EFS 550 / 650 Series | Mod

Installation, Operation and Maintenance Instructions

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Safety First!

Throughout the installation phases and operation of this equipment, safety procedures take precedence over all other activities. As a minimum:

1. Read and follow all instructions in this IOM.

2. Before handling electrical connections, disconnect power feeds. There may be multiple power feeds connected to this unit. Proceed carefully when opening the cabinet cover.

3. Risk of electric shock! All wiring must be in accordance with applicable local codes, regulations and the NEC. Be aware that there may be hazardous voltages present which can shock, burn, or possibly cause permanent injury or even death. This is a stored energy system. This device is designed to supply backup power when mains power is lost or disconnected. **Terminals are live whenever the battery is connected.**

Handling & Storage:

This product contains a lead-acid battery storage system. It is designed as a backup power supply for industrial electric actuators. The enclosure is a weather-resistant NEMA4X polycarbonate enclosure with a clear hinged door. Care must be taken during shipping and handling to prevent damage to any of the components or the enclosure. It contains logic control PC boards, various discrete electronic components and electrical storage devices, all of which are susceptible to damage from high humidity environments. For this reason, this device must be protected from direct contact with water and/or high humidity storage environments.

Protect the device from physical damage while awaiting the completion of installation processes.

Product shipping information:

The EFS system is packaged in two separate boxes inside one larger shipping carton. This is done to prevent shipping damage to both the polycarbonate enclosure as well as to sensitive components associated with the heavier control panel and battery back up system.

1. BOX 1 contains the fiberglass enclosure. Do NOT use sharp objects when opening the carton as you may damage the clear lexan door attached to the enclosure cabinet.

2. BOX 2 contains the main face plate panel, battery system and control electronics.

3. This unit is shipped with the battery system disconnected. Follow the instructions below to correctly reconnect the battery to the power unit. Failure to follow the connection sequence will prevent the battery unit from starting.

4. Do NOT mount the panel in the cabinet until instructed to do so.

Installation:

1. Mount the cabinet either indoors or outdoors protected from direct sunlight or other high heat sources. The cabinet mounts with the latches to the RIGHT, and hinge to the LEFT. The suggested EMT entry location is shown on page 18 in the dimensional drawing. Make all conduit penetrations per local code and perform all wire pulls prior to installing the main control panel.

2. The enclosure must be mounted onto a stable, vibration-free structure. The control panel is very heavy, and unstable platforms my cause the panel to dislodge from the enclosure.

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3. After the enclosure is properly mounted, install the four corner standoffs using a 3/8" socket or a nut driver. There are two (2) 3" long hex standoffs connected together for EACH corner of the enclosure. These are located inside the enclosure when shipped. (see Fig 1). **DO NOT OVERTIGHTEN!**

Fig. 1

4. Turn the main panel over to reveal the back side of the plate. Remove the sliding battery compartment cover from the APC unit. (see Fig 2).

Fig. 2

5. Tilt the entire assembly to slide the battery partially out of the enclosure. This will give you access to the battery terminals.

6. Connect the positive (red) wire to the red battery terminal. The black terminal and wire should already be connected. (see Fig 3).

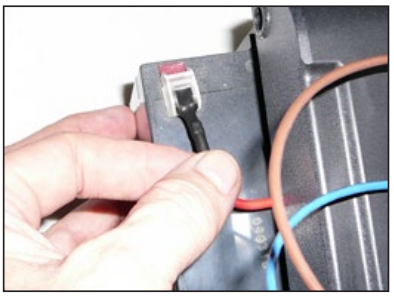

Fig. 3

7. Slide the battery back into the enclosure, and replace the slide cover. Take care not to pinch the battery wires in the process. (see Fig 4).

Fig. 4

8. After the battery is installed, take care NOT to press the recessed START button on the APC unit. If it gets pressed, the APC unit will start and it will immediately start generating 120vac power on several of the screw termninals, which makes the panel rather difficult to handle. If the START button gets pressed accidently, you can press for a few seconds again to shut off the generator. (see Fig 5).

Fig. 5

9. Install the panel onto the four standoff posts from step 2 (above) using 10-32 x 1/2" PH screws from parts bag. (see Fig 6).

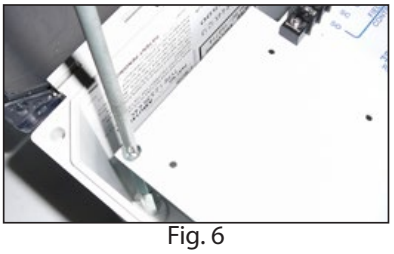

Fig. 6

10. Make wiring connections (see pages 6-16).

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Installation and Application Notes

1. After installation and wiring are complete and the battery has been connected, apply power and PRESS the START button to enable the battery system. There is LIVE voltage present on the back of the main panel as well as on the terminal block, even after the main power has been disconnected. Handle appropriately!

2. Place the FAIL POSITION SELECTOR switch in the desired mode (Fail OPEN or Fail CLOSED) based on the requirements of the site.

