

SECTION 5— TROUBLESHOOTING AND MAINTENANCE

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

For 460 V units:

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Never operate energized switch with door open.
- Turn off switch before removing or installing fuses or making load side connections.
- Always use a properly rated voltage sensing device at all line and load fuse clips to confirm switch is off.
- Turn off power supplying switch before doing any other work on or inside switch.
- Do not use renewable link fuses in fused switches.

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

For 208 and 230 V units:

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must be installed and serviced only by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside the equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand this bulletin in its entirety before installing or operating E-Flex drives. Installation, adjustment, repair, and maintenance of the drives must be performed by qualified personnel.
- Disconnect all power including external control power that may be present before servicing the drive. WAIT 15 MINUTES for the DC bus capacitors to discharge. Then follow the DC bus voltage measurement procedure on page 42 to verify that the DC voltage is less than 42 V. The drive LEDs are not accurate indicators of the absence of DC bus voltage.
- DO NOT short across DC bus capacitors or touch unshielded components or terminal strip screw connections with voltage present.
- Install and close all covers before applying power or starting and stopping the drive.
- The user is responsible for conforming to all applicable code requirements with respect to grounding all equipment.
- Many parts in this drive, including printed wiring boards, operate at line voltage. DO NOT TOUCH. Use only electrically insulated tools.

Before servicing the drive:

- Disconnect all power.
- Place a "DO NOT TURN ON" label on the drive disconnect.
- Lock disconnect in open position.

Failure to follow these instructions will result in death or serious injury.

INTRODUCTION

A number of diagnostic and status codes are included on the power converter. The graphic display terminal provides visual indication of controller operating and protective circuit functions and indicator lights to assist in maintenance and troubleshooting. If the controller trips while operating, the codes must be viewed before power is removed because removing power resets the fault code.

NOTE: For controllers equipped with optional line contactor (MOD B09) the power is removed via the line contactor upon power converter trips.

EXTERNAL SIGNS OF DAMAGE

The following are examples of external signs of damage:

- Cracked, charred, or damaged covers or enclosure parts
- Damage to the graphic display terminal such as scratches, punctures, burn marks, chemical burns, or moisture in the screen
- Oil or electrolyte on the bottom of the drive which might have leaked from the capacitors inside
- Excessive surface temperatures of enclosures and conduits
- Damage to power or control conductors
- Unusual noise or odors from any of the equipment
- Abnormal temperature, humidity, or vibration

If any of the above signs are found while the equipment is powered up, immediately inform operating personnel and assess the risk of leaving the drive system powered up. Before removing power from the equipment, always consult with the operating personnel responsible for the machinery and process.

If troubleshooting indicates the need for component replacement, refer to “Field Replacement of the Power Converter” on page 92.

PREVENTIVE MAINTENANCE

All Type 1 controllers use convection cooling. All Type 12K controllers for 10 hp and above at 460 V and 7.5 hp and above at 208/230 V use forced air cooling. All Type 3R controllers use ventilation cooling. Inspect the interior fans (if used) and exterior fans of the controller for blockage and impeded rotation. To prevent overheating and to allow proper air flow, maintain the clearances shown on the enclosure outline drawings in this instruction bulletin.

To maintain the environmental rating of Type 12K or 3R enclosures, periodically inspect the enclosure gaskets for damage.

The graphic display terminal is an integral part of the enclosure and must be installed on the door to maintain the environmental integrity of a Type 12K enclosure. It can be omitted when MOD D09 is selected and in that case a closing plate must be installed to maintain the Type 12K environmental rating.

PRODUCT SUPPORT

When troubleshooting the E-Flex™ drive, discuss with operating personnel the symptoms of the reported problems. Ask them to describe the problem, when they first observed the problem, and where the problem was seen. Observe directly the drive system and process.

For more information, call, fax, or write:

Drives Product Support Group
P.O. Box 27446
Raleigh, NC 27611-7446

The Product Support Group is staffed from 8 am to 6 pm Eastern time for product selection, start-up assistance, or diagnosis of product problems and advice for the correct course of action. **Emergency phone support** is available 24 hours a day, 365 days a year.

