Three Phase Motor Controller Installation Instructions

8040366 Revision AA

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Appendices

1 Introduction

Introduction

The Three Phase Motor Controller P/N 8124063G001, 8124100G001, 8124115G001, shown in Figure 1-1, is designed to provide power for up to three On-Board Cryopumps and can be used with the 9700A, 9600, 8200 (three-phase compressor), 8510, 8500, and 1020R compressors. The dimensions are shown in Figure 1-2.

NOTE: *The 8200 single phase compressor requires the use of cable P/N 8132646G050. The cable is used between 8200 compressor and three phase motor controller. Refer to Table 3-1 for 8200 compressor application.*

Section 3 - Installation provides all the required information for installing and interfacing the Three Phase Motor Controller with each CTI-CRYOGENICS compressor.

Specifications

Table 1-1: Three Phase Motor Controller Specifications

Parameter	Value
Weight	50 lbs (22.67 kg)
Ambient Temperature	50 - 100°F (10 - 38°C)

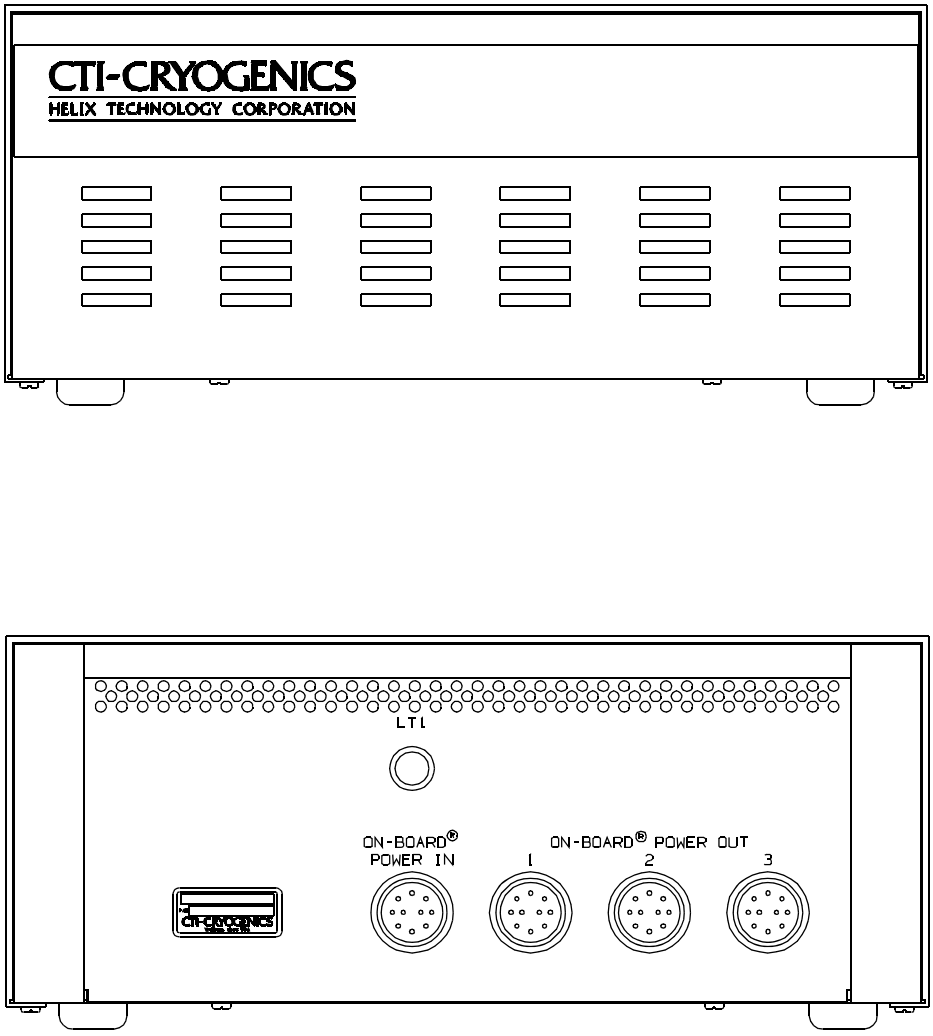

Figure 1-1: Three Phase Motor Controller

Dimensions

The dimensions of the Three Phase Motor Controller are shown in Figure 1-2.