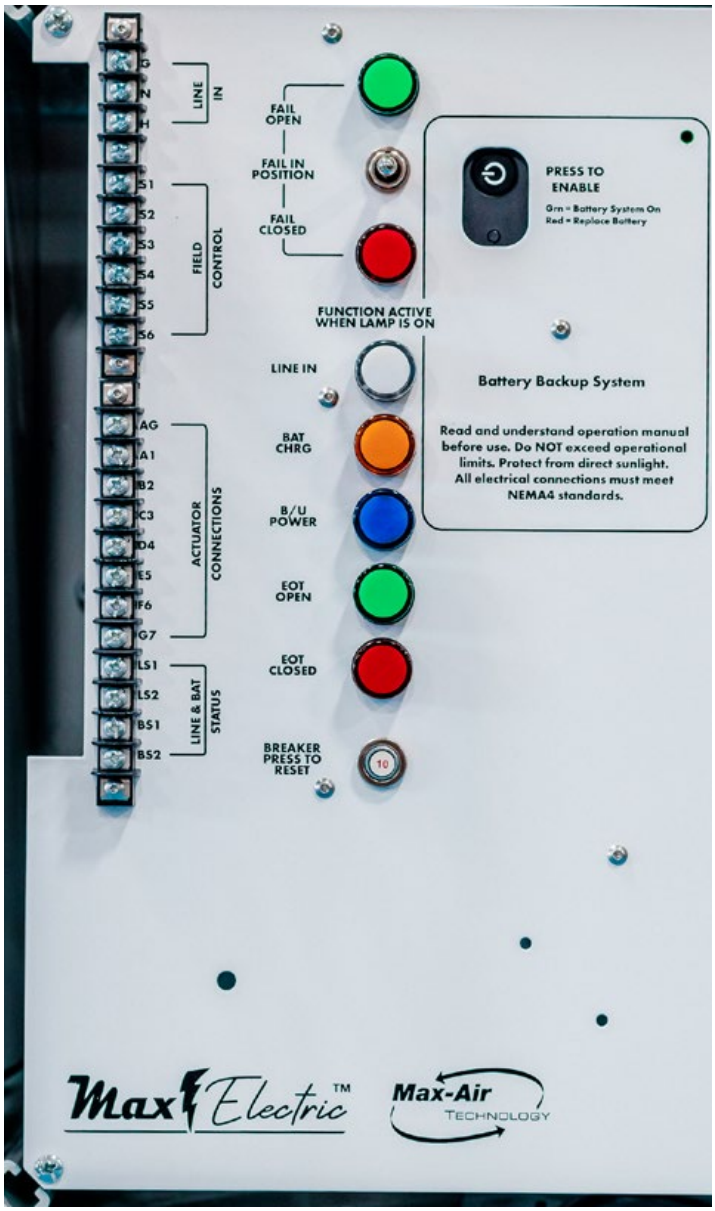
3. Indicator lamps show when Power is applied, which Fail position has been selected, when the Battery is Charging, and when the system is running on Battery Power.

4. Units are equipped with end-of-travel (EOT) indicators that will function if interface wiring has been connected to the actuator. Open End of Travel and Closed End of Travel LED's will illuminate when the actuator has reached its respective end of travel position.

5. The Line Status and Battery Status are dry form C contacts rated at 8A, 250 vac/30vdc. Line status is CLOSED when mains power is applied. Battery system status is CLOSED when the EFS battery charge is operational.

6. Overloading the backup system will TRIP the breaker. This is a PRESS to RESET type and is NOT self resetting.

7. It is possible to connect multiple actuators to a single EFS PROVIDED THE TOTAL ACTUATOR DEMAND DOES NOT EXCEED THE RATING OF THE EFS. Reference page 4 for details and contact Max-Air Technology for assistance.



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EFS Series Sequence of Operation - Open/Close/Jog Actuators

The electronic fail-safe system (EFS) is wired in series between the mains power and the actuator. Under normal operation, 120VAC power supplied to the EFS H & N terminals will illuminate the white "LINE IN" indicator light, and provide charging voltage to the battery system.

While Mains power is present, the remotely generated analog control signal (either 2-10vdc or 4-20mA) is passed through the EFS and on to the actuator. The actuator will follow that control signal. While under mains power the blue "BAT CHARGING" indicator light will illuminate and the yellow "B/U POWER" indicator light will be off. While under mains power, the positon of the "FAIL POSITION SELECT" switch is irrelevant. Power is supplied through the back-up system cabinet and the actuator heater is enabled. No current is being drawn from the battery system during this mode of operation. Optional indicator lights can be wired to show actuator end of travel status. These lamps are active as long as the battery system is running or Mains power is present. Optional STATUS contacts can be used for remote health indicators of LINE voltage coming into the EFS and if the Battery System is operating.

When the mains power is lost, charging power is no longer supplied to the battery system. The green "LINE IN" indicator light is turned off, and the battery system automatically generates modified-sine wave line voltage to provide power for the transformer to generate 24v actuator power. The blue "BAT CHARGING" indicator light is turned off, and the yellow "B/U POWER" indicator light is turned on. The "FAIL POSITION SELECT" switch becomes active, and depending on its position, drives the actuator either fully OPEN or fully CLOSED via its own signal generator. During this mode of operation, the remote analog control signal (if present or not) is irrelevant. The battery system will provide ample power to drive the actuator more than 5 full torque cycles. However, once the actuator reaches its end-of-travel limit switch, power drain from the back-up system is reduced to the requirements of the yellow "B/U POWER" indicator light and the transformer eddy current draw (up to 10% of rated load).

