

**INSTRUCTION SHEET D2-3171  
Expanded Cabinet Kit**

**Model 1EX4000**

**For use with 1-20 HP 230, 460, and 575 VAC GP2000 A-C V\*S® Drive Controllers**

**DANGER**

**ONLY QUALIFIED ELECTRICAL PERSONNEL FAMILIAR WITH THE CONSTRUCTION AND OPERATION OF THIS EQUIPMENT AND THE HAZARDS INVOLVED SHOULD INSTALL, ADJUST, OPERATE, AND/OR SERVICE THIS EQUIPMENT. READ AND UNDERSTAND THIS MANUAL IN ITS ENTIRETY BEFORE PROCEEDING. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN SEVERE BODILY INJURY OR LOSS OF LIFE.**

**DESCRIPTION**

The products described in this instruction sheet are manufactured and/or distributed by Reliance® Electric Industrial Company.

The Expanded Cabinet Kit provides a convenient means to mount the GP2000 controller and its kits within the same cabinet. The controller mounts in the left-hand side of the enclosure, and the kits mount in the channel on the right-hand side (See Figure 1). A factory-installed inverter Bypass option is also available. (See Figure 9A and pages 13-14 for details.)

Table 1 lists the kits that require the use of the Expanded Cabinet Kit.

Table 1. Controller Kits.

Description	Model	Instruction Sheet
Pressure-to-Electrical Transducer	1PE4020	D2-3175
Output Contactor <sup>(1)</sup> 230 V 1/4 thru 10 HP 460 V 1/4 thru 20 HP 575 V 3 thru 20 HP	1CN4020 1CN4020 1CN4020	D2-3177 D2-3177 D2-3177
RPM A-C Blower Motor Protection <sup>(2)</sup>	1BM4000	D2-3174
Main Input Circuit Breaker 230 V 1/4 thru 10 HP 460 V 1/4 thru 20 HP	1CB4020 1CB4020	D2-3173 D2-3173
Motor Overload 230 V 1/4 thru 10 HP 460 V 1/4 thru 20 HP	1ML2010 1ML4020	D2-3172 D2-3172
Dynamic Braking 230 V 1/4 thru 5 HP (UL) 230 V 1/4 thru 5 HP (CSA) 230 V 7-1/2 thru 10 HP (UL) 230 V 7-1/2 thru 10 HP (CSA)  460 V 7-1/2 thru 10 HP (UL) 460 V 7-1/2 thru 10 HP (CSA) 460 V 15 thru 20 HP (UL) 460 V 15 thru 20 HP (CSA)  575 V 3 thru 10 HP (CSA) 575 V 15 thru 20 HP (CSA)	2DB2005 2DC2005 2DB2010 2DC2010  2DB4010 2DC4010 2DB4020 2DC4020  1DC5010 1DC5020	D2-3178 D2-3178 D2-3178 D2-3178  D2-3179 D2-3179 D2-3179 D2-3179  D2-3180 D2-3180

(1) Includes the Remote Motor Interface Card.

(2) Mounting the RPM A-C Blower Motor Protection Kit may be mutually exclusive with other kits within the Expanded Cabinet. Contact your Reliance Electric Sales Office for assistance.

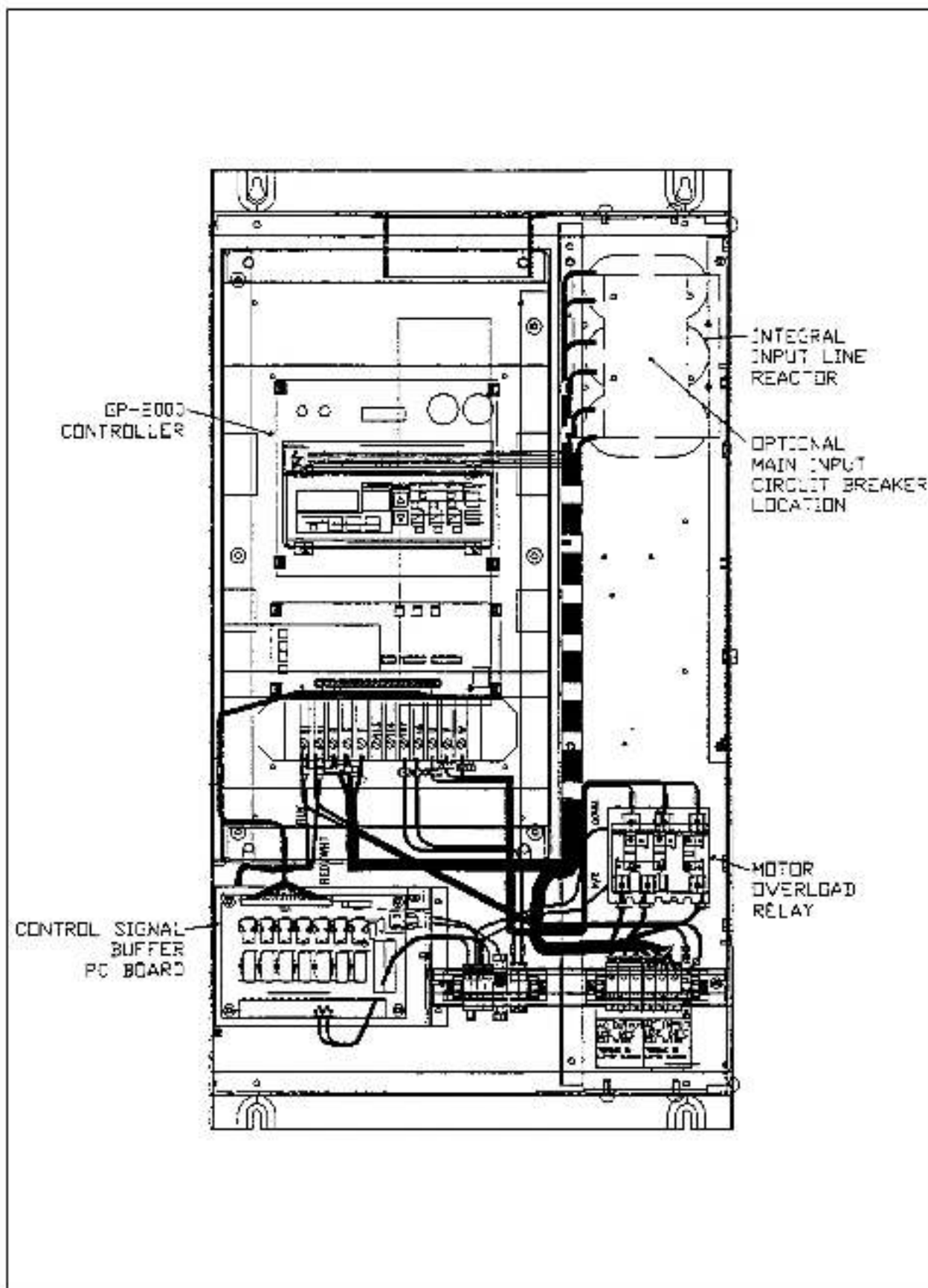


Figure 1. Typical Expanded Cabinet Component Locations (20 HP shown).

## MODIFICATIONS

Remote Analog Meters  
115 VAC Control Interface  
Magnetic Bypass

**Note:** The Bypass factory modification consists of two magnetic contactors, a motor overload, and separate inverter input disconnect. See "Expanded Cabinet with Bypass Modification" on page 13 for additional details.

## INSTALLATION

### DANGER

**THE USER IS RESPONSIBLE FOR CONFORMING WITH THE NATIONAL ELECTRICAL CODE AND ALL OTHER APPLICABLE LOCAL CODES. WIRING PRACTICES, GROUNDING, DISCONNECTS AND OVERCURRENT PROTECTION ARE OF PARTICULAR IMPORTANCE. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN SEVERE BODILY INJURY OR LOSS OF LIFE.**

### DANGER

**DO NOT INSTALL MODIFICATION KITS WITH POWER APPLIED TO THE UNIT. DISCONNECT AND LOCK OUT INCOMING POWER BEFORE ATTEMPTING SUCH INSTALLATION. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN SEVERE BODILY INJURY OR LOSS OF LIFE.**

### Select the Expanded Cabinet Mounting Location

1. Select the controller location. Verify that the controller can be kept clean, cool, and dry.
2. Check that the controller is away from oil, coolant, and other airborne contaminants.