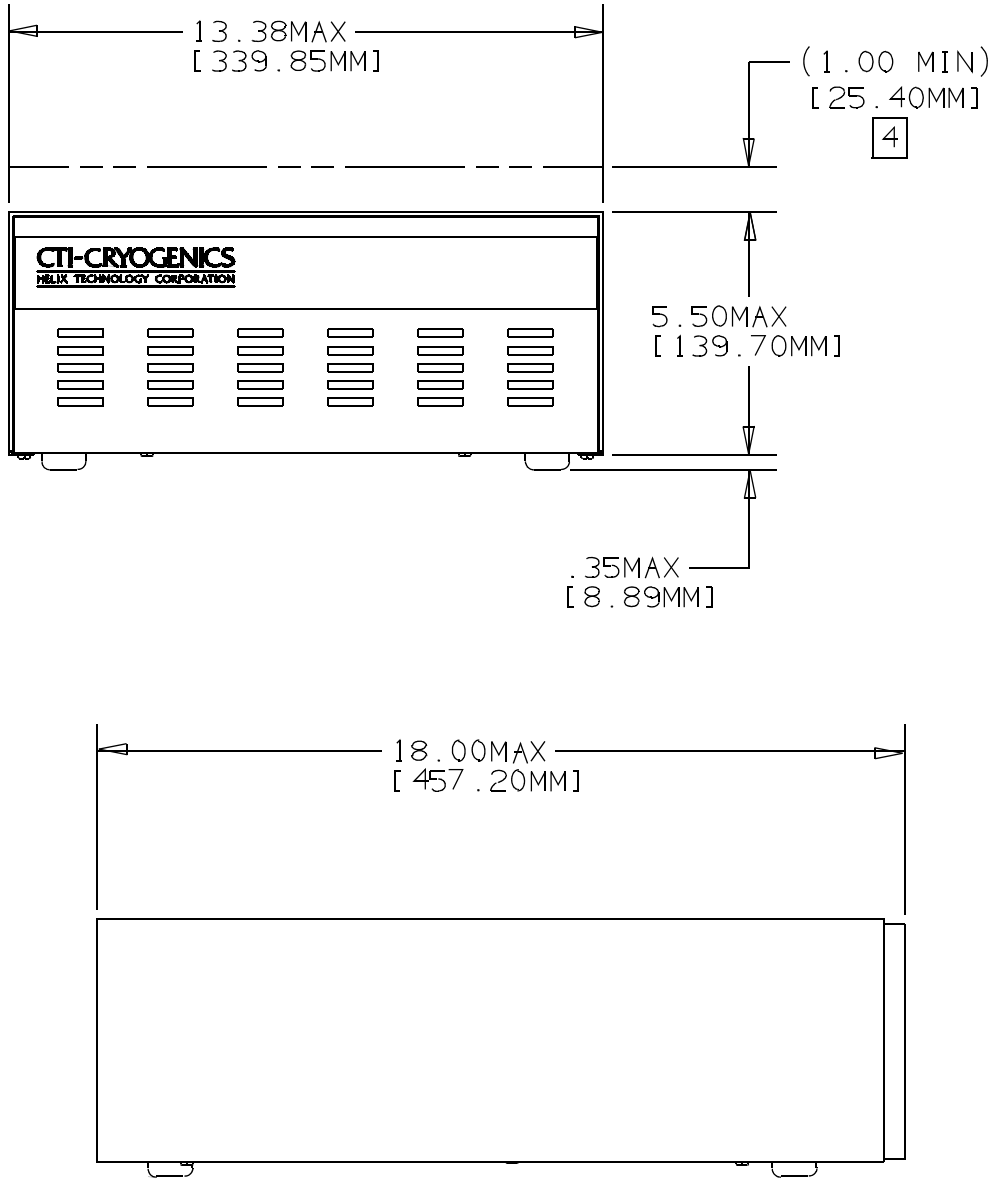

Figure 1-2: Three Phase Motor Controller Dimensions

2 Safety

Overview

This section describes safety conventions for the Brooks Automation Product. All personnel involved in the operation or maintenance of the product must be familiar with the safety precautions outlined in this section.

NOTE: *These safety recommendations are basic guidelines. If the facility where the Product is installed has additional safety guidelines they should be followed as well, along with the applicable national and international safety codes.*

Chapter Contents

Introduction

Follow all safety precautions during installation, normal operation, and when servicing CTI-Cryogenics products.

This chapter explains the safety conventions used throughout this manual. CTI-Cryogenics uses a specific format for cautions and warnings, which includes standard signal words and safety shapes.

See also the *Customer Support* appendix or call your local Customer Support Center for assistance.

Signal Word Descriptions

All cautions and warnings contain signal words, which call attention to safety messages and designate the degree of hazard seriousness. The following table shows the signal words and their meanings that may be used in this document.

Table 2-1: Safety Signal Words

Term	Example	Definition
CAUTION	CAUTION	A signal word that indicates a situation or unsafe practice, which if not avoided may result in **equipment damage**. A CAUTION is highlighted in yellow.
CAUTION	⚠ CAUTION	A signal word accompanied by a safety shape that indicates a potentially hazardous situation or unsafe practice. If not avoided, the action may result in **minor or moderate personal injury or equipment damage**. A CAUTION is highlighted in yellow.
WARNING	⚠ WARNING	A signal word accompanied by a safety shape that indicates indicates a potentially hazardous situation. If not avoided, the action may result in **serious injury or death**. A WARNING is highlighted in orange.

Safety Shape Descriptions

All cautions and warnings contain safety shapes, which have specific safety meanings. The following table shows some of the safety shapes used in this document and their meanings.

Table 2-2: Safety Shapes

Example	Term	Shape Definition
	General Warning	Indicates a general hazard. Details about this hazard appear in the safety notice explanation.
	High Voltage	Indicates a high voltage hazard.
	Hot Surface	Indicates a surface is hot enough to cause discomfort or a burn.

References

For more information about safety standards, see the following documents:

- ISO 7010: 2003(E), Graphic symbols - Safety colours and safety signs - Safety signs used in workplaces and public areas
- ISO 3864-1: 2002(E), Graphic symbols - Safety colours and safety signs - Part 1: Design principles for safety signs in workplaces and public areas

3 Installation

Introduction

The 9600, 8200, 8510, 8500, and 1020R Compressor Cable Connection procedures provide quick access to all required information for interconnecting the Three Phase Motor Controller to each compressor.

Refer to **Electrical Preparation of Compressors** for more information regarding specific cable requirements and electrical preparation of the particular compressor.

9600 Compressor Cable Connections

This procedure involves the following components:

- 9600 Compressor, P/N 8135900GXXX
- Three Phase Motor Controller P/N 8124063G001, 8124100G001, or 8124115G001, which includes the On-Board power cable P/N 8112463G050

Refer to **Figure 4-3-1** during this procedure.

1. Carefully place the Three Phase Motor Controller on top of the 9600 Compressor.
2. Connect the three On-Board coldhead power cables (customer supplied) to the *On-Board Power* connectors on the rear panel of the Three Phase Motor Controller.
3. Connect the On-Board power cable P/N 8112463G050 (supplied) to the *On-Board Power In* connector on the Three Phase Motor Controller and the On-Board Cryopump electrical outlet on the 9600 Compressor.

CAUTION

Overheated Equipment

To avoid overheating, allow a 1.0 inch minimum space above the top of the Controller for adequate ventilation.