The battery system will provide ample power to drive the actuator more than 5 full torque cycles. However, once the actuator reaches its end-of-travel limit switch, power drain from the back-up system is reduced to the requirements of the blue "B/U POWER" indicator light.

After 15 minutes, the battery system turns itself off and waits for the mains power to return. The design of the Max-Air ME & MX series actuators provides automatic locking of the actuator position after the battery system shuts down. Normal operation is resumed when mains power returns.

EFS Load Tables - 120vac Actuators

ME Frame / Voltage	Max # Capacity	Torque ("lbs)	Voltage	Runtime (Seconds) (60Hz)	EFS Model (2 POS)	EFS Model (MOD)	Model	Capacity Used @ Full Runtime	Replacement Battery
A003-120A	3	310	120	12	EFS550-120-OC	EFS550-120-MOD	BE550G	0.7%	RBC110
B004-120A	3	445	120	27			BE550G	1.6%	
C004-120A	3	445	120	27			BE550G	1.6%	
E008-120A	2	800	120	17			BE550G	1.7%	
E013-120A	2	1335	120	26			BE550G	2.6%	
G035-120A	1	3560	120	19	EFS650-120-OC	EFS650-120-MOD	BE650G1	3.1%	RBC17
G044-120A	1	4450	120	26			BE650G1	4.0%	
G058-120A	1	5785	120	34			BE650G1	6.3%	

EFS Load Tables - 24vac Actuators

ME Frame / Voltage	Max # Capacity	Torque ("lbs)	Voltage	Runtime (Seconds) (60Hz)	EFS Model (2 POS)	EFS Model (MOD)	Model	Capacity Used @ Full Runtime	Replacement Battery
A003-24A	3	310	24vac	18	EFS550-24A-OC	EFS550-24A-MOD	BE550G	2.1%	RBC110
B004-24A	3	445	24vac	36			BE550G	4.2%	
C004-24A	3	445	24vac	36			BE550G	4.2%	
E008-24A	1	801	24vac	18			BE550G	4.3%	
E013-24A	1	1335	24vac	27			BE550G	5.9%	
G035-24A	1	3560	24vac	21	EFS650-24A-OC	EFS650-24A-MOD	BE650G1	12.4%	RBC17
G044-24A	1	4450	24vac	28			BE650G1	15.9%	
G058-24A	1	5785	24vac	37			BE650G1	25.5%	

It is possible to connect multiple actuators to a single EFS PROVIDED THE TOTAL ACTUATOR DEMAND DOES NOT EXCEED THE POWER CAPACITY OF THE EFS.

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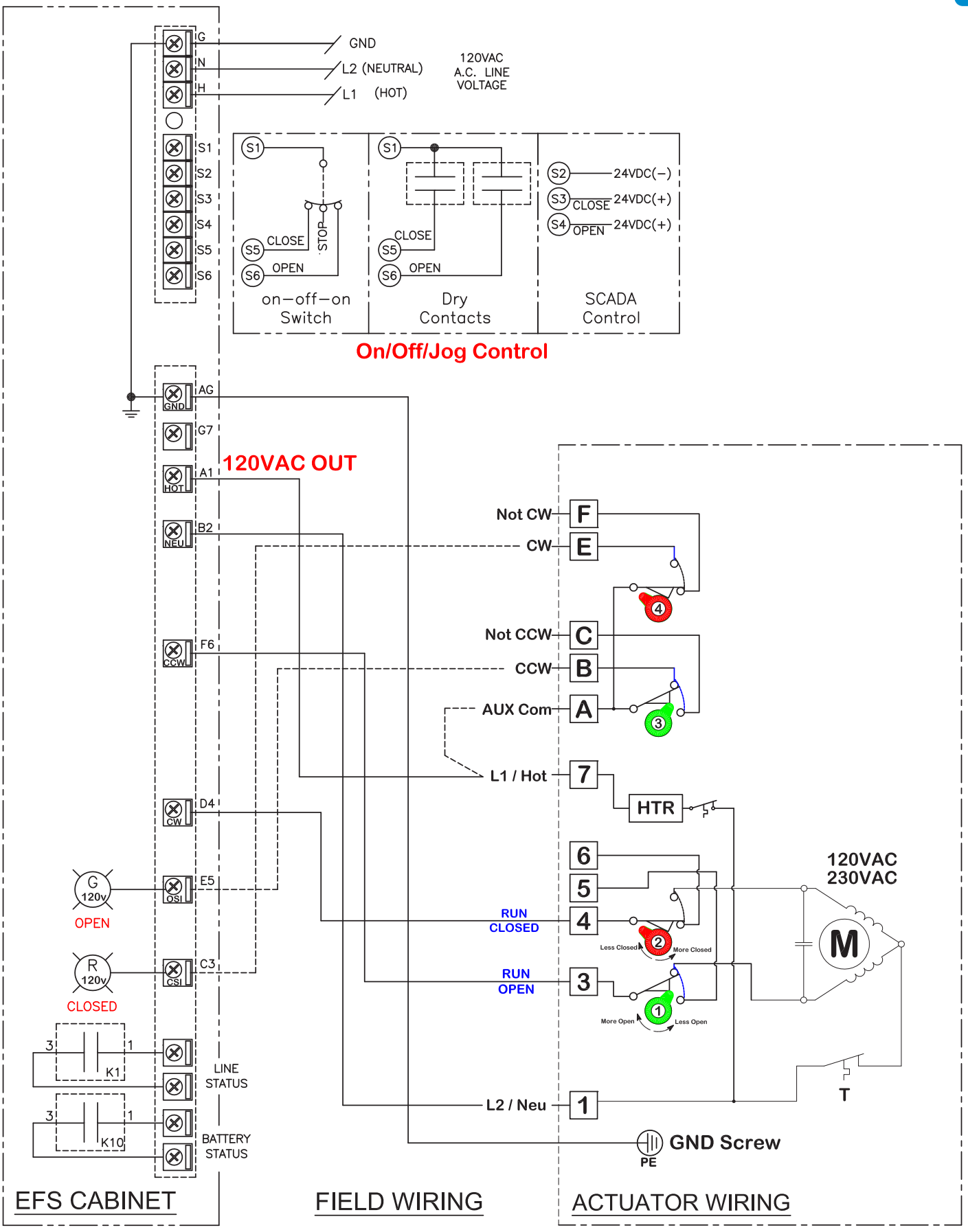
Wiring Diagram for EFS550/650 - 120vac ABC Frame On/Off Actuators