**CAUTION:** Salt, chlorine, other corrosive gases and/or liquids must be avoided. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

3. Check that the temperature in the controller vicinity is maintained between  $-10^{\circ}\text{C}$  to  $40^{\circ}\text{C}$  ( $14^{\circ}\text{F}$  to  $104^{\circ}\text{F}$ ).
4. Check that relative humidity is between 5 and 95% (non-condensing).
5. Do not install above 3300 feet (1000 meters) without derating. For every 300 feet (91.4 meters) above 3300 feet, derate the current rating

1%. Consult your Reliance Electric Sales Office for operation above 10,000 feet.

### Mount the Expanded Cabinet

1. In the location selected, using the provided lifting holes (see Figure 2), mount the expanded cabinet controller vertically with the input/output terminals at the bottom.
2. Make sure surrounding components do not hinder service access. See Figure 2 for mounting dimensions.
3. Provide adequate clearance for air ventilation:
  - At least 2 inches from the sides and 4 inches from the top and bottom of the controller to adjacent non-heat producing equipment.

**Note:** For servicing, you should leave approximately 10 inches clearance on the right side of the controller.

- At least 2 inches from the side and 10 inches from the top and bottom of adjacent controllers. When mounting three or more controllers, offset them for best air movement. Do not mount the controllers in a vertical stack.

### Convert the NEMA 1 GP2000 Controller to a Chassis Controller

The standard controller is shipped as a NEMA 1 enclosed unit. Convert it to a chassis controller as follows:

1. Remove the front cover from the controller.
2. Remove the bottom plate with conduit provisions from the controller.
3. Remove the plate that covers the ventilation slots at the top of the cover by removing the retaining pins or attachment screws.

### Mount the Chassis Controller in the Expanded Cabinet

**CAUTION:** Complete all drilling, cutting, welding, etc., before mounting the controller in the Expanded Cabinet. During installation, protect the controller and any kits from metal chips, weld splatters, and other debris. Failure to observe these precautions could result in damage to, or destruction of, the equipment.

1. Locate the controller on the left-hand side in the Expanded Cabinet (Figure 1).
2. Attach two controller mounting brackets to the back of the cabinet using four M6 x 10mm TTS screws provided. Select the mounting brackets according to controller horsepower as detailed in Table 2.

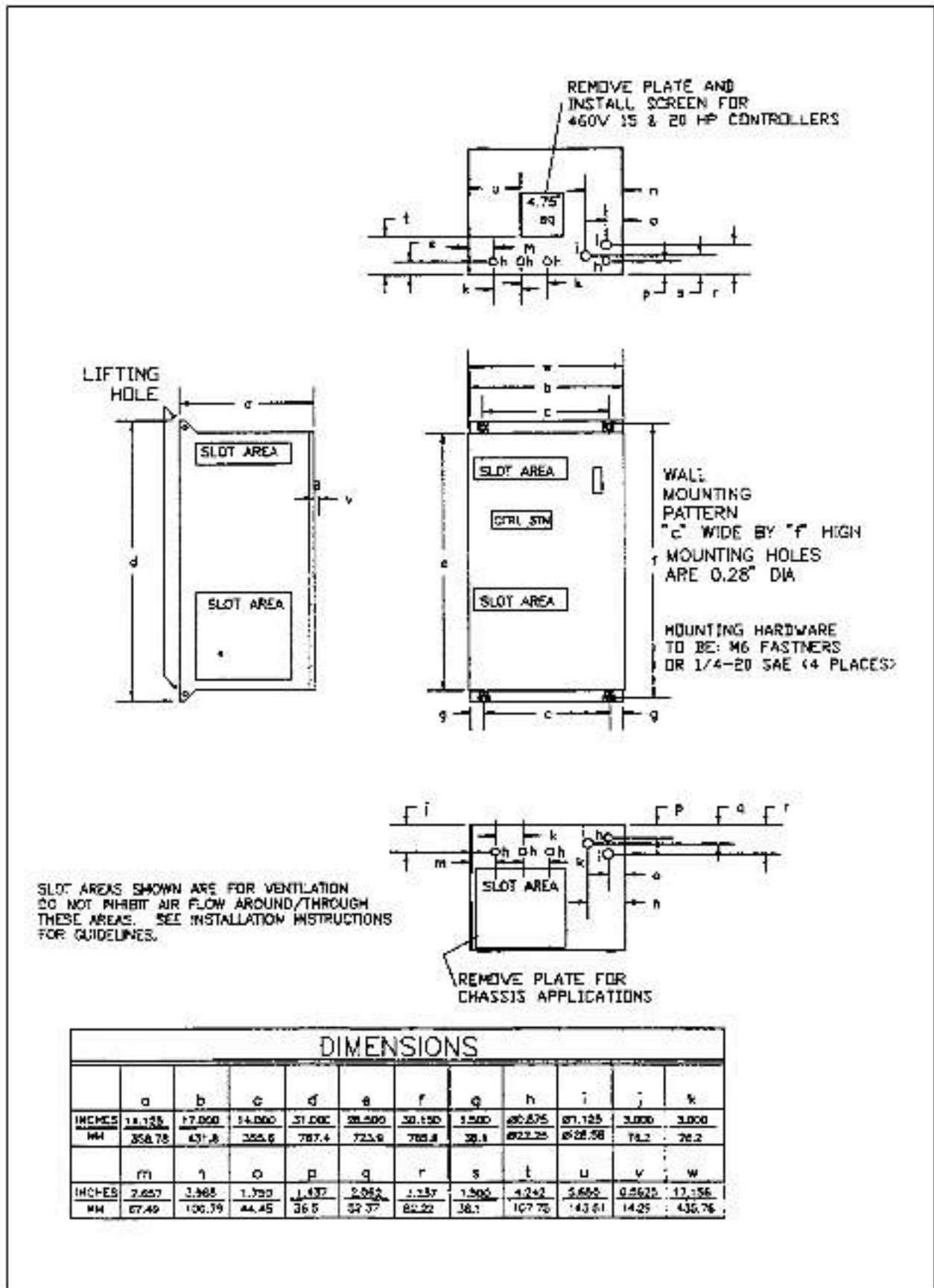


Figure 2. Expanded Cabinet Physical Dimensions.

3. Mount the controller to the mounting brackets using four M6 x 8mm HHMS screws provided.
4. For 460-volt 15 and 20 HP units, remove the plate from the top of the Expanded Cabinet. Add the screen in place of the plate. (See Figure 3.) The heatsink opening for the 15 and 20 HP controllers should align with the screened opening.

**Table 2. Controller Mounting Bracket Selection.**

Controller Horsepower	Mounting Bracket Part Number (2 brackets)
1 thru 5 HP	708205-49S
7-1/2 thru 10 HP 15 thru 20 HP	708205-49R

### Ground the Controller

**DANGER**

**THE USER IS RESPONSIBLE FOR MEETING ALL CODE REQUIREMENTS WITH RESPECT TO GROUNDING ALL EQUIPMENT. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN SEVERE BODILY INJURY OR LOSS OF LIFE.**

1. Remove the controller cover if you have not already done so.
2. Run a suitable equipment grounding conductor **unbroken** from the controller ground terminal (Figure 3) to the grounding electrode conductor.
3. Connect a suitable equipment grounding conductor to the motor frame, the remote control station (if used), the transformer (if required), and the controller enclosure. Run each conductor unbroken to the grounding electrode conductor (earth ground).
4. When required by code, the 24 VDC Stop/Start circuit can be grounded. Run a suitable grounding conductor unbroken from terminal 19 to the controller ground terminal. (See Figures 3 and 4.)

### Connect Expanded Cabinet Wiring to the Controller

1. Connect line reactor lead wires marked 181, 182, and 183 to controller input terminals R, S, and T respectively. Refer to Figure 4 for wiring detail.

