence 075~110

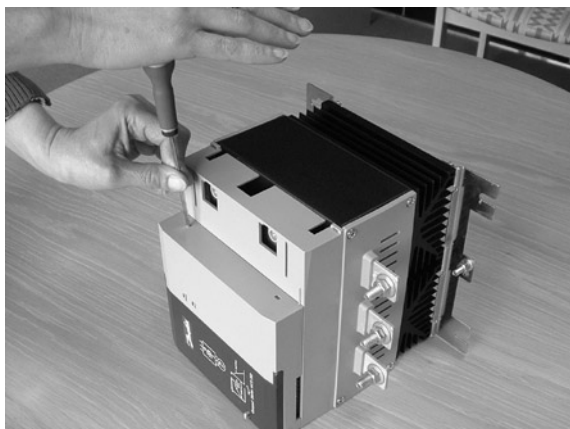
**Step 1.** Remove plastic cover located on the right hand side of the front face using the following procedure.

- With the MCD 200 unit on its side, locate the blade of a small flat bladed screw driver between the lower edge of the plastic and the metal side plate.
- Lever the cover off.

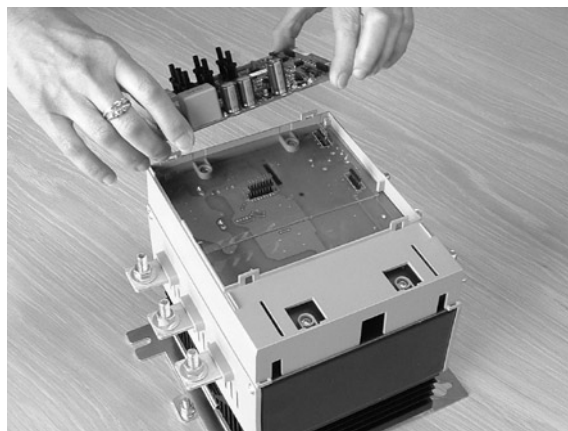


**Step 2.** Remove plastic lid (complete with door) from the body of the starter using the following procedure.

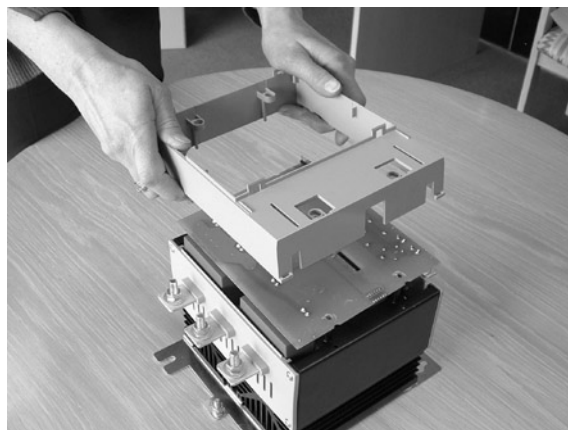
- With the MCD 200 unit on its side, locate the blade of a small flat bladed screw driver in one of the four slots (2 each side) on the side of the lid.
- While ensuring the screw driver blade is pushed into the deepest part of the slot (the edge nearest the front face of the MCD 200) tap the screw driver so that it is driven into the starter 5-10mm. This will release the clip securing the lid the upper body moulding.
- Repeat the above procedure for each of the four clips.