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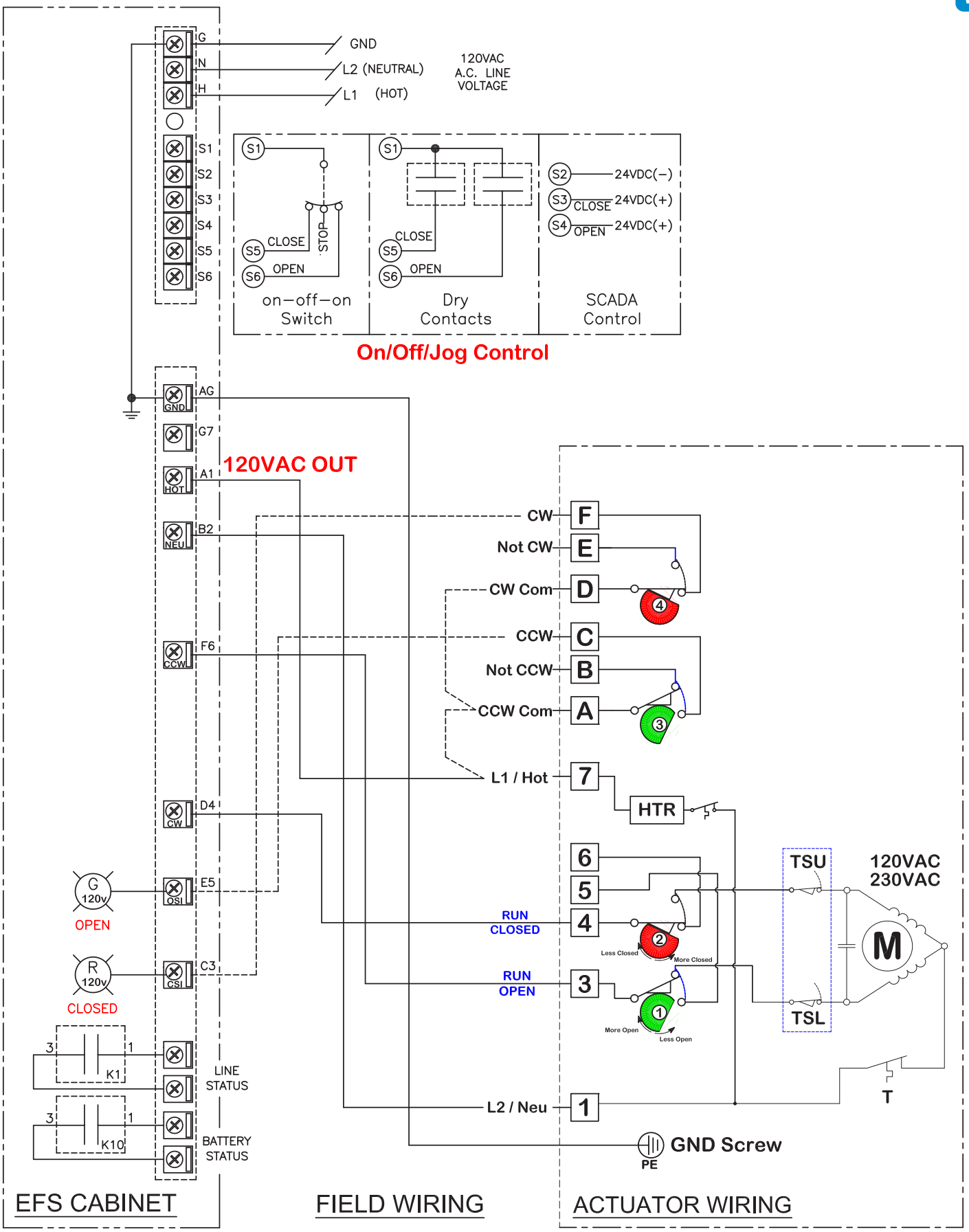
Wiring Diagram for EFS550/650 - 120vac E~K Frame On/Off Actuators