Toll Free	1-888-778-2733 (888-Square D)
E-mail	drive.products.support@us.schneider-electric.com
Fax	919-217-6508

SERVICE (ON-SITE)

The Services division is committed to providing quality on-site service that consistently meets customer expectations. Services responds to your requests, seven days a week, 24 hours a day.

Toll Free	1-888-778-2733 (888-Square D)
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CUSTOMER TRAINING

Schneider Electric offers a variety of instructor-led, skill enhancing and technical product training programs for customers. For a complete list of drives/soft start training with dates, locations, and pricing, please call:

Phone	978-975-9306
Fax	978-975-2821

E-FLEX TROUBLESHOOTING SHEET

When requesting after-sales service, it is important to disclose all conditions under which the Square D equipment currently operates. This will help in diagnosing the system quickly.

Call the Product Support Group at 888-SQUARED (778-2733)

DATE: _____
 CONTACT NAME: _____
 COMPANY: _____
 ADDRESS: _____
 CITY: _____
 STATE: _____
 PHONE: _____
 FAX: _____

DRIVE CONFIGURATION

CATALOG NUMBER: CLASS **8839** TYPE **EFD**: _____
 APPLICATION/EQUIPMENT DESIGNATION: _____

MOTOR NAMEPLATE DATA

HORSEPOWER: _____ VOLTAGE (3 PHASE): _____ FREQUENCY: _____ POLES: _____ FLA: _____
 SERVICE FACTOR: _____ MOTOR INSULATION: NEW OR EXISTING
 MOTOR CABLE TYPE: _____ LENGTH IN FEET: _____
 IS MOTOR DESIGNED TO COMPLY WITH NEMA MG-1 PART 31 GUIDELINES? YES NO

POWER SOURCE AND ENVIRONMENT

VOLTAGE BETWEEN: L1 AND L2: _____ L2 AND L3: _____ L3 AND L1: _____
 SERVICE TRANSFORMER RATING: _____ KVA _____ % Z FREQUENCY: 60 HZ OR 50 HZ
 AMBIENT TEMPERATURES: MIN °C (°F) _____ MAX °C (°F) _____ HUMIDITY: _____
 ALTITUDE IF GREATER THAN 3300 FEET ABOVE SEA LEVEL, SPECIFY: _____ FT

