



Allen-Bradley

1398 ULTRA Plus Series Power Supply Module

(Catalog Number 1398-PSM-125C)

Installation Manual

Automation **Rockwell
Automation**

Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of this control equipment must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards.

The illustrations, charts, sample programs and layout examples shown in this guide are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Allen-Bradley® does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Allen-Bradley publication SGI-1.1, *Safety Guidelines for the Application, Installation and Maintenance of Solid-State Control* (available from your local Allen-Bradley office), describes some important differences between solid-state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication.

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Throughout this manual we use notes to make you aware of safety considerations:

ATTENTION



Identifies information about practices or circumstances that can lead to personal injury or death, property damage or economic loss.

Attention statements help you to:

- identify a hazard
- avoid a hazard
- recognize the consequences

IMPORTANT

Identifies information that is critical for successful application and understanding of the product.

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Preface

Introduction

Read this preface to familiarize yourself with the rest of the manual. This preface contains the following topics:

- Who Should Use this Manual
- Purpose of this Manual
- Contents of this Manual
- Related Documentation
- Conventions Used in this Manual
- Product Receiving and Storage Responsibility
- Allen-Bradley Support

Who Should Use this Manual

Use this manual for designing, installing, and wiring your ULTRA Plus™ Power Supply Module-125C (PSM-125C). The manual is intended for engineers or technicians directly involved in the installation and wiring of the PSM-125C.

If you do not have a basic understanding of the ULTRA Plus PSM-125C, contact your local Allen-Bradley representative for information on available training courses before using this product.

Purpose of this Manual

This manual provides the mounting, wiring, and connecting procedures for the ULTRA Plus PSM-125C when used in conjunction with Rockwell Automation/Allen-Bradley drives and motors.

Contents of this Manual

Refer to the following listing for the descriptive contents of this installation manual.

Chapter	Title	Contents
	<i>Preface</i>	Describes the purpose, background, and scope of this manual. Also specifies the audience for whom this manual is intended.
1	<i>Mounting the ULTRA Plus PSM-125C</i>	Provides mounting information for the ULTRA Plus PSM-125C.
2	<i>ULTRA Plus PSM-125C Connections</i>	Provides I/O, power, and shunt connector locations and signal descriptions.
3	<i>Wiring Your ULTRA Plus PSM-125C</i>	Provides connection and wiring information for the ULTRA Plus PSM-125C.
Appendix A	<i>Specifications</i>	Provides physical, electrical, environmental, and functional specifications for the ULTRA Plus PSM-125C. Dimensional, chassis wiring, and power wiring drawings are also provided.
Appendix B	<i>Interconnect Diagrams</i>	Provides interconnect diagrams for the ULTRA Plus PSM-125C.
Appendix C	<i>Catalog Numbers and Accessories</i>	Provides catalog numbers and descriptions of the ULTRA Plus PSM-125C and related products.

Related Documentation

The following documents contain additional information concerning related Allen-Bradley products. To obtain a copy, contact your local Rockwell Automation office or distributor, or access the documents on-line at **www.theautomationbookstore.com** or **www.ab.com/manuals/gmc**.

For:	Read This Document:	Catalog Number:
Information on mounting, wiring, configuring and troubleshooting ULTRA Plus products	<i>ULTRA Plus Positioning Drive Modules Installation Manual</i>	1398-5.1
Information on Rockwell Automation/Allen-Bradley Motion Control products and accessories	<i>Motion Control Selection Guide</i>	GMC-SG001x-EN-P
Active shunt installation instructions for: <ul style="list-style-type: none"> • 1394-SR9A • 1394-SR9AF • 1394-SR36A • 1394-SR36AF (fan-cooled module) 	<i>1394 Shunt Module Packing Data</i>	1394-SRxAx
Information on mounting, wiring, configuring and troubleshooting your Ultra5000™	<i>Ultra5000 Digital Servo Drives Installation Manual</i>	2098-IN001x-EN-P
Information on mounting and wiring your Ultra3000™	<i>Ultra3000 Digital Servo Drives Installation Manual</i>	2098-IN003x-EN-P
Information on configuring and troubleshooting your Ultra3000	<i>Ultra3000 Digital Servo Drives Integration Manual</i>	2098-IN005x-EN-P
How to minimize and control system-level noise	<i>System Design for Control of Electrical Noise</i>	GMC-RM001x-xx-x

Conventions Used in this Manual

The following conventions are used throughout this manual.

- Bulleted lists such as this one provide information, not procedural steps
- Numbered lists provide sequential steps or hierarchical information
- Words that you type or select appear in bold
- When we refer you to another location, the section or chapter name appears in italics

Product Receiving and Storage Responsibility

You, the customer, are responsible for thoroughly inspecting the equipment before accepting the shipment from the freight company. Check the item(s) you receive against your purchase order. If any items are obviously damaged, it is your responsibility to refuse delivery until the freight agent has noted the damage on the freight bill. Should you discover any concealed damage during unpacking, you are responsible for notifying the freight agent. Leave the shipping container intact and request that the freight agent make a visual inspection of the equipment.

Store the product in its shipping container prior to installation. If you are not going to use the equipment for a period of time, store using the following guidelines.

- Use a clean, dry location
- Maintain an ambient temperature range of -40 to 70° C (-40 to 158° F)
- Maintain a relative humidity range of 5% to 95%, non-condensing
- Store it where it cannot be exposed to a corrosive atmosphere
- Store it in a non-construction area

Allen-Bradley Support

Allen-Bradley offers support services worldwide, with over 75 Sales/Support Offices, 512 authorized Distributors and 260 authorized Systems Integrators located throughout the United States alone, plus Allen-Bradley representatives in every major country in the world.

Local Product Support

Contact your local Allen-Bradley representative for:

- Sales and order support
- Product technical training
- Warranty support
- Support service agreements

Technical Product Assistance

If you need technical assistance, please review the information in *Maintaining and Troubleshooting Your ULTRA Plus PSM-125C* on page 5-1 first, then contact your local Allen-Bradley representative or Rockwell Automation Technical Support at the phone number or email address listed on the back cover. Please have the catalog numbers of your products available for reference.