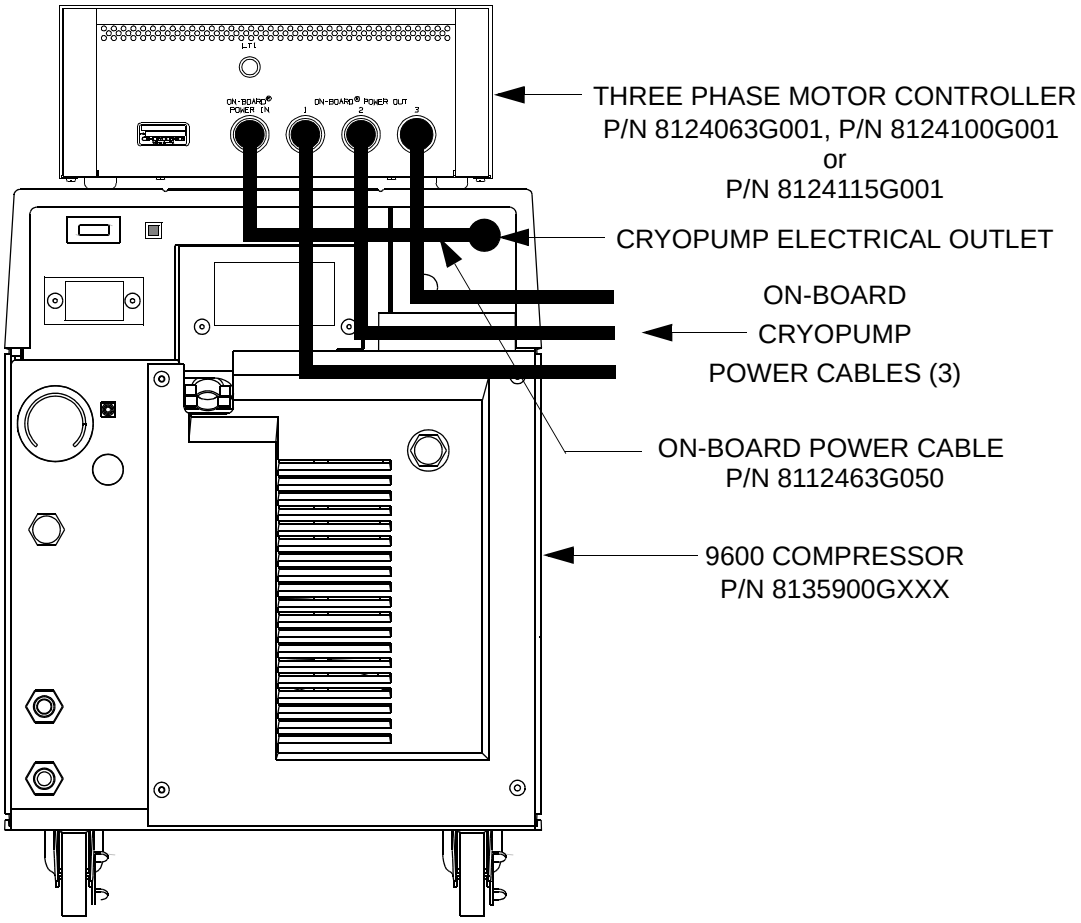

Figure 3-1: 9600 Compressor Cable Connections

8200 Compressor Cable Connections

NOTE: *The 8200 single phase compressor requires the use of cable P/N 8132646G050. The cable is used between 8200 compressor and three phase motor controller. Refer to Table 3-1 for 8200 compressor application.*

This procedure involves the following components:

- 8200 Compressor, P/N 8032549GXXX.
- Three Phase Motor Controller P/N 8124063GXXX or 8124100G001 which includes the On-Board power cable P/N 8112463G050.

Refer to **Figure 4-3-2** during this procedure.

1. Carefully place the Three Phase Motor Controller on top of the 8200 Compressor.

2. Connect the three On-Board coldhead power cables (customer supplied) to the *On-Board Power* connectors on the rear panel of the Three Phase Motor Controller.

3. Connect the On-Board power cable P/N 8112463G050 (supplied) to the *On-Board Power In* connector on the Three Phase Motor Controller and the *On-Board Power* outlet on the 8200 Compressor.

CAUTION

Overheated Equipment

To avoid overheating, allow a 1.0 inch minimum space above the top of the Controller for adequate ventilation.

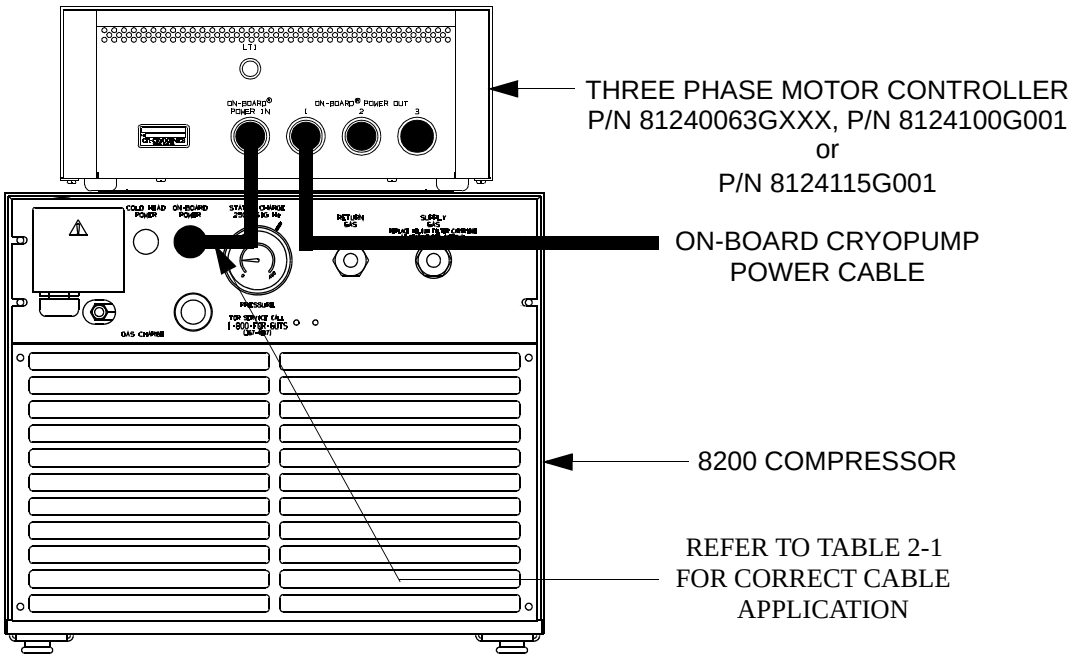

Figure 3-2: 8200 Compressor Cable Connections

Table 3-1: Three Phase Motor Controller Power Cable Applications for 8200 Compressors

Three Phase Motor Controller P/N	8200 Compressor P/N	Power Cable P/N
8124063G001	8032549G001 (air cooled)	8112463G050
8124063G001	8032550G001 (water cooled)	8112463G050
8124063G002	8032549G002 (air cooled)	8132646G050
8124063G002	8032550G002 (water cooled)	8132646G050
8124100G001	8032549G001 (air cooled)	8112463G050
8124100G001	8032550G001 (water cooled)	8112463G050
8124115G001	8032549G001 (air cooled)	8112463G050
8124115G001	8032550G001 (water cooled)	8112463G050
8124115G001	8032549G002 (air cooled)	8132646G050
8124115G001	8032550G002 (water cooled)	8132646G050

8500 Compressor Cable Connections

This procedure involves the following components:

- 8500 Compressor, P/N 8031348G001 or G002
- Three Phase Motor Controller P/N 8124063GXXX, 8124100G001, or 8124115G001, which includes the On-Board power cable P/N 8112463G050
- On-Board 8011 Controller P/N 8052300

Refer to **Figure 4-3-3** during this procedure.