DRIVE DETECTED FAULT CODES

Refer to ATV61 Programming Manual for possible causes and corrective action

- | | | | | |
|---|---|--|---|--|
| <input type="checkbox"/> Ai2F Ai2 input | <input type="checkbox"/> FCF1 Output contactor stuck | <input type="checkbox"/> InFb Internal-thermal sensor | <input type="checkbox"/> OPF2 3 motor phase loss | <input type="checkbox"/> SCF4 IGBTshort circuit |
| <input type="checkbox"/> APF Application fault | <input type="checkbox"/> FCF2 Output contactor open | <input type="checkbox"/> InFC Internal-time measurement | <input type="checkbox"/> OSF Mains overvoltage | <input type="checkbox"/> SCF5 Motor short circuit |
| <input type="checkbox"/> bOF DB resistor overload | <input type="checkbox"/> HCF Cards pairing | <input type="checkbox"/> InFE Internal-CPU | <input type="checkbox"/> OtF1 PTC1 overheat | <input type="checkbox"/> SLF1 Modbus comm. |
| <input type="checkbox"/> bUF DB unit short circuit | <input type="checkbox"/> HdF IGBT desaturation | <input type="checkbox"/> LCF Input contactor | <input type="checkbox"/> OtF2 PTC2 overheat | <input type="checkbox"/> SLF2 Powersuite comm. |
| <input type="checkbox"/> CFF Incorrect config. | <input type="checkbox"/> ILF Internal comm. link | <input type="checkbox"/> LFF2 Ai2 4-20mA loss | <input type="checkbox"/> OtFL Li6 = PTC overheat | <input type="checkbox"/> SLF3 HMI communication |
| <input type="checkbox"/> CFI Invalid configuration | <input type="checkbox"/> InF1 Rating error | <input type="checkbox"/> LFF3 Ai3 4-20mA loss | <input type="checkbox"/> PHF Input phase loss | <input type="checkbox"/> SOF Overspeed |
| <input type="checkbox"/> CnF Comm. network | <input type="checkbox"/> InF2 Incompatible power board | <input type="checkbox"/> LFF4 Ai4 4-20mA loss | <input type="checkbox"/> PrF Phase removal | <input type="checkbox"/> SPIF PI Feedback |
| <input type="checkbox"/> COF CAN comm. | <input type="checkbox"/> InF3 Internal serial link | <input type="checkbox"/> nFF External flow sensor | <input type="checkbox"/> PrtF Power identification | <input type="checkbox"/> SSF Torque/current limit |
| <input type="checkbox"/> CrF1 Precharge | <input type="checkbox"/> InF4 Internal MFG area | <input type="checkbox"/> ObF Overbraking | <input type="checkbox"/> PtF1 PTC1 probe | <input type="checkbox"/> tJF IGBT overheat |
| <input type="checkbox"/> CrF2 Thyristor soft charge | <input type="checkbox"/> InF6 Internal-option | <input type="checkbox"/> OCF Overcurrent | <input type="checkbox"/> PtF2 PTC2 probe | <input type="checkbox"/> tnF Auto tuning |
| <input type="checkbox"/> EEF1 Control Eeprom | <input type="checkbox"/> InF7 Internal-hard initialization | <input type="checkbox"/> OHF Drive overheat | <input type="checkbox"/> PtFL Li6 = PTC probe | <input type="checkbox"/> ULF Process underload |
| <input type="checkbox"/> EEF2 Power Eeprom | <input type="checkbox"/> InF8 Internal-control supply | <input type="checkbox"/> OLC Process overload | <input type="checkbox"/> SCF1 Motor short circuit | <input type="checkbox"/> USF Undervoltage |
| <input type="checkbox"/> EPF1 External fault via logic input | <input type="checkbox"/> InF9 Internal-current measure | <input type="checkbox"/> OLF Motor overload | <input type="checkbox"/> SCF2 Impedant short circuit | |
| <input type="checkbox"/> EPF2 External fault via comm. link | <input type="checkbox"/> InFA Internal-mains circuit | <input type="checkbox"/> OPF1 1 motor phase loss | <input type="checkbox"/> SCF3 Ground short circuit | |

DETAILED DESCRIPTION OF PROBLEM

FIELD REPLACEMENT PROCEDURES

FIELD REPLACEMENT OF THE POWER CONVERTER

Refer to Appendix A beginning on page 103 for the part numbers of the equipment required for the following field replacement procedures. For component locations, refer to Figures 2–4 on pages 16–18.

If the power converter becomes inoperable in the E-Flex controllers, it must be replaced. Refer to Table 36 for power converter weights.

Table 36: Power Converter Weights

460 V	230/208 V	Converter		Converter w/ Flange	
		lb	kg	lb	kg
VT					
1–5	1–3	6.6	3	12.54	5.7
7.5	5–7.5	8.8	4	15.62	7.1
10–15	10	12.1	5.5	20.24	9.2
20	15	15.4	7	25.52	11.6
25–30	20–25	19.8	9	30.58	13.9
40	30–40	41.8	19	50.38	22.9
	50	85.8	39	96.58	43.9
50–60		57.2	26	66.44	30.2
75–100		96.8	44	108.24	49.2

Observe the lockout/tagout procedures as identified in OSHA Standard 29 CFR, Subpart J covering:

- 1910.147: The control of hazardous energy (lockout/tagout).
- 1910.147: App A, Typical minimal lockout procedures.