2. Connect Control Signal Buffer transformer to the terminal board on the GP2000 controller for either 230-, 460-, or 575-volt control power supply as follows:

**DANGER**

**ALL TRANSFORMER PRIMARY TAPS HAVE LIVE VOLTAGE WHEN POWERED. IF THE TRANSFORMER IS USER WIRED FOR OTHER THAN FACTORY VOLTAGE, THE USER IS RESPONSIBLE FOR PROPERLY SHIELDING THE UNUSED TAP LEADS TO PREVENT ACCIDENTAL CONTACT WITH LIVE VOLTAGE. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN SEVERE BODILY INJURY OR LOSS OF LIFE.**

- a. For 230-volt GP2000, connect transformer black wire to R1 on the controller. Remove the insulator from transformer green/white wire and connect the wire to S1 on the controller. Place the insulator on the unused transformer wire.
  - b. For 460-volt GP2000, connect transformer black wire to R1 on the controller. Remove the insulator from transformer red/white wire and connect the wire to S1 on the controller. Place the insulator on the unused transformer wire.
  - c. For 575-volt GP2000, connect transformer black wire to R1 on the controller. Remove the insulator from transformer black/white wire and connect the wire to S1 on the controller. Place the insulator on the unused transformer wire.
3. Using internal wire harness 601, 602, 603, connect controller output terminals U, V, and W to output terminals 601A, 602A, and 603A on the Expanded Cabinet terminal board. Refer to Figures 4 and 5 for wiring detail.
  4. Using wire harness 811699-56R, connect terminals 45 and 147 on the controller to the corresponding Dynamic Braking terminals on the Expanded Cabinet terminal board. Refer to Figures 4 and 5 for wiring detail.
  5. Attach the plug end of harness 708205-45R to connector TB12 on the Control Signal Buffer PC Board (CN47). Attach the wires on the other end of the harness to Regulator Board connector 1TB. Refer to Figure 6 for wiring detail.

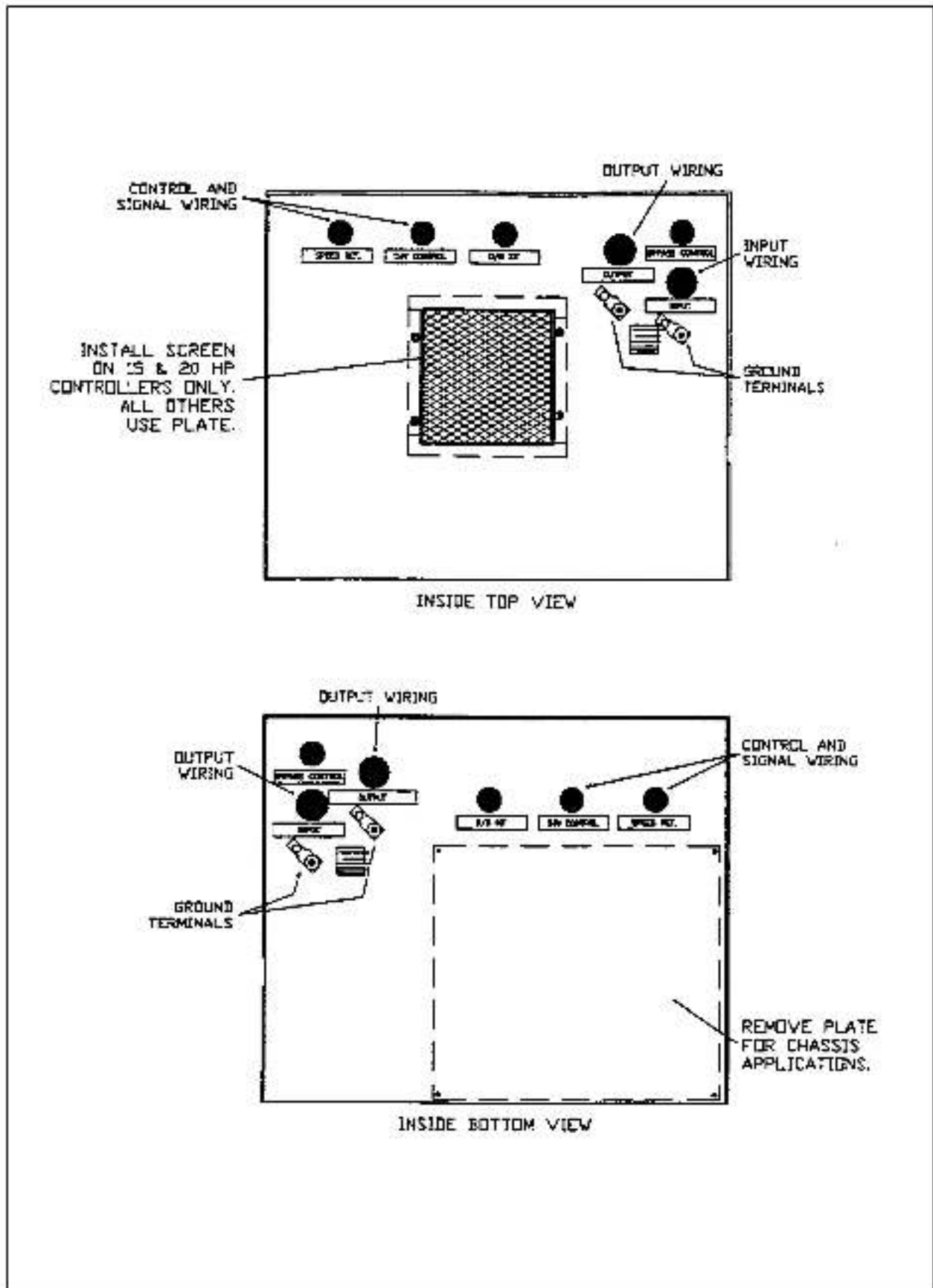


Figure 3. Expanded Cabinet Wiring Entrance Locations and Ground Terminals.

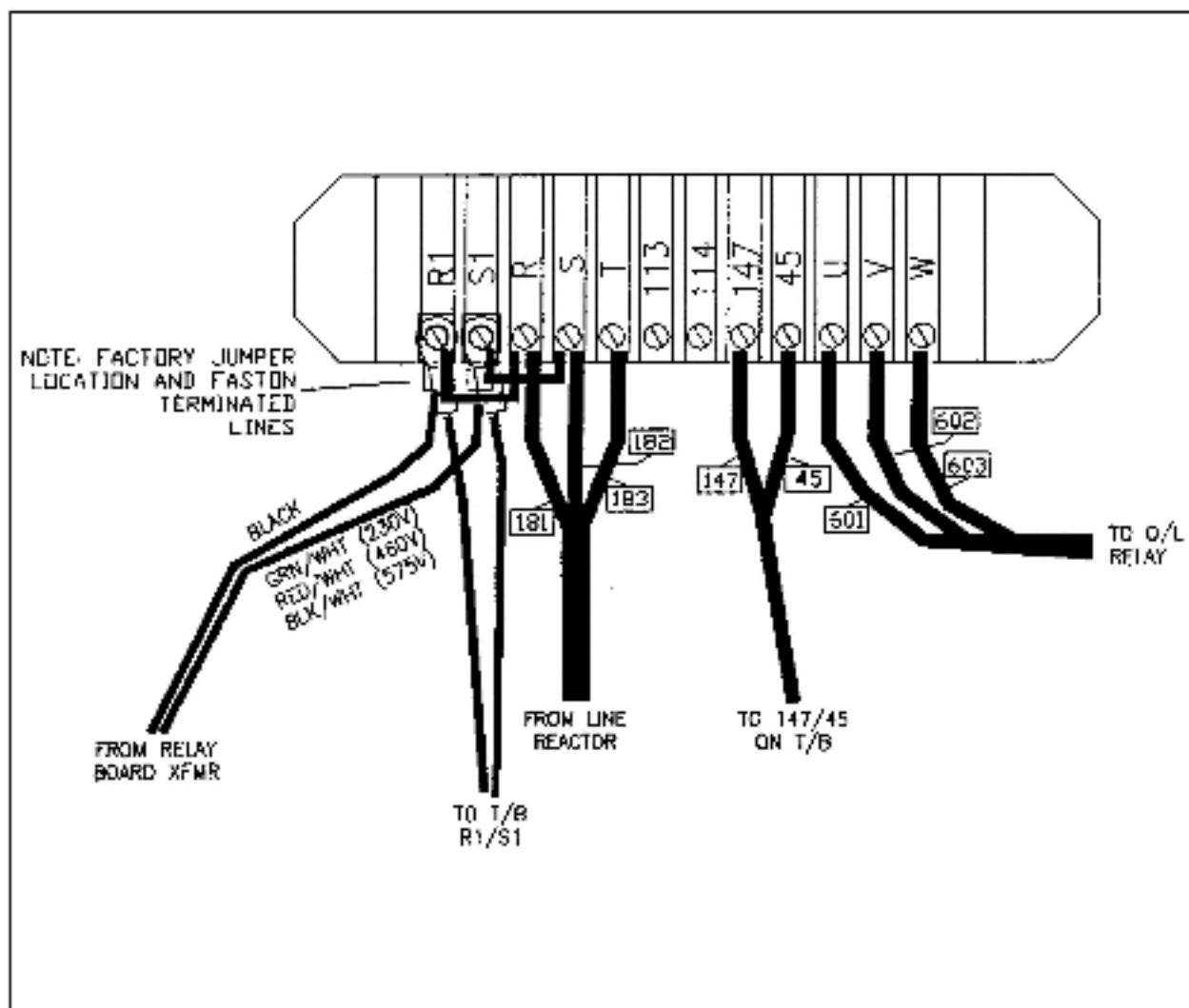


Figure 4. GP2000 Terminal Board Wiring Locations.