1. Carefully place the On-Board 8011 Controller on top of the 8500 Compressor.
2. Carefully place the Three Phase Motor Controller on top of the 8500 Compressor.
3. Connect the three On-Board coldhead power cables (customer supplied) to the *On-Board Power* connectors on the rear panel of the Three Phase Motor Controller.
4. Connect the 8500 compressor coldhead power cable P/N 8032222 to the *Coldhead 1 In* connector on the 8011 controller.

5. Connect the On-Board power cable P/N 8112463G050 (supplied) to the On-Board *Power In* connector on the Three Phase Motor Controller and the *Cold-head 1 Out* connector on the 8011 controller.
6. Set the voltage selector switches to the settings as described in Table 3-2 and as shown in Figure 4-3-6.
7. Place the Compressor and On-Board power switches on the 8500 compressor to the On position.

CAUTION

Overheated Equipment

To avoid overheating, allow a 1.0 inch minimum space above the top of the Controller for adequate ventilation.

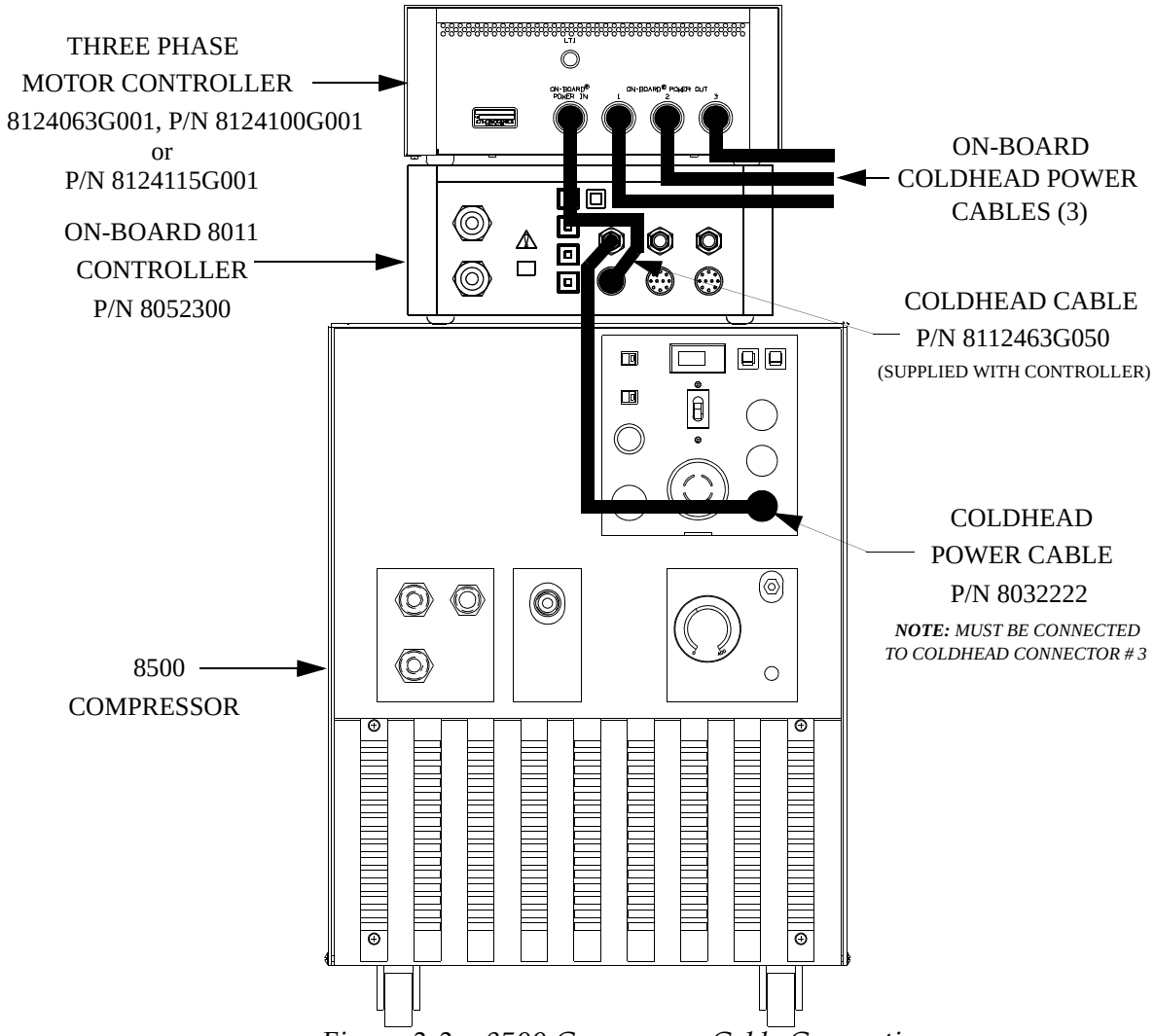

Figure 3-3: 8500 Compressor Cable Connections

8510 Compressor Cable Connections

This procedure involves the following components:

- 8510 Low-Voltage Compressor, P/N 8031315.
- Three Phase Motor Controller P/N 8124063G001, 8124100G001, or 8124115G001, which includes On-Board Power Cable, P/N 8112463G050.

Refer to Figure 4-3-4 during this procedure.

1. Carefully place the Three Phase Motor Controller on top of the 8510 Compressor.
2. Disconnect the three On-Board power cables (customer-supplied) from *Coldhead 1, 2 and 3* connectors on the compressor. Reconnect the cables to the corresponding On-Board *Power Out 1, 2 and 3* connectors on the Three Phase Motor Controller.
3. NOTE: Make sure the On-Board Power Cable is connected to the correct location as indicated in step 3. The Customer Remote capability will not function if the On-Board Power Cable is connected to Coldhead 1 or 2.
4. Install the On-Board power cable, P/N 8112463G050 (supplied), between the *On-Board Power In*, connector on the converter and the *Coldhead 3* connector on the compressor.
5. Place the Compressor and On-Board power switches on the 8510 compressor to the ON position.

CAUTION

Overheated Equipment

To avoid overheating, allow a 1.0 inch minimum space above the top of the Controller for adequate ventilation.