Removing the Power Converter Assembly

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Disconnect all power.
- Place a “Do Not Turn On” label on the drive disconnect.
- Lock the disconnect in the open position.
- Read and understand the bus voltage measurement procedure on page 42 before performing the procedure. Measurement of bus capacitor voltage must be performed by qualified personnel.
- DO NOT short across DC bus capacitors or touch unshielded components or terminal strip screw connectors with voltage present.
- Many parts in the drive, including printed wiring boards, operate at line voltage. DO NOT TOUCH. Use only electrically insulated tools.

Failure to follow these instructions will result in death or serious injury.

⚠ CAUTION

ELECTROSTATIC DISCHARGE

Do not subject this device to electrostatic discharge. This controller contains electronic components that are very susceptible to damage from electrostatic discharge.

Failure to follow these instructions can result in injury or equipment damage.

Observe the following precautions when handling static sensitive components:

- Keep static producing material (plastic, upholstery, carpeting) out of the immediate work area.
- Store the power converter assembly in its protective packaging when it is not installed in the drive.
- When handling the power converter assembly, wear a conductive wrist strap connected to the power converter assembly through a minimum of one megaohm resistance.
- Avoid touching exposed conductors and component leads with skin or clothing.

To replace the power converter, follow these steps:

1. Open the door of the drive. To open the door, turn the circuit breaker and handle assembly to the Off position.
2. Measure the DC bus voltage as described on page 42 of this instruction bulletin.
3. Disconnect all power and control wiring from the power converter assembly. Identify each wire for ease of re-assembling the new power converter.
4. Remove the heatsink fan assembly before removing the power converter. Refer to the “Field Replacement of Heatsink Fan Assembly” on page 95 for directions.
5. Remove the outside flange screws that secure the power converter to the enclosure back pan. Refer to Figures 12–16 starting on page 46 for screw locations. Refer to Table 37 for the number of screws on your controller. Keep the screws for the new power converter.

Table 37: Number of Flange Screws

460 V	No. of Screws	208/230 V	No. of Screws
1–7.5	10	1–5	10
10–25	10	7.5–10	10
30 40 50	10 12 14	15–25	10
60 75–100	14 16	30–40 50	12 14

6. Remove the power converter assembly from the enclosure.

Installing the Power Converter Assembly

Before installing, remove the side panels from the new drive.

To install the new power converter, follow these steps:

1. Install the new power converter assembly in the enclosure.
2. Secure the power converter picture frame to the enclosure back pan using the picture frame screws from the removed power converter. Torque the screws to 15 ± 2 lb-in. (1.7 ± 0.2 N•m).
3. Install all power and control wiring to the power converter assembly terminal blocks. Install all other removed equipment. Tighten the hardware to the torque values given in Table 38. Check all wiring connections for correct terminations and check the power wiring for grounds with an ohmmeter.

Table 38: Terminal Torques

Terminal		Torque	
		lb-in	N•m
Power Terminal Strip:			
460 V	EFDC•4V_ to EFDG•4V_ (1–7.5 hp)	12.3	1.4
	EFDH•4V_ to EFDK•4V_ (10–20 hp)	26.5	3
	EFDL•4V_ to EFDM•4V_ (25–30 hp)	47.7	5.4
	EFDN•4V_ to EFDQ•4V_ (40–60 hp)	106.2	12
	EFD R•4V_ to EFDS•4V_ (75–100 hp)	360	41
230 V	EFDC•3V_ to EFDG•3V_ (1–7.5 hp)	12.3	1.4
	EFDH•3V_ to EFDJ•3V_ (10–15 hp)	26.5	3
	EFDK•3V_ to EFDL•3V_ (20–25 hp)	47.7	5.4
	EFD M•3V_ to EFDN•3V_ (30–40 hp)	106.2	12
	EFD P•3V_ (50 hp)	360	41
208 V	EFDC•2V_ to EFDG•2V_ (1–7.5 hp)	12.3	1.4
	EFDH•2V_ to EFDJ•2V_ (10–15 hp)	26.5	3
	EFDK•2V_ to EFDL•2V_ (20–25 hp)	47.7	5.4
	EFD M•2V_ to EFDN•2V_ (30–40 hp)	106.2	12
	EFD P•2V_ (50 hp)	360	41
S	Shield Connection (power converter)	3.5	0.34

