Allen-Bradley

Line Interface Module

Catalog Numbers 2094-AL15S, 2094-AL25S, 2094-AL50S, 2094-AL75S, 2094-BL10S, 2094-BL25S, 2094-BL50S, 2094-BL75S, 2094-XL75S-C1, 2094-XL75S-C2, 2094-AL09, 2094-BL02

About the Line Interface Module

The Bulletin 2094 line interface module is designed to replace many of the common-input power devices required for your servo drive system. Use these instructions when mounting your module to the panel or wiring your module into the system.

For installation information regarding equipment and accessories excluded here, see Additional Resources on page 56 or the information available for those products.

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

	**WARNING:** Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
	**ATTENTION:** Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.

Labels may also be on or inside the equipment to provide specific precautions.

	**SHOCK HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
	**BURN HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.
	**ARC FLASH HAZARD:** Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

Catalog Number Explanation

Catalog numbers and descriptions for the line interface module are listed in the table below.

Cat. No.	Input Voltage	Current Rating	Description	
2094-AL15S	230V	15 A	• 230V AC auxiliary power output. • Customer-configurable branch-circuit protection. This feature provides the option for connecting CB2 and CB3 before or after the main (CB1) disconnect. See Configure Branch-circuit Protection on page 40 for more information.	• 24V DC power output with 20 A current capacity. • Branch circuit protection and disconnect when used with the variable-depth rotary mechanism (catalog number 140G-G-RVM12B). • Power to multiple Bulletin 2093 or 2094 power rails. • Internal 24V DC I/O line filter. • Internal 230V AC control line filter. • External (customer supplied) 3-phase line filter.
2094-AL25S		25 A		
2094-AL50S		50 A		
2094-AL75S		75 A		
2094-BL10S	460V	10 A		
2094-BL25S		25 A		
2094-BL50S		50 A		
2094-BL75S		75 A		
2094-XL75S-C1	230/460V	75 A	110V AC auxiliary power input.	
2094-XL75S-C2	230/460V	75 A	230V AC auxiliary power input.	
2094-AL09	230V	20 A	• 24V DC power output with 8 A current capacity. • Internal 3-phase line filter. • Internal 230V AC control line filter.	
2094-BL02	460V	30 A		

Before You Begin

Before you begin mounting your line interface module, make sure you:

- unpack your line interface module.
- understand the mounting requirements.
- establish noise zones.

Unpack Your Line Interface Module

Remove all packing material, wedges, and braces from within and around the components. After unpacking, check the item nameplate catalog number against the purchase order.

Line interface modules ship with the following items:

- Connector set for 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x* line interface modules includes I/O (IOL), VAC line (IPL), VAC load (OPL), control power (CPL), 24V brake/IO power (P1L), auxiliary 230V Output (P2L), and auxiliary 230V input (APL) connectors.
- Connector set for 2094-AL09 and 2094-BL02 line interface modules includes VAC line (IPL), VAC load (OPL), control power (CPL), and 24V brake I/O power (PSL) connectors.

  The I/O (26-pin) connector for 2094-AL09 and 2094-BL02 line interface modules is not provided. See Accessories on page 51 for the catalog number and a complete description of the connector sets.
- These installation instructions, publication 2094-IN005.

Mounting Requirements

ATTENTION: Plan the installation of your system so that you can perform all cutting, drilling, tapping, and welding with the system removed from the enclosure. Because the system is of the open type construction, be careful to keep any metal debris from falling into it. Metal debris or other foreign matter can become lodged in the circuitry, which can result in damage to components.

The following requirements apply when preparing to mount your line interface module:

- The line interface module must be enclosed in a grounded conductive enclosure offering protection as defined in standard EN 60529 (IEC 529) to IP55 such that they are not accessible to an operator or unskilled person, to comply with UL and CE requirements. A NEMA 4X enclosure exceeds these requirements providing protection to IP66.
- The panel you install inside the enclosure for mounting your system components must be on a flat, rigid, vertical surface that won't be subjected to shock, vibration, moisture, oil mist, dust, or corrosive vapors.
- Observe the Environmental Specifications on page 55.
- Maintain minimum clearances for proper airflow, easy module access, and proper cable bend radius as shown in the figures on page 5.

IMPORTANT Mount the line interface module in an upright position as shown. Do not mount the module on its side.

Figure 1 - Minimum Clearance Requirements (catalog numbers 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x*)

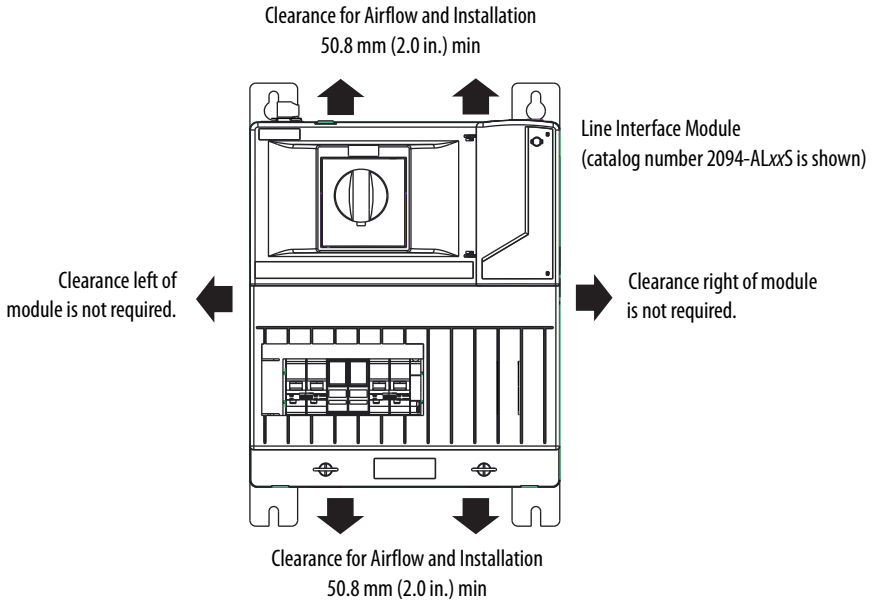
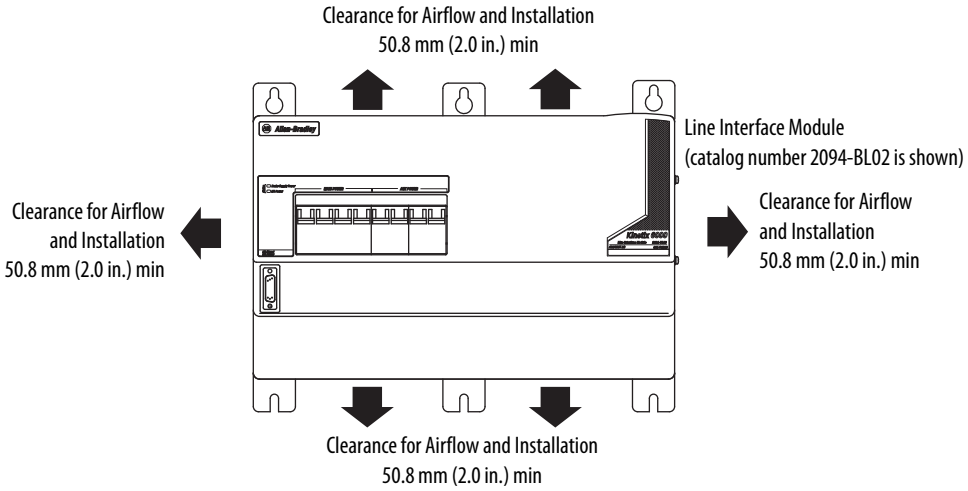


Figure 2 - Minimum Clearance Requirements (catalog numbers 2094-AL09 and 2094-BL02)



Cat. No.	Cabinet Depth Clearance, min
2094-AL*xx*S	200 mm (7.9 in.)
2094-XL75S	
2094-BL*xx*S	250 mm (9.8 in.)
2094-AL09	200 mm (7.9 in.)
2094-BL02	300 mm (11.8 in.)

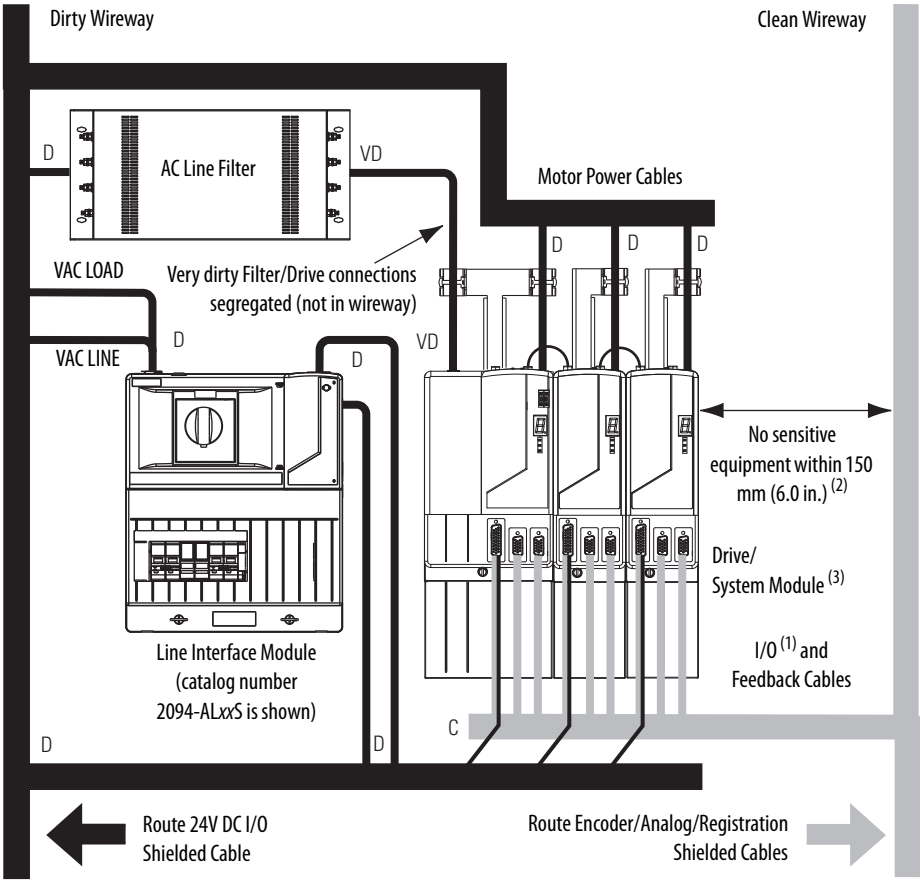
For Power Dissipation Specifications, see page 54.

Establishing Noise Zones

Observe these guidelines when a 2094-AL*xx*S, 2094-BL*xx*S, or 2094-XL75S-C*x* line interface module is used in the system and mounted left of the drive with the AC (EMC) line filter mounted above the module:

- The clean zone (C) is to the right and beneath the drive system (gray wireway).
- The dirty zone (D) is to the left and above the drive system, and above and below the line interface module (black wireway).
- The very dirty zone (VD) is from the filter output to drive. Shielded cable is required on the EMC filter (LOAD side) and the braided shield attached to the clamp (when provided).
- The sercos fiber-optic cables are immune to electrical noise.

Figure 3 - Establishing Noise Zones (EMC filter above the line interface module)

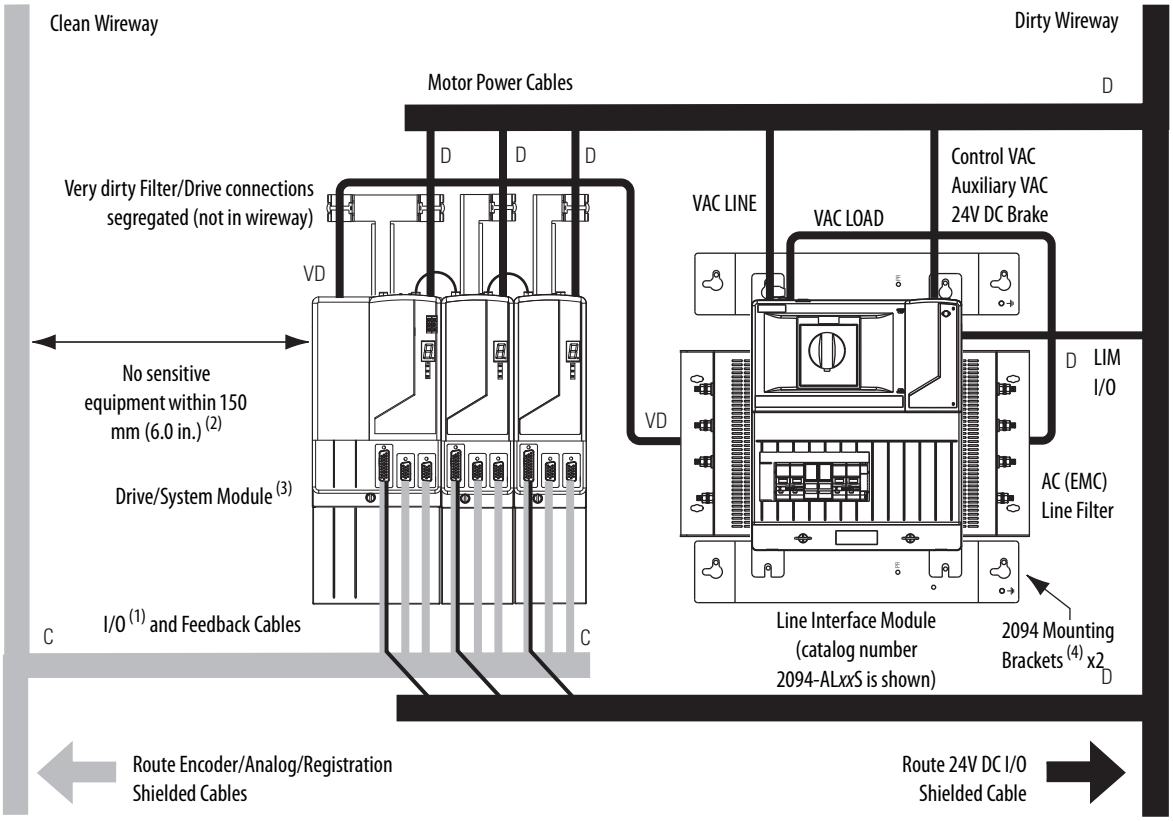


(1) If drive system I/O cable contains (dirty) relay wires, route cable with module I/O cable in dirty wireway.
(2) When space does not permit the 150 mm (6.0 in.) segregation, use a grounded steel shield instead. For examples, see the System Design for Control of Electrical Noise Reference Manual, publication GMC-RM001.
(3) The Kinetix® 6000 drive is shown as an example of any drive or other device in configuration with the line interface module; however, noise zones of other products will vary.

Observe these guidelines when a 2094-AL*xx*S, 2094-BL*xx*S, or 2094-XL75S-C*x* line interface module is used in the system and mounted right of the drive with the AC (EMC) line filter mounted behind the line interface module:

- The clean zone (C) is to the left and beneath the drive system (gray wireway).
- The dirty zone (D) is to the right and above the drive, and above and below the line interface module (black wireway).
- The very dirty zone (VD) is from the filter output to drive. Shielded cable is required on the EMC filter (LOAD side) and the braided shield attached to the clamp (when provided).
- The sercos fiber-optic cables are immune to electrical noise.

Figure 4 - Establishing Noise Zones (EMC filter behind the line interface module)



(1) If the drive system I/O cable contains (dirty) relay wires, route cable with the module I/O cable in dirty wireway.

(2) When space does not permit the 150 mm (6.0 in.) segregation, use a grounded steel shield instead. For examples, see the System Design for Control of Electrical Noise Reference Manual, publication GMC-RM001.

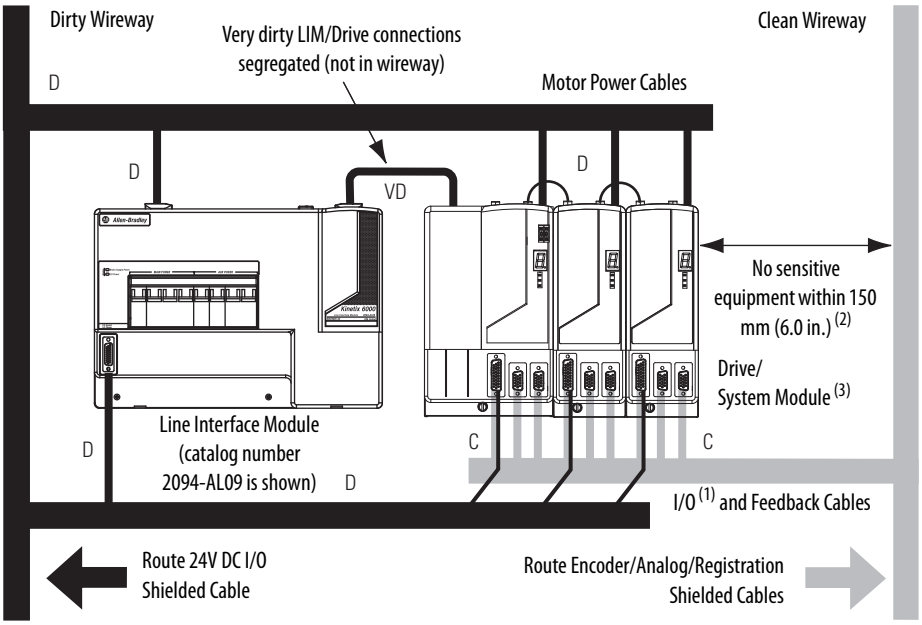
(3) The Kinetix 6000 drive is shown as an example of any drive or other device in configuration with the line interface module; however, noise zones of other products will vary.

(4) Only the 2094-AL*xx*S and 2094-XL75S-C*x* line interface modules are compatible with 2094 mounting brackets. The 2094-BL*xx*S, 2094-AL09, and 2094-BL02 line interface modules are not compatible.

Observe these guidelines when a 2094-AL09 or 2094-BL02 line interface module is used in the drive system:

- The clean zone (C) is to the right and beneath the drive system (gray wireway).
- The dirty zone (D) is to the left and above the drive, and above and below the line interface module (black wireway).
- The very dirty zone (VD) is limited to where the line interface module VAC output jumpers over to the drive. Shielded cable is required only if the very dirty cables enter a wireway.
- The sercos fiber-optic cables are immune to electrical noise.