### Install A-C Input Branch Circuit Protection

**DANGER**

**THE NEC REQUIRES THAT UPSTREAM BRANCH CIRCUIT PROTECTION BE PROVIDED TO PROTECT INPUT POWER WIRING. INSTALL THE RECOMMENDED RATING IN TABLE 3 OR 4. IF THE FUSE RATING IS INCREASED DUE TO LOADS REQUIRING HIGH STARTING CURRENTS, DO NOT EXCEED THE MAXIMUM ALLOWABLE RATINGS IN TABLE 3 OR 4. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN SEVERE BODILY INJURY OR LOSS OF LIFE.**

**CAUTION:** The Input Fuse Ratings listed in Table 3 (up to 5 HP) are applicable for one drive per branch circuit. No other load can be applied to the fused branch circuit. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

1. Install branch circuit protection according to the NEC.
2. Size the branch circuit according to Table 3 or 4.

### Install Power Wiring

1. Route the wiring through the openings indicated on the bottom or top of the Expanded Cabinet. Refer to Figure 3 for conduit hole opening locations.
2. Connect user-supplied protected input power to terminals R', S', and T'. Refer to Figure 5 for location.

3. Normally, control power is supplied internally through two factory-installed jumpers between R and R1 and S and S1. If control power is user-supplied from an external source, connect this source to R1 and S1 on the terminal board. Re-

move the two factory-installed jumper wires between terminals R and R1 and S and S1 on the GP2000 controller. Refer to Figures 4 and 5 for wiring detail.

**Table 3. A-C Input Line Branch Circuit Protection with Three-Phase Input.**

Controller Horsepower	Controller 3-Phase Input Volts	Input Current (Amps)	Recommended Input Fuse Rating		Max Allowable Input Fuse Rating	
			UL Class	Rating (Amps)	UL Class	Rating (Amps)
1/4 to 1	230	5.3	RK5	8	RK5	10
2	230	8.8	RK5	12	RK5	15
3	230	12.5	RK5	17.5	RK5	20
5	230	19.6	RK5	25	RK5	30
7-1/2	230	28.2	RK5	40	RK5	50
10	230	38.8	RK5	50	RK5	60
1/4 to 1	480	2.5	RK5	5	RK5	6
2	480	4.2	RK5	6	RK5	8
3	480	6.4	RK5	8	RK5	12
5	480	9.9	RK5	15	RK5	20
7-1/2	480	13.4	RK5	17.5	RK5	20
10	480	17.2	RK5	25	RK5	30
15	480	25.4	RK5	35	RK5	40
20	480	32.7	RK5	45	RK5	50
3 to 5	575	7.5	RK5			
7-1/2 to 10	575	14.5	RK5			
15 to 20	575	27.9	RK5			

**Table 4. A-C Input Line Branch Circuit Protection with Single-Phase Input.**

Controller Model Number	Applicable Horsepower Range	Controller 1-Phase Input Volts	Input Current (Amps)	Recommended Input Fuse Rating		Max Allowable Input Fuse Rating	
				UL Class	Rating (Amps)	UL Class	Rating (Amps)
2GU21001	1/4 to 1/2	230	4.6	RK5	8	RK5	10
2GU21002	1	230	9.1	RK5	12	RK5	15
2GU21003	1-1/2	230	12.1	RK5	17.5	RK5	20
2GU21005	2	230	15.2	RK5	20	RK5	25
2GU21007	3	230	21.6	RK5	30	RK5	35



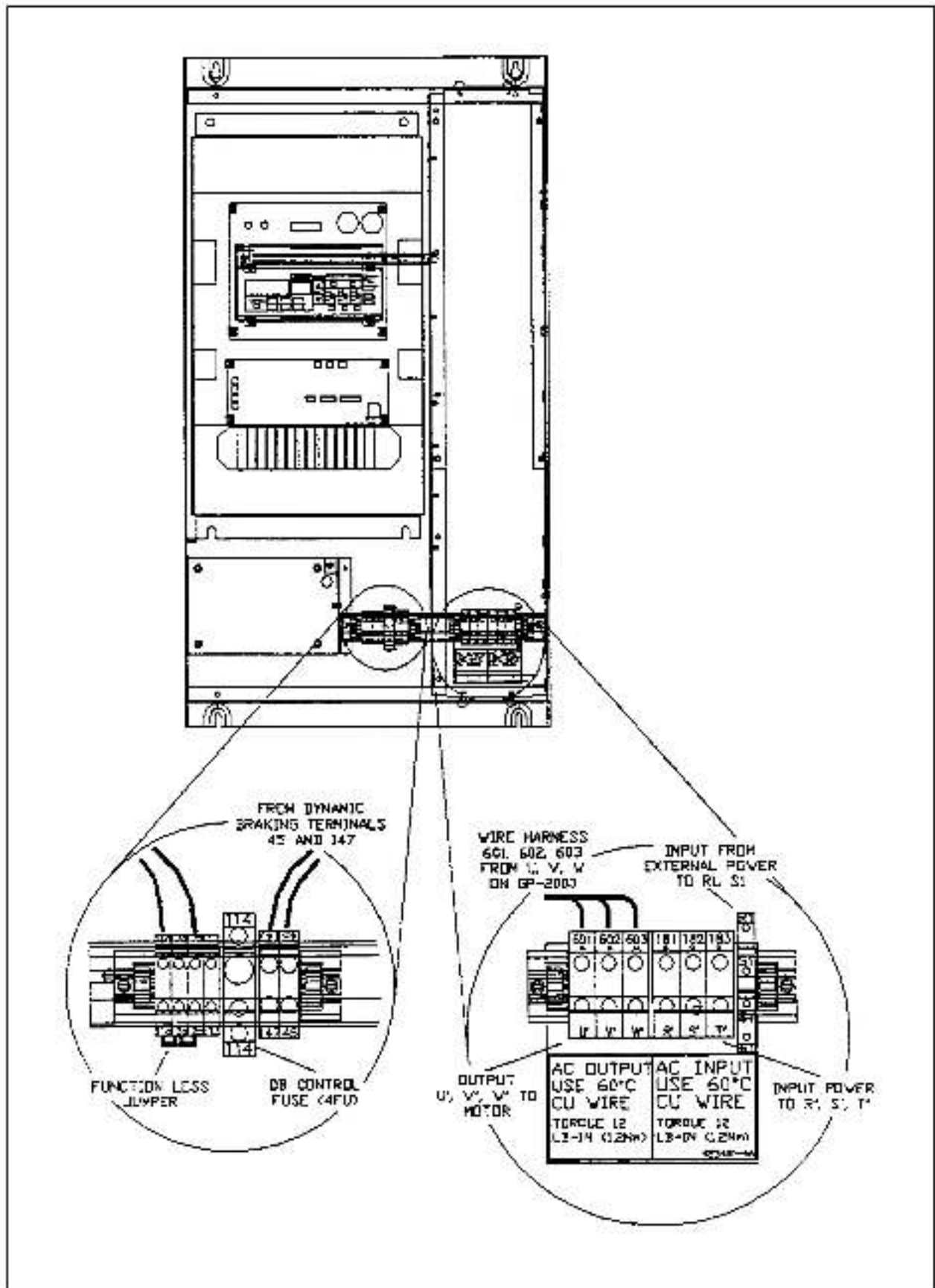


Figure 5. Expanded Cabinet DIN Rail Terminal Board Wiring Locations.