Comments Regarding this Manual

To offer comments regarding the contents of this manual, go to **www.ab.com/manuals/gmc** and download the Motion Control Problem Report form. Mail or fax your comments to the address/fax number given on the form.

Mounting the ULTRA Plus PSM-125C

Chapter Objectives

This chapter provides a brief product introduction, system installation guidelines, and procedures for mechanical installation of your ULTRA Plus PSM-125C. This chapter covers the following topics:

- Product Overview
- Required Tools
- Before Mounting Your System
- Bonding Your System
- Mounting Your ULTRA PSM-125C

ATTENTION

The following information is a guideline for proper installation. The National Electrical Code and any other governing regional or local codes overrule this information. The Allen-Bradley Company cannot assume responsibility for the compliance or the noncompliance with any code, national, local or otherwise, for the proper installation of this system or associated equipment. If you ignore codes during installation, hazard of personal injury and/or equipment damage exists.

Product Overview

The ULTRA Plus PSM-125C is a power supply module that may be shared among multiple servo drives and compatible motors to achieve a powerful and economical system package.

The PSM-125C output current rating is 100A. It requires 100-240V ac, three phase input power, which may be optionally isolated through a transformer. The output is a two wire DC bus.

The PSM-125C requires no adjustments, protects itself, provides troubleshooting diagnostics, and has a built-in solid state soft charge of the DC bus capacitors. It also includes connections for a dissipative shunt regulator that provides quick discharge of the DC bus capacitors and assists absorption of rotational energy.

Required Tools

Standard mechanical and electrical tools (nutdrivers, screwdrivers, needlenose plier, wire cutter/stripper, etc.) are required to mount and wire a system using the ULTRA Plus PSM-125C.

Before Mounting Your System

Before you mount your ULTRA PSM-125C system make sure you understand the following:

- How to store your ULTRA PSM-125C before installation
- How to unpack the system
- The minimum mounting requirements
- How to size the system and auxiliary components

ATTENTION

Complete all drilling, cutting, welding, etc., before mounting the equipment. During installation, protect equipment from metal chips, weld splatters and other debris. Failure to observe this precaution could result in damage to or the destruction of the equipment.

Storing Your ULTRA PSM-125C Before Installation

The ULTRA PSM-125C should remain in the shipping container prior to installation. If the equipment is not to be used for a period of time, store it as follows:

- Use a clean, dry location
- Maintain an ambient temperature range of -40° to 70° C (-40° to 158° F)
- Maintain a relative humidity range of 5% to 95%, non-condensing
- Store it where it cannot be exposed to a corrosive atmosphere
- Store it in a non-construction area

Unpacking Modules

Each ULTRA PSM-125C ships with one installation manual (publication 1398-IN125A-EN-P — September 2002)

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

System Mounting Requirements

There are several things that you need to take into account when preparing to mount the ULTRA Plus PSM-125C:

- The PSM-125C 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, in order to comply with UL[®]. A NEMA 4X enclosure exceeds these requirements providing protection to IP66.
- To minimize DC bus inductance locate the PSM-125C within your system as follows:
 - Center the PSM-125C between the controlling drives.
 - Mount the highest power drives closest to the PSM-125C, and consequently lowest power drives farthest from the PSM-125C.
- The ambient temperature of the location in which you will install the PSM-125C must not exceed 55° C (131° F).
- You must install the panel on a flat, rigid, vertical surface that won't be subjected to shock, vibration, moisture, oil mist, dust, or corrosive vapors.
- You need to maintain minimum clearances (refer to Figure 1.1 and Figure B.1) for proper airflow, easy module access, and proper cable bend radius.

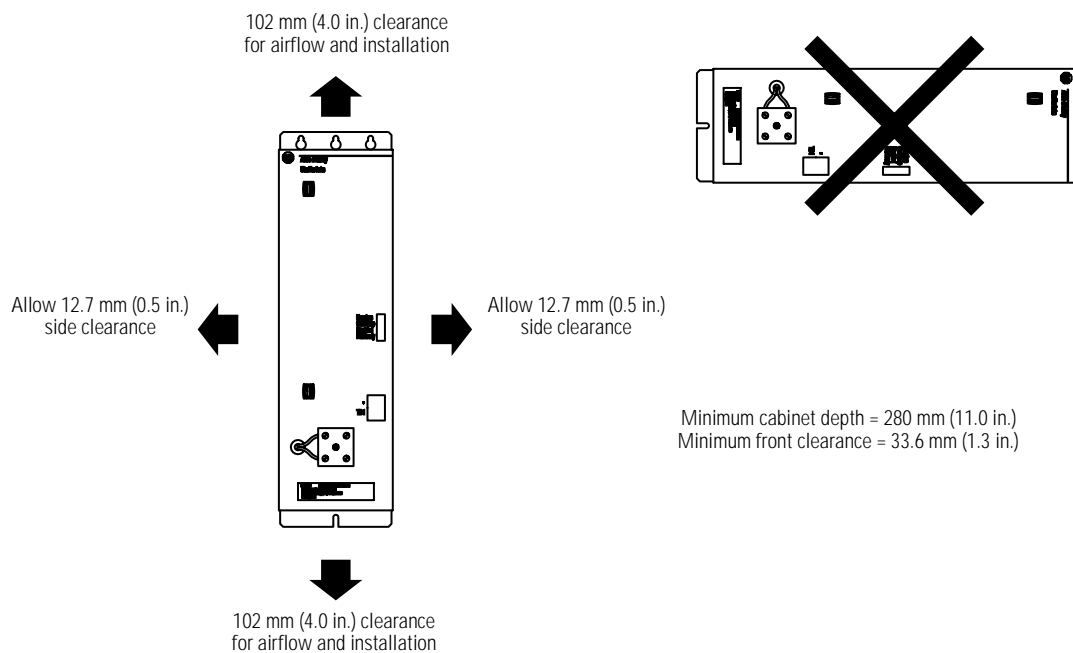
Refer to *Appendix A* and *Appendix B* for power dissipation, environmental specifications, and mounting dimensions for the ULTRA PSM-125C.

Ventilation Requirements

This section provides information to assist you in sizing your cabinet and locating your PSM-125C(s) inside the cabinet. Maximum power loss for a PSM-125C is 240 Watts.

Refer to *Appendix A* for ULTRA Plus PSM-125C power dissipation specifications.