Figure 5 - Establishing Noise Zones (catalog numbers 2094-AL09 or 2094-BL02)



(1) If drive system I/O cable contains (dirty) relay wires, route cable with module I/O cable in dirty wireway.

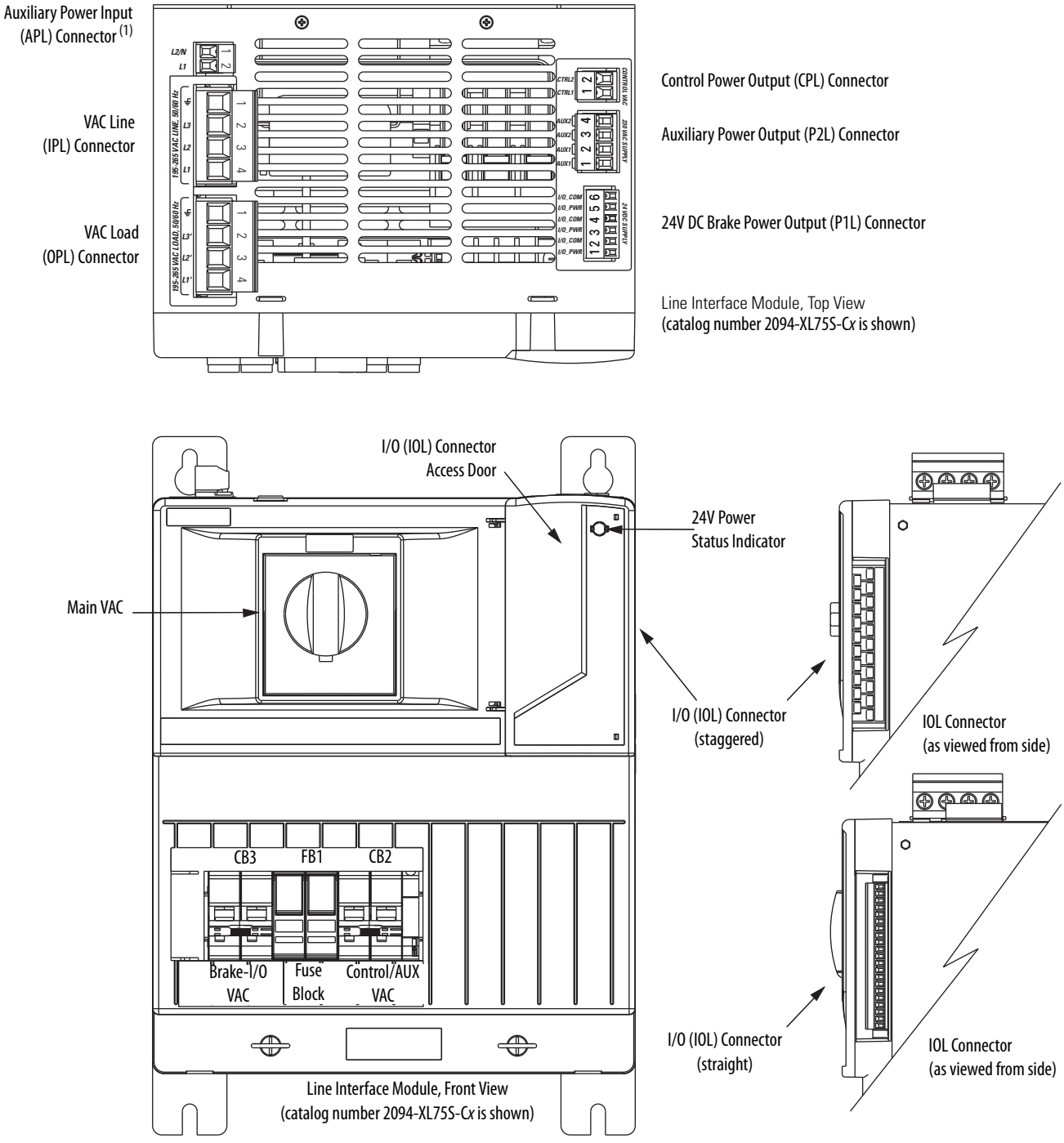
(2) When space does not permit the 150 mm (6.0 in.) segregation, use a grounded steel shield instead. For examples, see the System Design for Control of Electrical Noise Reference Manual, publication GMC-RM001.

(3) The Kinetix 6000 drive is shown as an example of any drive or other device in configuration with the line interface module; however, noise zones of other products will vary.

Connector Data

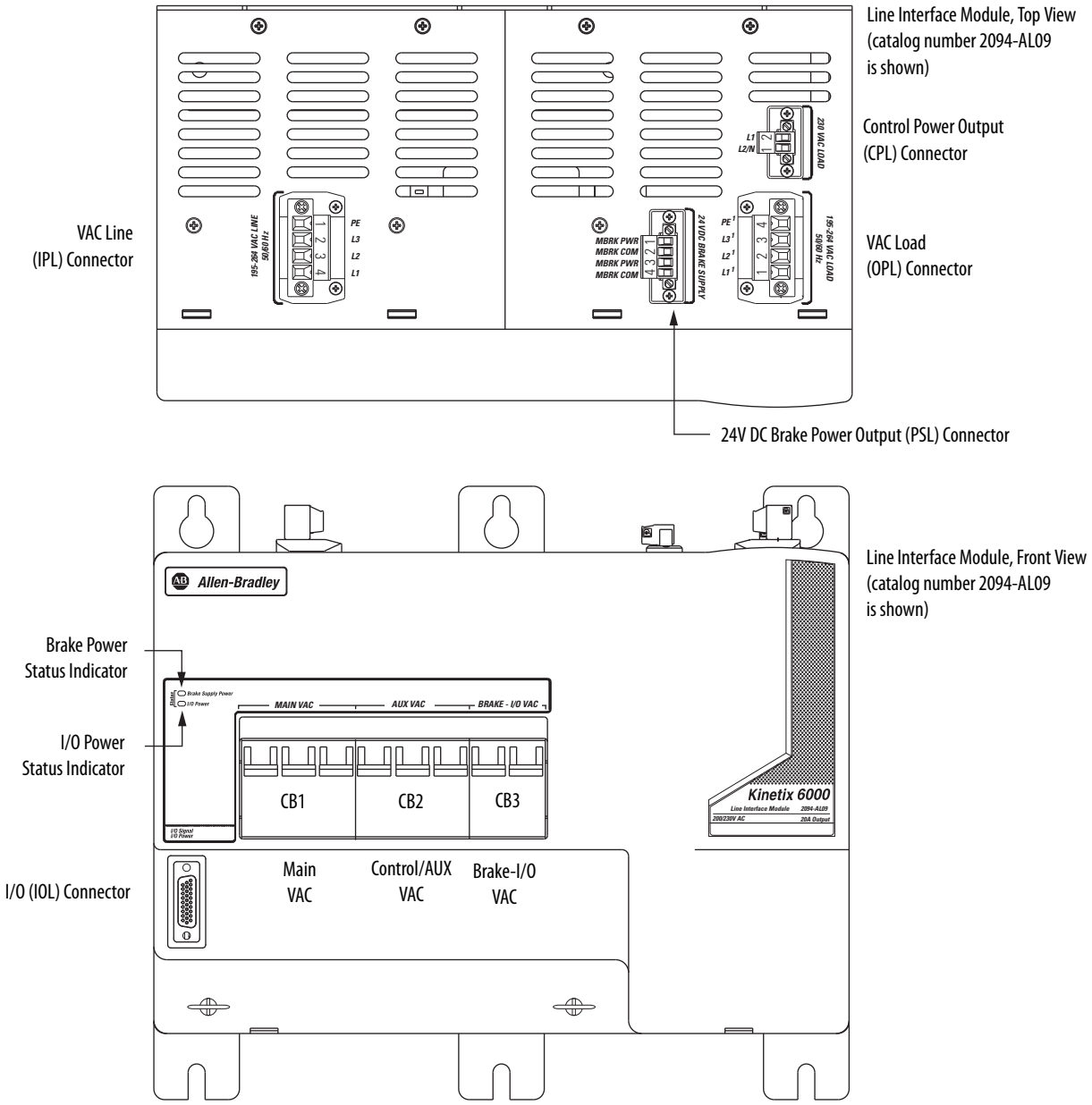
Use the figures below to locate the line interface module connectors and indicators.

Figure 6 - Connectors and Indicators
(catalog numbers 2094-AL*xx*S, 2094-BL7*xx*S, and 2094-XL75S-C*x*)



(1) Auxiliary Power Input (APL) connector is present only on the 2094-XL75S-C*x* line interface module.

Figure 7 - Connectors and Indicators (catalog numbers 2094-AL09 and 2094-BL02)



Line Interface Module Connectors

Table 1 - Connectors (catalog numbers 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x*)

Designator	Description	Connector
IOL	Status I/O	21-pin (plugable) terminal block
IPL	VAC LINE input power	4-position plug/header
OPL	VAC LOAD output power	4-position plug/header
P1L	Brake and I/O power output (24V DC)	6-position plug/header
P2L	Auxiliary power output (230V AC)	4-position plug/header
CPL	Control power output	2-position plug/header
APL(1)	Auxiliary power input	2-position plug/header

(1) Auxiliary power input (APL) connector is present only on the 2094-XL75S-C*x* module.

Table 2 - Connectors (catalog numbers 2094-AL09 and 2094-BL02)

Designator	Description	Connector
IOL	Status I/O	26-pin high-density D-shell
IPL	VAC LINE input power	4-position terminals
OPL	VAC LOAD output power	4-position terminals
PSL	Brake and I/O power output (24V DC)	4-position plug/header
CPL	Control power output	2-position plug/header

I/O Connector

These tables provide signal descriptions and pinouts for the I/O (IOL) connector.

Table 3 - IOL (21-pin) Connector Pinouts (catalog numbers 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x*)

IOL Pin	Description	Signal
1	IO 24V supply	IO_PWR1
2	IO 24V common	IO_COM1
3	IO 24V supply	IO_PWR1
4	IO 24V common	IO_COM1
5	IO 24V supply	IO_PWR1
6	IO 24V common	IO_COM1
7	24V contactor coil positive	COIL_E1
8	24V contactor coil negative	COIL_E2
9	Alarm make contact (CB1)	ALRM_M
10	SHIELD	SHIELD
11	Alarm break contact (CB1)	ALRM_B

IOL Pin	Description	Signal
12	Alarm common (CB1)	ALRM_COM
13	Contactor auxiliary contact (NC) #1 IN	CONSTAT_11
14	Contactor auxiliary contact (NC) #1 OUT	CONSTAT_12
15	Contactor auxiliary contact (NC) #2 IN	CONSTAT_21
16	Contactor auxiliary contact (NC) #2 OUT	CONSTAT_22
17	Contactor auxiliary contact (NC) #3 IN	CONSTAT_31
18	Contactor auxiliary contact (NC) #3 OUT	CONSTAT_32
19	Contactor auxiliary contact (NO) #5 IN	CONSTAT_53
20	Contactor auxiliary contact (NO) #5 OUT	CONSTAT_54
21	SHIELD	SHIELD

Your IOL connector terminals may be staggered, as in Figure 8, or straight, as in Figure 9.

Figure 8 - Pin Orientation for the IOL (21-pin) Connector, Staggered

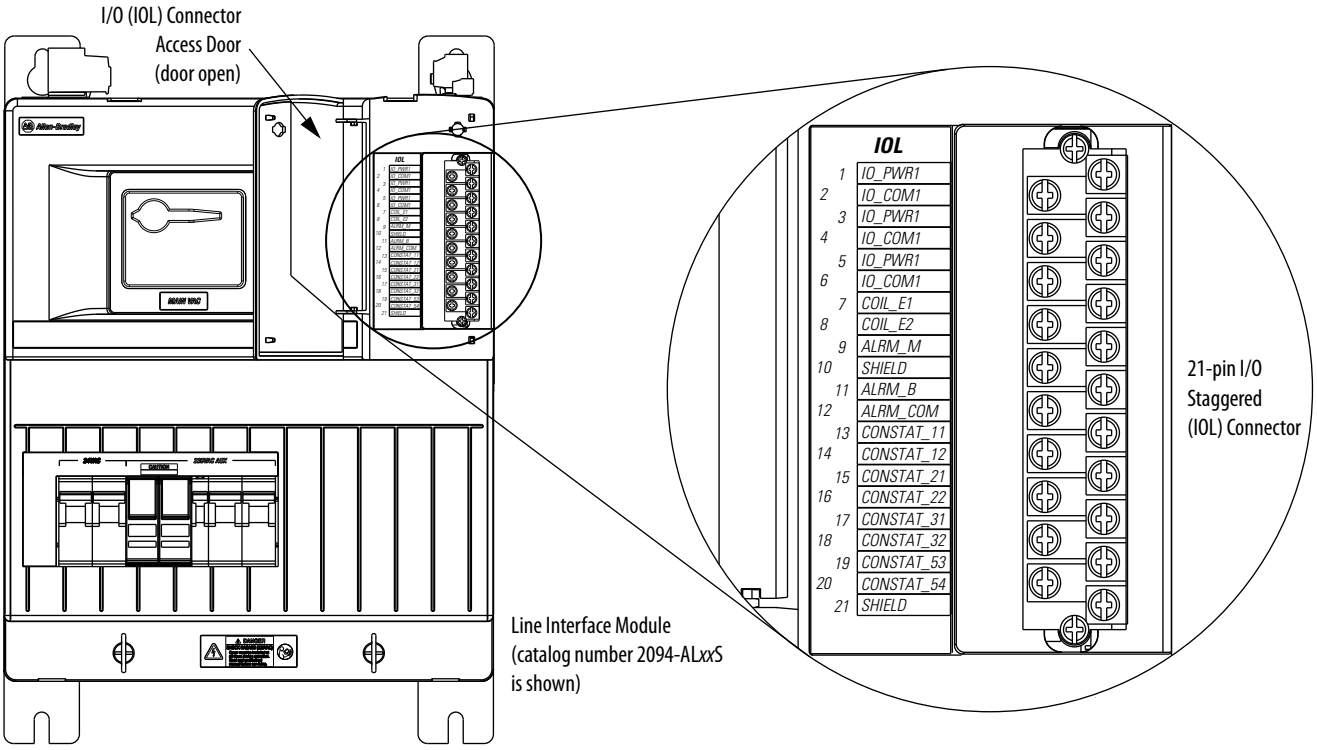


Figure 9 - Pin Orientation for the IOL (21-pin) Connector, Straight

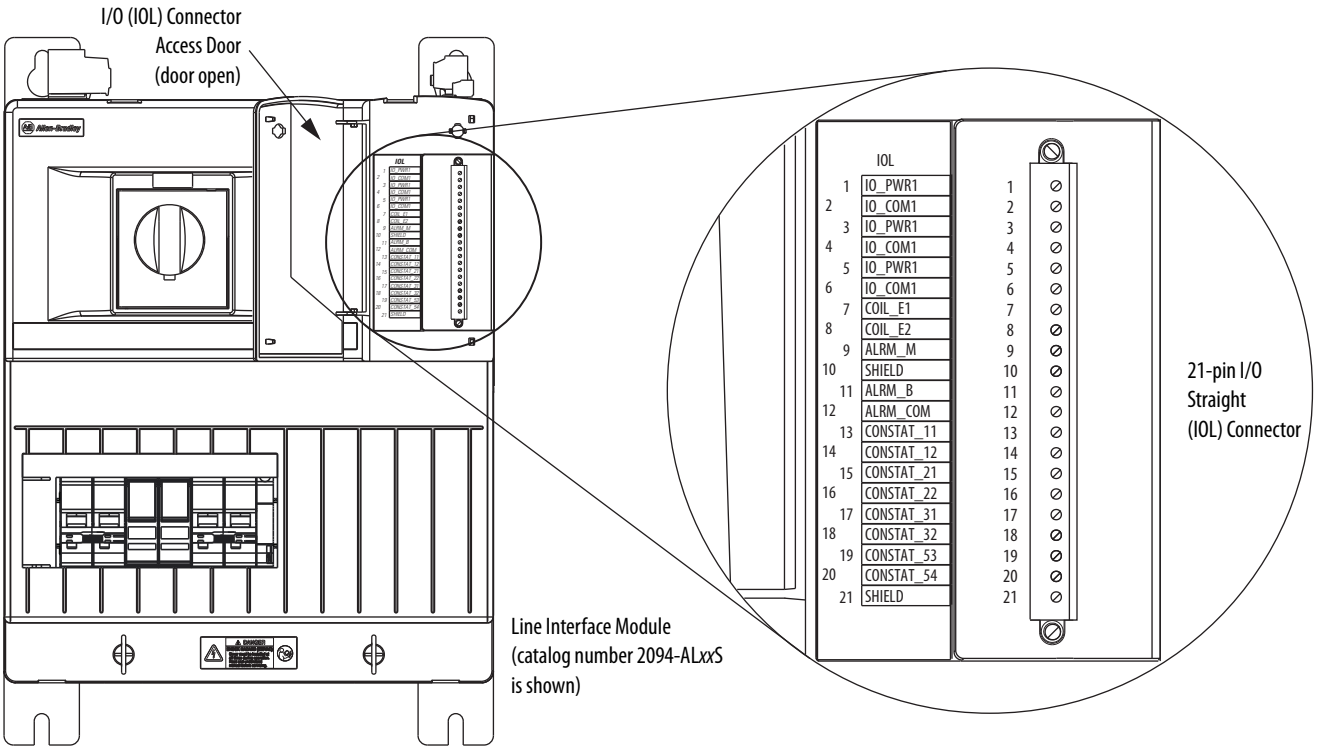
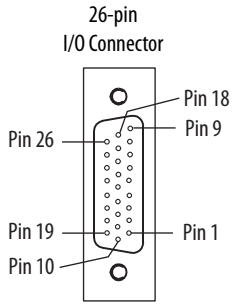


Table 4 - IOL (26-pin) Connector Pinouts (catalog numbers 2094-AL09 and 2094-BL02)

IOL Pin	Description	Signal
1	Reserved	–
2	Reserved	–
3	Reserved	–
4	24V contactor coil negative	COIL_A2
5	Reserved	–
6	Contactor auxiliary contact (NC) #1 OUT	CONSTAT_12
7	Contactor auxiliary contact (NC) #2 OUT	CONSTAT_22
8	Contactor auxiliary contact (NC) #3 OUT	CONSTAT_32
9	Contactor auxiliary contact (NC) #4 OUT	CONSTAT_42
10	Reserved	–
11	Reserved	–
12	Reserved	–
13	24V contactor coil positive	COIL_A1

IOL Pin	Description	Signal
14	Reserved	–
15	Contactor auxiliary contact (NC) #1 IN	CONSTAT_11
16	Contactor auxiliary contact (NC) #2 IN	CONSTAT_21
17	Contactor auxiliary contact (NC) #3 IN	CONSTAT_31
18	Contactor auxiliary contact (NC) #4 IN	CONSTAT_41
19	Reserved	–
20	IO 24V common	IO_COM
21	IO 24V common	IO_COM
22	IO 24V common	IO_COM
23	Reserved	–
24	IO 24V supply	IO_PWR
25	IO 24V supply	IO_PWR
26	IO 24V supply	IO_PWR

Figure 10 - Pin Orientation for the IOL (26-pin) Connector



Auxiliary Power Input Connector

This table provides the signal descriptions and pinouts for the auxiliary power input (2-pin) APL connector. This connector applies only to 2094-XL75S-C1 and 2094-XL75S-C2 line interface modules.