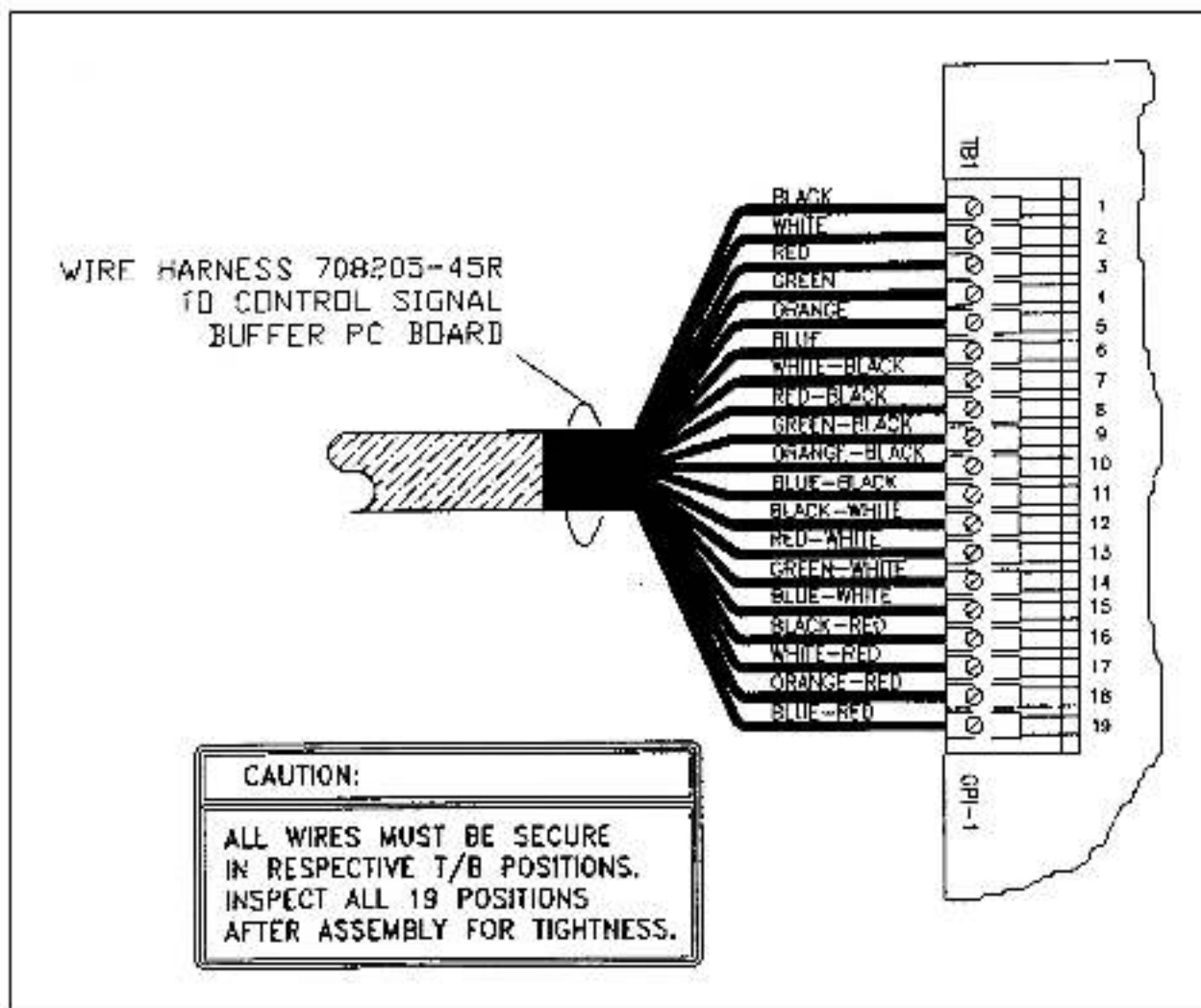


Figure 6. Control Signal Buffer PC Board to Regulator Board Wiring Locations.

### Install Control and Signal Wiring (If used)

1. For 24 VDC control and signal wiring, use twisted wire having two to three twists per inch. If you use shielded twisted pair wire rather than twisted wire, the shields should not attach to any ground point; they should "float."

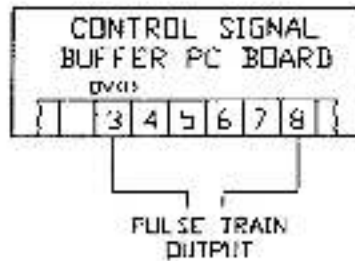
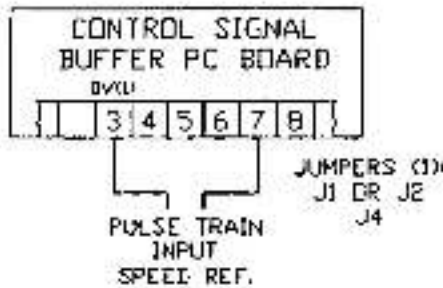
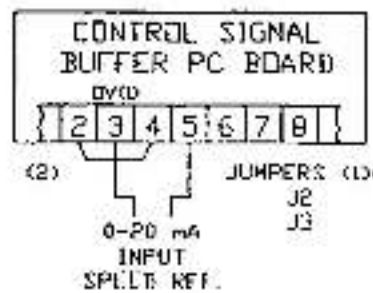
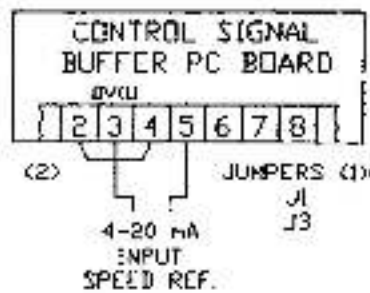
**Note:** The signal wiring is connected to the Control Signal Buffer PC Board, not the controller regulator board. All customer interlocks shall be suitable for operation with 24-volt, 40 millamp signals (standard contacts).

2. For distances of 1,000 feet or less, use a minimum of #22 AWG. For distances of more than 1,000 feet, contact your Reliance Electric Sales Office.

### WARNING

**THE FACTORY-INSTALLED JUMPER ACROSS TERMINALS 11A AND 12A MUST BE REMOVED WHEN FUNCTION LOSS INPUT OR INTERLOCKS ARE USED SO THESE CONTACTS WILL OPEN TO STOP THE CONTROLLER. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY.**

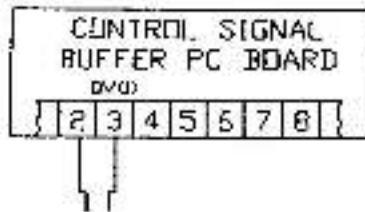
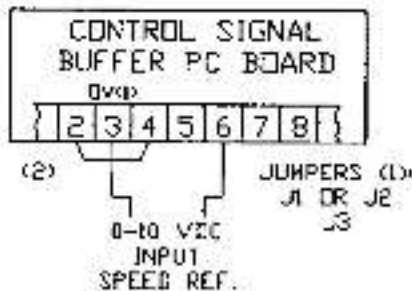
3. Route user-supplied 24 VDC interlock and function loss wiring (if used) through a center opening (24 VDC control) in the bottom of the Expanded Cabinet. Remove the factory-installed jumper across terminals 11A and 12A. Refer to Figure 5.
4. Route external 120 VAC control wiring (if used) through the Bypass Control openings indicated on Figure 3 in the bottom of the Expanded Cabinet in separate steel conduit to eliminate electrical noise pick-up. The conduit can be rigid or flexible armored steel.



