SECTION II

INSTALLATION

1. When the controller is received, inspect it for shipping damage. Report all damage immediately to the carrier. Any claims for damages during shipment must be resolved with the carrier.

2. Remove the shipping containers and all packing material.

3. Check internal components for physical damage. Hidden damage caused during transit should be reported immediately to the carrier. Damaged components must be replaced before power is applied to the controller.

4. Comply with all instruction tags attached to the controller.

5. Compare the rating of the controller with the supply voltage and frequency, and the motor horsepower and voltage to ensure that they are electrically compatible. See "Controller Identification," page 1-2.

Note: If the controller is used for a ski-lift application, it must be installed and utilized in accordance with the current ANSI B77.1 Code.

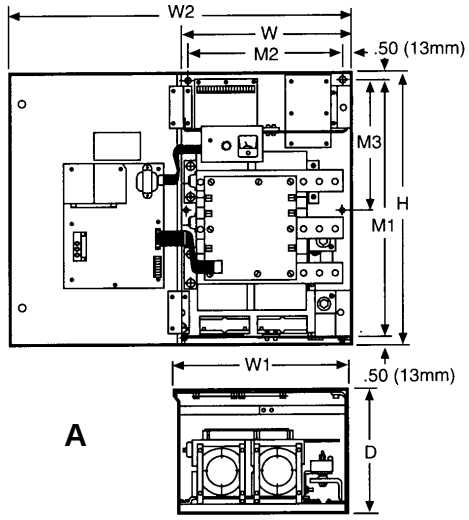
MOUNTING INSTRUCTIONS

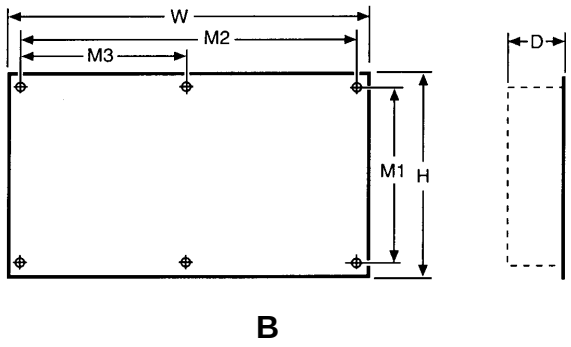
CONTROLLER

Install the controller in an upright vertical position for maximum cooling efficiency. Allow for free air circulation around the controller. Provide at least 4 inches (101.6 mm) clearance on each side. If the controller is to be mounted in an enclosure by the user, allow for adequate ventilation. Air passages into the bottom, with exit openings near the top, form an adequate configuration. If a small enclosure is used, a ventilation fan may be required. Controller damage may occur if the ambient temperature inside the enclosure exceeds 55°C (131°F).

The controller should not be subjected to external vibrations. Shock and excessive vibrations are detrimental to performance and life. Vibrations can cause general deterioration of connections and component damage.

Surface mount unenclosed controllers (3120M Modules and 3120S panel-mounted units) using their respective mounting holes. See Figure 2-1 (page 2-2) for 3120M Module dimensions and Figure 2-2 (page 2-2) for unenclosed (panel-mounted) 3120S Controller dimensions.