APL Pin	Description	Signal
1	Auxiliary power input	L2/N
2		L1

Control Power Output Connector

These tables provide signal descriptions and pinouts for the control power (2-pin) CPL connector.

Table 5 - CPL (2-pin) Connector Pinouts (catalog numbers 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x*)

CPL Pin	Description	Signal
2	Control power output	CTRL 2
1		CTRL 1

Table 6 - CPL (2-pin) Connector Pinouts (catalog numbers 2094-AL09 and 2094-BL02)

CPL Pin	Description	Signal
2	Control power LOAD output	L1
1		L2/N

24V DC Brake Supply Connector

These tables provide signal descriptions and pinouts for the 24V brake supply connector, intended for use with mechanical motor brake or Bulletin 2090 resistive-brake module (RBM) applications.

Table 7 - P1L (6-pin) Connector Pinouts (catalog numbers 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x*)

P1L Pin	Description	Signal
1	+24V DC supply	IO_PWR2
2	+24V DC common	IO_COM2
3	+24V DC supply	IO_PWR2
4	+24V DC common	IO_COM2
5	+24V DC supply	IO_PWR2
6	+24V DC common	IO_COM2

Table 8 - PSL (4-pin) Connector Pinouts (catalog numbers 2094-AL09 and 2094-BL02)

PSL Pin	Description	Signal
1	+24V DC supply	MBRK PWR
2	+24V DC common	MBRK COM
3	+24V DC supply	MBRK PWR
4	+24V DC common	MBRK COM

VAC LINE Connector

These tables provide signal descriptions and pinouts for the 3-phase input power (4-pin) IPL connector.

Table 9 - IPL (4-pin) Connector Pinouts (catalog numbers 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x*)

IPL Pin	Description	Signal
1	Chassis ground	⏚
2	3-phase input power	L3
3		L2
4		L1

Table 10 - IPL (4-pin) Connector Pinouts (catalog numbers 2094-AL09 and 2094-BL02)

IPL Pin		Description	Signal
2094-AL09	2094-BL02		
1	4	Chassis ground	⏚ PE
2	3	3-phase input power	L3
3	2		L2
4	1		L1

IMPORTANT **ATTENTION:** Make the chassis (earth) ground connection from a grounded configuration only.

VAC LOAD Connector

These tables provide signal descriptions and pinouts for the 3-phase output power (4-pin) OPL connector.

Table 11 - OPL (4-pin) Connector Pinouts (catalog numbers 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x*)

OPL Pin	Description	Signal
1	Chassis ground	⏚
2	3-phase output power	L3′
3		L2′
4		L1′

Table 12 - OPL (4-pin) Connector Pinouts (catalog numbers 2094-AL09 and 2094-BL02)

OPL Pin		Description	Signal
2094-AL09	2094-BL02		
4	1	Chassis ground	⏚ PE′
3	2	3-phase output power	L3′
2	3		L2′
1	4		L1′

Auxiliary Power Connector

This table provides signal descriptions and pinouts for the auxiliary power output (4-pin) P2L connector.

Table 13 - P2L (4-pin) Connector Pinouts (catalog numbers 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x*)

Cat. No.	P2L Pin	Description	Signal
2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C2	1	230V AC power supply. Can be used with the Bulletin 2090-XB120 resistive-brake module (RBM) or other as needed.	AUX1_L1
	2		AUX1_L2
	3	230V AC power supply. Can be used with the Bulletin 2090-XB120 resistive-brake module (RBM) or other as needed.	AUX2_L1
	4		AUX2_L2
2094-XL75S-C1	1	110V AC power supply. For use as needed.	AUX1_L1
	2		AUX1_L2
	3	110V AC power supply. For use as needed.	AUX2_L1
	4		AUX2_L2

Understanding Signal Specifications

A description of the I/O (IOL), brake power (P1L/PSL), control power (CPL), and auxiliary power (P2L) signals and circuit specifications is provided on the following pages.

See the Block Diagrams beginning on page 45 for your line interface modules schematic.

I/O Signals

The 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x* line interface module I/O (IOL) signals include the contactor coil, alarm contacts, status contacts, and I/O power supply.

This table provides a description and electrical specifications for the IOL connector signals. See Power Specifications on page 52 for auxiliary contactor specifications.

Table 14 - IOL (21-pin) Signal Specifications (catalog numbers 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x*)

IOL Pin	Signal	Description	Voltage (Volts)			Current (Amps)		
			Min	Nom	Max	Min	Nom	Max
IOL-8 IOL-7	COIL_E2 COIL_E1	Line contactor coil connections with an auxiliary contact from the control power circuit breaker wired in series with the contactor coil. The line contactor is a safety contactor that includes three main contacts with three auxiliary contacts (see the figure on page 19).	18	24	30	0.005	0.011	0.017
IOL-12	ALRM_COM	Non-voltage contact (ALRM_M) to indicate that CB1 is closed (make) when CB1 is tripped. (DC) Non-voltage contact (ALRM_B) to indicate that CB1 is closed (make) when CB1 is not tripped. See the figure on page 18. (DC)	—	—	125	—	—	1
IOL-9 IOL-11	ALRM_M ALRM_B	[AC]	—	—	250	—	—	5
		[AC]	—	—	600	—	—	2
IOL-14 IOL-13	CONSTAT_12 CONSTAT_11	Three safety-rated auxiliary contacts that are normally-closed on the line contactor (see the figure on page 20).	—	24	—	—	—	10
IOL-16 IOL-15	CONSTAT_22 CONSTAT_21							
IOL-18 IOL-17	CONSTAT_32 CONSTAT_31							
IOL-20 IOL-19	CONSTAT_54 CONSTAT_53	One auxiliary contact (normally-open) that is not safety rated and should not be used in a safety string.						
IOL-2 IOL-4 IOL-6	IO_COM1	Power supply capable of supplying 24V @ 20 A for I/O functions and switches. Each set of pins is capable of 8 A. To use the full rating of the supply, all pins must be used to provide the appropriate current rating (see the figure on page 21).	21.6	24	26.4	—	—	8
IOL-1 IOL-3 IOL-5	IO_PWR1							

For more information regarding the Bulletin 100S-C85*x*-14 contactor, see the Safety Products Catalog, website http://www.ab.com.

The 2094-AL09 and 2094-BL02 line interface module I/O (IOL) signals include the contactor coil, status contacts, and I/O power supply.

Table 15 - IOL (26-pin) Signal Specifications (catalog numbers 2094-AL09 and 2094-BL02)

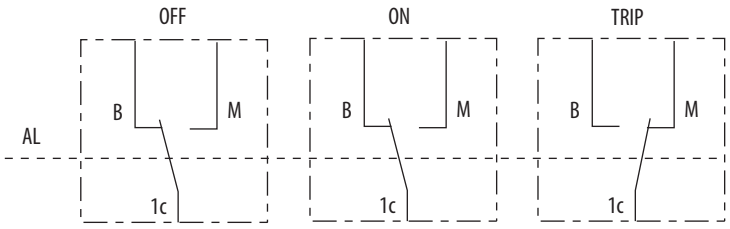
IOL Pin	Signal	Description
IOL-4 IOL-13	COIL_A2 COIL_A1	Line contactor coil connections with an auxiliary contact from the control power circuit breaker wired in series with the contactor coil. The line contactor is a safety contactor that includes three main contacts with four auxiliary contacts (see figure on page 19).
IOL-6 IOL-15	CONSTAT_12 CONSTAT_11	Four pairs of auxiliary contacts that are normally-closed on the line contactor (see figure on page 21).
IOL-7 IOL-16	CONSTAT_22 CONSTAT_21	
IOL-8 IOL-17	CONSTAT_32 CONSTAT_31	
IOL-9 IOL-18	CONSTAT_42 CONSTAT_41	
IOL-20 IOL-21 IOL-22	IO_COM	Power supply capable of supplying 24V @ 6 A for I/O functions and switches. Each set of pins is capable of 2 A. To use the full rating of the supply, all pins must be used to provide the appropriate current rating (see figure on page 23).
IOL-24 IOL-25 IOL-26	IO_PWR	

See Power Specifications beginning on page 52 for auxiliary contactor specifications.

CB1 Alarm Operation

The CB1 alarm circuitry (ALRM_M contact) in the 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x* line interface modules is closed only when CB1 trips (meaning input current exceeds instantaneous current trip setting) and not dependant on the ON/OFF switch. The ALRM_B contact is closed when CB1 is manually set to the ON or OFF position, and open when CB1 is tripped.

Figure 11 - CB1 Alarm Operation (catalog numbers 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x*)



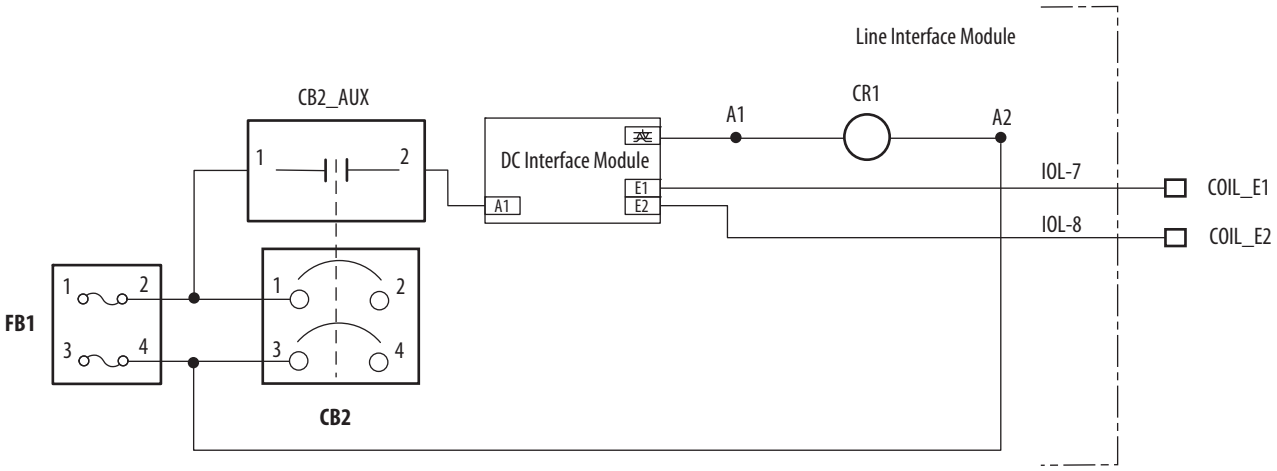
Contactor Coil

For safety reasons, the internal wiring is arranged so that if the control power (CPL) circuit breaker (CB2) trips, the opening contact will interrupt the coil voltage and remove main input power to the drive.

The 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x* line interface modules use an AC coil and a DC interface module allows the contactor coil to be controlled by the 24V DC output of the drive. Additional surge suppression is not required for these contactors.

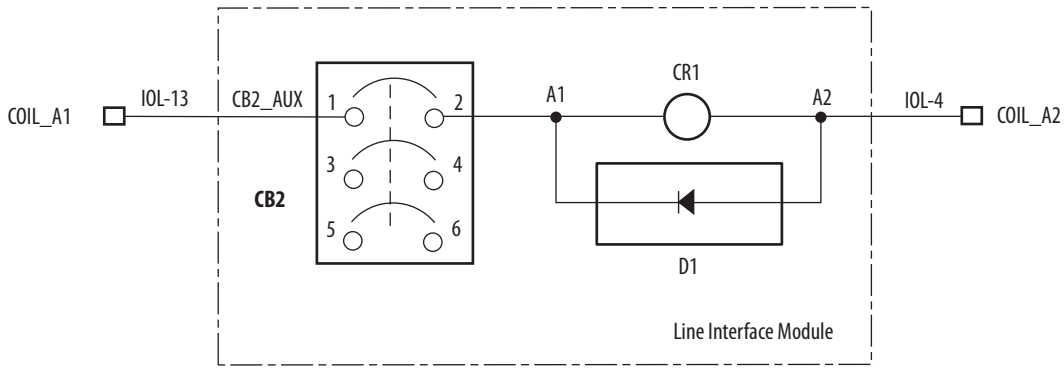
IMPORTANT **ATTENTION:** Do not apply AC voltage to COIL_E1 and COIL_E2.

Figure 12 - IOL Contactor Coil
(catalog numbers 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x*)



The contactors in the 2094-AL09 and 2094-BL02 line interface modules use a DC coil. The contactor coil voltage is 24V DC with a suitably-rated surge suppressor fitted inside the line interface module.

Figure 13 - IOL Contactor Coil
(catalog numbers 2094-AL09 and 2094-BL02)



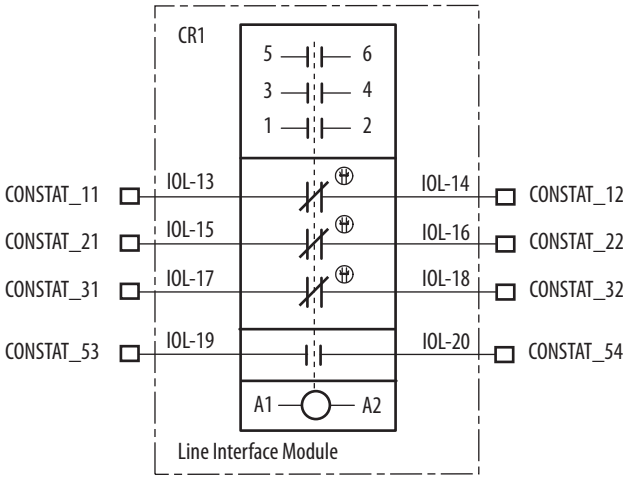
Safety Contactor

The safety contactor includes three main contacts (normally-open) that close when coil power is applied.

The three auxiliary (safety) contacts (used in 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x* line interface modules) are volt-free, positively-guided, and mechanically-latched.

IMPORTANT A fourth volt-free normally-open contact is also available, but is not safety rated and should not be used in a safety string.

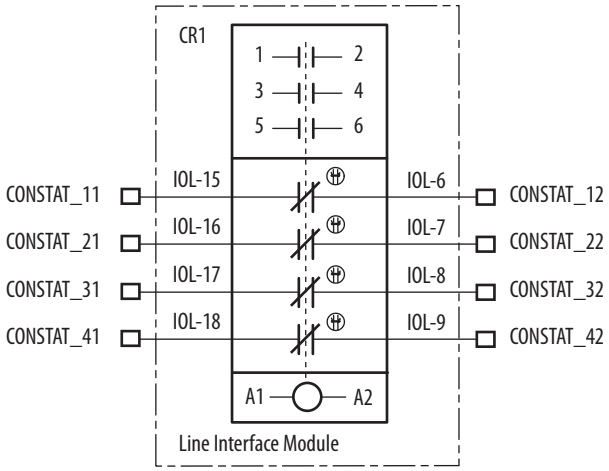
Figure 14 - IOL Contactor Status (catalog numbers 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x*)



See Power Specifications on page 52 for auxiliary contactor specifications.

The four auxiliary (safety) contacts (used in 2094-AL09 and 2094-BL02 line interface modules) are volt-free, positively-guided, and mechanically-latched.

Figure 15 - IOL Contactor Status
(catalog numbers 2094-AL09 and 2094-BL02)



See Power Specifications beginning on page 52 for auxiliary contactor specifications.

24V Power Supply
(catalog numbers 2094-ALxxS, 2094-BLxxS, and 2094-XL75S-Cx)

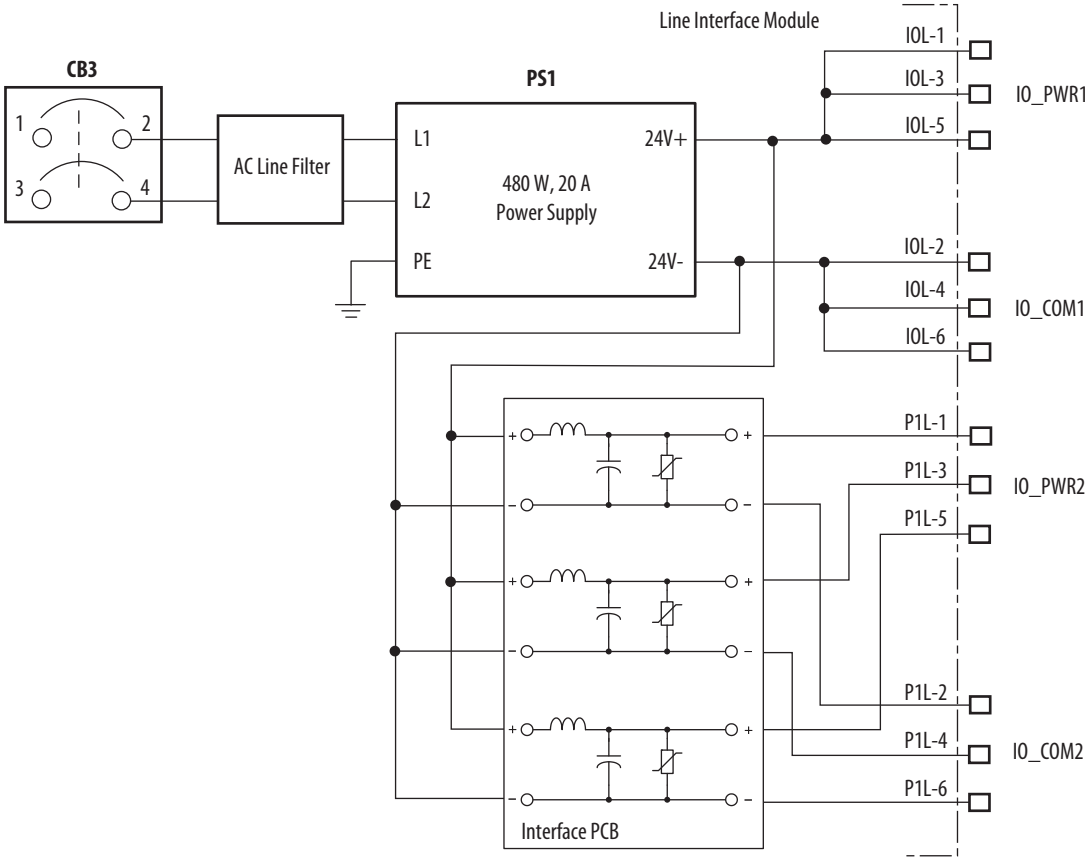
The 24V DC power supply on 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C2 line interface modules is capable of supplying +24V @ 20 A for PLC I/O functions (IOL connector), mechanical motor brakes, and the Bulletin 2090 resistive-brake module (RBM) I/O (P1L connector). An AC line filter is placed on the input to the supply to provide conditioning. The supply is protected by circuit breaker CB3.