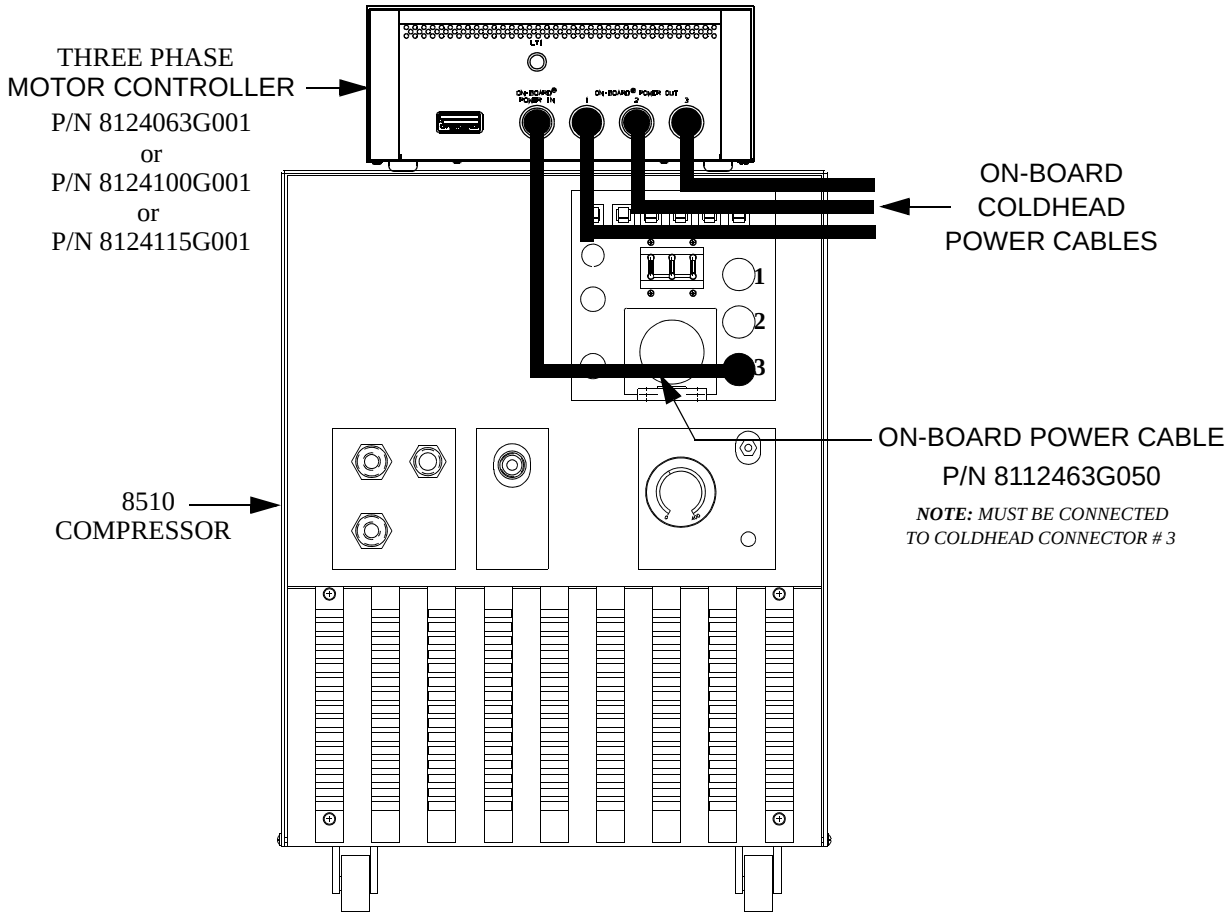

Figure 3-4: 8510 Compressor Cable Connections

1020R Compressor Cable Connections

This procedure involves the following components:

- 1020R Compressor P/N 8031023G001 or G004.
- Three Phase Motor Controller P/N 8124063G001, 8124100G001, or 8124115G001, which includes On-Board Power Cable, P/N 8112463G050.
- On-Board 8011 Controller P/N 8052300.

Refer to **Figure 4-3-5** during this procedure.

1. Carefully place the On-Board 8011 Controller on top of the 1020R Compressor.

2. Carefully place the Three Phase Motor Controller on top of the On-Board 8011 Controller.

3. Connect the three On-Board coldhead power cables (customer-supplied) into the *On-Board Power Out 1, 2 and 3* connectors on the Three Phase Motor Controller.

4. Connect the coldhead power cable, hard-wired to the compressor, into the *Coldhead 1 In* connector on the 8011 Controller.

5. Connect the On-Board power cable, P/N 8112463G050 (supplied) to the On-Board *Power In* connector on the converter and the *Coldhead 1 Out* connector on the 8011 Controller.

6. Place the Compressor and On-Board power switches on the 1020R compressor to the On position.

CAUTION

Overheated Equipment

To avoid overheating, allow a 1.0 inch minimum space above the top of the Controller for adequate ventilation.