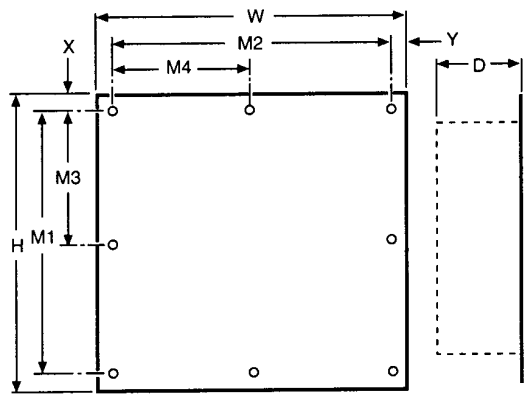




MODEL NUMBER	MAXIMUM HORSEPOWER			WEIGHT lbs. (kgs)	DIMENSIONS, INCHES (mm)[a]									FIG.
					REGULATED POWER CONVERSION MODULE					MOUNTING				
	230V	380V	460V		H	W	D	W1	W2	M1	M2	M3	HOLES	
3121M	15	15	20	24 (10.8)	19.0 (483)	12.0 (305)	8.5 (216)	12.3 (312)	24.5 (622)	18.0 (457)	11.0 (279)	---	4x 0.281 (7) Dia.	A
3122M	30	50	60	26 (11.7)										
3123M	75	125	150	49 (22.1)	19.5 (495)	14.5 (368)	10.3 (262)	14.8 (376)	29.6 (752)	18.5 (470)	13.5 (343)	--- ---	4x 0.375 (10) Dia.	A
3124M	125	200	250	66 (29.7)	26.0 (660)	16.0 (406)	11.5 (292)	16.3 (414)	32.6 (828)	25.0 (635)	15.0 (381)	12.5 (318)	6x 0.375 (10) Dia.	A
3125M	---	300	400	225 (102.3)	30.0 (762)	48.0 (1219)	11.2 (285)	---	---	28.25 (718)	46.25 (1175)	23.13 (588)	6x 0.41 (10.4) Dia	B
3126M	---	600	700											
3127M	---	900	1000											

a. Dimensions are for reference only.

FIGURE 2-1. 3120M REGULATOR POWER CONVERSION MODULE DIMENSIONS



MODEL NUMBER	MAXIMUM HORSEPOWER			DIMENSIONS, INCHES (mm)								
				PANEL			MOUNTING					
	230V	380V	460V	H	W	D	M1	M2	M3	M4	X	Y
3121S	10	15	20	27.0 (686)	29.0 (737)	8.6 (218)	26.0 (660)	28.0 (711)	---	---	0.5 (13)	0.5 (13)
3122S	30	50	60									
3123S	75	125	150	45.0 (1143)	35.0 (889)	10.4 (264)	44.0 (1118)	34.0 (864)	22.0 (559)	---	0.5 (13)	0.5 (13)
3124S	125	200	250	45.0 (1143)	35.0 (889)	11.6 (295)	44.0 (1118)	34.0 (864)	22.0 (559)	---	0.5 (13)	0.5 (13)
3125S	---	300	400	56.0 (1422)	46.0 (1168)	18.0 (457)	54.0 (1372)	44.0 (1118)	27.0 (686)	22.0 (559)	1.0 (25)	1.0 (25)
3126S	---	600	700									
3127S	---	900	1000									

FIGURE 2-2. 3120S UNENCLOSED (PANEL MOUNTED) DIMENSIONS

If the 3120 Controller is factory installed in an enclosure (Models 3120S and 3120C), position the enclosure upright in a clean, dry location. Allow the enclosure door(s) to open fully for ease of maintenance. A minimum swing of 90° is required for access.

Dimensions of the standard NEMA Type 1 enclosures supplied with Series 3120 Controllers are shown on page 2-4. These enclosures should not be used where a watertight, weatherproof, or explosion proof enclosure is required.

Model W8 enclosure (Figure 2-3) is designed for wall mounting, and Model F3 (Figure 2-5) is designed for free standing. Model U200 enclosure (Figure 2-4) can be either wall or floor mounted. If the U200 enclosure is to be wall mounted, use the holes in the lifting tabs and in the rear of the floor stands. If the U200 enclosure is to be floor mounted, bolt the enclosure to the floor using the 4 holes in the bottom of the floor stands.

CAUTION

- **DO NOT RESTRICT THE FLOW OF AIR TO THE ENCLOSURE INTAKE AND EXHAUST OPENINGS.**
- **NEVER MOUNT THE CONTROLLER IMMEDIATELY BESIDE OR ABOVE HEAT-GENERATING EQUIPMENT, OR DIRECTLY BELOW WATER AND STEAM PIPES.**

OPERATOR CONTROL STATION

Fincor Series SCS160 standard operator control station can be wall mounted using the two holes in the back of the station enclosure. See Figure 2-6 (page 2-4) for dimensions.

MOTOR

If the motor is to be foot-mounted, bolt it to a firm, flat foundation. If the foundation is not flat, use shims to prevent strain when tightening the bolts. If the motor is to be connected directly to a machine, be sure of correct alignment. Pulleys and couplings must slip freely onto the motor shaft. Refer to installation instructions supplied by the motor manufacturer.