FREQ RANGE: 0-97,656 Hz  
 PULSE AMPLITUDE: 0 TO +12 V  
 PULSE WIDTH MIN INPUT:  
 2.5μSEC (HIGH OR LOW LEVEL)

JUMPERS (1):  
 J1 OR J2  
 J4 WITH PULSE TRAIN  
 INPUT SPEED REF.  
 J3 WITH ANY INPUT SPEED  
 REF. BUT PULSE TRAIN

FREQ RANGE: 0-97,656 Hz  
 PULSE AMPLITUDE: 0 TO +12 V  
 PULSE WIDTH OUTPUT=50% DUTY  
 (TYPICAL)



FROM CURRENT/VOLTAGE  
 REFERENCE PC BOARD  
 TERMINALS 3, 4.  
 DISREGARD ALL JUMPERS ON  
 THE CONTROLLER WHEN  
 USING THIS KIT.

PRESSURE TO ELECTRICAL  
 TRANSDUCER CONNECTION  
 (IF KIT JPC4020 IS USED)

(1) SEE FIGURE 3-2 IN  
 GP-2000 I/M FOR  
 LOCATION ON  
 REGULATOR PCB

(2) LOCAL CONTROL REQUIRES  
 JUMPER BETWEEN TERMINALS  
 2 AND 4 FOR PROCESS  
 CONTROL OPERATION

Figure 7. Process Control Speed Reference and Pulse Train Wiring.

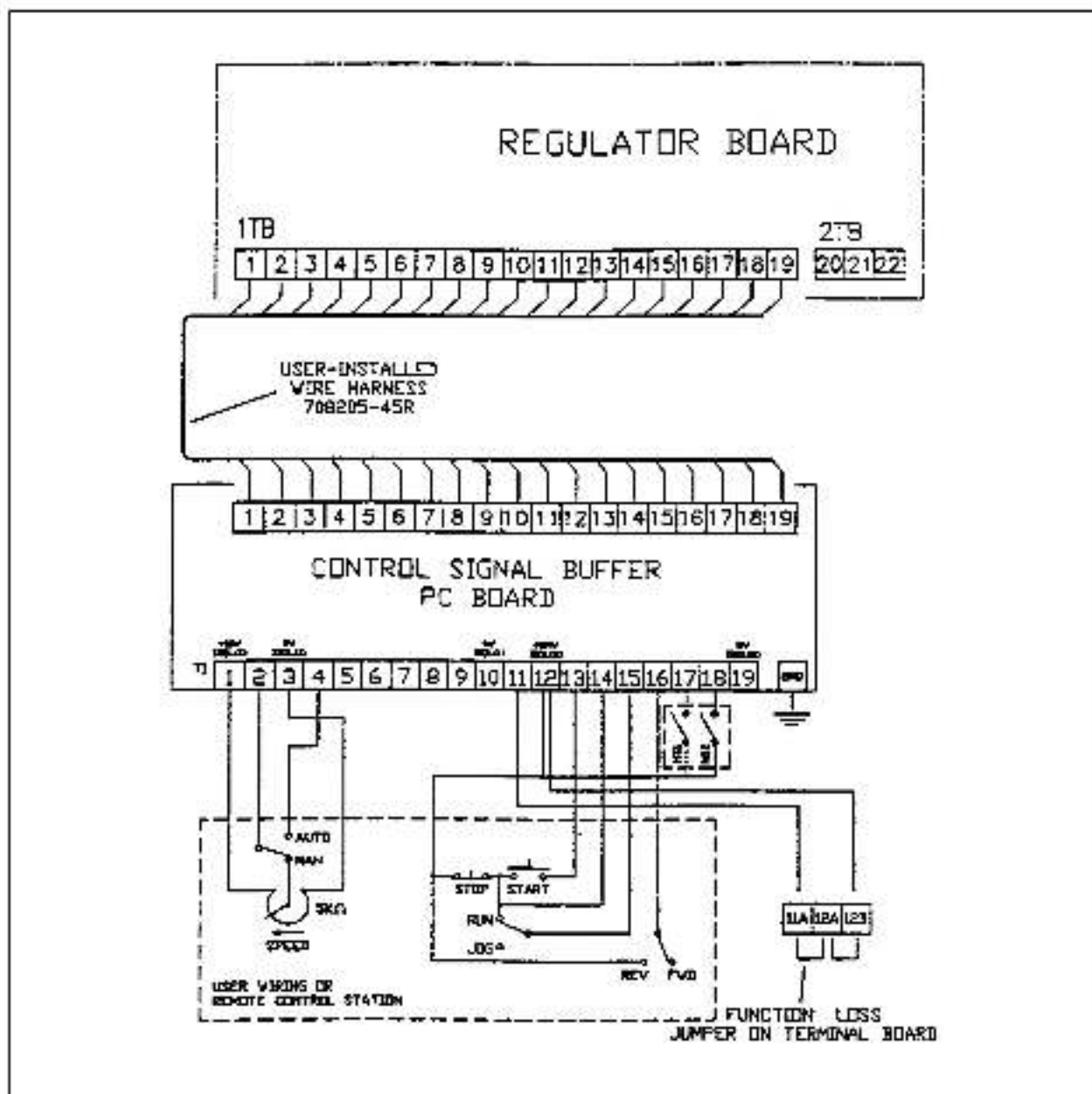


Figure 8. Typical Remote Control Wiring.

5. Do not route any 24 VDC signal wire through junction or terminal boxes that contain power or control wire.
6. Do not route any signal wire in close proximity to devices producing external magnetic fields.
7. Auto Mode: Install the process signal wiring (if used) as indicated in Figure 7.

**Note:** The controller can be operated in any of four modes. See Table 6.

8. Remote Mode: Install the control signal wiring (if used) as indicated in Figure 8.

### Connect the Motor

1. Route the leads through the openings indicated in the bottom of the Expanded Cabinet. Refer to Figure 3 for location.
2. Connect motor leads to terminals U', V', and W' on the terminal board. Refer to Figure 5 for wiring detail.
3. Replace the cabinet cover.
4. Turn power ON.

**Table 5. Replacement Parts for Expanded Cabinet (without Optional Bypass Modification).**

Quantity	Description	Reliance Part Number
1	Control Signal buffer PC Board Harness	708205-45R
1	Control Signal Buffer PC Board to Terminal Board Harness	611899-63R
1	R1, S1 Harness	611899-57R
1	Line Reactor	608895-54A
1	CSB PC Board	0-55325-49
1	CSB Board Transformer	708205-31R
2	Controller Mounting Bracket	803432-35R
2	Controller Mounting Bracket (1 to 5 HP)	708205-49S
2	Controller Mounting Bracket (7-1/2 to 20 HP)	708205-49R
1	Terminal Board Assembly	708205-39R
1	4FU Fuse – Dynamic Braking Kit	64876-21T
1	Wiring Diagram	30380-3

**Table 6. GP2000 Operating Modes.**

Mode	Control Interface	Speed Reference
Local Manual	Keypad	Speed increment/decrement keys
Local Auto	Keypad	Process Signal
Remote Manual	Terminal Board	Speed pot connected to terminal board
Remote Auto	Terminal Board	Process Signal

**Table 7. Additional Replacement Parts for Optional Bypass Modification.**

Quantity	Description	Reliance Part Number
1	Transformer	417155-SC
1	Bypass contactor	705310-34A
1	Inverter contactor	705310-32A
1	Overload relay	704263-3A
2	230V primary fuses	64876-64D
2	180V primary fuses	61676-61B

## EXPANDED CABINET WITH BYPASS MODIFICATION

The Optional Bypass modification is required in many Expanded Cabinet HVAC applications. This option is composed of two power contactors; 115 VAC control transformer; a three-position switch to select INVERTER, OFF, or BYPASS operation; and interlocking auxiliary contacts to ensure proper operation. These components are factory installed when this option is included.

### DANGER

**THIS UNIT MAY BE FED BY EXTERNAL POWER SUPPLIES. DO NOT ASSUME THAT IT IS SAFE TO WORK ON INTERNAL COMPONENTS WHEN ONLY THE "MAIN" POWER SOURCE IS DISCONNECTED. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN SEVERE BODILY INJURY OR LOSS OF LIFE.**

Bypass enables the user to operate the motor directly off the user-supplied power line while disconnecting the inverter portion of the controller. Refer to Figures 9A and 9B for Bypass modification details.

### Start the Expanded Cabinet Drive with Bypass

In addition to the Installation Instructions found in Sections 3 and 4 of GP2000 Instruction Manual D2-3166, the following procedures should be performed prior to operation.