Figure 1.1
Minimum Clearance Requirements



IMPORTANT

If the cabinet is ventilated, use filtered or conditioned air to prevent the accumulation of dust and dirt on electronic components. The air should be free of oil, corrosives, or electrically conductive contaminants.

Sizing an Enclosure

As an additional aid in sizing an enclosure, with no active method of heat dissipation, either of the following approximate equations can be used:

Metric	Standard English
$A = \frac{0.38Q}{1.8T - 1.1}$	$A = \frac{4.08Q}{T - 1.1}$
Where T is temperature difference between inside air and outside ambient (°C), Q is heat generated in enclosure (Watts), and A is enclosure surface area (m ²). The exterior surface of all six sides of an enclosure is calculated as	Where T is temperature difference between inside air and outside ambient (°F), Q is heat generated in enclosure (Watts), and A is enclosure surface area (ft ²). The exterior surface of all six sides of an enclosure is calculated as
$A = 2dw + 2dh + 2wh$	$A = (2dw + 2dh + 2wh) / 144$
Where d (depth), w (width), and h (height) are in meters.	Where d (depth), w (width), and h (height) are in inches.

Transformer Sizing

The ULTRA PSM-125C does not require isolation transformers. However, a transformer may be required to match the voltage requirements of the controller to the available service. To size a transformer for the main AC power inputs, the power output (KVA) of each axis must be known. This can be derived by calculating the horsepower for each axis and converting that horsepower into units of watts. If you are supplying power to more than one motor and an ULTRA PSM-125C, simply add the kW ratings together from each calculation to get a system kW total.

IMPORTANT

If using an autotransformer, ensure that the phase to neutral/ground voltages do not exceed the input voltage ratings of the unit.

Definitions:

kW = power or real power

KVA = apparent power

Transformer KVA rating = (Sum of average output power of each axis) x 2.0.

IMPORTANT

If you are using the Rockwell Automation/ Allen-Bradley system sizing program, the average speed and average torque data has already been calculated and can be used in the above equation. If you are not sure of the exact speed and torque in your application, another approach is to look at the speed/torque curve for your Ultra drive/motor combination and use the values for the worst case continuous speed and torque.

IMPORTANT

Calculations are multiplied by a factor to compensate for the power and loss elements within a power system. A factor of 2.0 is used with a single phase system and a factor of 1.5 is used with a three phase system. This factor should minimize the effects of the secondary line voltage sagging in the transformer during peak current periods.

Example: sizing a transformer to the voltage requirements of an 2098-DSD-020 and MPL-A320P motor:

$$KVA = \frac{Speed(RPM) \times Torque(lb-in)}{63,025} \times \frac{746Watts}{HP} \times \frac{KVA}{1000Watts} \times 2.0$$

$$KVA = \frac{(5,000(RPM)) \times 17.7(lb-in)}{42,250}$$

$$Transformer\ Size = 2.1\ KVA$$

The speed/torque curve information for 230V motors is based upon an ULTRA PSM-125C input voltage of 230V ac. For a 115V ac input voltage, the maximum speed can be reduced up to one half.

Fuse Sizing

Fusing for the ULTRA Plus PSM-125C differs from the Ultra Series drives, as this external power supply can power up to six drives. Therefore the 4 times motor Full Load Amperage (FLA) rule for controlling drives does not apply.

The ULTRA PSM-125C is listed by Underwriters Laboratories, Inc. with fuses sized as four times the continuous output current of the drives (FLA), according to UL 508C.

In most cases, fuses selected to match the input current rating should meet the NEC requirements and provide the full power capabilities. Dual element, time delay (slow acting) fuses should be used to avoid nuisance trips during the inrush current of power initialization. Refer to the section *General Power* in *Appendix A* for input current and inrush current specifications.

The ULTRA PSM-125C utilizes solid state, short circuit protection rated as shown in the table below.

Model:	Short Circuit Current Rating with Fuse Restrictions:
1398-PSM-125C	Suitable for use on a circuit capable of delivering not more than 200,000 rms symmetrical amperes, 240V maximum, when protected by high interrupting capacity, current limiting fuses meeting UL 198C (Classes CC, G, J, L, R, or T).

Refer to *Chassis Wiring Diagram - ULTRA Plus PSM-125C (9101-0454)* on page B-4 for further information.