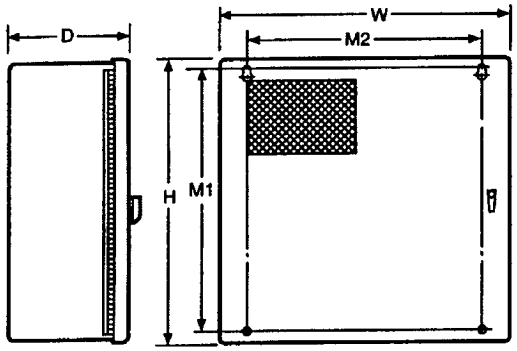
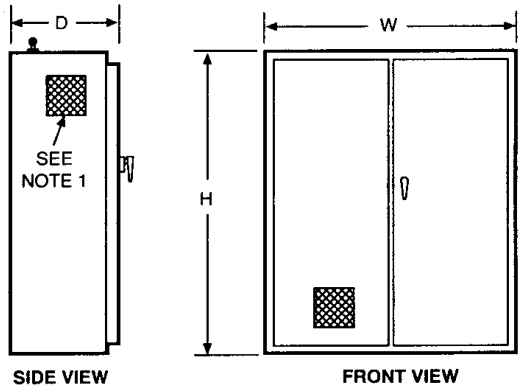


FIGURE 2-3. NEMA TYPE 1 VENTILATED ENCLOSURE, W8



NOTE 1: Vent on both ends of enclosure.

FIGURE 2-5. NEMA TYPE 1 VENTILATED ENCLOSURE, F3

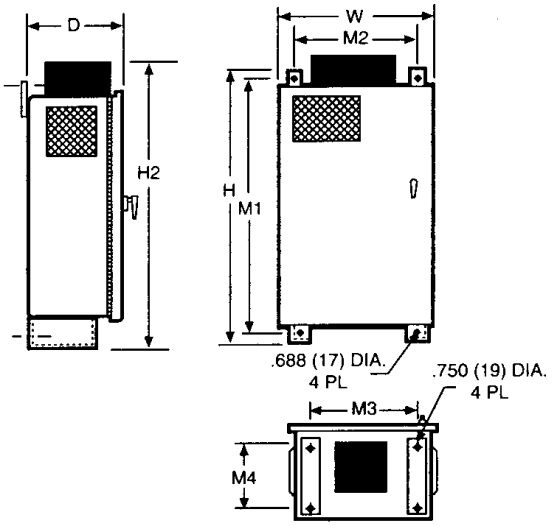


FIGURE 2-4. NEMA TYPE 1 VENTILATED ENCLOSURE, U200

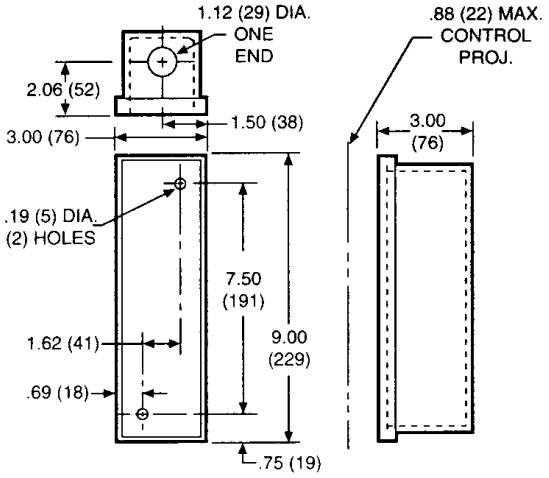


FIGURE 2-6. OPERATOR CONTROL STATION

Table 2-1: ENCLOSURE DIMENSIONS

ENCLOSURE	DIMENSIONS, Inches (mm)[a]							
	Enclosure				Mounting			
	H	H2[b]	W	D	M1	M2	M3	M4
W8 (Figure 2-3)	30.3 (770)	NA	30.3 (770)	12.0 (305)	28.5 (724)	25.0 (635)	NA	NA
U200 (Figure 2-4)	55.0 (1397)	62.0 (1575)	36.5 (927)	15.3 (389)	51.0 (1295)	32.0 (813)	33.5 (851)	11.0 (279)
F3 (Figure 2-5)	90.0 (2286)	NA	72.0 (1829)	25.5 (648)	NA	NA	NA	NA

a. Dimensions are for reference only.
b. With Option 1039 (Penthouse)

WIRING INSTRUCTIONS

Interconnection wiring is required from the AC line supply, motor, and operator controls to the controller.

WIRING PRACTICES

- All wiring must be sized and installed according to the National Electrical Code and all applicable local codes.

- **Do not use solid wire.** Intermittent and broken connections may occur if solid wire is used.

- Signal and control wiring refer to wiring for potentiometers, tachometer generators, encoders, transducers, and operator controls.