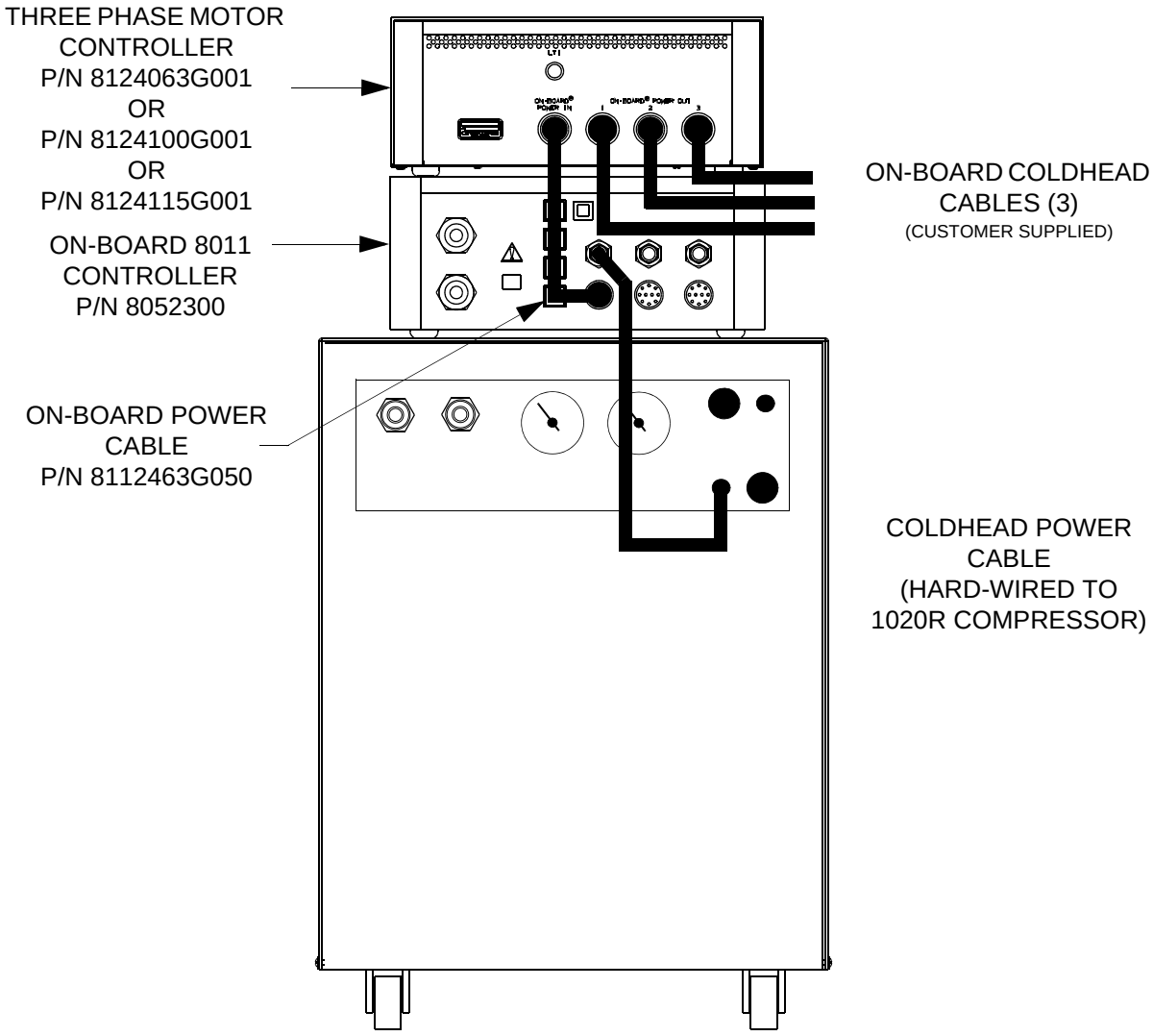

Figure 3-5: 1020R Compressor Cable Connections

Electrical Preparation of Compressors

9600 Compressor

The 9600 Compressor will automatically configure all power related settings. All that is required is to connect the Three Phase Motor Controller as shown in **Figure 4-3-1**.

8500 Compressor

1. Using a voltmeter, measure the phase-to-phase voltage from the power source.

2. Once the power source phase-to-phase voltage has been measured, refer to Table 2-2 and set the compressor voltage selector switches S2 and S3, as shown in **Figure 2-6** to the appropriate range.

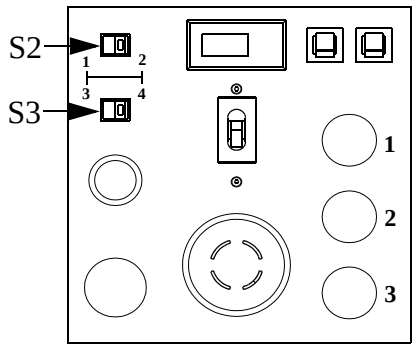

Figure 3-6: 8500 Compressor Control Module

Table 3-2: 8500 Compressor Voltage Selector Switch Settings

Configuration	Line Frequency	Line Voltage	S2 Setting	S3 Setting	Coldhead Voltage
P/N 8031348G001 208/230 VAC 50/60Hz	50	190 - 210	2	3	137 - 153
	50	210 - 230	2*	4*	131 - 144
	60	198 - 230	2	3	145 - 169
	60	230 - 250	2*	4*	144 - 158
P/N 8031348G002 380 VAC 50Hz 460VAC 60Hz	50	342 - 400	2	3	126 - 147
	50	400 - 457	2*	4*	125 - 143
	60	395 - 460	2	3	145 - 169
	60	460 - 506	2*	4*	144 - 158

* Factory Setting

8200 Compressor

The 8200 Compressor requires that the power switches located on the front panel be set to the correct position.

1. Using a voltmeter, measure the phase-to-phase voltage from the power source. Compare this voltage to the following table and position the voltage range selector switch to the *208V* or *220V* position as required. Also, set the frequency selector switch to the 50 Hz or 60 Hz position, as appropriate. See Figure 4-3-7 for location of selector switches.

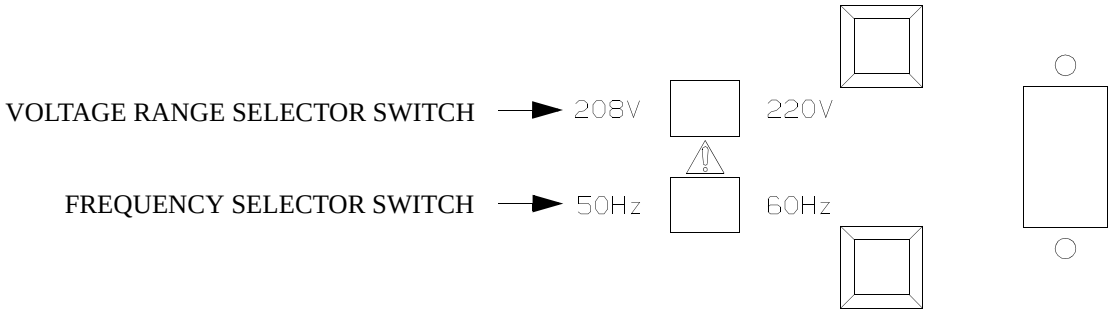

Figure 3-7: 8200 Compressor Power Selector Switches

2. Ensure that water is turned on for the water-cooled compressor.

3. Set the compressor ON/OFF switch to OFF. Connect the input-power cable to the power source Refer to Table 3-3 and Table 3-4 for electrical power requirements.

Table 3-3: 8200 Compressor Power Requirements

Operating Voltage Range		Voltage Adjustment Switch S1 Position
60 Hz	**50 Hz**	
198-212	180-212	208V
213-250	213-220	220V

4. Turn the compressor switch to the ON position and allow the compressor to run for 15 minutes to stabilize the oil circuit. Make sure that the compressor fan operates freely in the air-cooled compressor.