PLC I/O power is available to the user via the IOL (21-pin) terminal block connector (as shown in the figure on page 22).

Motor brakes and the resistive-brake module I/O power is available to the user via the P1L (6-pin) connector. Each P1L output contains an LC circuit to prevent electrical noise contamination of the 24V supply and an MOV to prevent current surges from the motor brake.

IMPORTANT Use the P1L +24V DC supply with devices that can potentially generate flyback currents (for example, brake coils and relays).

Figure 16 - IOL Power Supply
(catalog numbers 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x*)



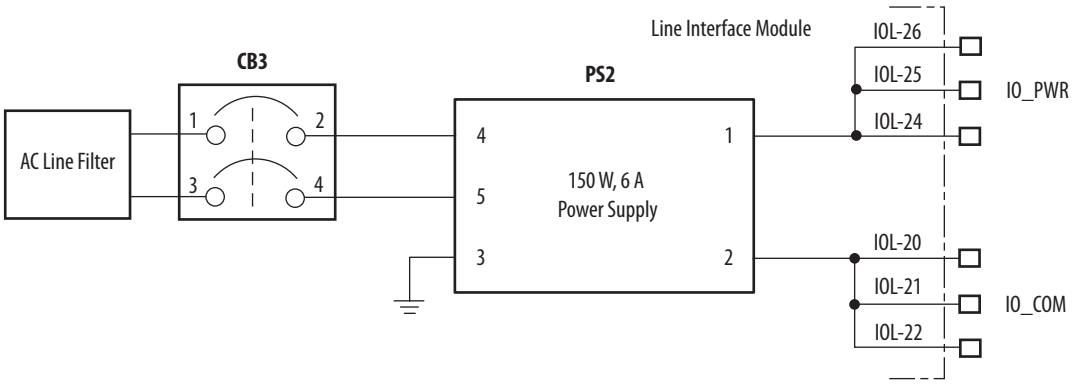
IMPORTANT Each set of pins (IO_PWR1 and IO_PWR2) is rated at 8 A (not to exceed 20 A for combined IOL and P1L use).

I/O Power Supply (catalog numbers 2094-AL09 and 2094-BL02)

The I/O power supply on 2094-AL09 and 2094-BL02 line interface modules is capable of supplying 24V @ 5.7 A for PLC I/O functions and switches. It is available to the user via the IOL (26-pin) D-sub connector. A single-phase filter is placed on the input to the supply to provide conditioning. The supply is protected by circuit breaker CB1.

ATTENTION: When current draw exceeds 2 A (IOL-24, IOL-25, or IOL-26), multiple pins must be used to provide appropriate current rating and avoid connector damage.

Figure 17 - IOL Power Supply (catalog numbers 2094-AL09 and 2094-BL02)



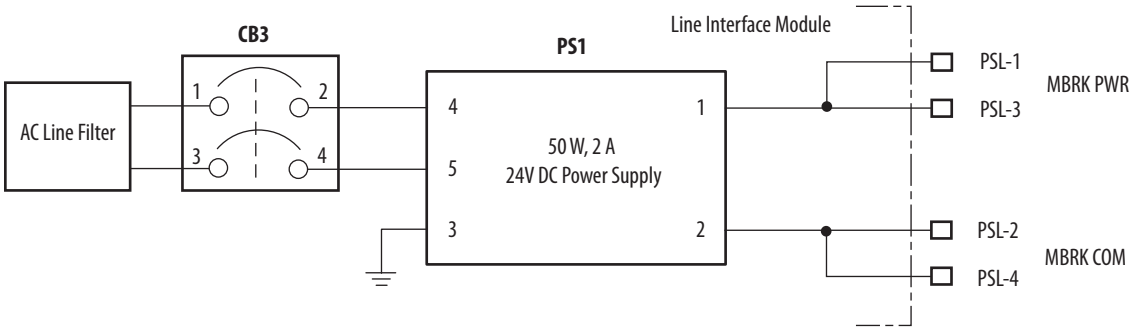
Brake Power Supply (catalog numbers 2094-AL09 and 2094-BL02)

A +24V DC supply is provided on the PSL connector of the 2094-AL09 and 2094-BL02 line interface modules for mechanical motor brakes and the Bulletin 2090 resistive-brake module I/O. The supply has over-current protection and is isolated from all other supplies. A single-phase filter placed on the input to the supply provides conditioning. The supply is protected by circuit breaker CB3.

The PSL brake power supply is rated at 2 A. If more current is required, consider using the IOL power supply.

IMPORTANT Use the PSL +24V DC supply with devices that can potentially generate flyback currents (for example, brake coils and relays). This supply requires external flyback protection with either a diode or MOV.

Figure 18 - PSL Power Supply (catalog numbers 2094-AL09 and 2094-BL02)



Control Power Supply

The control power supply on 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C2 line interface modules is protected by FB1 and one 2-pole circuit breaker (CB2).

The control power supply on 2094-AL09 and 2094-BL02 line interface modules is protected by one 3-pole circuit breaker (CB2).

They all have a single-phase filter placed in the control VAC supply to provide protection/conditioning. For safety reasons, the internal wiring is arranged so that, if the control power (CPL) circuit breaker (CB2) trips, the opening contact will interrupt the coil voltage. Circuit breaker CB2 and fuse block FB1 are field-replaceable.

For FB1 replacement fuse part numbers, see the table on page 50.

Table 16 - Control Power Output Source

Cat. No.	Input Voltage	Control Power Source
2094-AL*xx*S	230V AC	Two phases of incoming power. (internal connection)
2094-AL09		
2094-XL75S-C1	230/460V AC	Auxiliary 110V AC input (APL) connector.
2094-XL75S-C2		Auxiliary 230V AC input (APL) connector.
2094-BL*xx*S	460V AC	Internal step down transformer.
2094-BL02		

See Power Specifications beginning on page 52 for control power output (CPL) specifications.

Figure 19 - CPL Power Supply (catalog numbers 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x*)

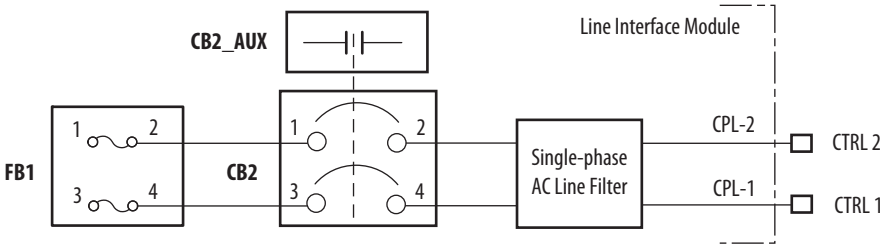
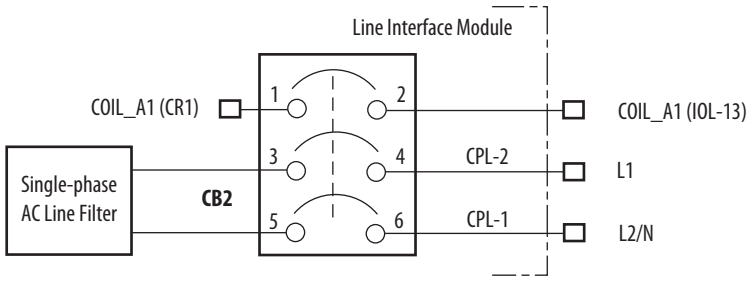


Figure 20 - CPL Power Supply (catalog numbers 2094-AL09 and 2094-BL02)

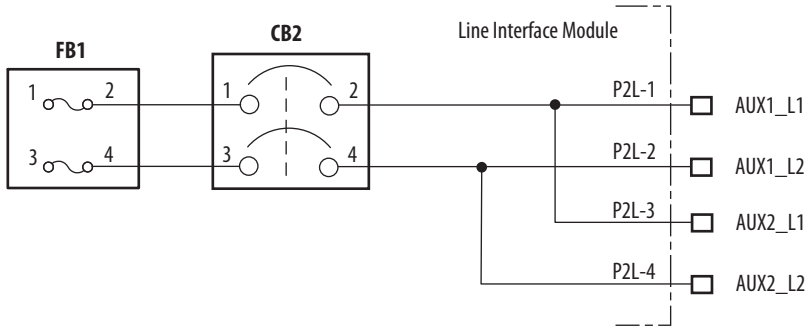


Auxiliary Power Output

An auxiliary 230V AC output is provided for use with the Bulletin 2090 resistive-brake module (RBM) or other customer requirement as needed on the P2L connector. This supply is present with 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C2 line interface modules. The supply is protected by circuit breaker CB2.

IMPORTANT Auxiliary power output (P2L) is 110V AC with catalog number 2094-XL75S-C1.

Figure 21 - P2L 230V Power (catalog numbers 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C2)



See Power Specifications beginning on page 52 for Auxiliary Power Output (P2L) specifications.

Auxiliary Power Input

The auxiliary power input (APL) connector is available only with the 2094-XL75S-C1 and 2094-XL75S-C2 line interface modules. This connector allows the customer to provide a separate auxiliary power source, independent from the mains supply, for control power and other uses.

The APL connector will accept either 110V (2094-XL75S-C1) or 230V AC (2094-XL75S-C2) input voltage. As a result, the auxiliary power output (P2L) and control power output (CPL) voltage is 110V or 230V AC, respectively. The 24V power supply is designed to operate on either 110V or 230V AC and will auto-detect the input voltage.

See Power Specifications beginning on page 52 for auxiliary power input (APL) and auxiliary power output (P2L) specifications.

See page 47 for the 2094-XL75S-C*x* line interface module block-diagram.

Install the Line Interface Module

This procedure assumes that you have prepared your panel and understand how to bond your system.

See the System Design for Control of Electrical Noise Reference Manual, publication GMC-RM001, for information on high-frequency bonding and reducing electrical noise.

ATTENTION: To avoid hazard of electrical shock, mount your line interface module to the panel before applying power. Once power is applied, connector terminals may have voltage present even when not in use.

IMPORTANT If you are using the 2094 mounting brackets and plan to mount your line interface module over the AC line filter, you must install the line filter and brackets first. See the 2094 Mounting Brackets Installation Instructions, publication 2094-IN008, for that information.

Only the 2094-AL*xx*S and 2094-XL75S-C*x* line interface modules are compatible with the 2094 mounting brackets. The 2094-BL*xx*S, 2094-AL09, and 2094-BL02 line interface modules are not compatible.

Mount the Line Interface Module

Follow these steps to mount your line interface module to the panel.

1. Layout the position for your module in the enclosure.

   See Establishing Noise Zones beginning on page 6 for panel layout recommendations. See Product Dimensions beginning on page 28.

   IMPORTANT To improve EMC performance, mount the line interface module on the same panel as the drive and as close to the drive as possible.

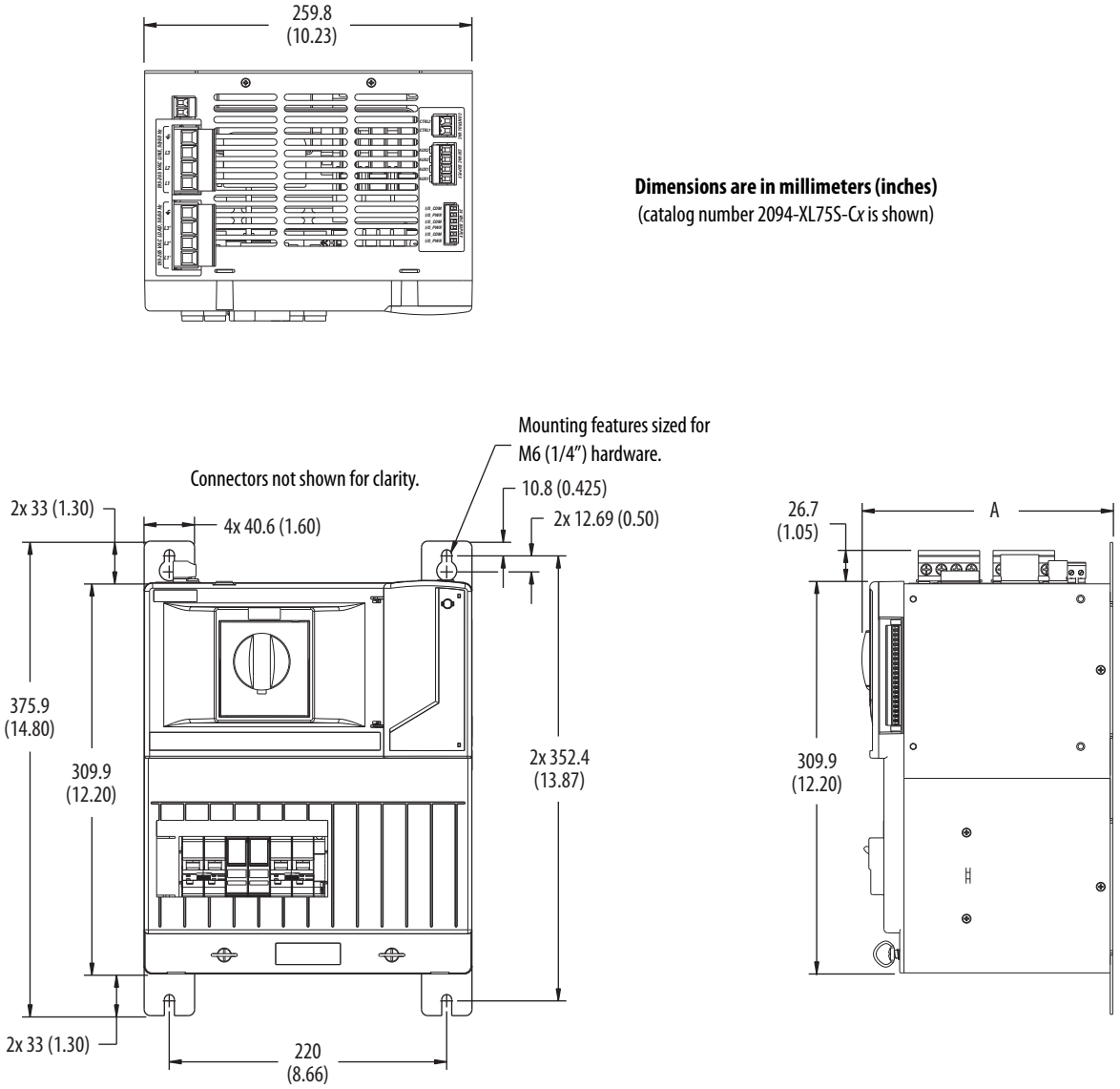
2. Attach the line interface module to the cabinet.

   The recommended mounting hardware is M6 metric (1/4 in.) bolts. Make sure all fasteners are properly bonded to the subpanel.