- Power wiring refers to wiring for the AC supply, motor armature and series field (if used), and motor shunt field. The power wiring must be sized for the rated currents listed on the controller identification label.

- Never run signal and control wiring in the same conduit with the power wiring. Maintain the separation between the signal and control wiring and the power wiring in the controller enclosure by at least 2 inches (5.08 cm). Electrical noise pickup on the signal wiring can cause erratic operation and controller damage.

- Low power control wiring (115 VAC) must be kept separated from all other power, control, and signal wiring.

- Multiconductor twisted cable (Alpha 5630B1801 or equal) is recommended for signal and control wiring.

- If shielded wire is used, shielded, twisted wire (Alpha 2422 - two conductor, 2423 - three conductor, 2424 - four conductor) is recommended for signal and control wiring. The shields must be connected to chassis ground (ground screw or terminal on controller panel or enclosure). The opposite ends of the shields must be taped. **Do not connect the shields at both ends.** Insulate all exposed shields to prevent accidental contact with high voltage.

CAUTION

METAL CHIPS FROM DRILLED CONDUIT HOLES IN THE ENCLOSURE CAN CAUSE SHORT CIRCUITS AND GROUNDS WHICH CAN DAMAGE THE CONTROLLER.

Power Wiring

Size the power wiring (AC line and motor) for the rated currents listed on the controller identification label. See “Controller Identification” on page 1-3. Also see Table 1-1 (page 1-1) and Table 9-2 (pages 9-2 and 9-3.

CAUTION

SEPARATE OVERCURRENT PROTECTION IS REQUIRED BY THE NATIONAL ELECTRICAL CODE. THE USER IS RESPONSIBLE FOR CONFORMING WITH THE NATIONAL ELECTRICAL CODE AND ALL APPLICABLE LOCAL CODES WHICH GOVERN SUCH PRACTICES AS WIRING PROTECTION, GROUNDING, DISCONNECTS, AND OTHER CURRENT PROTECTION.

Table 2-2 lists recommended lugs for connecting the AC line and motor armature and series field (if used) to the 3120M Module. Models 3120S and 3120C have terminals for connecting the line and motor; therefore, lugs are not needed.

Table 2-2: RECOMMENDED LUGS FOR POWER CONNECTIONS TO 3120M MODULES

MODULE MODEL	WIRE SIZE	LUG TYPE	
		CRIMP-ON T & B	COMPRESSION
3121M & 3122M	14	14RB-14	ILSCO TA-6-S FINCOR 104722101
	12	10RC-14	
	10	10RC-14	
	8	54130	
	6	54105	
	4	54106	ILSCO TA-2/0 FINCOR 104722102
	3	54107	
	2	54107	
	1	54108	
	1/0	54152	
(Contd on next page)			

Table 2-2: RECOMMENDED LUGS FOR POWER CONNECTIONS TO 3120M MODULES

MODULE MODEL	WIRE SIZE	LUG TYPE	
		CRIMP-ON T & B	COMPRESSION
3123M	2	54134	T & B 62235 FINCOR 104722103
	1	54148	
	1/0	54109	
	2/0	54110	
	3/0	54163	
	4/0	54112	
	250MCM	54174	
	300MCM	54179	
	350MCM	54115	
	400MCM	54116	
3124M	350MCM	54115	
	400MCM	54116	
	500MCM	54118	ILSCO TA-1000-2N FINCOR 104722104
	600MCM	54120	
	700MCM	54122	
	750MCM	54123	
	800MCM	54124	
	900MCM	54126	
	1000MCM	54128	
3125M[a]	4/0	54212	NA
	250MCM	54113	
3126M[a]	3/0	54266	NA
	300MCM	54114	
	400MCM	54116	
3127M[a]	4/0	54212	NA
	600MCM	54120	

a. Crimp-on lugs supplied with the module.

Grounding

The controller enclosure, controller panel, and chassis, in addition to the motor frame, must be connected to earth ground according to applicable electrical codes.

WARNING

NORMAL STRAY CAPACITANCE BETWEEN THE CONTROLLER HEAT SINKS AND POWER DEVICES AND THE AC LINE PROVIDES A HIGH IMPEDANCE SHOCK HAZARD. IN ADDITION, COMPONENT FAILURE CAN PROVIDE A LOW IMPEDANCE HIGH ENERGY SHOCK HAZARD. DO NOT APPLY POWER TO THE CONTROLLER IF THE CONTROLLER IS NOT GROUNDED. FAILURE TO OBSERVE THIS WARNING CAN CAUSE ELECTRIC SHOCK RESULTING IN PERSONAL INJURY OR LOSS OF LIFE.