Bonding Your System

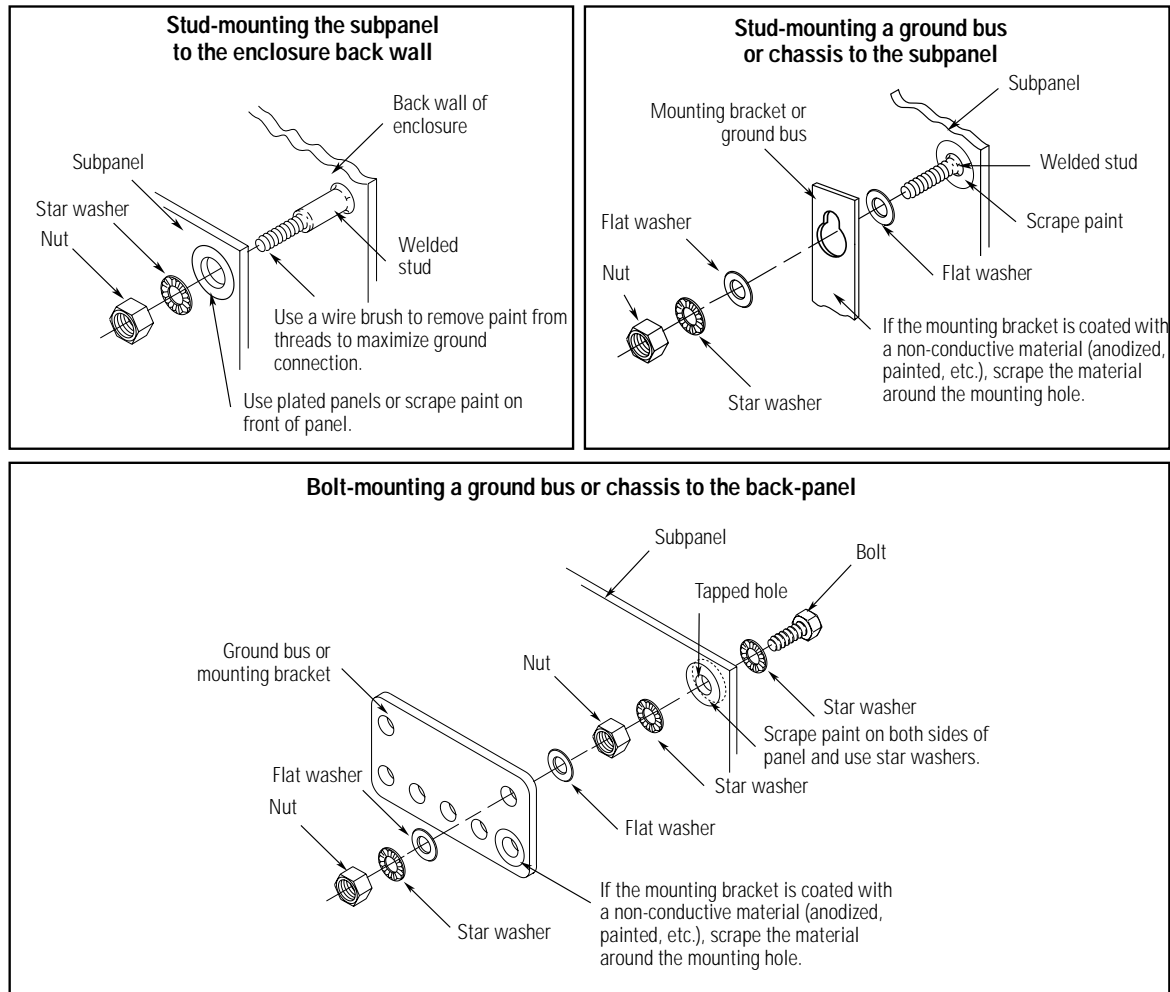
Bonding is the practice of connecting metal chassis, assemblies, frames, shields and enclosures to reduce the effects of electromagnetic interference (EMI).

Bonding Modules

Unless specified, most paints are not conductive and they act as insulators. To achieve a good bond between modules and the subpanel, surfaces need to be paint-free or plated. Bonding metal surfaces creates a low-impedance exit path for high-frequency energy.

Improper bonding blocks that direct exit path and allows high-frequency energy to travel elsewhere in the cabinet. Excessive high-frequency energy can effect the operation of other microprocessor controlled equipment. The illustrations that follow (refer to Figure 1.2) show details of recommended bonding practices for painted panels, enclosures, and mounting brackets.

Figure 1.2
Recommended Bonding Practices



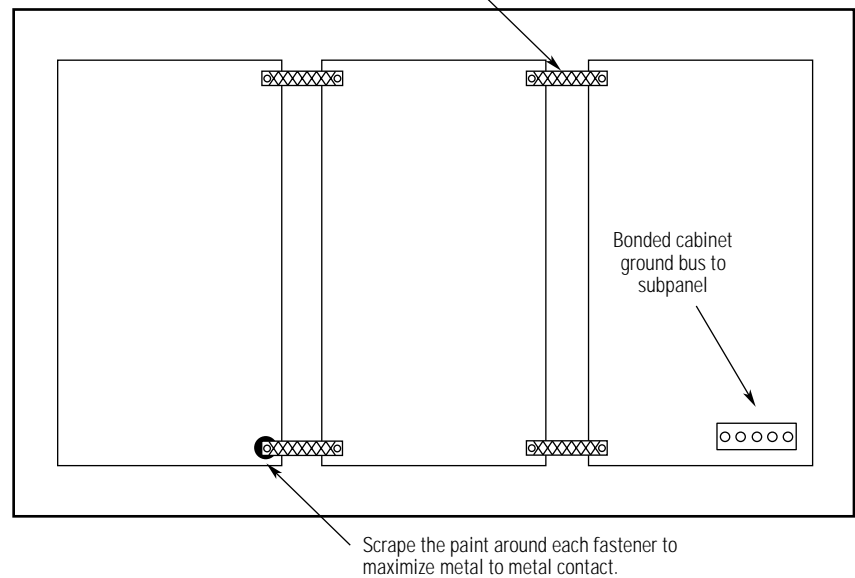
Bonding Multiple Subpanels

Bonding multiple subpanels creates a common low impedance exit path for the high frequency energy inside the cabinet. Subpanels that are not bonded together may not share a common low impedance path. This difference in impedance may affect networks and other devices that span multiple panels. Refer to Figure 1.3 for recommended bonding practices.

Figure 1.3
Multiple Subpanels and Cabinet

Recommended:

Bond the top and bottom of each subpanel to the cabinet using 25.4 mm (1.0 in.) by 6.35 mm (0.25 in.) wire braid.



Mounting Your ULTRA PSM-125C

The procedures in this section assume you have prepared your panel and understand how to bond your system. For installation instructions regarding other equipment and accessories, refer to the instructions that came with each of the accessories for their specific requirements.

ATTENTION



This unit contains ESD (Electrostatic Discharge) sensitive parts and assemblies. You are required to follow static control precautions when you install, test, service, or repair this assembly. If you do not follow ESD control procedures, components can be damaged. If you are not familiar with static control procedures, refer to Allen-Bradley publication 8000-4.5.2, *Guarding Against Electrostatic Damage* or any other applicable ESD Protection Handbook.

To mount your ULTRA PSM-125C:

1. Layout the positions for the ULTRA PSM-125C and accessories in the enclosure. Mounting hole dimensions for the ULTRA PSM-125C are shown in *Appendix B*.

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- 2.** Attach the ULTRA PSM-125C to the cabinet, first using the upper mounting slots of the backpanel and then the lower. The recommended mounting hardware is M5 metric (1/4-20) or #10 MS bolts. Observe bonding techniques as described in *Bonding Your System*.
- 3.** Tighten all mounting fasteners.