**CAUTION:** Insure proper motor rotation in Inverter and Bypass modes. When the Forward/Reverse function is enabled, motor rotation in "Bypass" must be the same as motor rotation in "Forward." Failure to observe this precaution could result in damage to, or destruction of, the equipment.

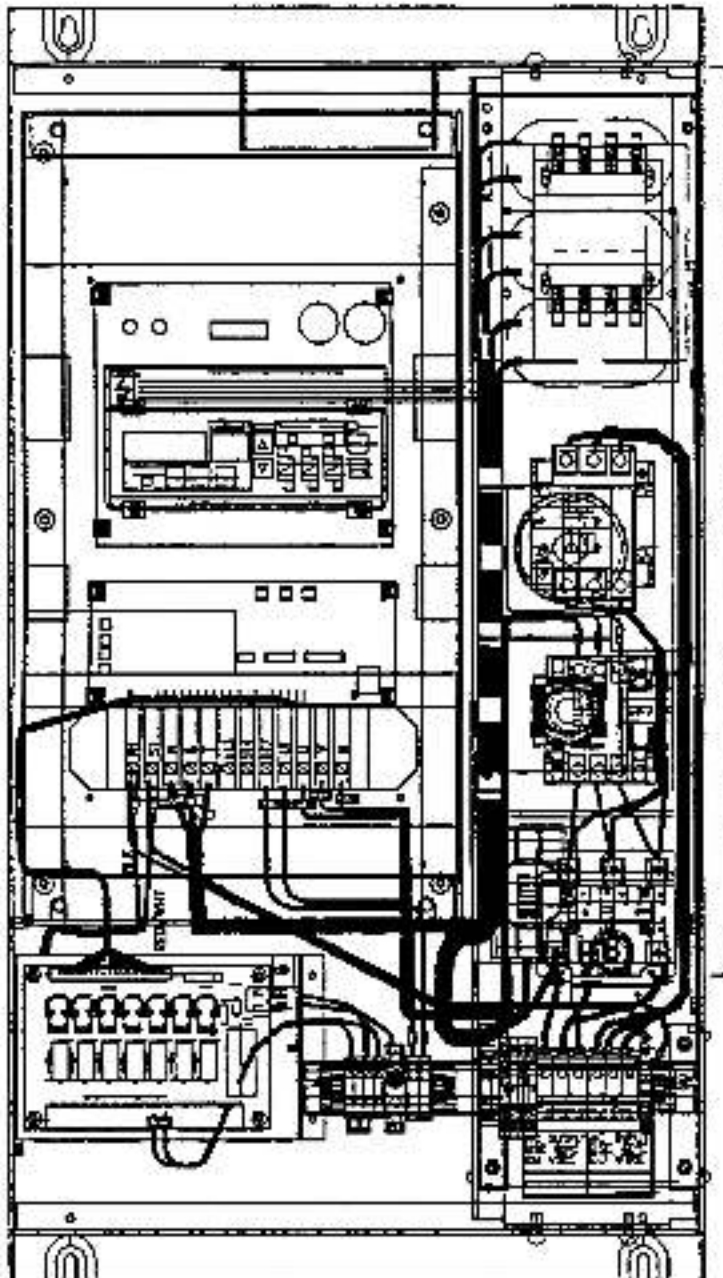
1. Verify that power wiring has been properly installed to give desired direction of rotation in the forward inverter mode. See pages 4:3 - 4:5 in Instruction Manual D2-3166 for details of this procedure.
2. Turn the power OFF.
3. Switch to Bypass.

4. Turn the power ON.
5. If the direction of rotation is correct, go to Instruction Manual D2-3166 and continue "Start the Drive" procedure. If shaft rotation is incorrect, proceed to Step 6.
6. Turn the power OFF.

#### DANGER

**THIS EQUIPMENT IS AT LINE VOLTAGE WHEN A-C POWER IS CONNECTED TO THE CONTROLLER. DISCONNECT ALL UN-GROUNDED CONDUCTORS OF THE A-C POWER LINE FROM THE CONTROLLER. AFTER POWER IS REMOVED, VERIFY WITH A VOLTMETER AT TERMINALS 147(+) AND 45(-) THAT THE D-C BUS CAPACITOR(S) IS DISCHARGED BEFORE TOUCHING ANY INTERNAL PARTS OF THE CONTROLLER. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN SEVERE BODILY INJURY OR LOSS OF LIFE.**

7. Reverse any two of the three incoming power leads (R', S', T'). Return to Step 4 to verify proper rotation direction. Refer to Figure 11 for Bypass wiring detail.



BYPASS CHANNEL  
 WITH POWER  
 CONTACTORS,  
 INTERLOCKING  
 AUXILIARY CONTACTS,  
 SELECTOR SWITCH,  
 115V CONTROL  
 TRANSFORMER

Figure 9A. Typical Expanded Cabinet with Optional Bypass (20 HP shown).

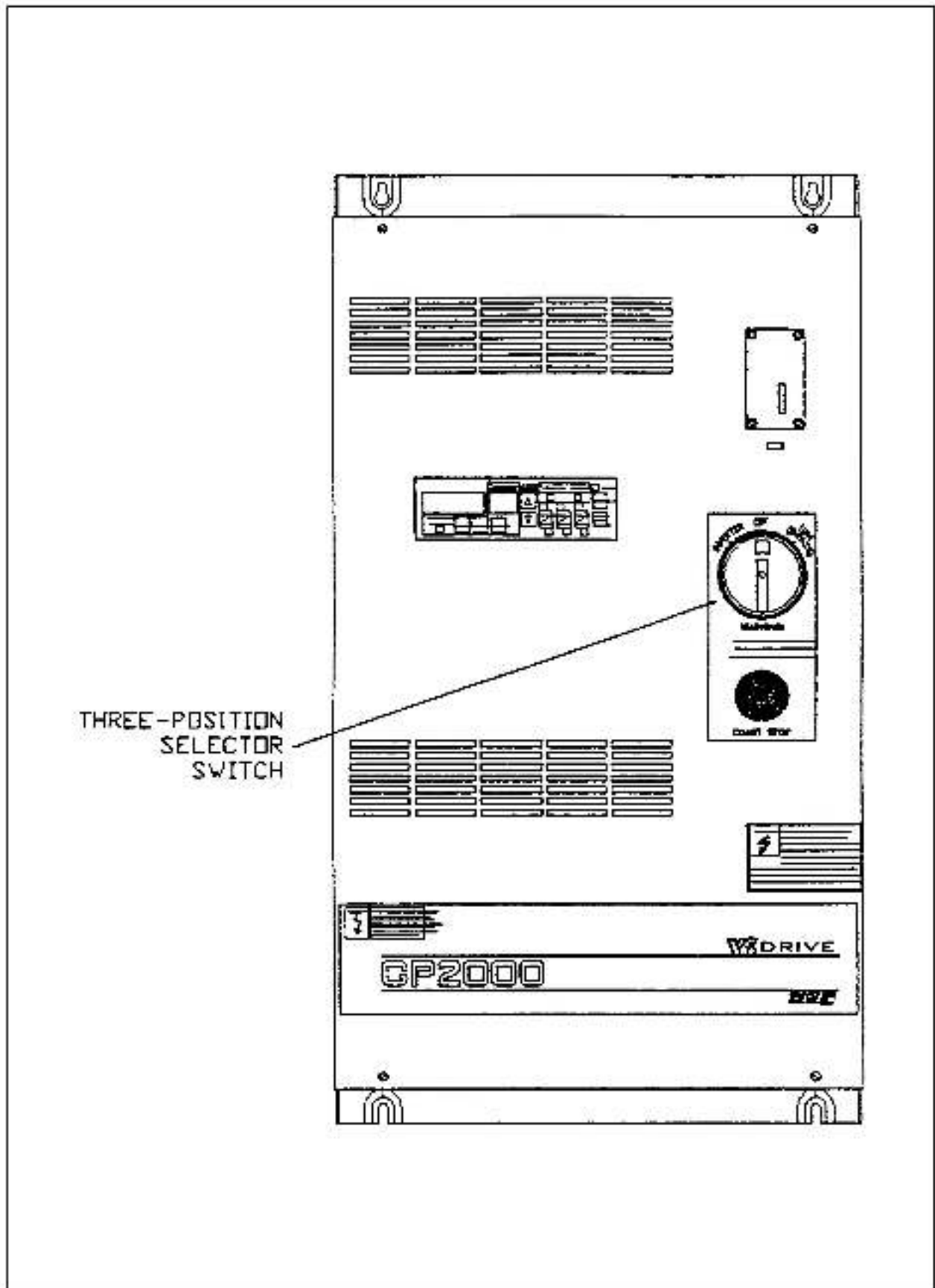


Figure 9B. Typical Expanded Cabinet with Optional Bypass (20 HP shown).