**Step 3.** Remove main Control PCB by lifting it up out of the unit.



**Step 4.** Remove the plastic body moulding using a flat or Torx screwdriver .

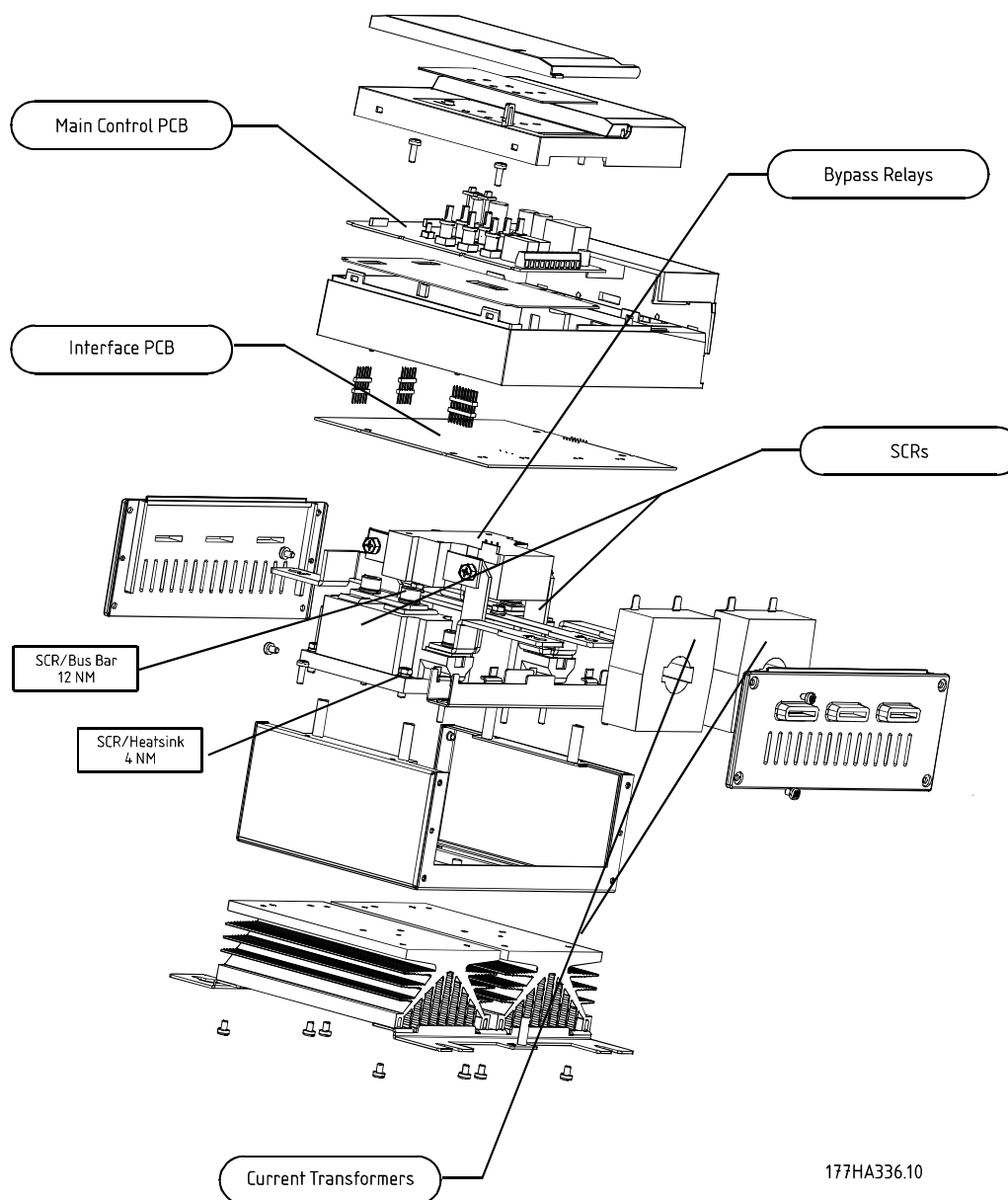


**Step 4.** Reassemble the MCD 200 is reverse order.





■ Exploded View MCD 202-075 ~ MCD 202-110



177HA336.10

## • Appendix

### Typical Causes of SCR Damage

SCR damage is generally caused by one of three mechanisms, overcurrent, overvoltage or overtemperature. Before replacing damaged SCRs it is important to identify the cause of damage if at all possible. The following list details some of the common problems.

#### Overcurrent

- Cable fault on output of soft starter.
- Motor fault.
- Start current and/or start time exceeds the soft starter ratings.
- Starts per hour exceed the soft starter rating.

#### Overvoltage

- Power supply transient or surge.
- Lightning strike (direct or indirect) on power supply.
- Motor fault.
- Loose connection in power circuit, before or after the starter.
- Power factor correction connected to the output of the soft starter.
- Over corrected bulk power factor correction on a lightly loaded system causing severe ringing voltages.

In most cases, failure caused by Overvoltage will be indicated by physical damage to the MOVs (2). These are located on the underside of the Interface PCB.

#### Overtemperature

- Blocked heatsinks or restricted ventilation.
- Inadequate ventilation.
- Excessive ambient temperatures.