ULTRA Plus PSM-125C Connections

Chapter Objectives

This chapter provides locations and signal descriptions for the I/O connectors and power terminals on your ULTRA Plus PSM-125C. This chapter includes:

- Understanding PSM-125C Connectors
- I/O Connections

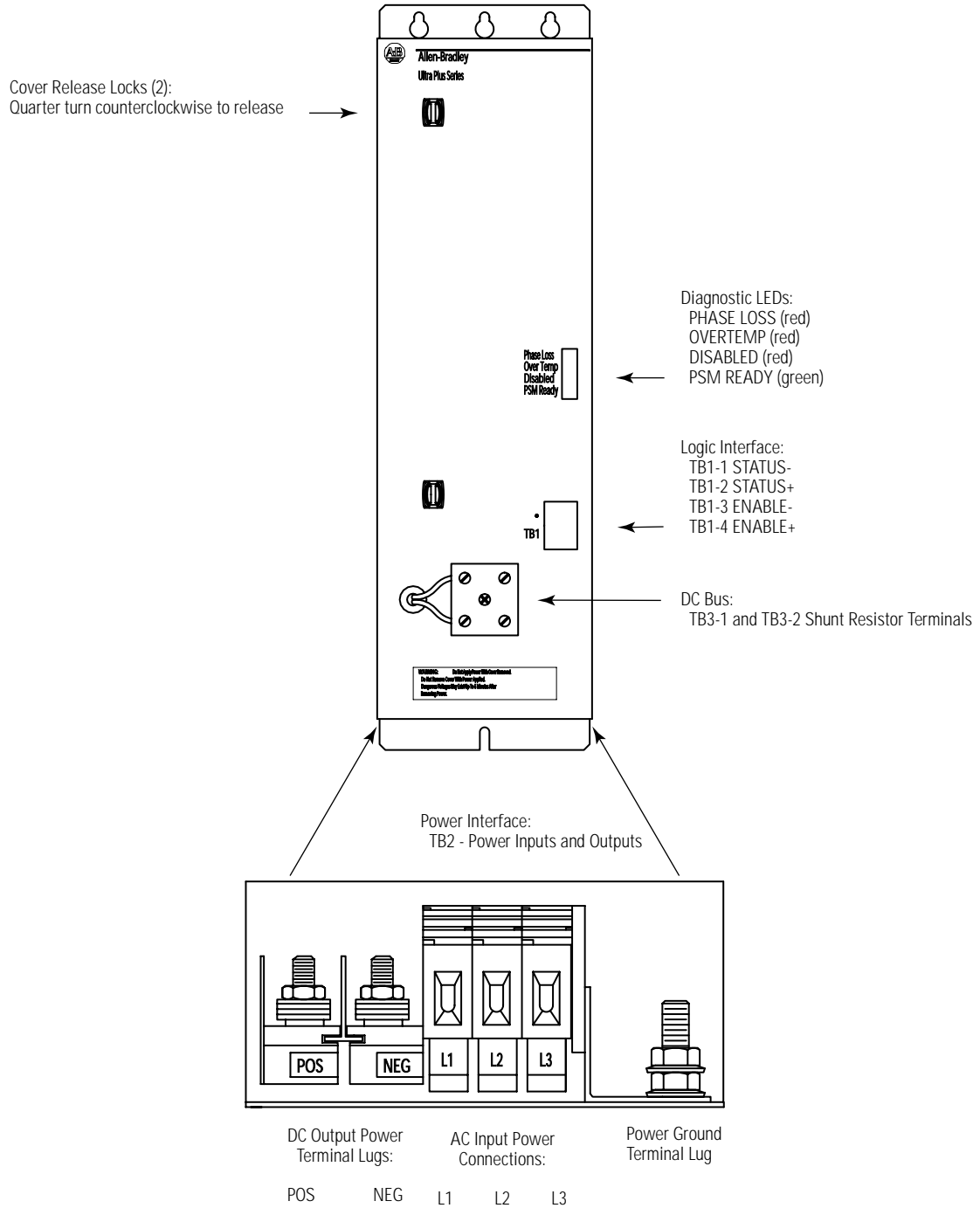
Understanding PSM-125C Connectors

The following table provides a brief description of the ULTRA Plus PSM-125C front panel connectors and describes the connector type.

Connector and Labelling		Description	Connector Type
TB1	Enable±, Status±	User Input/Output	4-position screw style barrier terminal strip
TB2	L1 - L3	AC power	3-position screw style barrier terminal strip
	POS/NEG	DC bus	Screw terminal posts
	GND	Safety(Earth) Ground	Screw terminal post
TB3	1,2	Shunt Resistor	2-position screw style barrier terminal strip

Use the following figure to locate the front panel connections on the ULTRA Plus PSM-125C.

Figure 2.1
ULTRA Plus PSM-125C Front and Bottom Panel Connections



I/O Connections

A description of the PSM-125C input/output is provided on the following pages.

PSM to Controller Interface Logic

The following table provides the signal descriptions and pin-outs for the TB1 controller interface terminal block.

TB1-Pin	Description	Signal
1	PSM status output from a normally open relay	STATUS-
2		STATUS+
3	Control of PSM power output from an optically isolated input	ENABLE-
4		ENABLE+

The STATUS and ENABLE signals on the TB1 terminal block interface the PSM with a controller. See *Connector and Wire Requirements A* on page A-3 for wire gauge and terminal torque recommendations.

Refer to Figure 3.4 on page 3-8 and Figure 3.5 on page 3-8 for internal and external connection examples.

Status

The STATUS- and STATUS+ outputs (TB1-1 and TB1-2 respectively) are the contacts of a normally open relay:

- Closed indicates the PSM is operating properly.
- Open indicates no AC power is applied to the PSM or that a PSM fault has occurred.

This relay is capable of handling up to 0.3mA at 24V dc.

Enable

The ENABLE- and ENABLE+ inputs (TB1-3 and TB1-4 respectively) are optically isolated inputs which control the power output of the power supply module. The PSM Enable input is turned on by sourcing current through the opto-isolator. The ENABLE signal is functional only if jumper W1 is in Enable Activated position as shown in Figure 2.2.

Note: ENABLE is deactivated as the factory setting for the W1 jumper.

If the ENABLE signal is in the Enable Activated position (shorted across the top 2 pins), the signal logic is:

- ENABLE = ON, the PSM is enabled.
- ENABLE = OFF, the PSM DC bus is turned OFF and the dissipative shunt is turned ON to quickly discharge the DC bus capacitors and dynamically brake synchronous motors. This is to allow time for controlling drives to power-up and apply the ENABLE signal to the PSM if the PSM is to remain on.