AC LINE CONNECTIONS

Considerations

- Refer to the controller identification label and be sure the AC line voltage is within ±10% of the controller rating.

- The National Electrical Code requires that a three-pole disconnect switch or circuit breaker be installed in the AC supply lines to the controller, and that this disconnect be located within sight of the controller. Do not operate the controller until this code requirement has been met.

- Do not connect the controller to an AC line supply capable of supplying more short-circuit current than that listed in Table 2-3. Short-circuit current can be limited by using a line supply transformer at or less than the KVA listed in Table 2-3, page 2-9. However, do not size the transformer less than the KVA listed in Table 2-4, page 2-9. If short-circuit current cannot be limited to the value in Table 2-3, AC Line Reactors (Option 1074) should be used. See “Reactors, AC Line Inductors” on page 8-25.

Table 2-3: SHORT-CIRCUIT CAPACITY

HORSEPOWER RANGE		MAXIMUM SHORT-CIRCUIT CURRENT (SYMMETRICAL AMPERES)	MAXIMUM TRANSFORMER KVA
230V	460V		
5 - 30	5 - 60	10,000	100
40 - 75	75 - 150	10,000	200
100 - 125	200 - 250	14,000	300
NA	300 - 400	24,000	500
NA	500 - 1000	24,000	NA - Use Option 1074

Table 2-4: MINIMUM TRANSFORMER KVA FOR VOLTAGE MATCHING OR ISOLATION

RATED HORSEPOWER	5	7.5	10	15	20	25	30	40	50	60	75	100
MINIMUM TRANSFORMER KVA	7.5	11	15	20	27	34	40	51	63	75	93	118

RATED HORSEPOWER	125	150	200	250	300	400	500	600	700	800	900	1000
MINIMUM TRANSFORMER KVA	145	175	220	275	330	440	550	660	760	870	980	1100

- While not required, the use of an isolation transformer can provide the following advantages:

  1. Reduced risk of personal injury if high voltage drive circuits are accidentally touched.

  2. Provide a barrier to externally generated AC supply transients. This can prevent controller damage from abnormal line occurrences.

  3. Reduced risk of damaging current if the motor or motor wiring becomes grounded.

- The controller is not sensitive to phase rotation.

- The controller is protected from normal line transients and surges. However, to prevent problems from high-energy transients and large surges, observe the following:

  1. Be sure the line supply to the controller does not also feed large inductive loads. If this cannot be avoided, supply additional suppression to limit transients or surges to 150% of peak line voltage.

2. If the input supply to the controller comes directly from a transformer, place the circuit breaker or disconnect switch between the transformer secondary and the controller. If the power is switched in the transformer primary, transients may be generated which can damage the controller. See Table 2-2 (page 2-7) for minimum transformer KVA.

3. If power factor correction capacitors are required on the supply lines to the controller, contact Fincor for requirements. Incorrect use of power factor correction capacitors on the supply lines to the controller or on the wiring to the motor can damage the solid-state components in the controller.

- Model 3130S Controllers have a magnetic only, adjustable-trip circuit breaker which serves as a disconnect of the AC input supply, and provides automatic instantaneous trip protection from a peak load. Table 2-3 lists the interrupting ratings of the circuit breakers supplied in 3130S Controllers

Table 2-3: CIRCUIT BREAKER FAULT INTERRUPTING CAPACITY

MAXIMUM HORSEPOWER			CIRCUIT BREAKER DATA				
			TYPE	TRIP RANGE (AMPS)	CONTINUOUS RATING (AMPS)	INTERRUPTING RATING (SYMMETRICAL AMPS)	
230V	380V	460V				230V	460V
10	15	20	HMCP	115 - 170	70	100,000	65,000
30	50	60	HMCP	210 - 560	100	100,000	65,000

For the circuit breaker to qualify as a branch circuit protective device, its interrupting capacity must be coordinated with the capacity of the distribution system (feeder) supplying the drive. Since the controller circuit breaker is rated to protect the drive, it may not have sufficient capacity to protect the branch circuit from short circuit current. Optional Current Limiting Fuses (Option 1018) or an additional circuit breaker may be required ahead of the controller circuit breaker to protect both the drive and branch circuit.

Model 3130M Modules do not have input line circuit breakers so the module must be provided with AC supply protection by the user. Consult applicable electrical codes for requirements.