If the internal bypass relay does not operate, SCRs will eventually fail due to thermal stress.

### Protecting SCRs

The SCRs used in modern soft starters are rugged and provide reliable operation in most industrial environments without the need for additional protection. However the potential for SCR damage can be reduced by use of semiconductor fuses and/or line contactors.

Semiconductor fuses: Use of semiconductor fuses reduces the potential for SCR damage caused by short circuits on the output of the starter. Note that protection systems such as circuit breakers or HRC

fuses do not operate quickly enough to protect SCRs from short circuits.

Line contactors: SCRs are most vulnerable to damage caused by overvoltage when they are in the off state and have voltage applied to their input terminal. In this condition the SCR is blocking the full line voltage. Use of a line contactor to remove voltage from the SCR input when the starter is in the off state eliminates the chance of SCR damage due to overvoltage.

Note that when the soft starter is operating in Run mode, the SCRs are bypassed by the internal bypass relay. In this situation, the soft starter is immune to damage caused by voltage fluctuations.

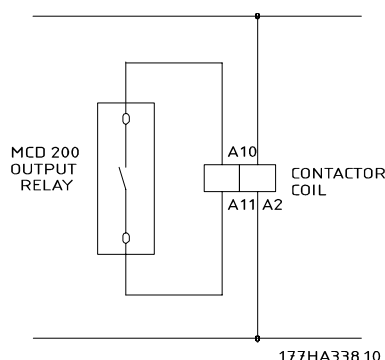
## Output Relay Compatibility

### Overview

The MCD 201 soft starter has one fixed (Main Contactor) output relay.

The MCD 202 soft starter has one fixed (Main contactor) and one programmable (Trip/Run) output relay.

These PCB mount relays are often used for line contactor control.

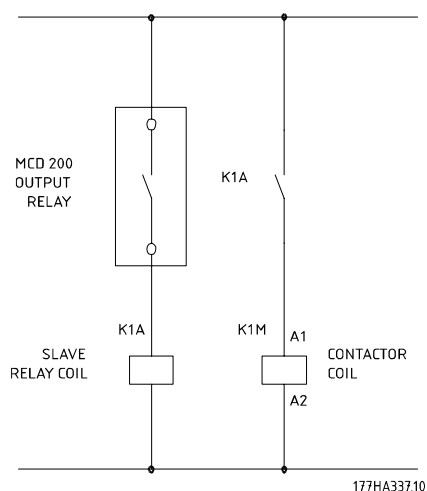


Recent advances in contactor design have lead to many manufacturers using electronic contactor coils. Initially these coils may appear to meet the specifications of the PCB mount relays. However, in some instances these electronic contactor coils have a high initial inrush current due to the internal switch mode power supply circuitry. This can have a damaging effect on the PCB mount relays if the contactor coil is switched directly.

### Solution

Before using an MCD 200 soft starter PCB mount output relay for direct switching of an electronic contactor coil, consult the contactor manufacturer/supplier to see if this is advisable. Certain contactor manufacturers (eg Klockner-Moeller) state that you cannot use PCB mount relays for direct switching of their electronic contactor coils. If this is the case, there are two solutions:

1. Use a MCD 200 soft starter output relay to control a slave relay. This slave relay can then be used to directly switch the electronic contactor coil circuit.



2. Some contactor brands have a volt free electronic input (low voltage/low current). If this is available, the MCD 200 output relay can be wired directly into this input for contactor control.

## **Control Input failure**

### **Overview**

The MCD 200 soft starter can be operated by external 2 wire or 3 wire control signals.

External contacts/switches are configured and wired into control input terminals N1 and N2.

### **Cause of Control Input failure**

External contacts/switches operating the control inputs must be rated for the control voltage being used and a continuous current of 100mA.

Incorrect configuration and wiring of the external contacts/switches to the control input terminals N1 and N2 may cause damage.

If long cable runs are used, wiring must be twisted pair or shielded cable and must be separated from AC power cables (minimum distance 300mm).

### **Testing for Control Input failure**

Refer to the Control Input Tests detailed in Section 2.6 of this manual.



#### **CAUTION:**

Application of incorrect voltages to the control inputs may cause equipment damage and necessitate replacement of the Main PCB.



#### **ATTENTION**

Damage to the control inputs caused by application of incorrect voltages is not covered by warranty.