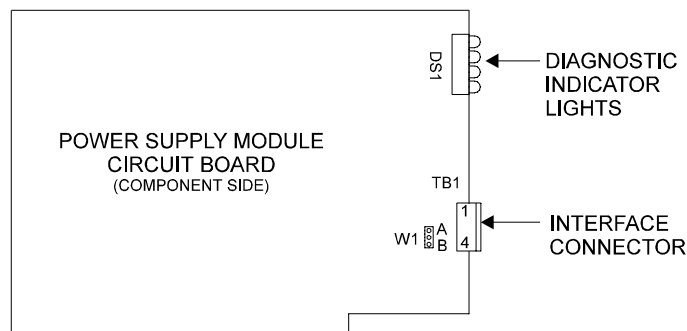
ATTENTION



If the PSM is disabled during a power up, the DC bus voltage will be present for at least two (2) seconds before returning to a zero (0) Volt condition.

If the W1 jumper is in the Enable Deactivated position (shorted across the bottom 2 pins) it has no effect on the PSM operation. The PSM activates itself when three phase voltage in the proper voltage range is applied to the PSM.

Figure 2.2
Power Supply Module Jumper Location



Power Connections

A description of the PSM-125C power connections are provided on the following pages.

AC Input Power

The following table provides a description and pin-outs for the L1, L2, and L3 AC power input.

Terminal Label	Description
L1	100 to 240V ac, three phase, 50/60 Hz, 100A input
L2	
L3	

See *Connector and Wire Requirements A* on page A-3 for wire gauge and terminal torque recommendations.

Refer to *Chassis Wiring Diagram - ULTRA Plus PSM-125C (9101-0454)* on page B-4 and *Power Wiring Connection Diagram - ULTRA Plus PSM-125C System (9101-0462)* on page B-5 for connection examples.

DC Bus Power Output

The following table provides a description and terminal connections for the DC bus power output.

Terminal Label	Description
POS	DC Power Bus +
NEG	DC Power Bus -
GND	Safety (Earth) Ground

See *Connector and Wire Requirements A* on page A-3 for wire gauge and terminal torque recommendations.

Refer to *Chassis Wiring Diagram - ULTRA Plus PSM-125C (9101-0454)* on page B-4 and *Power Wiring Connection Diagram - ULTRA Plus PSM-125C System (9101-0462)* on page B-5 for connection examples.

Shunt Terminals

The following table and Figure 2.3 provide a description and terminal connections for the Return DC bus (shunt) power connections.

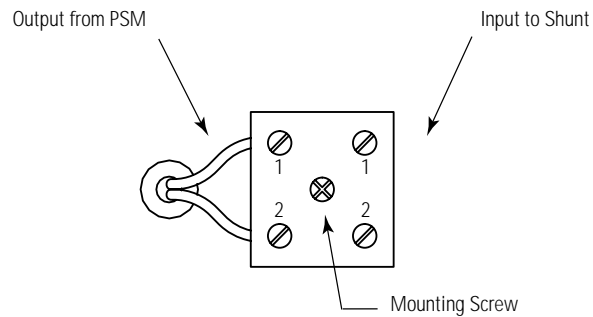
TB3-Pin	Description	Signal
1	Return DC Bus Power – External Shunt Connections	DC Bus -
2		DC Bus +
1	Return DC Bus Power – PSM Connections	DC Bus -
2		DC Bus +

See *Connector and Wire Requirements A* on page A-3 for wire style, wire gauge, and terminal torque recommendations.

Note: Remove or disable any shunting (internal or external) of drives powered by the DC bus output of the ULTRA Plus PSM-125C, when an external shunt is connected to the PSM-125C. Refer to the drive's installation manual for instructions.

Refer to *Chassis Wiring Diagram - ULTRA Plus PSM-125C (9101-0454)* on page B-4 and *Power Wiring Connection Diagram - ULTRA Plus PSM-125C System (9101-0462)* on page B-5 for connection examples.

Figure 2.3
TB3 - Return DC Bus (Shunt) Connector



Wiring Your ULTRA Plus PSM-125C

Chapter Objectives

This chapter provides procedures for wiring your ULTRA Plus PSM-125C and making cable connections. This chapter includes:

- Understanding Basic Wiring Requirements
- Grounding Your ULTRA Plus PSM-125C
- Wiring Your ULTRA Plus PSM-125C

Understanding Basic Wiring Requirements

This section contains basic wiring information for the ULTRA Plus PSM-125C.

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.

IMPORTANT

This section contains common PWM servo system wiring configurations, size, and practices that can be used in a majority of applications. National Electrical Code, local electrical codes, special operating temperatures, duty cycles, or system configurations take precedence over the values and methods provided.

Building Your Own Cables

When building your own cables, use a twisted pair cable whenever possible, twisting differential signals with each other, and single-ended signals with the appropriate ground return.

Refer to *Appendix C* for mating connector kit catalog numbers.

IMPORTANT

Factory made cables are recommended over hand-built cables and are designed to minimize EMI.