5. Switch off the compressor and disconnect the input-power cable.

6. Install the compressor in its permanent location on a level surface. Air cooled units must have a minimum clearance of 12 inches at the front and back for adequate airflow

Table 3-4: 8200 Compressor Power Requirements (Steady-State Conditions)

Part Number	Cooling	Phase	Hz	Operating Voltage Range	Nominal Operating Current
8032549G001	Air Air	3 3	50 60	180-220 198-250	10A 10A
8032549G002	Air Air	1 1	50 60	180-220 198-250	10A 10A
8032550G001	Water Water	3 3	50 60	180-220 198-250	8.5A 8.5A
8032550G002	Water Water	1 1	50 60	180-220 198-250	8.5A 8.5A

8510 Low Voltage Compressor Control Module

1. Using a voltmeter, measure the phase-to-phase voltage from the power source.

2. Once the power source phase-to-phase voltage has been measured, refer to Table 3-5 and rotate the compressor voltage selector switch S3, as shown in Figure 4-3-8, to the appropriate position.

Table 3-5: 8510 Low Voltage Compressor S3 Switch Settings

Configuration	Line Frequency	Voltage Range	S3 Position
P/N 8031315 220/230VAC, 50/60 Hz	50	190 - 210*	Low
	50	210 - 230	Med
	60	198 - 230*	Low
	60	230 - 250	Med
* Factory Setting			

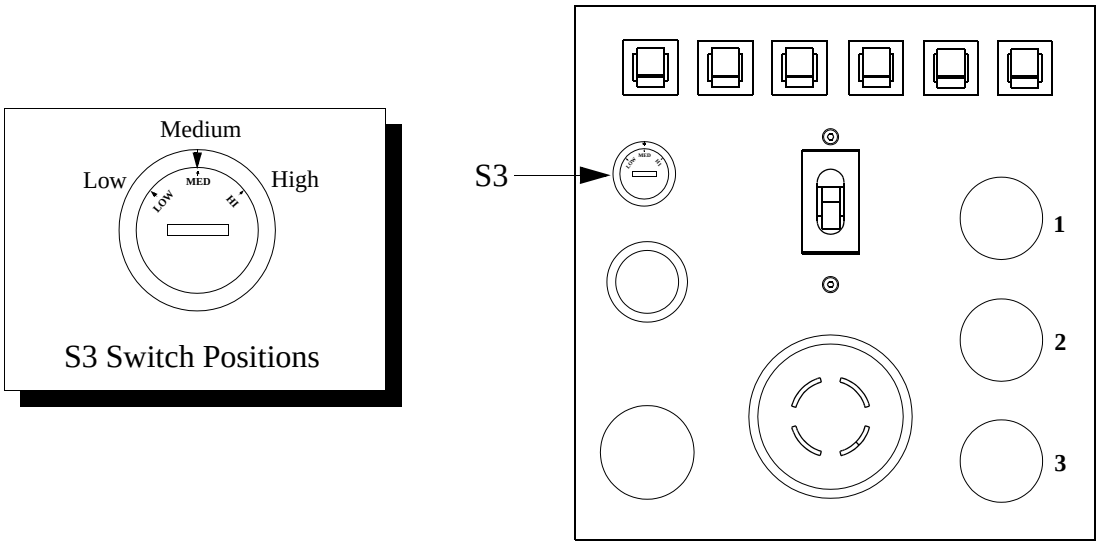

Figure 3-8: 8510 Low Voltage Compressor Control Module

8510 High Voltage Compressor Control Module

1. Using a voltmeter, measure the phase-to-phase voltage from the power source.

2. Once the power source phase-to-phase voltage has been measured, refer to Table 3-6 and set the compressor voltage selector switches S2 and S3, as shown in Figure 4-3-9, to the appropriate range.

Table 3-6: 8510 High Voltage Compressor S2 and S3 Switch Settings

Compressor Configuration	Line Frequency (Hz)	Voltage	S2 Setting	S3 Setting
P/N 8031400G002 380/460VAC 50/60 HZ	50	342 - 405	2	3
	50	406 - 457	2*	4*
	60	395 - 450	2	3
	60	451 - 506	2*	4*

* Factory Setting

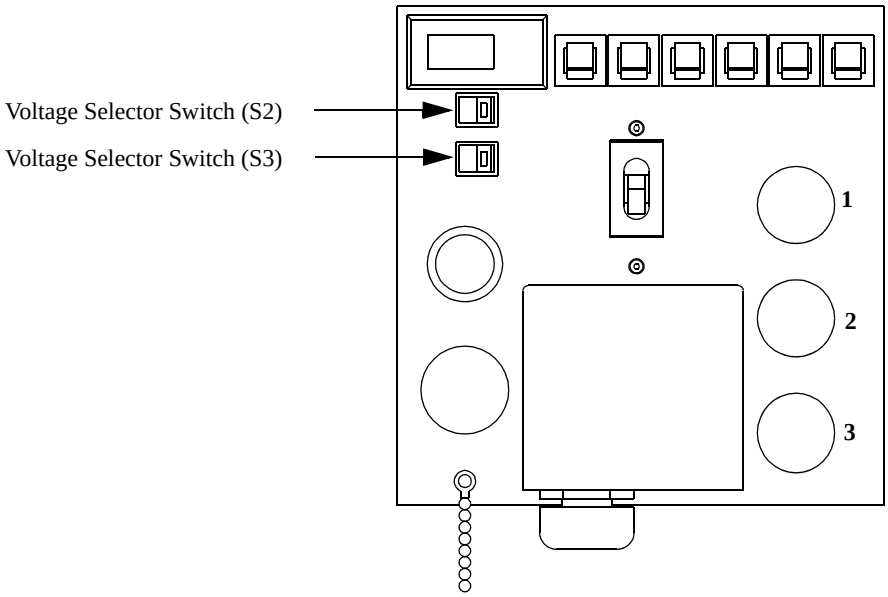

Figure 3-9: 8510 High Voltage Compressor Control Module

1020R Compressor Control Module

1. Remove the top panel of the compressor as follows:

    a. Remove the two screws from the under side of the top panel that pass through the two brackets at the top of the rear frame and secure the top panel in place.

    b. Raise the rear of the top panel slightly and push the panel toward the front of the compressor until the slots at the front of the top panel are free of the washer-head screws in the compressor frame.

    c. Remove the top panel and set it aside.

2. On the compressors that use 380, 400, or 480 volts input power, remove the perforated-metal top cover of the electrical control chassis, and ensure proper input voltage to the coldhead drive motor by making the following output connections for transformer T1 as shown in Figure 4-3-10. Be sure to replace the perforated-metal cover on the electrical control chassis after the connections are completed.

    a. Compressors are shipped from the factory with tap 6 of transformer T1 employed for the output connection. Use this connection if the control voltage supplied to the compressor measures 215 VAC or greater.

b. If the control voltage supplied to the compressor measures less than 215 VAC, use tap 5 for the output connection. Move the slip-on lug from tap 6 to tap 5.