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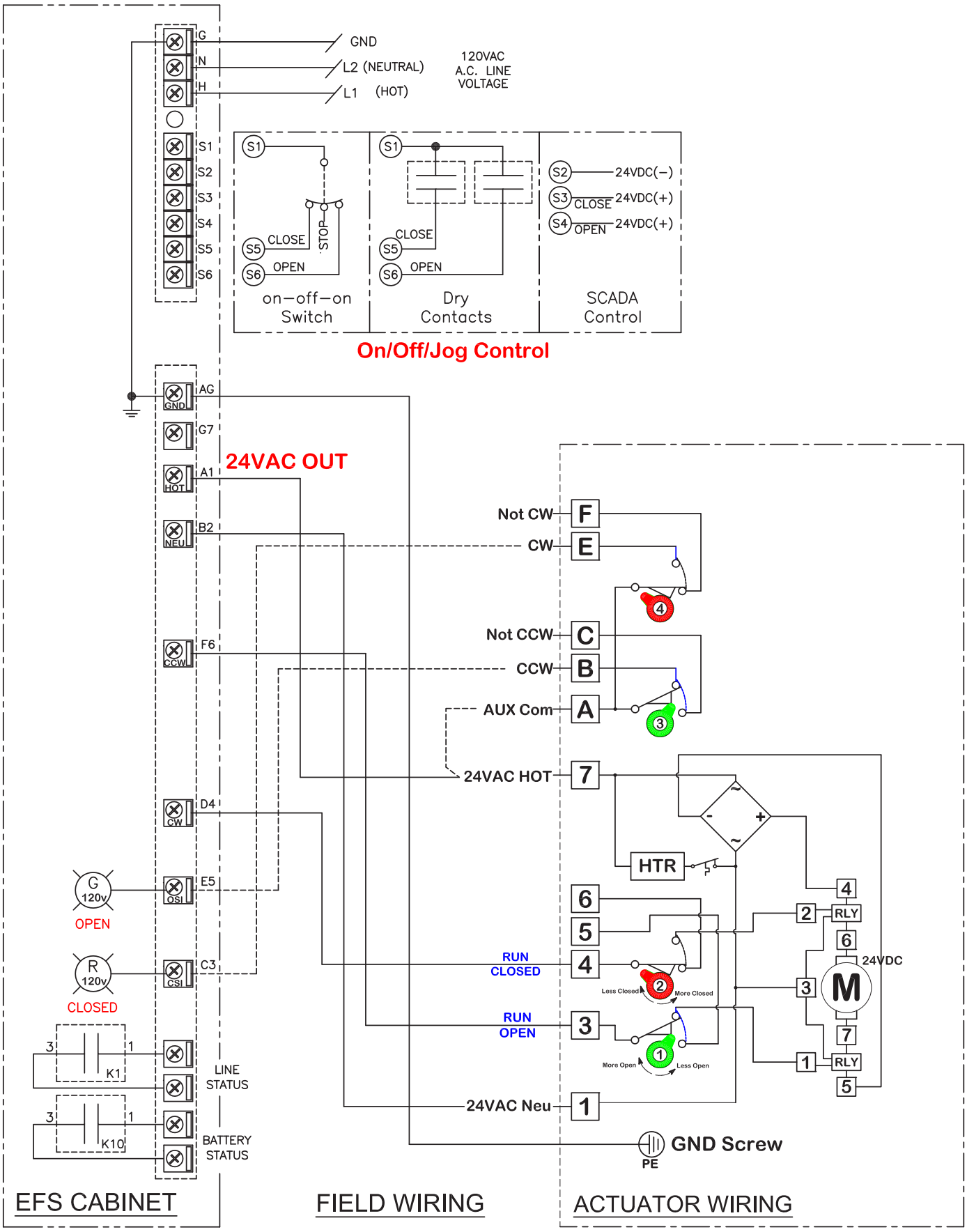
Wiring Diagram for EFS550/650 - 24vac ABC Frame On/Off Actuators