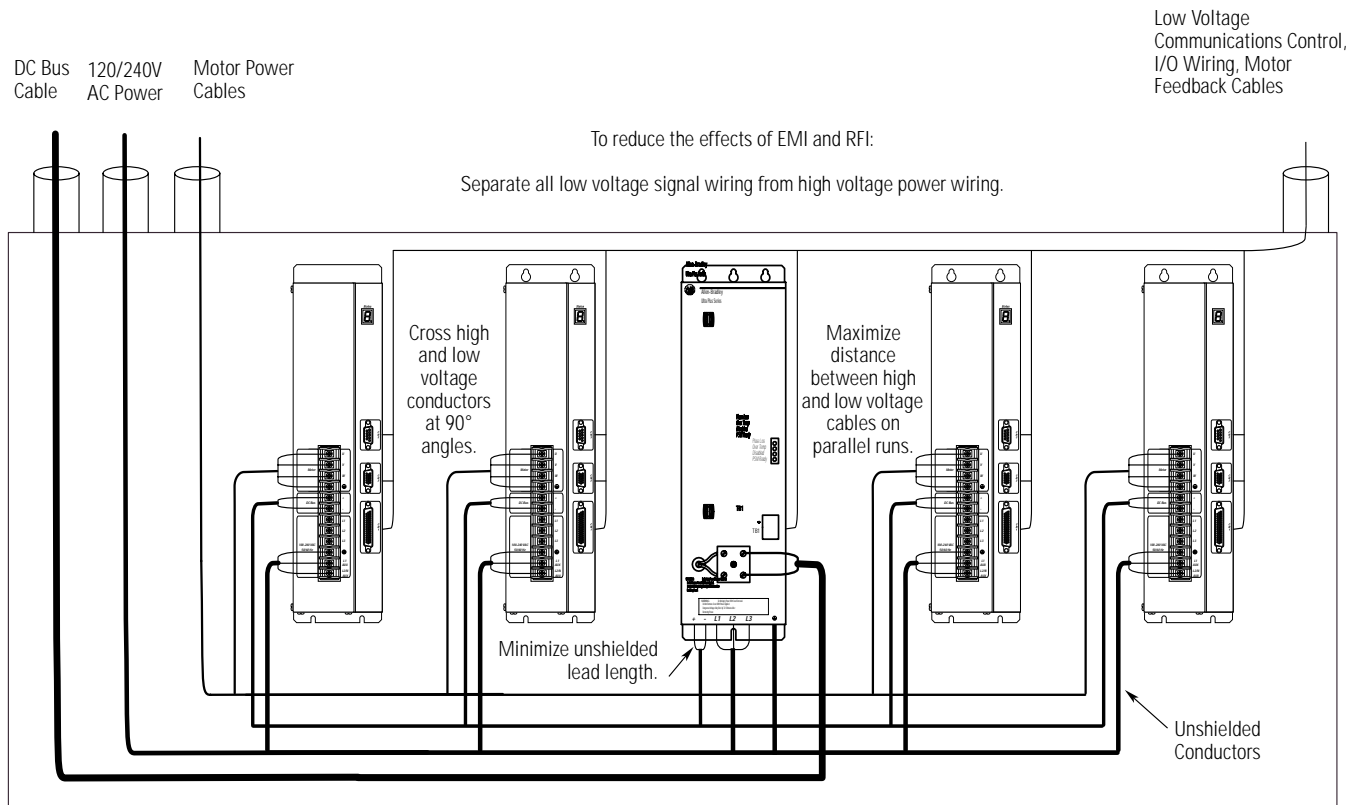
Routing High and Low Voltage Cables

Be aware that when you connect and route power and signal wiring on a machine or system, radiated noise from nearby relays (relay coils should have surge suppressors), transformers, and other electronic drives, can be induced into motor or encoder feedback, communications, or other sensitive low voltage signals. This can cause system faults and communication problems. To minimize the levels of radiated noise:

- Route machine power lines separately from other power lines, and especially from signal lines.
- Cross high and low voltage conductors at 90 angles.
- Maximize the distance between high and low voltage cables on parallel runs.
- Minimize the length of unshielded conductors.

Refer to *System Design for Control of Electrical Noise* (publication GMC-RM001x-xx-x) for additional information on how to minimize and control system-level noise.

Figure 3.1
Routing Power and Signal Cables Inside Your Cabinet



Note: 120V/240V Power shown supplying auxiliary power to drives after DC Bus power is removed. (e.g., to retain diagnostics).

Grounding Your ULTRA Plus PSM-125C

We recommend that all equipment and components of a machine or process system have a common earth ground point connected to their chassis. A grounded system provides a safety ground path for short circuit protection. Grounding your modules and panels minimize shock hazard to personnel and damage to equipment caused by short circuits, transient overvoltages, and accidental connection of energized conductors to the equipment chassis. For CE grounding requirements, refer to *Appendix B*.

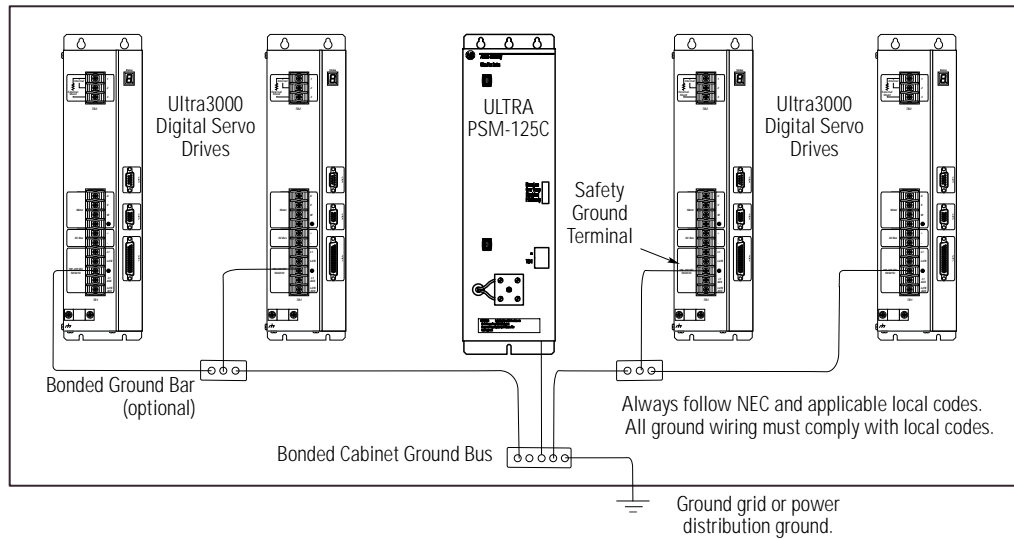
Grounding Your System to the Subpanel

ATTENTION



The National Electrical Code contains grounding requirements, conventions, and definitions. Follow all applicable local codes and regulations to safely ground your system. Refer to the illustration below for details on grounding your ULTRA Plus PSM-125C. Refer to *Appendix B* for the power wiring diagram for your ULTRA Plus PSM-125C.