2. On compressors that use 200/220 and 208/230 volts input power, remove the perforated-metal top cover of the electrical control chassis. Using the phase-to-phase voltage measured from the power source, prepare the *Scott-T* transformers T1 and T2, in accordance with Table 3-7 and Figure 4-3-10. Be sure to replace the perforated-metal top cover of the electrical control chassis after the connections are completed.

3. Reinstall the top panel on the compressor, ensuring that the slots at the front of the top panel slip past the corresponding washer-head screws that project from the compressor frame.

4. Reinstall the rear panel on the compressor, reactivating the interlock switch.

5. Install the compressor into its permanent location on a level surface. Allow a minimum clearance of 12 inches (30 cm) at the front and back to ensure adequate airflow.

Table 3-7: 1020R Compressor Control Module Transformer T1 and T2 Tap Settings

Line Frequency	Voltage	T1 and T2 Tap Settings
50	190 - 210	B
50	210 - 230*	C
60	198 - 230	B
60	230 - 253*	C
* Factory Setting		

6. Position the voltage adjustment switch (S1) on the On-Board 8011 Controller to the HI or LO position as follows:
   a. Using a voltmeter, measure the phase-to-phase voltage from the power source.
   b. Compare this voltage to Table 3-8 and position the voltage adjustment switch located on the 8011 rear panel to the HI or LO position as required

Table 3-8: 1020R Compressor Voltage Adjustment Switch Positions

Operating Voltage Range	Line Frequency	S1 Position
198 - 230	60	Lo
395 - 450	60	Lo
231 - 250	60	Hi
451 - 506	60	Hi
190 - 204	50	Lo
342 - 400	50	Lo
205 - 240	50	Hi
401 - 457	50	Hi

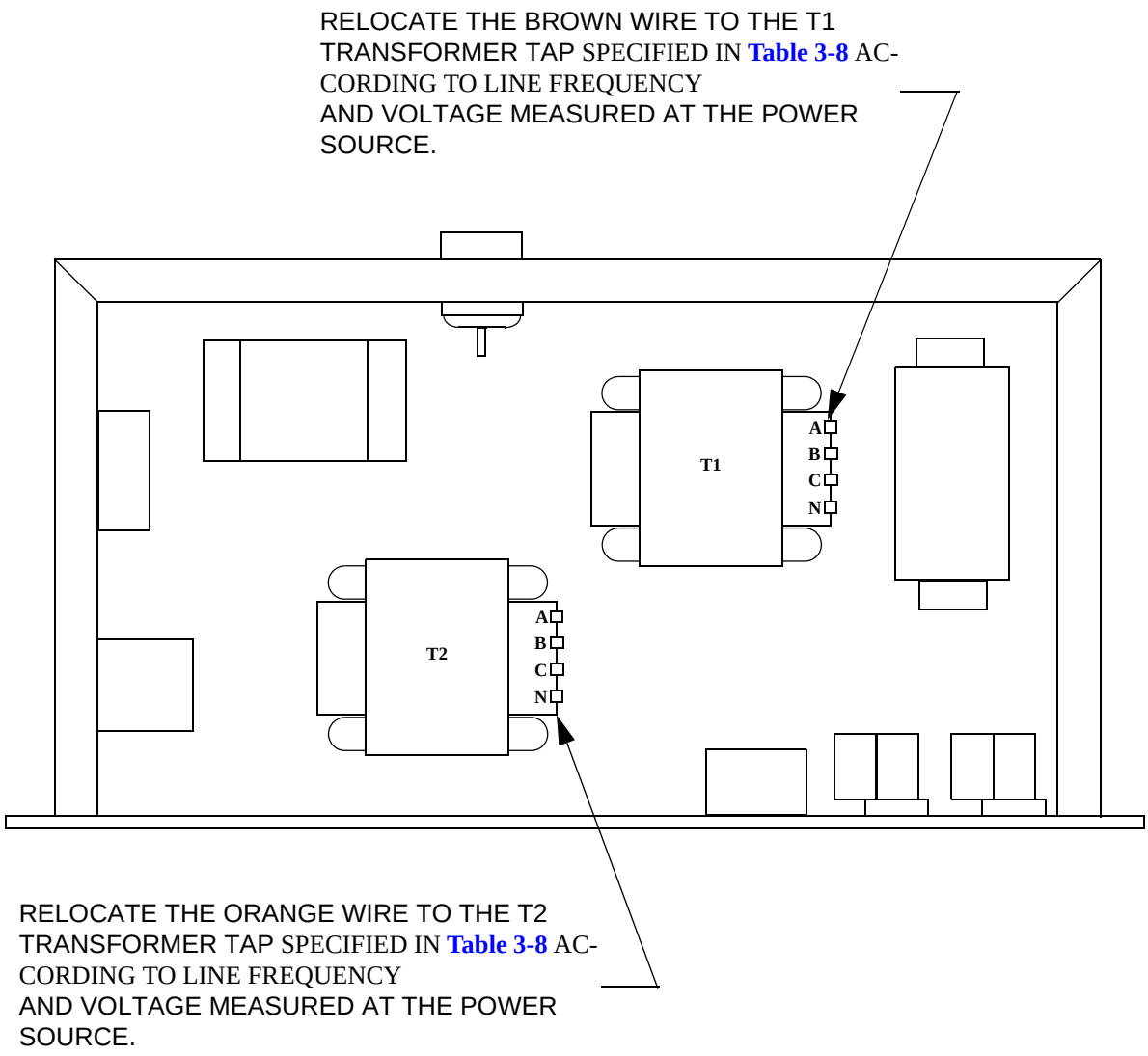

Figure 3-10: 1020R Compressor Control Module Modifications (Cover Removed)

4 Appendices

Overview

The following appendices are included to provide the user with a single location for specific information related to the Brooks Automation Product.

Contents

Appendix A: Customer Support Information

Customer Support Center Locations

To locate a Customer Support Center near you, please visit our website ***www.brooks.com*** on the world wide web and select *CONTACT* on the home page.

Guaranteed Up-Time Support (GUTS®)

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Product Information

Please have the following information available when calling so that we may assist you:

- Product Part Number
- Product Serial Number
- Product Application
- Specific Problem Area
- Hours of Operation
- Equipment Type
- Vacuum System Brand/Model/Date of Manufacture

E-mail

For your convenience, you may also e-mail us at:

techsupport@brooks.com