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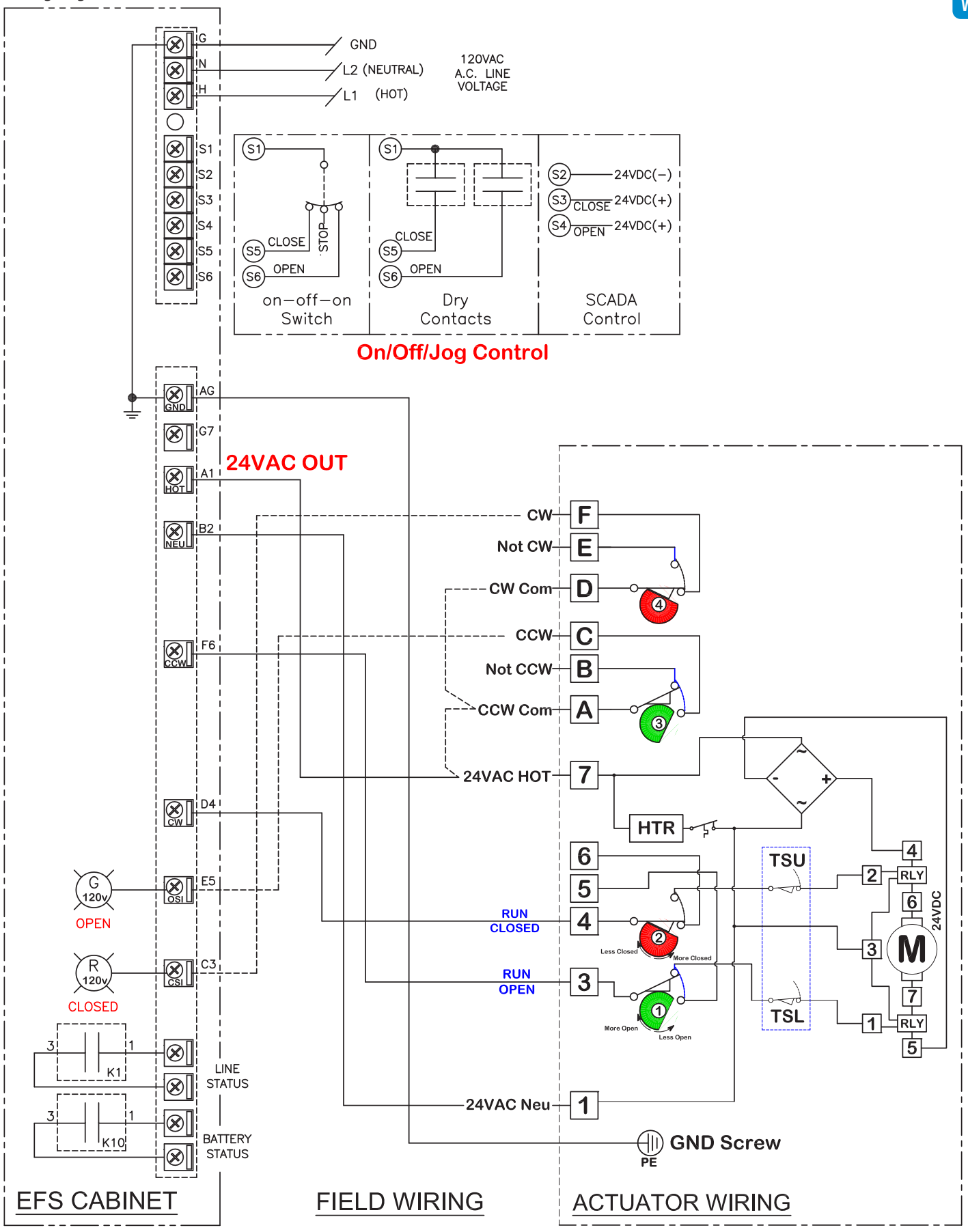
Wiring Diagram for EFS550/650 - 24vac E~K Frame On/Off Actuators