3. Tighten all mounting fasteners.

Product Dimensions

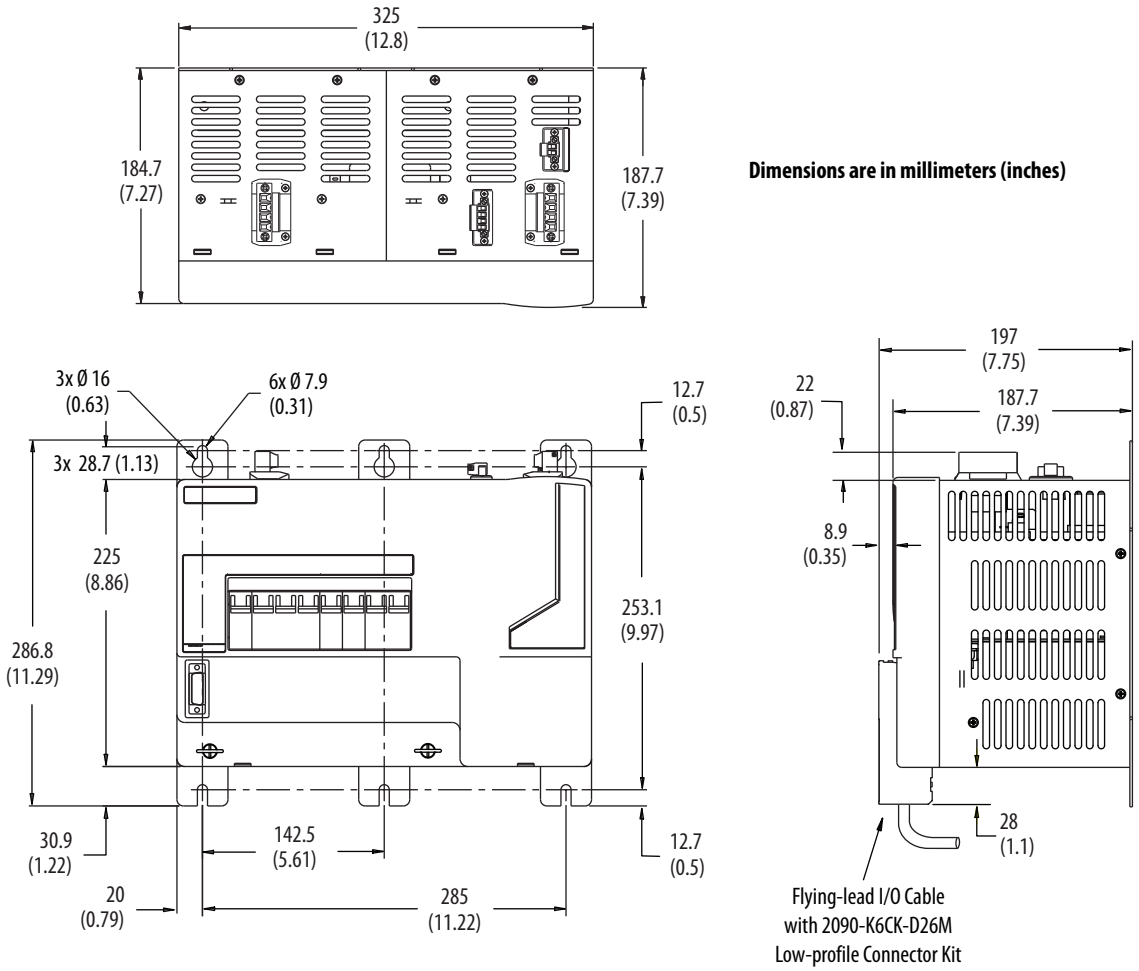
Figure 22 - Mounting Dimensions
(catalog numbers 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x*)



Dimensions are in millimeters (inches)
(catalog number 2094-XL75S-C*x* is shown)

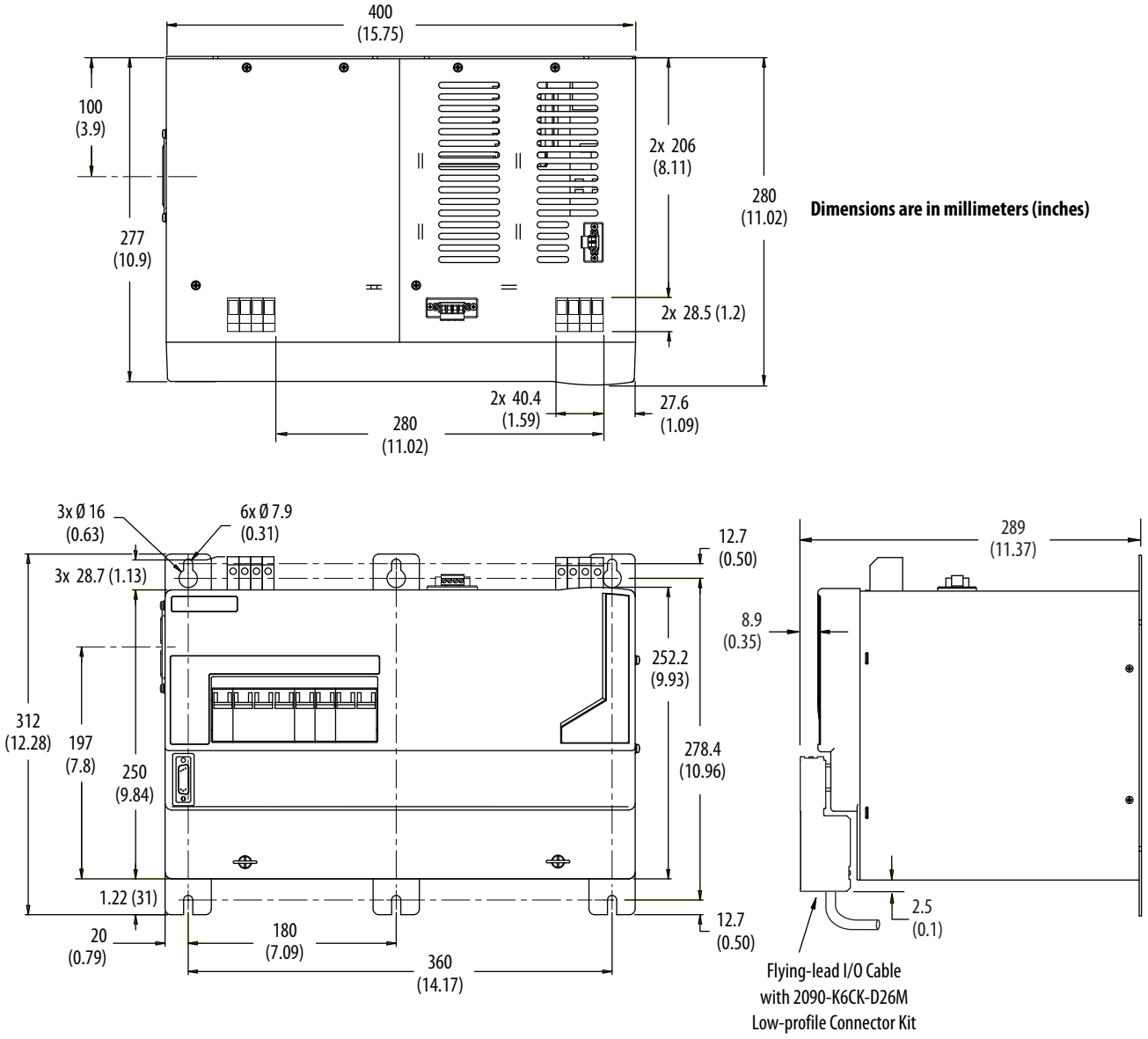
Cat. No.	**Dimension A** mm (in.)
2094-AL*xx*S	198.3 (7.81)
2094-XL75S-C*x*	
2094-BL*xx*S	248.0 (9.76)

Figure 23 - Mounting Dimensions (catalog number 2094-AL09)



IMPORTANT Additional clearance below the low-profile I/O connector is necessary to provide the recommended cable-bend radius.

Figure 24 - Mounting Dimensions (catalog number 2094-BL02)



Dimensions are in millimeters (inches)

IMPORTANT Additional clearance below the low-profile I/O connector is necessary to provide the recommended cable-bend radius.

Wire the Line Interface Module

This section provides wiring requirements for each connector on the line interface module.

IMPORTANT The National Electrical Code and local electrical codes take precedence over the values and methods provided.

Wire should be copper with 75 °C (167 °F) minimum rating. Phasing of main AC power is arbitrary and earth-ground connection is required for safe and proper operation.

Use these tables to determine the recommended wire size, strip length, and torque value for wiring your line interface module.

Table 17 - Wiring Requirements (catalog numbers 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C2)

Description	Connects to Terminals		Recommended Wire Size mm^2 (AWG)	Strip Length mm (in.)	Torque Value N•m (lb•in)
	Pin	Signal			
VAC LINE	IPL-1 IPL-2 IPL-3 IPL-4	⏚ L3 L2 L1	2.5…25 (14…4)	16.0 (0.63)	2.7 (24)
VAC LOAD	OPL-1 OPL-2 OPL-3 OPL-4	⏚ L3′ L2′ L1′			
Auxiliary power input (1)	APL-1	L2/N	0.2…4.0 (24…10)	7.0 (0.28)	0.5…0.6 (4.4…5.3)
	APL-2	L1			
Control power output	CPL-1	CTRL 1	0.2…4.0 (24…10)	7.0 (0.28)	0.5…0.6 (4.4…5.3)
	CPL-2	CTRL 2			
Auxiliary power output	P2L-1 P2L-2 P2L-3 P2L-4	AUX1_L1 AUX1_L2 AUX2_L1 AUX2_L2	0.2…4.0 (24…10)	7.0 (0.28)	0.5…0.6 (4.4…5.3)
Brake and I/O power output	P1L-1 P1L-2 P1L-3 P1L-4 P1L-5 P1L-6	IO_PWR2 IO_COM2 IO_PWR2 IO_COM2 IO_PWR2 IO_COM2	0.08…1.5 (28…16)	7.0 (0.28)	0.22…0.25 (1.9…2.2)
Status I/O (21-pin terminal block)	IOL-1…IOL-21		0.5…1.5 (22…14)	6.0 (0.25)	1.13 (10)

(1) The auxiliary power input (APL) connector is present only on the 2094-XL75S-C*x* line interface modules.

Table 18 - Wiring Requirements (catalog numbers 2094-AL09 and 2094-BL02)

Cat. No.	Description	Connects to Terminals		Recommended Wire Size mm^2 (AWG)	Strip Length mm (in.)	Torque Value N•m (lb•in)
		Pin	Signal			
2094-AL09 (230V)	VAC LINE	IPL-1 IPL-2 IPL-3 IPL-4	⏚ L3 L2 L1	2.5 (14)	10.0 (0.38)	0.5…0.6 (4.4…5.3)
	VAC LOAD	OPL-4 OPL-3 OPL-2 OPL-1	⏚ L3′ L2′ L1′			
2094-BL02 (460V)	VAC LINE	IPL-4 IPL-3 IPL-2 IPL-1	⏚ L3 L2 L1	4.0 (12)	10.0 (0.38)	1.5…1.8 (13.2…15.9)
	VAC LOAD	OPL-1 OPL-2 OPL-3 OPL-4	⏚ L3′ L2′ L1′			
Common (230V or 460V)	Control power output	CPL-2 CPL-1	L1 L2/N	2.5 (14)	10.0 (0.38)	0.5…0.6 (4.4…5.3)
	Brake and I/O power output	PSL-1 PSL-2 PSL-3 PSL-4	MBRK PWR MBRK COM MBRK PWR MBRK COM			

ATTENTION: To avoid hazard of electrical shock, complete the wiring of your module before applying power. Once power is applied, connector terminals may have voltage present even when not in use.

ATTENTION: The input power for Bulletin 2094 line interface modules must come from a grounded configuration. When an ungrounded power configuration is used, phases L1, L2, and L3 (without a reference to earth ground) can drift and stress the line-filter components internal to the line interface module.

Your Bulletin 2093, 2094, and 2099 servo drive user manual includes examples of grounded and ungrounded power configurations. See Additional Resources on page 56 for publication numbers.

Wiring Guidelines

Use these guidelines as a reference when wiring the connectors on your line interface module.

IMPORTANT	See Connector Data on page 9 for the connector locations of your line interface module. When tightening screws to secure the wires, see the tables beginning on page 31 for torque values. When removing insulation from wires, see the tables beginning on page 31 for strip lengths.

IMPORTANT	To ensure system performance, run wires and cables in wireways as shown in Establishing Noise Zones on page 6.

See Wiring Diagrams beginning on page 43 for interconnect diagrams including the line interface module.

Follow these steps when wiring the connectors on your line interface module.

1. Prepare the wires for attachment to each connector plug by removing insulation equal to the recommended strip length.

IMPORTANT	Use caution not to nick, cut, or otherwise damage strands as you remove the insulation.

2. Route the cable/wires to your line interface module.
3. Insert wires into connector plugs.

   See connector pinout tables beginning on page 11.
4. Tighten the connector screws.
5. Gently pull on each wire to make sure it does not come out of its terminal. If any wires are loose, then repeat steps 3 and 4.
6. Insert the connector plug into the appropriate connector.

Wiring the Auxiliary-input Power (APL) Connector

The auxiliary-input power (APL) connector is present only on the 2094-XL75S-C*x* line interface modules.

Figure 25 - Line Interface Module (APL connector)

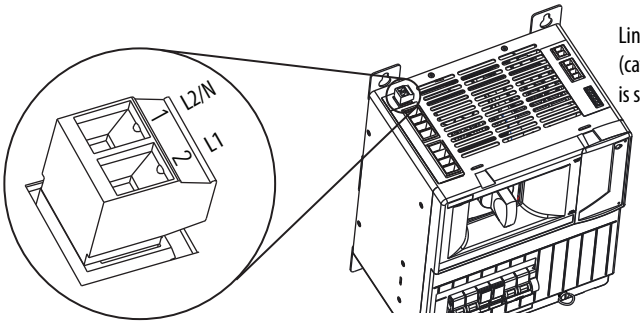
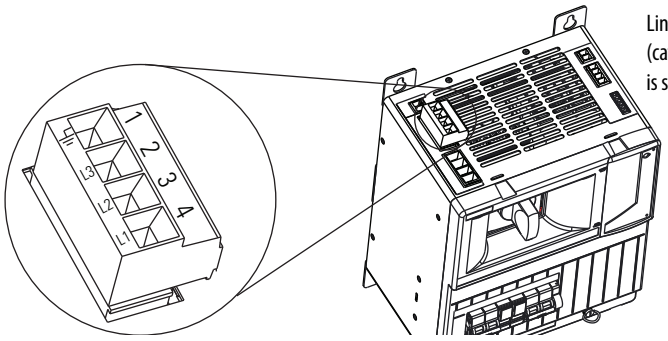


Table 19 - Auxiliary Input Power (APL) Connector

Single-phase Supply	APL Pin	Signal	Recommended Wire Size mm^2 (AWG)	Strip Length mm (in.)	Torque Value N•m (lb•in)
L1	1	L1	0.2…4.0 (24…10)	7.0 (0.28)	0.5…0.6 (4.4…5.3)
L2	2	L2/N			

Wiring the VAC LINE (IPL) Connector

Figure 26 - Line Interface Module (IPL connector)



Line Interface Module, Top View (catalog number 2094-XL75S-C*x* is shown)

ATTENTION: The input power for Bulletin 2094 line interface modules must come from a grounded configuration. When an ungrounded power configuration is used, phases L1, L2, and L3 (without a reference to earth ground) can drift and stress the line filter components internal to the line interface module.

Your Bulletin 2093, 2094, and 2099 servo-drive user manual includes examples of grounded and ungrounded power configurations. See Additional Resources on page 56 for publication numbers.

Table 20 - VAC LINE (IPL) Connector (catalog numbers 2094-AL09, 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x*)

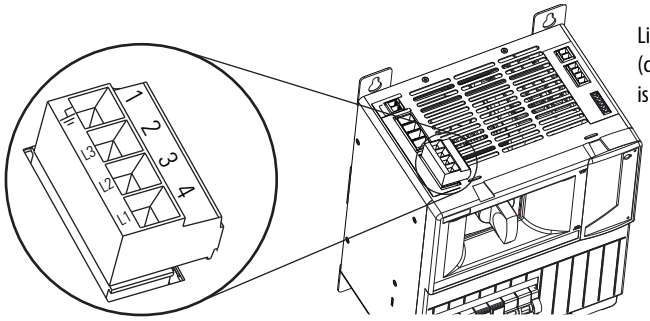
3-phase Supply	IPL Pin	Signal	Recommended Wire Size mm^2 (AWG)	Strip Length mm (in.)	Torque Value N•m (lb•in)
L1	4	L1	2.5…25 (14…4)	16.0 (0.63)	2.7 (24)
L2	3	L2			
L3	2	L3			
⏚	1	⏚			

Table 21 - VAC LINE (IPL) Connector (2094-BL02 module)

3-phase Supply	IPL Pin	Signal	Recommended Wire Size mm^2 (AWG)	Strip Length mm (in.)	Torque Value N•m (lb•in)
L1	1	L1	4.0 (12)	10.0 (0.38)	1.5…1.8 (13.2…15.9)
L2	2	L2			
L3	3	L3			
⏚	4	⏚			

Wiring the VAC LOAD (OPL) Connector

Figure 27 - Line Interface Module (OPL connector)



Line Interface Module, Top View
(catalog number 2094-XL75S-C*x* is shown)

IMPORTANT The 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x* line interface modules are capable of connecting to multiple drives, providing each drive has its own line filter and the maximum current specification is not exceeded.

For example diagrams, see the user manual for your drive. See Additional Resources on page 56 for publications.

Table 22 - VAC LOAD (OPL) Connector (catalog numbers 2094-AL*xx*S, 2094-BL*xx*S, or 2094-XL75S-C*x*)

3-phase Supply	OPL Pin	Signal	Recommended Wire Size mm^2 (AWG)	Strip Length mm (in.)	Torque Value N•m (lb•in)
L1	4	L1′	2.5…25 (14…4)	16.0 (0.63)	2.7 (24)
L2	3	L2′			
L3	2	L3′			
⏚	1	⏚			

Table 23 - VAC LOAD (OPL) Connector (catalog number 2094-AL09)

3-phase Supply	OPL Pin	Signal	Recommended Wire Size mm^2 (AWG)	Strip Length mm (in.)	Torque Value N•m (lb•in)
L1	1	L1′	2.5…25 (14…4)	16.0 (0.63)	2.7 (24)
L2	2	L2′			
L3	3	L3′			
⏚	4	⏚			

Table 24 - VAC LOAD (OPL) Connector (catalog number 2094-BL02)

3-phase Supply	OPL Pin	Signal	Recommended Wire Size mm^2 (AWG)	Strip Length mm (in.)	Torque Value N•m (lb•in)
L1	4	L1′	4.0 (12)	10.0 (0.38)	1.5…1.8 (13.2…15.9)
L2	3	L2′			
L3	2	L3′			
⏚	1	⏚			

Wiring the Control Power Output (CPL) Connector

Figure 28 - Line Interface Module (CPL connector)

Line Interface Module, Top View
(catalog number 2094-XL75S-C*x* is shown)

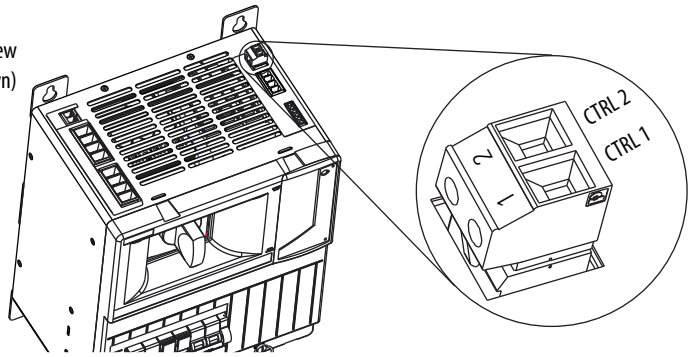


Table 25 - Control Power Output (CPL) Connector (catalog numbers 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x*)

CPL Pin	Signal	Recommended Wire Size mm^2 (AWG)	Strip Length mm (in.)	Torque Value N•m (lb•in)
1	CTRL 1	0.2…4.0 (24…10)	7.0 (0.28)	0.5…0.6 (4.4…5.3)
2	CTRL 2			

Table 26 - Control Power Output (CPL) Connector (catalog numbers 2094-AL09 and 2094-BL02)

CPL Pin	Signal	Recommended Wire Size mm^2 (AWG)	Strip Length mm (in.)	Torque Value N•m (lb•in)
2	L1	2.5 (14)	10.0 (0.38)	0.5…0.6 (4.4…5.3)
1	L2/N			

Wiring the Auxiliary Power Output (P2L) Connector

Figure 29 - Line Interface Module (P2L connector)

Line Interface Module, Top View
(catalog number 2094-XL75S-C*x* is shown)