- Do not turn-on the AC supply to the controller until instructed to do so in the Start-up Instructions (Section III).

Connecting The Line Supply

1. Be sure the AC line supply is turned-off.

2. Connect the AC supply lines to Model 3120S and 3120C Controllers as shown in the drawings supplied with the controller. For 3120M Modules, connect the AC supply lines to the module line connection terminals. For terminal locations, see Figure 10-11 (page 10-13) for 3121M and 3122M Modules, Figure 10-12 (page 10-14) for 3123M Modules, or Figure 10-13 (page 10-15) for 3124M Modules. On 3125M, 3126M, and 3127M Modules, the line connection terminals are located on the heat sink of the SCR bridge. The controller is not sensitive to phase rotation.

3. If AC Line Reactors (Option 1074) are required, see “Reactors, AC Line Inductors” on page 8-25.

4. Do not turn-on the AC supply to the controller until instructed to do so in the Start-up Instructions (Section III).

MOTOR CONNECTIONS

Considerations

- Six wires are usually required to connect the motor to the controller: two for the armature and series field (if used), two for the shunt field, and two for the thermal switch.

  Controllers with armature reversing capabilities (Option 1004) normally require eight wires: two for the armature, two for the series field (if used), two for the shunt field, and two for the thermal switch.

- Series Field Lead S1 (if used) must have the same polarity as Shunt Field Lead F1. If Leads S1 and F1 have unlike polarity, speed instability may occur. If the controller has armature reversing capabilities (Option 1004), the motor must be connected to the controller so that the series field polarity does not change.

- Do not ground the motor wiring. Grounded motor wiring can cause controller damage.

- Do not connect an underrated motor (smaller than 20% of the HP rating of the controller) to the controller. An underrated motor may cause speed instability or loss of speed control.

- During startup, if motor rotation is opposite to that desired, turn-off the AC line supply, and interchange Armature Leads A1 and A2 at the motor connection box.

Connecting The Motor

1. Be sure the AC line supply is turned-off to the controller.

2. For 3120M Modules, connect the motor to the appropriate motor connection terminals on the module. For terminal locations, see Figure 10-11 (page 10-13) for Model 3121M and 3122M Modules, Figure 10-12 (page 10-14) for Model 3123M Modules, Figure 10-13 (page 10-15) for Model 3124M Modules, and Figure 10-14 (page 10-16) for Model 3125M, 3126M and 3127M Modules. The motor Armature Lead (+A1) connects to the module Shunt (SH1). However, Model 3122M Modules have two shunts. Therefore, if rated motor armature current is 36 amperes or less, connect Lead +A1 to the smaller of the two shunts. If rated armature current is more than 36 amperes, connect Lead +A1 to the larger shunt.

   For 3120S and 3120C Controllers, connect the motor as shown on the drawings supplied with the controller.

3. If a motor thermal switch is used, connect it in the controller run/stop circuit so a Stop or Emergency Stop function occurs if the thermal switch trips. See Figure 10-2 (page 10-3) and Figure 10-3 (page 10-4) for typical thermal switch connections.

OPERATOR CONTROL CONNECTIONS

Operator controls include pushbuttons, switches, relays, contactors, and speed control devices (e.g., potentiometers and transducers). The quantity and type of controls used depend on application requirements.

1. For 3120S and 3120C Controllers, connect the operator controls to the controller as shown on the drawings supplied with the controller.

   For 3120M Modules, the operator controls and magnetic control logic are usually supplied by the user. Figure 10-2 (page 10-3) shows typical logic for Run/ Stop, Jog Forward, Crawl, and Preset Speed. Figure 10-3 (page 10-4) shows typical logic for Run Forward, Run Reverse, Stop, Jog Forward, Jog Reverse, Crawl, and Preset Speed. Also see Figure 10-1 (page 10-2) for typical Run Forward, Run Reverse, Stop, and armature reversing connections. Use the appropriate drawing as a guide and connect the operator controls and magnetic control logic to the module.

2. If a Fincor Series SCS160 remote operator control station is used, refer to the instruction sheet supplied with the station for wiring and connection diagrams.

Note: Be sure the 115 VAC supply to Terminals 1 and 2 (neutral) on the relay/interface board is interlocked so that the supply is applied at the same time or after the AC line supply is applied to the 3120M Module. If the 115V supply is applied before the line supply, the phase loss circuit may prevent the controller from operating.

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