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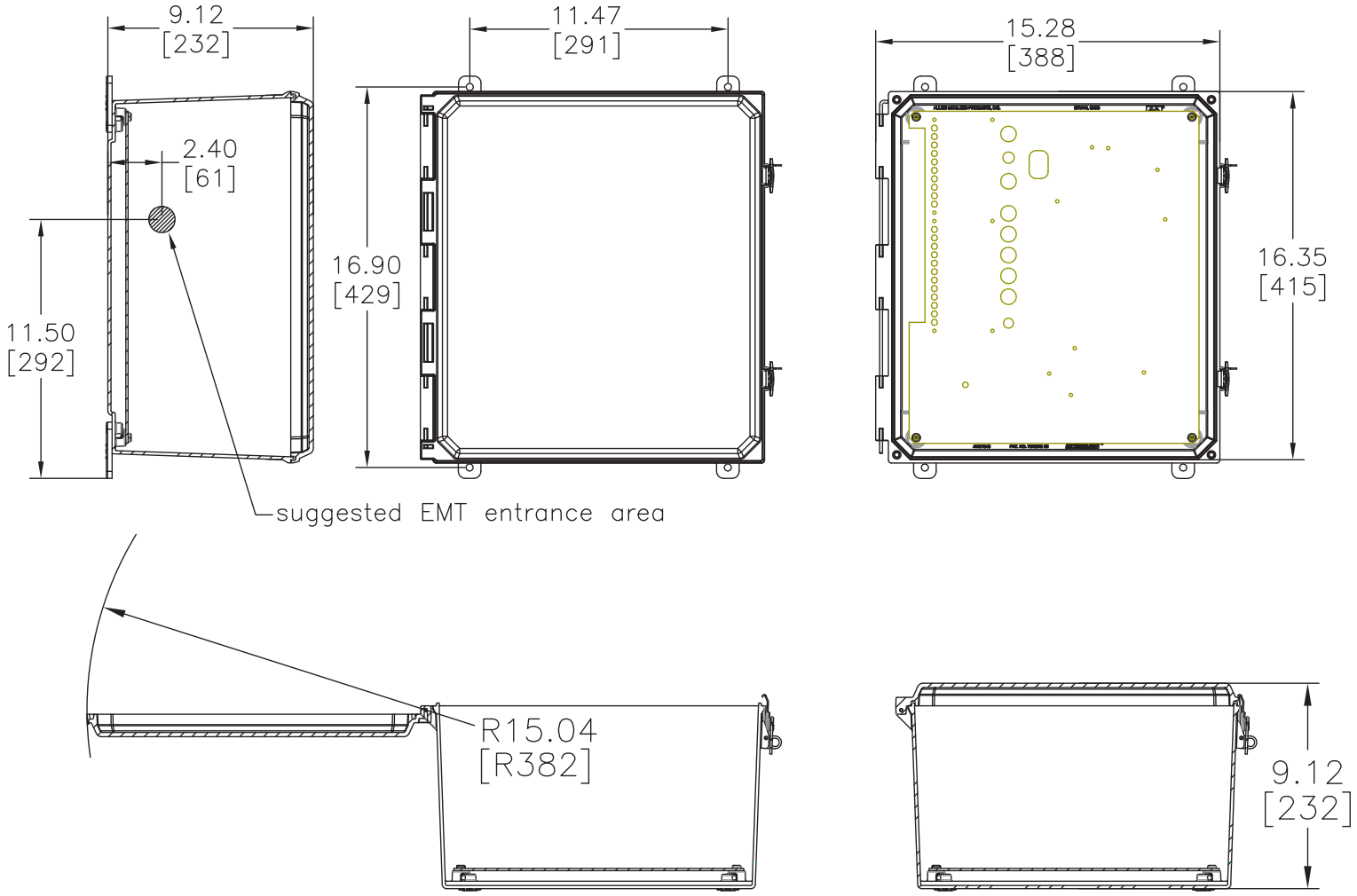
Mounting Dimensional Data - EFS550/650 Enclosure



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Technical Specifications

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		EFS550-120	EFS550-24
Input:	Nominal input voltage: Mains Input Voltage Range:	120vac 88-139vac	120vac 88-139vac
	Input Frequency:	50/60Hz +/- 1Hz (auto sensing)	
Output:	Nominal Output voltage:	120vac	24vac
	Power Capacity: Waveform Type:	550VA/ 300 Watts Stepped approximation to a sinewave	
Batteries:	Typical backup time at half-load: Type: Typical recharge time:	5.6 minutes Maintenance-Free sealed lead-acid Suspended electrolyte: Leakproof 16 hours **	
Filtering	Full time multi-pole noise filtering:	5% IEEE surge let-through. Response time meets UL 1449	

		EFS650-120	EFS650-24
Input:	Nominal input voltage: Mains Input Voltage Range:	120vac 88-139vac	120vac 88-139vac
	Input Frequency:	50/60Hz +/- 1Hz (auto sensing)	
Output:	Nominal Output voltage:	120vac	24vac
	Power Capacity: Waveform Type:	650VA/ 390 Watts Stepped approximation to a sinewave	
Batteries:	Typical backup time at half-load: Type: Typical recharge time:	13.4 minutes Maintenance-Free sealed lead-acid Suspended electrolyte: Leakproof 24 hours **	
Filtering	Full time multi-pole noise filtering:	5% IEEE surge let-through. Response time meets UL 1449	

** The time to recharge to 90% of full battery capacity following a discharge to shutdown using a load rated for 1/2 the full load rating of the UPS.

Environmental:

Operating Relative Humidity 0 - 95%
Operating Elevation 0-10000 feet (0-3000 m)
Storage Temperature -15 - 45 °C (5 - 113°F)
Storage Relative Humidity 0 - 95%
Storage Elevation 0-50000 feet (0-15000 m)
Audible noise at 1 meter from surface of unit 45 dBA
Online thermal dissipation 104 BTU/hr

Conformance - APC Back UP Module:

Approvals: cUL Listed
FCC Part 15 Class B
FCC part 68, NOM
UL1778
UL497A
UL498

Physical Dimensions EFS Series Back Up Systems

	EFS550		EFS 650	
VAC	120	24	120	24
Max HT	17.50	17.50	17.50	17.50
Max WD	15.05	15.05	15.05	15.05
Net Depth	9.50	9.50	9.50	9.50
Net WT	35	45	45	58
Ship WT	45	55	58	71

***Note: EFS Series ships in two separate cartons.**

Commissioning

After completing all mounting and wiring procedures, main power is available and battery has been connected per instructions found on page 2, it is now possible to commission the EFS.