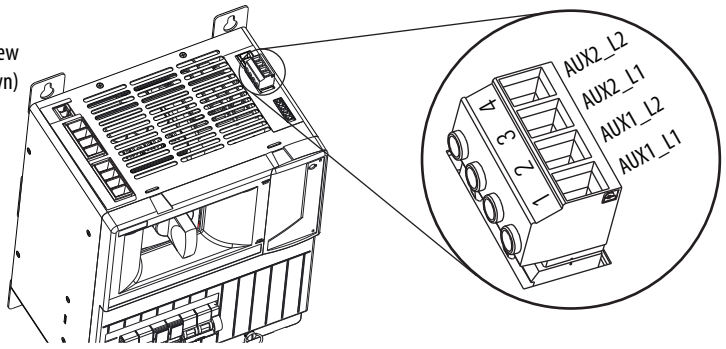


Table 27 - Auxiliary Power Output (P2L) Connector (catalog numbers 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x*)

P2L Pin	Signal	Recommended Wire Size mm^2 (AWG)	Strip Length mm (in.)	Torque Value N•m (lb•in)
1	AUX1_L1	0.2…4.0 (24…10)	7.0 (0.28)	0.5…0.6 (4.4…5.3)
2	AUX1_L2			
3	AUX2_L1			
4	AUX2_L2			

Wiring the Brake Power Output (24V DC) Connector

Figure 30 - Line Interface Module (24V connector)

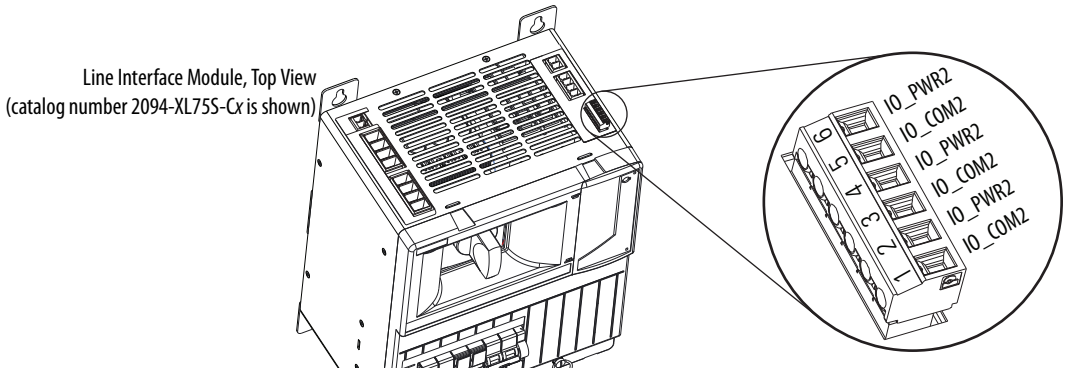


Table 28 - Brake Power Output (24V DC) Connector (catalog numbers 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x*)

P1L Pin	Signal	Recommended Wire Size mm^2 (AWG)	Strip Length mm (in.)	Torque Value N•m (lb•in)
1	IO_PWR2	0.08…1.5 (28…16)	7.0 (0.28)	0.22…0.25 (1.9…2.2)
2	IO_COM2			
3	IO_PWR2			
4	IO_COM2			
5	IO_PWR2			
6	IO_COM2			

Table 29 - Brake Power Output (24V DC) Connector (catalog numbers 2094-AL09 and 2094-BL02)

PSL Pin	Signal	Recommended Wire Size mm^2 (AWG)	Strip Length mm (in.)	Torque Value N•m (lb•in)
1	MBRK PWR	2.5 (14)	10.0 (0.38)	0.5…0.6 (4.4…5.3)
2	MBRK COM			
3	MBRK PWR			
4	MBRK COM			

Configure Branch-circuit Protection

Branch-circuit protection for the line interface module is customer configurable. By moving the CB2/CB3 wiring harness (P4) from one side of CB1 to the other, you can change the module operation. To understand this option, see the simplified block diagram and table below.

Figure 31 - Simplified Block Diagram (catalog numbers 2094-AL*xx*S and 2094-BL*xx*S)

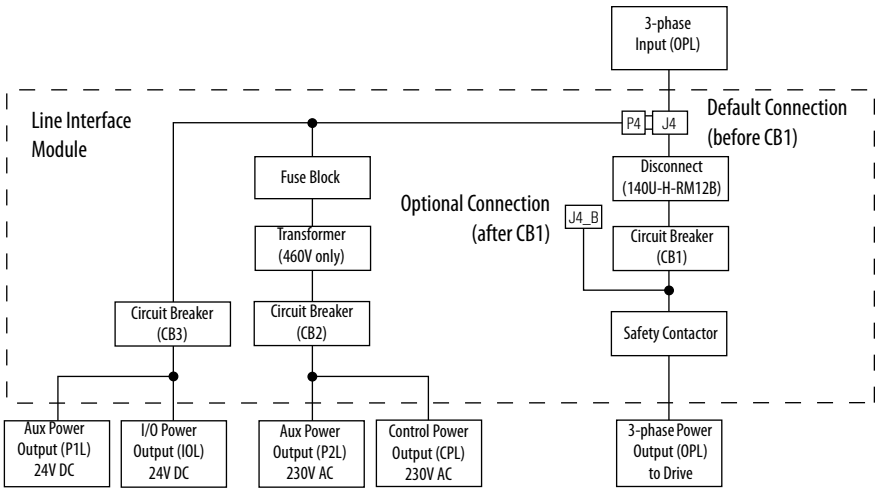


Table 30 - Branch-circuit Operation (catalog numbers 2094-AL*xx*S and 2094-BL*xx*S)

Cat. No.	Branch-circuit Protection Configurations	Module Operation
• 2094-AL15S, 2094-AL25S, 2094-AL50S, 2094-AL75S (1) (230V) line interface modules • 2094-BL10S, 2094-BL25S, 2094-BL50S, 2094-BL75S (1) (460V) line interface modules	Input VAC to CB2 and CB3 before CB1 (default configuration)	Closing CB1 removes 3-phase power to the device (servo drive), however 24V DC (CB2) and 230V AC (CB3) auxiliary circuits remain energized.
	Input VAC to CB2 and CB3 after CB1 (optional configuration)	Closing CB1 removes all power to the line interface module.

(1) Applies to 2094-AL*xx*S and 2094-BL*xx*S (series B) line interface modules only.

IMPORTANT For the input VAC to CB2/CB3 before CB1 (default) configuration, no action is required.

Follow these steps to move the CB2/CB3 wiring harness to the optional configuration.

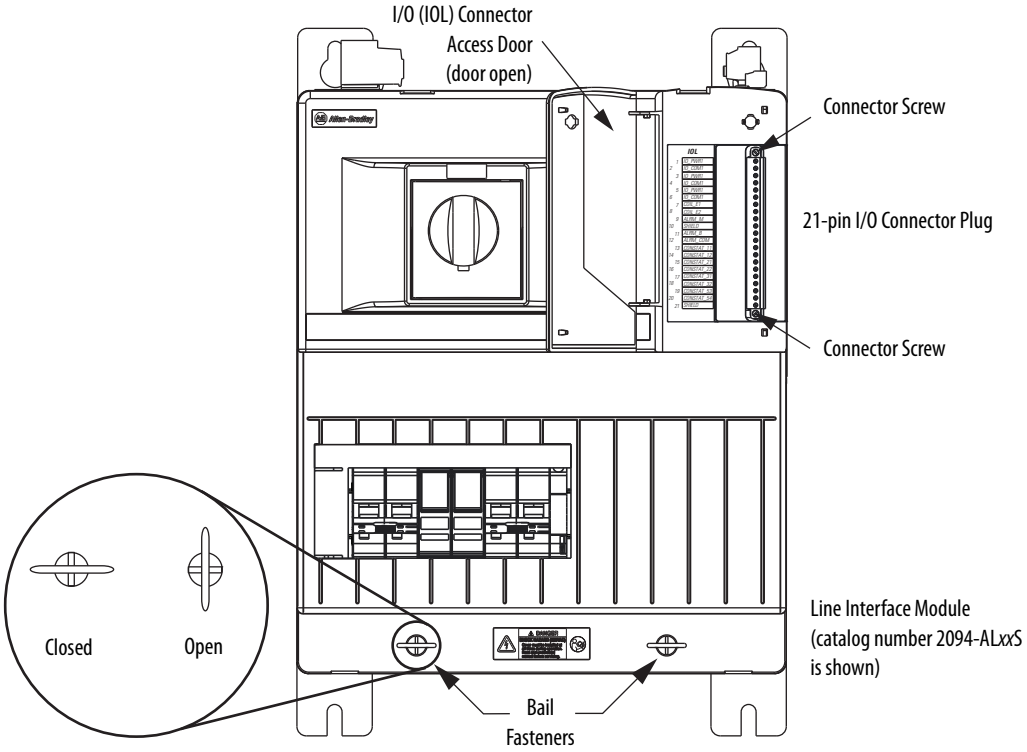
1. Remove all input power from the line interface module.

ATTENTION: To avoid shock hazard or personal injury, verify that all power has been removed before proceeding. This system may have multiple sources of power. Multiple disconnect switches may be required to de-energize the system.

2. Allow five minutes for the 24V power supplies to completely discharge before proceeding.

ATTENTION: This product contains stored energy devices. To avoid hazard of electrical shock, verify that all voltage on capacitors has been discharged before attempting to service, repair, or remove this unit. You should attempt the procedures in this document only if you are qualified to do so and are familiar with solid-state control equipment and the safety procedures in publication NFPA 70E.

3. Open the I/O (IOL) connector access door.



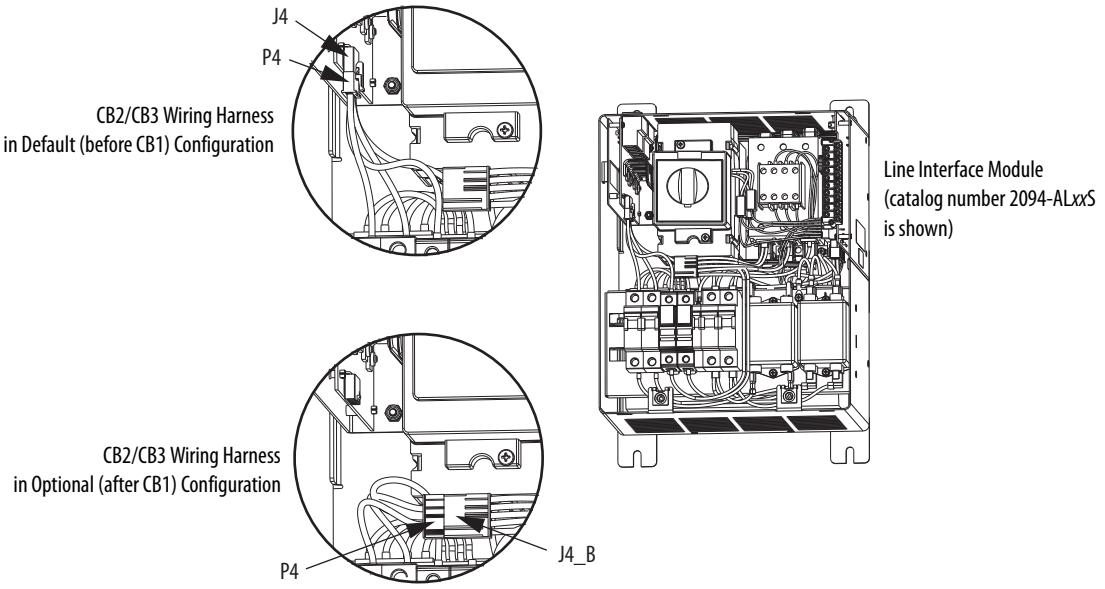
4. Loosen the two (captive) connector screws.
5. Remove the I/O connector plug by pulling it straight out from the mating connector inside the line interface module.

IMPORTANT It is not necessary to remove any of the wires attached to the I/O connector.

6. Locate the two bail fasteners (lower front cover) and rotate them one-quarter turn counterclockwise.
7. Starting at the bottom, pull the front cover away from the line interface module, then up and over the module to completely remove the cover.

   The cover pivots from two latches at the top of the module.
8. Unplug the CB2/CB3 wiring harness (P4) from the J4 (default) connection.

9. Move the CB2/CB3 wiring harness (P4) to the J4_B (optional) connection.
10. Fully insert the P4 connector into the J4_B housing until latched.

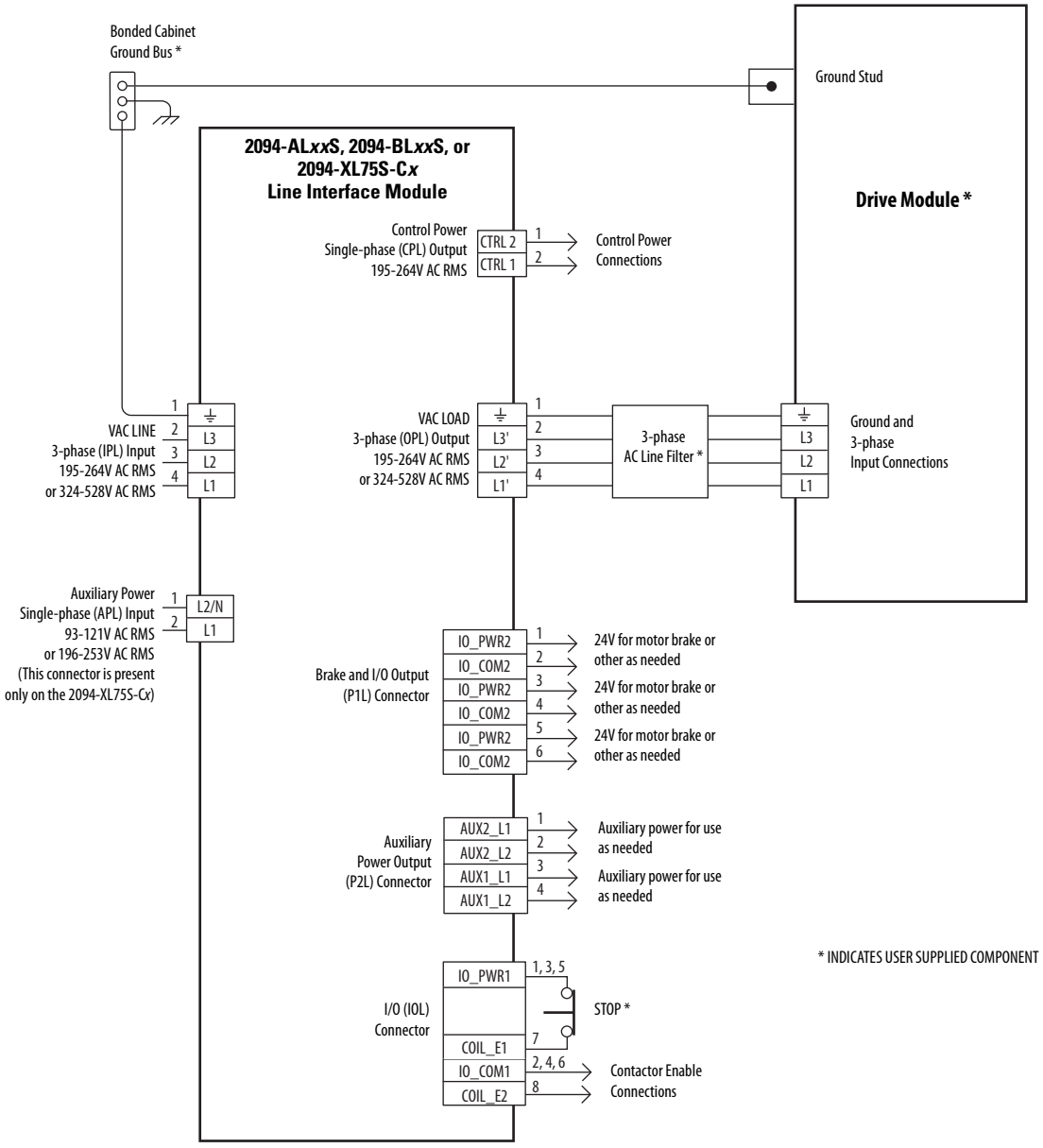


11. Replace the cover and I/O connector by following steps 3...7 in reverse order.

Wiring Diagrams

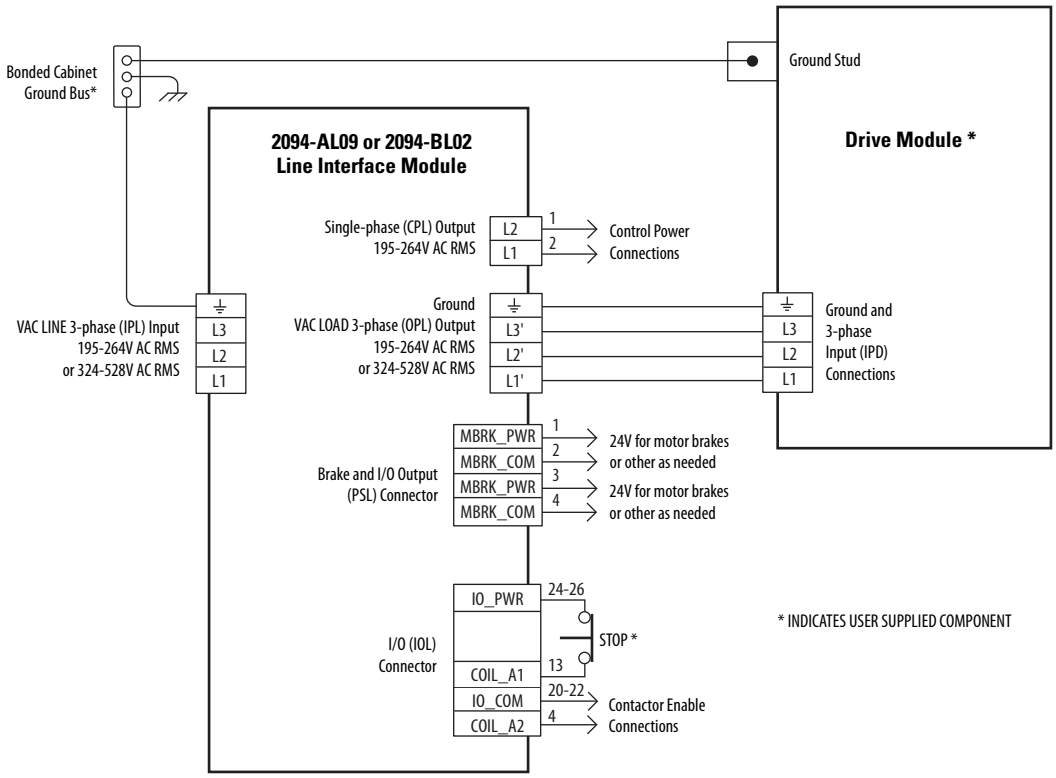
In this example configuration, the servo drive has input power, brake power, and the start/stop string wired from 2094-AL*xx*S, 2094-BL*xx*S, or 2094-XL75S-C*x* line interface modules. These modules do not contain an AC line filter, so an external filter is added between the module and the drive.