Figure 10. Typical Expanded Cabinet Wiring Diagram (without Bypass).

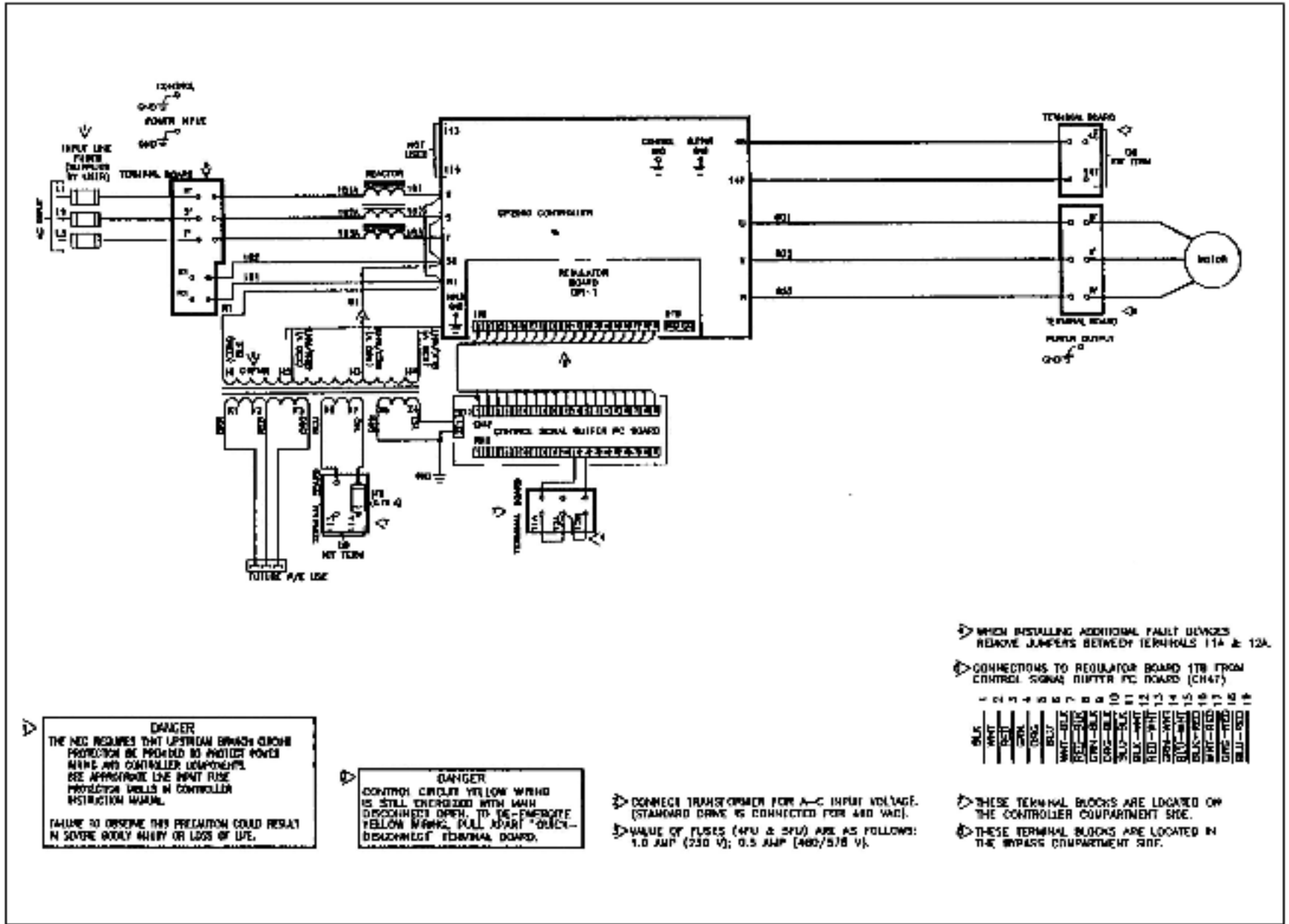
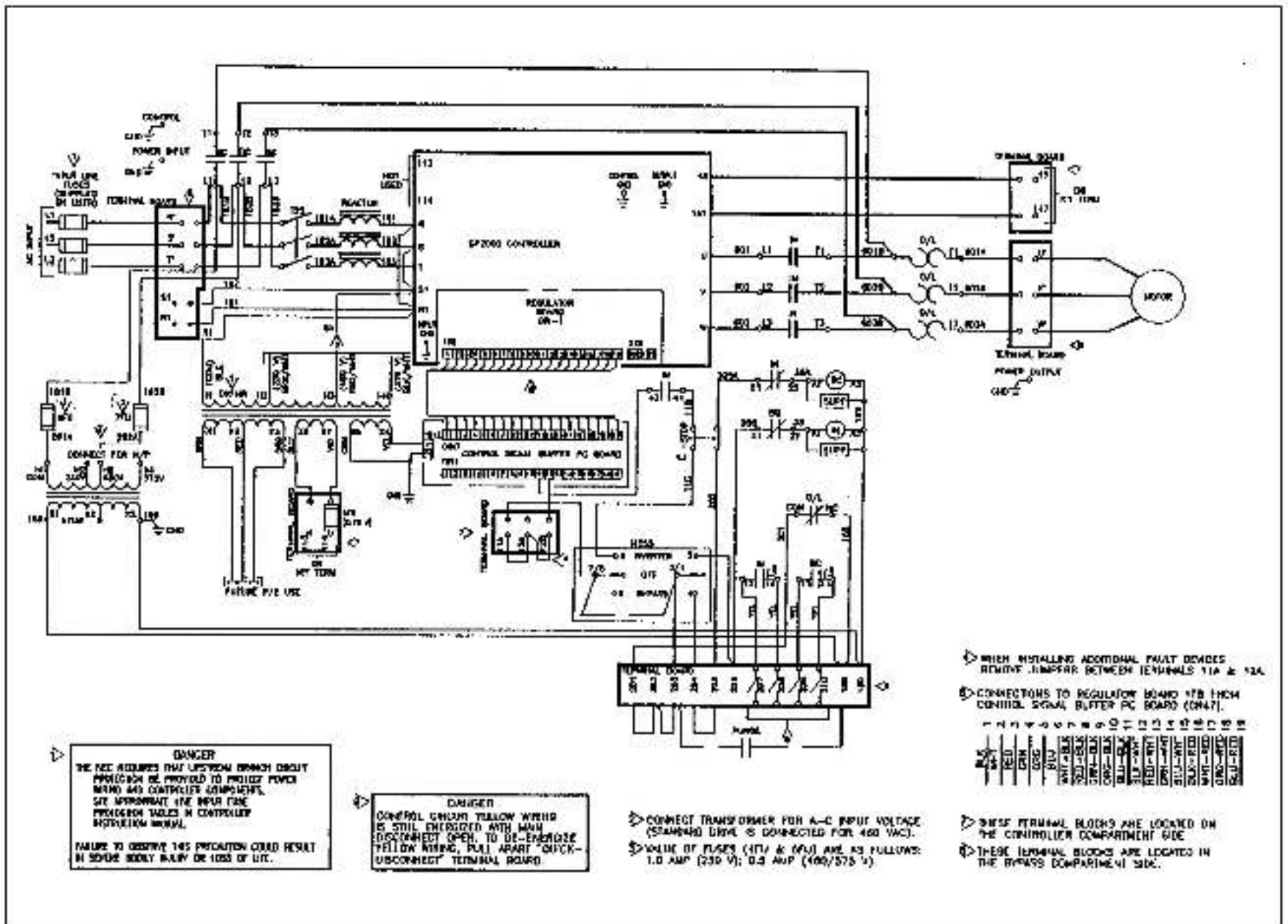


Figure 11. Typical Expanded Cabinet Bypass Wiring Diagram.





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