1. Apply power to the unit, the green LINE IN indicator is illuminated.
2. Measure (for your unit) xxx vac on terminals H & N on the EFS panel face.
   2.01 EFS 120V & 24V units, measure 100-125vac on terminals H & N on the EFS panel face.
3. Press the START button on the battery unit (see item 8 page 2).
4. Wait for 30 seconds, then the LED on the battery unit itself will turn green and stay on solid.
5. Measure (for your unit) xxx vac on terminals A1 & B2 on the EFS panel face.
   5.01 EFS 120V units, measure 100-125vac on terminals A1 & B2 on the EFS panel face.
   5.02 EFS 24V units, measure 22.5-26.0vac on terminals A1 & B2 on the EFS panel face.
6. The yellow CHARGE indicator is illuminated.
7. The blue BAT POWER indicator is NOT illuminated.
8. Select CLOSE actuator at the FIELD CONTROL DEVICE. The actuator will drive CLOSED.
9. Measure (for your unit) xxx vac on terminals B2 & D4 on the EFS panel face.
   9.01 EFS 120V units, measure 100-125vac on terminals B2 & D4.
   9.02 EFS 24V units, measure 22.5-26.0vac on terminals B2 & D4.
10. Select OPEN actuator at the FIELD CONTROL DEVICE. The actuator will drive OPEN.
11. Measure (for your unit) xxx vac on terminals B2 & F6.
    11.01 EFS 120V units, measure 100-125vac on terminals B2 & F6.
    11.02 EFS 24V units, measure 22.5-26.0vac on terminals B2 & F6.
12. Move the Fail Position Selector switch to the OPEN position, and the green FAIL OPEN indicator is illuminated. This will have no effect on the position of the ACTUATOR.
13. Move the Fail Position Selector switch to the CLOSE position, and the red FAIL CLOSED indicator is illuminated. This will have no effect on the position of the ACTUATOR.
14. Disconnect MAIN power from the EFS.
15. The ALARM will start beeping on the battery unit, once every 30 seconds until power is restored.
16. The green LINE IN indicator will turn off.
17. The yellow BAT CHARGE indicator will turn off.
18. The blue BAT POWER indicator will be illuminated.
19. The commands received from the FIELD CONTROL DEVICE will have no effect on the positioning of the actuator.
20. Measure 0 vac on terminals H & N (all models).
21. Measure 0 vac on terminals A1 & B2 (all models).
22. Move the Fail Position Selector switch to the CLOSE position, the red FAIL CLOSE indicator is illuminated and the actuator will drive CLOSED. The FIELD CONTROL DEVICE will have no effect on the position of the actuator in this mode.
23. Measure (for your unit) xxx vac on terminals B2 & D4.
    23.01 EFS 120V units, measure 100-125vac on terminals B2 & D4.
    23.02 EFS 24V units, measure 22.5-26.0vac on terminals B2 & D4.
24. Move the Fail Position Selector switch to the OPEN position, the green FAIL OPEN indicator is illuminated and the actuator will drive OPEN. The FIELD CONTROL DEVICE will have no effect on the position of the actuator in this mode.
25. Measure (for your unit) xxx vac on terminals B2 & F6.
    25.01 EFS 120V units, measure 100-125vac on terminals B2 & F6.
    25.02 EFS 24V units, measure 22.5-26.0vac on terminals B2 & F6.
26. Re-establish Main power, whereupon the unit will automatically return to normal operating mode.
27. Unit is now ready for automatic operation.

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Troubleshooting - On/Off Units

Issue:	Check:
The green LINE IN indicator does not illuminate.	• Measure for proper line voltage on terminals H & N on the panel face. • Check the indicator bulb.
The green start indicator on the internal battery system does not turn on when the start button is pressed.	• Measure for proper line voltage on terminals H & N on the panel face. • Is the battery connected as instructed on page 2? • Has the panel breaker tripped? • Check the indicator bulb on the panel face. • Check the status indicator adjacent to the START button. Other than solid green color indicates a system problem.
The yellow charge indicator does not illuminate.	• Has the START button been pressed? • Has the battery been connected as instructed on page 2? • Check the indicator bulb.
The blue BATTERY B/U indicator does not illuminate.	• Has the START button been pressed? • Has the battery been connected as instructed on page 2? • Has line voltage been removed from terminals H & N? • Has the panel breaker tripped? • Check the indicator bulb.
The breaker keeps tripping.	• Check for proper actuator and EFS supply wiring and correct input voltage. • Check thermal temperature of panel face.
The connected actuator does not respond properly to FIELD CONTROL Signals.	• Check FIELD CONTROL DEVICE (FCD) wiring to EFS terminals S1, S5 & S6 compared to wiring diagrams in this manual. Connecting S1 to S5 should drive the actuator CLOSED, and connecting S1 to S6 should drive it OPEN. If actuator responds in reverse, either FCD to EFS interface wiring is reversed, or EFS to Actuator wiring is reversed.
The connected actuator does not respond properly in battery backup mode.	• Has the START button been pressed? • Has the battery been connected as instructed on page 2? • Has line voltage been removed from terminals H & N? • Has the panel breaker tripped? • Has the FAIL Position switch been set properly? • Does the actuator respond correctly in POWER mode?
The connected actuator does not drive completely to the selected fail position before stopping.	• Check the status indicator adjacent to the START button. Other than solid green color indicates a system problem. • Check product selection tables for proper actuator / EFS sizing. • Measure the running current between EFS terminal D4 and actuator terminal 4 while CLOSING, as well as from EFS terminal F6 and actuator terminal 6 while OPENING, to check for abnormally high current readings.