Figure 32 - Power-interconnect Diagram (line interface module with drive)



In the example configuration below, the servo drive has input power, brake power, and the start/stop string wired from a 2094-AL09 or 2094-BL02 line interface module. These modules contain an AC line filter, so an external filter is not required.

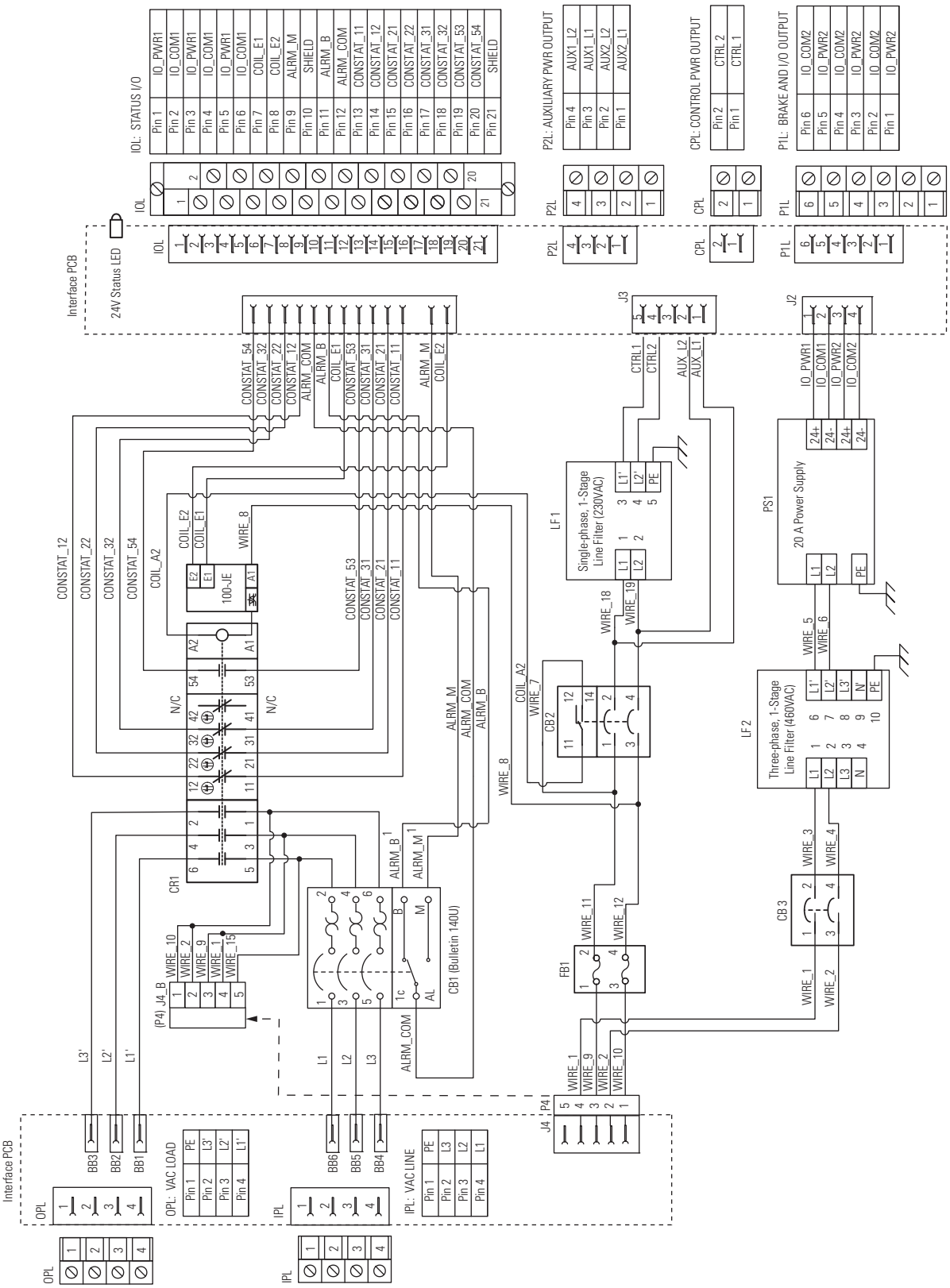
Figure 33 - Power-interconnect Diagram (line interface module with drive)



Block Diagrams

These are block diagrams for the Bulletin 2094 line interface modules.

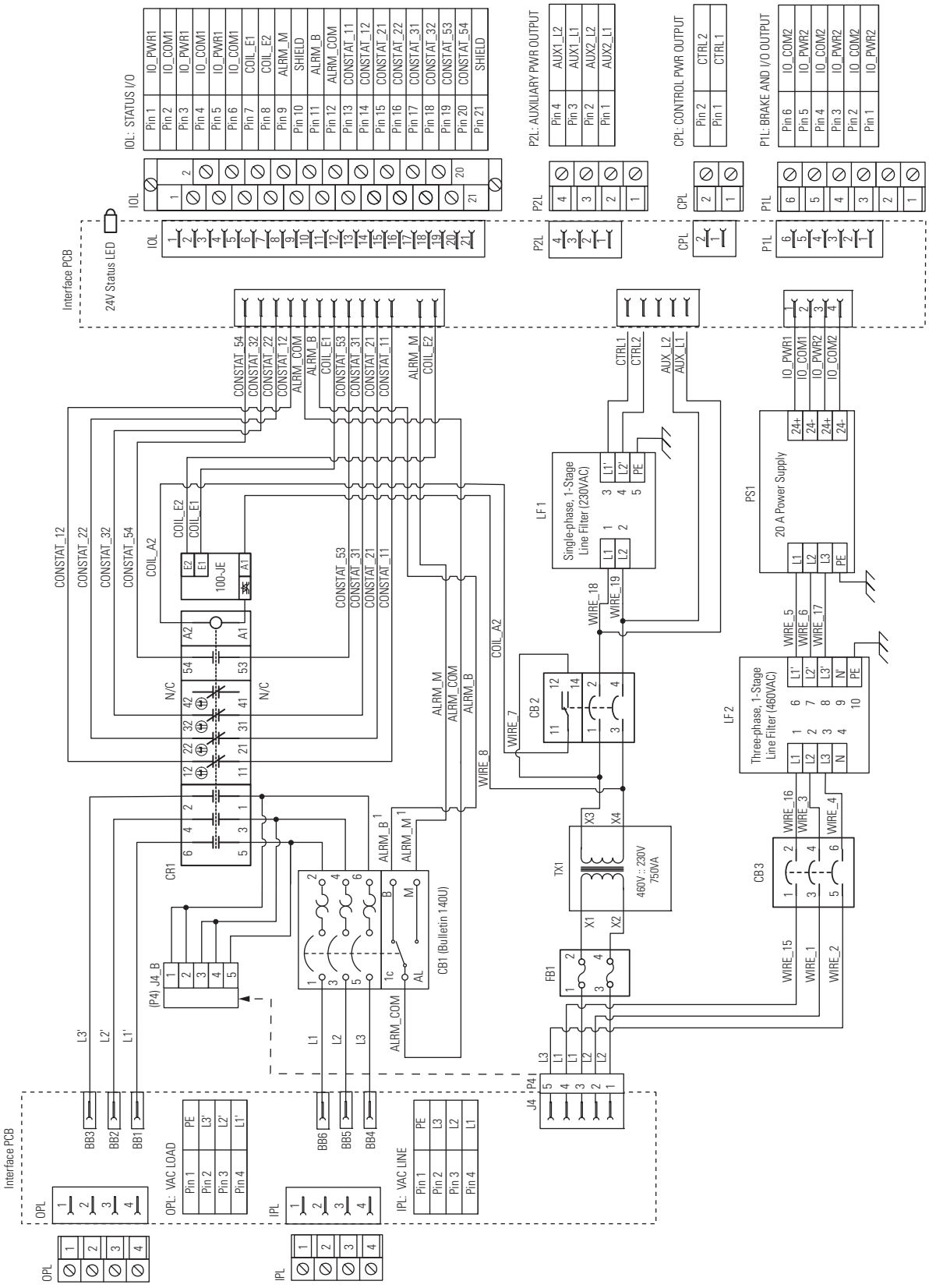
Figure 34 - Block Diagram (catalog number 2094-AL*xx*S)



(1) Alarm contacts (ALRM_B and ALRM_M) only change state when CB1 trips, not when manually operated. See CB1 Alarm Operation on page 18 for more information.

(2) The IOL (21-pin) terminal block may have staggered terminals or straight terminals.

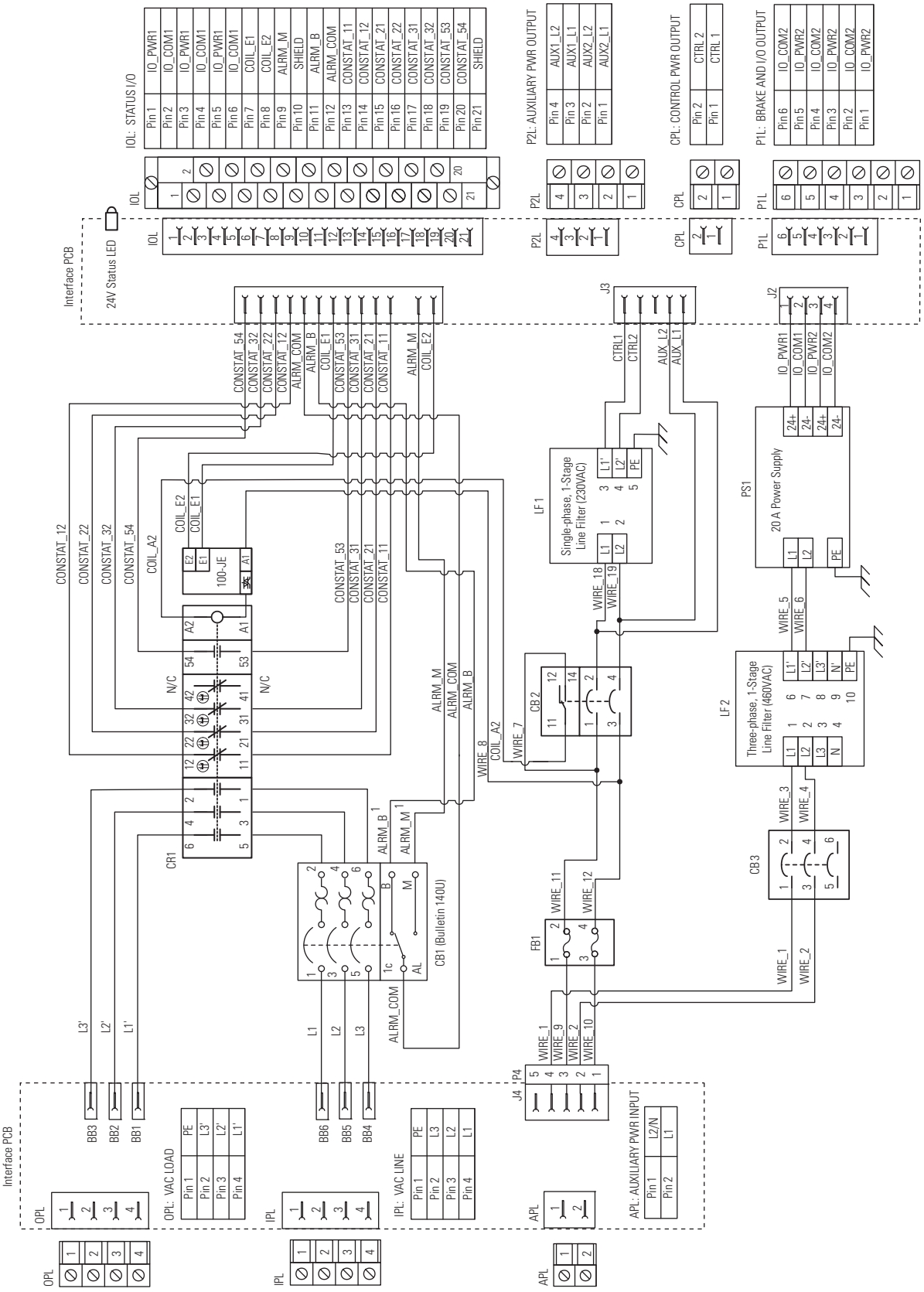
Figure 35 - Block Diagram (catalog number 2094-BLxxS)



(1) Alarm contacts (ALRM_B and ALRM_M) only change state when CB1 trips, not when manually operated. See CB1 Alarm Operation on page 18 for more information.

(2) The IOL (21-pin) terminal block may have staggered terminals or straight terminals.

Figure 36 - Block Diagram (catalog number 2094-XL75S-Cx)



(1) Alarm contacts (ALRM_B and ALRM_M) only change state when CB1 trips, not when manually operated. See CB1 Alarm Operation on page 18 for more information.

(2) The IOL (21-pin) terminal block may have staggered terminals or straight terminals.

Figure 37 - Block Diagram (catalog number 2094-AL09)

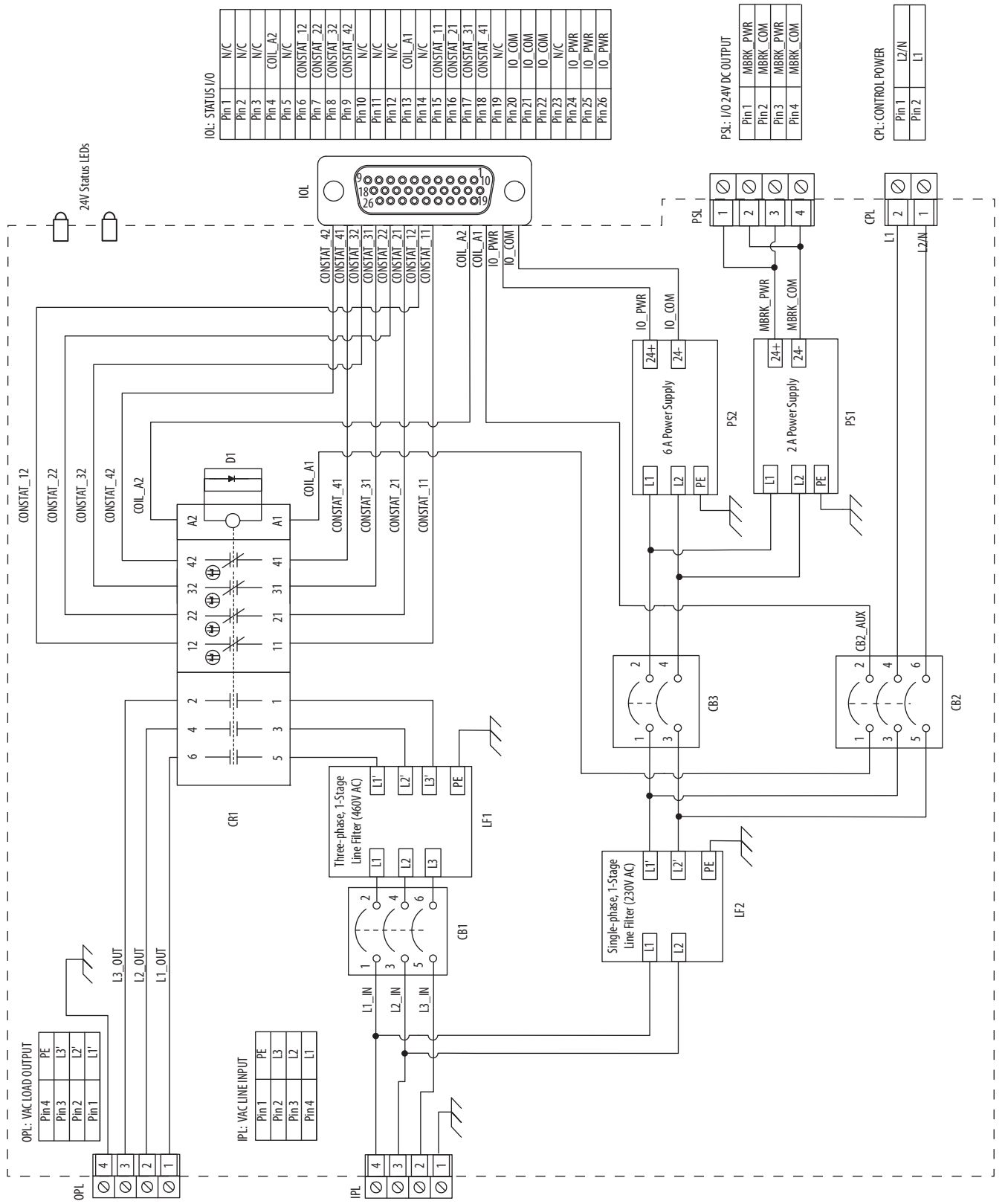
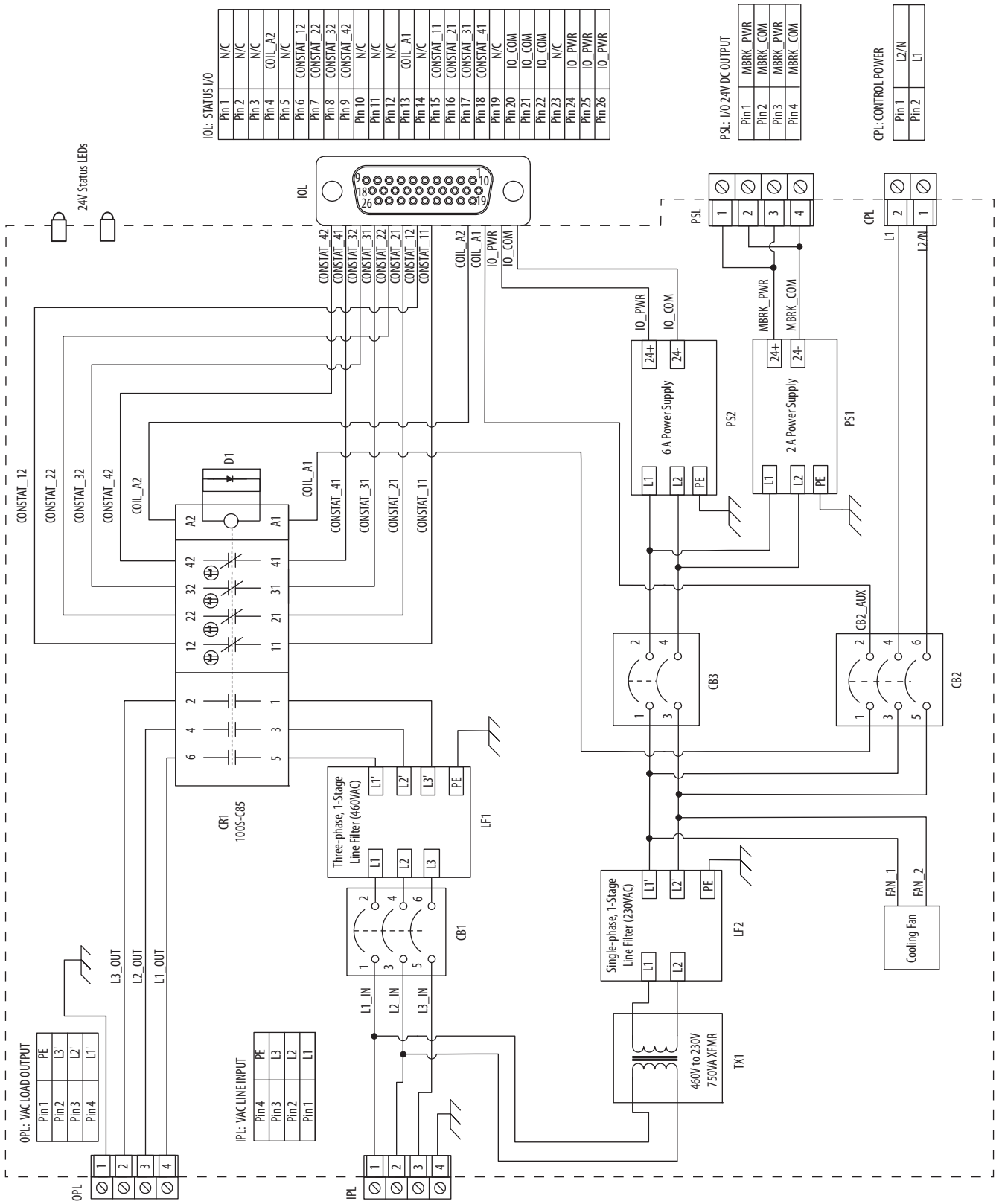