4. Shut the enclosure door, secure the door with door fasteners, and close the circuit breaker disconnect.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- This equipment must be installed and serviced only by qualified personnel.
- Qualified personnel performing diagnostics or troubleshooting requiring electrical conductors to be energized must comply with NFPA 70 E - Standard for Electrical Safety Requirements for Employee Workplaces and OSHA Standards – 29 CFR Part 1910 Subpart S Electrical.

Failure to follow these instructions will result in death or serious injury.

5. To set the drive to allow increase in horsepower, do the following:
 - Make sure the Hand off Auto selector switch is in the Off position, and the Test Normal switch (if present) is in the Test position, then apply power to the drive.
 - Go to menu 2 (Access Level) and select Expert.
 - Go to Menu 1.4 (Motor Control) and change the Power Ident (Prt) from IP20 to IP00.
6. Program the drive according to the control circuit elementary diagrams in Section 5 beginning on page 99. Follow the initial start-up procedure on page 56.

The drive is now ready to operate.

Refer to Appendix A beginning on page 103 for the part numbers of the equipment required for the following field replacement procedures. For component locations, refer to Figures 2–4 on pages 16–18.

FIELD REPLACEMENT OF HEATSINK FAN ASSEMBLY

If a heatsink fan becomes inoperable the fan assembly must be replaced. Observe the lockout / tagout procedures as identified in OSHA Standard 29 CFR, Subpart J covering:

- 1910.147: The control of hazardous energy (lockout/tagout).
- 1910.147: App A, Typical minimal lockout procedures.

Removing the Heatsink Fan Assembly

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Disconnect all power.
- Place a “Do Not Turn On” label on the drive disconnect.
- Lock the disconnect in the open position.
- Read and understand the bus voltage measurement procedure on page 42 before performing procedure. Measurement of bus capacitor voltage must be performed by qualified personnel.
- DO NOT short across DC bus capacitors or touch unshielded components or terminal strip screw connectors with voltage present.
- Many parts in the drive, including printed wiring boards, operate at line voltage. DO NOT TOUCH. Use only electrically insulated tools.

Failure to follow these instructions will result in death or serious injury.

⚠ CAUTION

ELECTROSTATIC DISCHARGE

Do not subject this device to electrostatic discharge. This controller contains electronic components that are very susceptible to damage from electrostatic discharge.

Failure to follow these instructions can result in injury or equipment damage.

Observe the following precautions when handling static sensitive components:

- Keep static producing material (plastic, upholstery, carpeting) out of the immediate work area.
- Store the heatsink fan assembly in its protective packaging when it is not installed in the drive.
- When handling the heatsink fan assembly, wear a conductive wrist strap connected to the heatsink fan assembly through a minimum of one megaohm resistance.
- Avoid touching exposed conductors and component leads with skin or clothing.

To replace the heatsink fan assembly, follow these steps:

1. Open the door of the drive. To open the door, turn the circuit breaker and handle assembly to the Off position.
2. Measure the DC bus voltage as described on page 42.
3. Locate the heatsink fan assembly below the power converter.
4. Remove the four screws securing the heatsink fan assembly. Keep the four screws.
5. Lift the fan assembly above the flange opening.
6. Disconnect the fan cable from the converter.
7. Remove the fan assembly from the enclosure.

Installing the Heatsink Fan Assembly

To install the new heatsink fan assembly, follow these steps:

1. Place the fan assembly near the flange opening.
2. Connect the fan assembly wiring plug to the converter cable, below the flange.
3. Install the heatsink fan assembly. Secure the assembly with the four screws saved from step 4 above. Torque the screws to 15 lb-in (1.7 N•m).
4. Shut the enclosure door and secure it with door fasteners. Then close the circuit breaker disconnect.
5. Fully test the drive before placing into service.