Figure 38 - Block Diagram (catalog number 2094-BL02)



Post-installation

This section provides descriptions and catalog numbers for accessory items and field-replaceable components internal to the line interface module. For component removal and replacement information, see Removing and Replacing line interface Module Internal Components Installation Instructions, publication 2094-IN009.

Table 31 - Field-Replaceable Components (catalog numbers 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x*)

Cat. No.	Quantity	Reference Designator	Description	Allen-Bradley Part Number	Bussmann Part Number
2094-AL*xx*S	1	CB2	Circuit breaker, 2-pole, 20 A	1492-SPM2D200	–
	1	CB3	Circuit breaker, 2-pole, 16 A	1492-SPM2C160	–
	2	FB1(1)	Fuse, 10 A, Class CC	–	FNQ-R-10
2094-BL*xx*S	1	CB2	Circuit breaker, 2-pole, 4 A	1492-SPM2D040	–
	1	CB3	Circuit breaker, 3-pole, 6 A	1492-SPM3C060	–
	2	FB1(1)	Fuse, 3.5 A, Class CC	–	FNQ-R-3.5
2094-XL75S-C1	1	CB2	Circuit breaker, 2-pole, 20 A	1492-SPM2D200	–
	1	CB3	Circuit breaker, 2-pole, 16 A	1492-SPM2C160	–
	2	FB1(1)	Fuse, 15 A, Class CC	–	FNQ-R-15
2094-XL75S-C2	1	CB2	Circuit breaker, 2-pole, 20 A	1492-SPM2D200	–
	1	CB3	Circuit breaker, 2-pole, 16 A	1492-SPM2C160	–
	2	FB1(1)	Fuse, 10 A, Class CC	–	FNQ-R-10
Common module components	1	FB1	Fuse block	1492-FB2C30-L	–
	1	CB2A	Auxiliary contact	189-ASCR3	–

(1) Fuses for FB1 are accessible from the front of each module. See page 9 for the location of FB1.

Table 32 - Field-Replaceable Components (catalog numbers 2094-AL09 and 2094-BL02)

Cat. No.	Quantity	Description	Allen-Bradley Part Number	Vendor Part Number
2094-AL09	1	Circuit breaker, 3-phase, 25 A, 480V	1492-SPM3D250	–
2094-BL02	1	Circuit breaker, 3-phase, 32 A, 480V	1492-SPM3D320	–
	1	Finger guard, fan, wire, 80 mm	–	8172 (Qual-Tek)
	1	Fan, 80 mm (3.15 in.), 230V	–	UF80B23-BTH (Mechatronics)
Common module components	1	Circuit breaker, 2-phase, 3 A, 480V	1492-SPM2D030	–
	1	Circuit breaker, 3-phase, 3 A, 480V	1492-SPM3D030	–

Table 33 - Accessories

Cat. No.	Description	Accessory Cat. No.
2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x*	Connector Set. Includes I/O (IOL), VAC LINE (IPL), VAC LOAD (OPL), control power (CPL), 230V auxiliary output (P2L), 24V brake power (P1L), and 230V auxiliary input (APL) replacement connectors for these catalog numbers.	2094-XNLIM-2
	Mounting bracket for use when panel configuration calls for mounting the AC line filter behind the line interface module.	2094-XNBRKT-1
	Variable-depth rotary mechanism. Provides disconnect from outside the cabinet when used with 140U device (CB1).	140G-G-RVM12B
2094-AL09 and 2094-BL02	Low-profile connector kit for I/O (26-pin high density D-shell).	2090-K6CK-D26M
	Connector Set. Includes VAC LINE (IPL), VAC LOAD (OPL), control power (CPL), and 24V brake power (PSL) replacement connectors for these catalog numbers.	2094-XNLIM-1

Status Indicators

The line interface module status indicators monitor the 24V output supply.

Table 34 - Troubleshooting Status Indicators

Status Indicator	Status	Description
• 24V power status indicator (1) • Brake power status indicator (2) • I/O power status indicator (2)	Steady Green	Normal, 24V power enabled
	Off (24V power disabled)	• CB3 is open. Reset CB3. • If CB3 continues to trip, call your Rockwell Automation representative to return module for repair.
		• Check 24V polarity. Correct polarity if reversed. • If polarity is correct and indicator is not steady green, call your Rockwell Automation representative to return module for repair.

(1) Applies to 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x* line interface modules.

(2) Applies to 2094-AL09 and 2094-BL02 line interface modules.

Specifications

This section provides power, fuse, weight, and environmental specifications for the line interface modules.

Power Specifications

Table 35 - Power Specifications (catalog numbers 2094-AL*xx*S and 2094-BL*xx*S)

Designators	Attribute	2094-AL*xx*S (230V)				2094-BL*xx*S (460V)			
		AL15S	AL25S	AL50S	AL75S	BL10S	BL25S	BL50S	BL75S
VAC LINE (IPL) connector	AC input voltage	195…265V rms 3-phase (230V nom)				380…520V rms 3-phase (460V nom)			
	AC input frequency	47…63 Hz				47…63 Hz			
VAC LOAD (OPL) connector	Main AC output current (rms)	15 A	25 A	50 A	75 A	10 A	25 A	50 A	75 A
Control power output (CPL) connector and Auxiliary power output (P2L) connector	AC output current (rms)	3 A (3)				3 A (3)			
	AC output voltage	195…265V rms single-phase (230V nom)				190…260V rms single-phase (230V nom)			
Brake power output (P1L) connector and I/O (IOL) connector	24V DC power supply	20 A (4)				20 A (4)			
Contactor (CR1)	Contactor control voltage (1)	21.6…26.4V DC				21.6…26.4V DC			
	Contactor control current (1)	12…9 mA				12…9 mA			
	Contactor pickup current (2)	N/A (Internal)				N/A (Internal)			
	Contactor hold-in current (2)	N/A (Internal)				N/A (Internal)			
	Contactor voltage	N/A (Internal)				N/A (Internal)			
	Contactor pickup time	18.5 ms (min) 30.0 ms (max)				18.5 ms (min) 30.0 ms (max)			
	Contactor dropout time	10.0 ms (min) 60.0 ms (max)				10.0 ms (min) 60.0 ms (max)			

(1) Power specifications for DC-interface module (100 JE) COIL_E1 and COIL_E2 input.
(2) Current provided by auxiliary VAC input.
(3) Sum of CPL and P2L current must not exceed 3 A.
(4) Sum of P1L and IOL current must not exceed 20 A.

Table 36 - Power Specifications (catalog numbers 2094-XL75S-Cx)

Designators	Attribute	2094-XL75S-C1 (230/460V)	2094-XL75S-C2 (230/460V)
VAC LINE (IPL) Connector	AC input voltage	195…520V rms 3-phase (230…460V nom)	
	AC input frequency	47…63 Hz	
VAC LOAD (OPL) connector	Main AC output current (rms)	75 A	
Auxiliary power input (APL) connector	Auxiliary AC input voltage	93…121V rms single-phase (110V nom)	196…253V rms single-phase (230V nom)
	Auxiliary AC input current (rms)	20 A	11 A
Control power output (CPL) connector and Auxiliary power output (P2L) connector	AC output current (rms)	12 A	5 A
	AC output voltage	93…121V rms single-phase (110V nom)	196…253V rms single-phase (230V nom)
Brake power output (P1L) connector and I/O (IOL) connector	24V DC power supply	20 A	
Contactor (CR1)	Contactor control voltage (1)	21.6…26.4V DC	
	Contactor control current (1)	12…9 mA	
	Contactor pickup current (2)	1.75 A	0.87 A
	Contactor hold-in current (2)	0.14 A	0.07 A
	Contactor voltage	93…121V rms single-phase (110V nom)	196…253V rms single-phase (230V nom)
	Contactor pickup time	18.5 ms (min) 30.0 ms (max)	
	Contactor dropout Time	10.0 ms (min) 60.0 ms (max)	

(1) Power specifications for DC-interface module (100 JE) COIL_E1 and COIL_E2 input.
(2) Current provided by auxiliary VAC input.

Table 37 - Power Specifications (catalog numbers 2094-AL09 and 2094-BL02)

Designator	Attribute	Value	
		2094-AL09 (230V)	2094-BL02 (460V)
VAC LINE (IPL) connector	AC input voltage	195-265V rms 3-phase (230V nom)	380-520V rms 3-phase (460V nom)
	AC input frequency	47…63 Hz	
VAC LOAD (OPL) connector	Main AC output current	20 A rms	30 A rms
Control power output (CPL) connector	AC output current	3 A	
	AC output voltage	195-265V rms 3-phase (230V nom)	190-260V rms 3-phase (230V nom)
Brake power output (PSL) connector	Brake power 24V DC	2.0 A	
	I/O brake power 24V DC	5.7 A	
Contactor (CR1)	Contactor pickup current	383 mA	
	Contactor hold-in current	383 mA	
	Contactor voltage	24V DC	
	Contactor pickup time	50 ms (min) 80 ms (max)	
	Contactor dropout time	80 ms (min) 125 ms (max)	

Table 38 - Power Dissipation Specifications

Cat. No.	Dissipation at 100% of Rated Power Output (watts)
2094-AL09	72
2094-AL*xx*S	52.5
2094-BL02	90
2094-BL*xx*S	42.9
2094-XL75S-C*x*	52.5

Fuse Specifications

Use Class CC, J, L, or R fuses with current rating as indicated in the table below. The table below lists fuse examples recommended for use with 2094-AL09 and 2094-BL02 line interface modules.

IMPORTANT The 2094-AL*xx*S, 2094-BL*xx*S, and 2094-XL75S-C*x* line interface modules provide branch-circuit protection. Follow all applicable NEC and local codes.

Table 39 - Fuse Specifications

Cat. No.	VAC Input Power Fuse (2)
2094-AL09 (1)	KTK-R-25 (25 A)
2094-BL02 (2)	KTK-R-30 (30 A)

(1) The maximum short circuit current available from the source must be limited to 5000 A.

(2) Part numbers shown are examples of Bussmann fuses.

ATTENTION: Bulletin 1492 and 140M circuit breakers should not be used on the output of an AC drive as an isolating disconnect switch or motor overload device. These devices are designed to operate on sine-wave voltage and the drive's PWM waveform does not allow it to operate properly. As a result, damage to the device will occur.

General Specifications

Table 40 - Environmental Specifications

Attribute	Value (operational range)	Value (storage range)
Temperature	0…50 °C (32…122 °F)	-40…70 °C (-40…158 °F)
Humidity	5…95% noncondensing	5…95% noncondensing
Altitude	1000 m (3281 ft)	3000 m (9843 ft) during transport
	The line interface module can operate at elevations up to 1000 m (3300 ft) without derating; however, the continuous current rating must be de-rated by 3% for each additional 300 m (1000 ft) up to 3000 m (10,000 ft). Consult your local Rockwell Automation representative before operating at over 3000 m (10,000 ft)	
Vibration (max)	0.152 mm (0.006 in.) peak-to-peak displacement, 1.0 g peak acceleration @ 5…2000 Hz	0.381 mm (0.015 in.) peak-to-peak displacement, 2.5 g peak acceleration @ 5…2000 Hz
Shock	15 g, 11 ms half-sine pulse (3 pulses in each direction of 3 mutually perpendicular directions)	30 g, 11 ms half-sine pulse (3 pulses in each direction of 3 mutually perpendicular directions)

Table 41 - Weight Specifications

Cat. No.	Weight, Approx. kg (lb)
2094-AL09	11.33 (25.0)
2094-AL*xx*S	10.70 (23.6)
2094-BL02	18.14 (40.0)
2094-BL*xx*S	17.15 (37.8)
2094-XL75S-C*x*	10.70 (23.6)

Table 42 - Certifications

Certification (1) (when product is marked)	Description
c-UL-us	UL Listed to U.S. and Canadian safety standards (UL 508 C File E59272).
CE	European Union 2004/108/EC EMC Directive compliant with EN 61800-3:2004: Adjustable Speed Electrical Power Drive Systems - Part 3; EMC Product Standard including specific test methods.
	European Union 2006/95/EC Low Voltage Directive compliant with: • EN 61800-5-1:2003 - Safety of Machinery - Electrical Equipment of Machines. • EN 50178:1997 - Electronic Equipment for use in Power Installations.

(1) See http://www.ab.com for Declarations of Conformity Certificates.

Additional Resources

These documents contain additional information concerning related Rockwell Automation products.

Resource	Description
Kinetix 2000 Multi-axis Servo Drives User Manual, publication 2093-UM001	Detailed mounting, wiring, setup with Studio 5000 Logix Designer®, applying power, and troubleshooting information with appendices to support firmware upgrades and common bus applications.
Kinetix 6000 Multi-axis Servo Drives User Manual, publication 2094-UM001	
Kinetix 6200 and Kinetix 6500 Modular Multi-axis Servo Drives User Manual, publication 2094-UM002	
Kinetix 7000 High Power Servo Drives User Manual, publication 2099-UM001	
Line Interface Module Installation Instructions, publication 2094-IN009	Removal and replacement procedures for field-replaceable line interface module internal components.
2094 Mounting Brackets Installation Instructions, publication 2094-IN008	Information on installing 2094 mounting brackets for use with the 2094 power rail or line interface modules.
Kinetix Motion Control Selection Guide, publication GMC-SG001	Overview of Kinetix servo drives, motors, actuators, and motion accessories designed to help make initial decisions for the motion control products best suited for your system requirements.
Kinetix Motion Accessories Specifications, publication GMC-TD004	Product specifications for Bulletin 2090 motor and interface cables, low-profile connector kits, drive power components, and other servo drive accessory items.
Motion Analyzer Sizing and Selection Tool, https://motionanalyzer.rockwellautomation.com	Online tool for sizing and selecting servo drive systems with the compatible motor, actuator, and accessories required for each axis.
Resistive-brake Module Installation Instructions, publication 2090-IN009	Information on the installation and wiring of the Bulletin 2090 resistive-brake module (RBM).
System Design for Control of Electrical Noise Reference Manual, publication GMC-RM001	Information, examples, and techniques designed to minimize system failures caused by electrical noise.
EMC Noise Management DVD, publication GMC-SP004	
Understanding the Machinery Directive, publication SHB-900-RM001	A road map to CE marking and safety-related control product applications.
Rockwell Automation Product Certification website, http://www.ab.com	For declarations of conformity (DoC) currently available from Rockwell Automation.
National Electrical Code, published by the National Fire Protection Association of Boston, MA	An article on wire sizes and types for grounding electrical equipment.
Allen-Bradley® Industrial Automation Glossary, publication AG-7.1	A glossary of industrial automation terms and abbreviations.

You can view or download publications at http://www.rockwellautomation.com/literature. To order paper copies of technical documentation, contact your local Rockwell Automation distributor or sales representative.

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Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At http://www.rockwellautomation.com/support you can find technical and application notes, sample code, and links to software service packs. You can also visit our Support Center at https://rockwellautomation.custhelp.com/ for software updates, support chats and forums, technical information, FAQs, and to sign up for product notification updates.

In addition, we offer multiple support programs for installation, configuration, and troubleshooting. For more information, contact your local distributor or Rockwell Automation representative, or visit http://www.rockwellautomation.com/services/online-phone.

Installation Assistance

If you experience a problem within the first 24 hours of installation, review the information that is contained in this manual. You can contact Customer Support for initial help in getting your product up and running.

United States or Canada	1.440.646.3434
Outside United States or Canada	Use the Worldwide Locator at http://www.rockwellautomation.com/rockwellautomation/support/overview.page, or contact your local Rockwell Automation representative.

New Product Satisfaction Return

Rockwell Automation tests all of its products to help ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

United States	Contact your distributor. You must provide a Customer Support case number (call the phone number above to obtain one) to your distributor to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete this form, publication RA-DU002, available at http://www.rockwellautomation.com/literature/.

Rockwell Automation maintains current product environmental information on its website at http://www.rockwellautomation.com/rockwellautomation/about-us/sustainability-ethics/product-environmental-compliance.page.

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