FIELD REPLACEMENT OF THE STIRRING FANS

If a stirring fan inside the enclosure becomes inoperable, the fan must be replaced.

Before removing the inoperable stirring fan, mark and note airflow direction to ensure proper installation of the replacement fan.

FIELD REPLACEMENT OF THE VENTILATION FAN ON TYPE 3R

Figure 27: Removing Mounting Screws

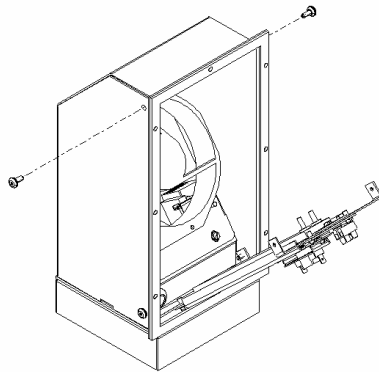
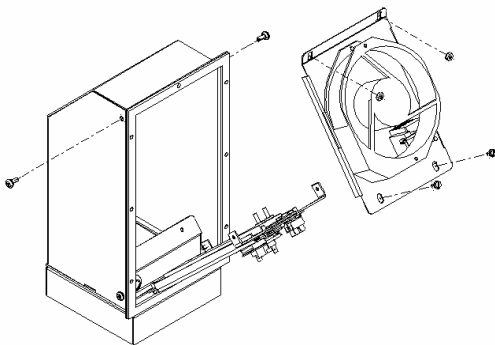


Figure 28: Removing Bracket Mounting Screws



FIELD REPLACEMENT OF THE SPACE HEATER ON TYPE 3R

FIELD MAINTENANCE AND REPLACEMENT OF HOOD FILTERS ON TYPE 3R

If a Type 3R ventilation fan becomes inoperable, the fan must be replaced. Before removing the inoperable ventilation fan, mark and note airflow direction to ensure proper installation of the replacement fan.

To replace the enclosure ventilation fan:

1. Observe the lockout/tagout procedures as identified in OSHA Standard 29 CFR, Subpart J covering:
 - 1910.147: The control of hazardous energy (lockout/tagout)
 - 1910.147: App A, Typical minimal lockout procedures
2. Open the disconnect between the input line and the drive, then lock and tag the disconnect between the input line and the drive in the Off position.
3. Remove all external control power that may be present.
4. Wait 15 minutes before opening the door of the drive.
5. Using a T20 Torx driver, remove the 7 screws used to hold the enclosure ventilation hood to the side of the enclosure.
6. Remove the control power wires and ground bonding jumper, then mark the location of these terminals.
7. Remove the bracket mounting screws and rotate the bracket forward. See Figure 27.
8. Using a 3/8 in. hex-head socket, remove the screws holding the fan bracket to the ventilation hood. See Figure 28.
9. Remove and replace the two screws that attaches the fan to the fan bracket.
10. Reassemble the ventilation hood. Make sure not to pinch the wires or allow the wires to come into contact with the heater surface.

CAUTION

EQUIPMENT DAMAGE

The surface of the heater is potentially hot.

- Prevent contact with the wires and the heater guard.
- Ensure that the wires do not contact the heater surface.

Failure to follow these instructions can result in equipment damage.

11. Reattach the control wires and the ground bonding jumper.
12. Mount the ventilation hood back to the side of the enclosure and secure with the 7 screws that were removed in step 4.

NOTE: To prevent displacement of the rubber washers, do not over tighten the screws.
13. After servicing the drive, close and secure the door.
14. Fully test the drive before placing into service.

If a Type 3R strip heater becomes inoperable, the strip heater must be replaced. The thermostat is factory set at 60 °F (15 °C).

The Type 3R E-Flex filter material located on the bottom of the side hoods is washable. Remove, wash, and install it as required to maintain airflow.