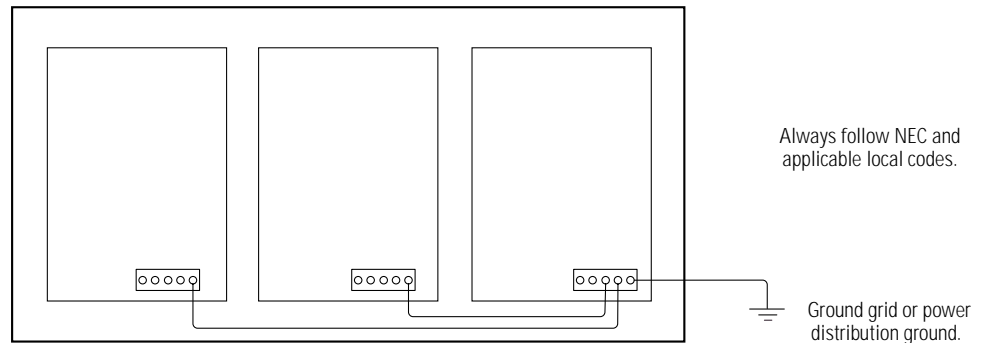
Figure 3.2
Safety Ground Configuration for ULTRA Plus PSM-125C System on One Panel



Grounding Multiple Subpanels

To ground multiple subpanels, refer to Figure 3.3.

Figure 3.3
Subpanels Connected to a Single Ground Point



Wiring Your ULTRA Plus PSM-125C

These procedures assume you have bonded and mounted your ULTRA Plus PSM-125C to the subpanel and that there is no power applied to the system.

ATTENTION



This unit contains ESD (Electrostatic Discharge) sensitive parts and assemblies. You are required to follow static control precautions when you install, test, service, or repair this assembly. If you do not follow ESD control procedures, components can be damaged. If you are not familiar with static control procedures, refer to Allen-Bradley publication 8000-4.5.2, *Guarding Against Electrostatic Damage* or any other applicable ESD Protection Handbook.

The following sections provide information and procedures on how to wire your ULTRA Plus PSM-125C. The PSM-125C can supply DC power to as many as six controllers.

AC Input Power

Three phase AC power, 115/230V ac, is the recommended input power for the PSM. Phasing of the input power at the L1, L2, and L3 terminals is arbitrary, however the input power may require isolation through a transformer.

Field wiring must be copper, with a minimum rating of 75° C (167° F). An earth ground connection is required for safe and proper system operation. *Appendix A* specifies wire sizing and terminal block torque connections. Supply fuses or disconnecting devices must be supplied by the machine builder and connected externally for safety and maintenance purposes.

The ULTRA Plus PSM-125C will continue to operate with reduced capacity with the loss of one phase. The red phase loss LED on the front of the PSM will turn ON to indicate the loss of the phase.

ATTENTION



The power supply module allows for operation to continue even in the event of loss of one phase or during power disruption on the three phase AC inputs. Under these conditions, the Phase Loss LED will light, but the power supply is not disabled. Extended operation of this product with an AC phase input missing will reduce the life of the product.

Refer to *Power Wiring Connection Diagram - ULTRA Plus PSM-125C System (9101-0462)* on page B-5 for additional details. This

drawing shows an optional AC line filter, and shielded motor cables. These can be used in conjunction with the grounded metal enclosure to meet the Electromagnetic Compatibility requirements of the European Machinery Directive. Refer to *System Design for Control of Electrical Noise* for a discussion of EMC.

DC Bus Output Power

The DC bus from the PSM supplies power for up to six drive controllers. The DC bus must be connected as shown in drawing *Power Wiring Connection Diagram - ULTRA Plus PSM-125C System (9101-0462)*, with the PSM in the center.

ATTENTION

DC bus wires must meet the requirements stated in *Appendix A, Specifications*, as a minimum, and should always be installed per local codes.

See *Connector and Wire Requirements* on page A-3 for wire gauge and terminal torque recommendations.

Note: Remove or disable any shunting (internal or external) of drives powered by the DC bus output of the ULTRA Plus PSM-125C, when an external shunt is connected to the PSM-125C. Refer to the drive's installation manual for instructions.

Dissipative Shunt

The dissipative shunt connector allows an external resistive shunt to drain excess regenerative power, to discharge the DC bus capacitors, and doubles as an emergency synchronous motor dynamic brake. The shunt should be connected as shown in drawing *Power Wiring Connection Diagram - ULTRA Plus PSM-125C System (9101-0462)*, but wiring polarity is arbitrary.

See *Connector and Wire Requirements* on page A-3 for wire gauge and terminal torque recommendations.

ATTENTION

The external shunt resistors and module enclosures can reach temperatures up to 350° C (662° F). Shunt wiring must meet the requirements stated in *Appendix A, Specifications*, as a minimum and should always be installed per local codes.

To avoid the hazard of shock or burn and ignition of flammable material, provide appropriate guarding. Do not handle a shunt module that has been operational until it has cooled sufficiently. Failure to observe this precaution may result in damage to or destruction of the equipment.

Note: Remove or disable any shunting (internal or external) of drives powered by the DC bus output of the ULTRA Plus PSM-125C, when an external shunt is connected to the PSM-125C. Refer to the drive's installation manual for instructions on how to do this.

PSM Logic Interface

The STATUS and ENABLE signals listed below interface the PSM with one or more servo controllers.

TB1-Pin	Signal Name
1	STATUS-
2	STATUS +
3	ENABLE-
4	ENABLE +

Typical internal circuitry for the interface, and sample external connections with the controller are shown below.

Figure 3.4
PSM Interface – Internal Circuit Examples

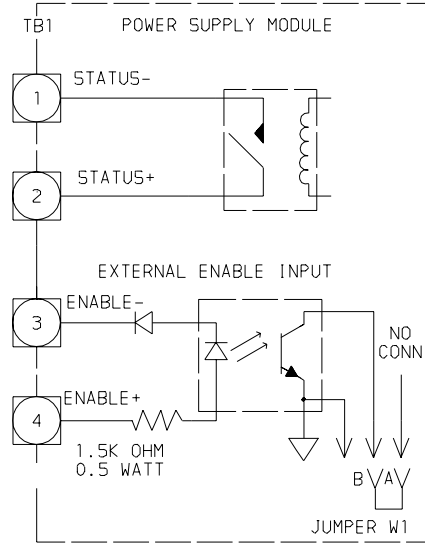
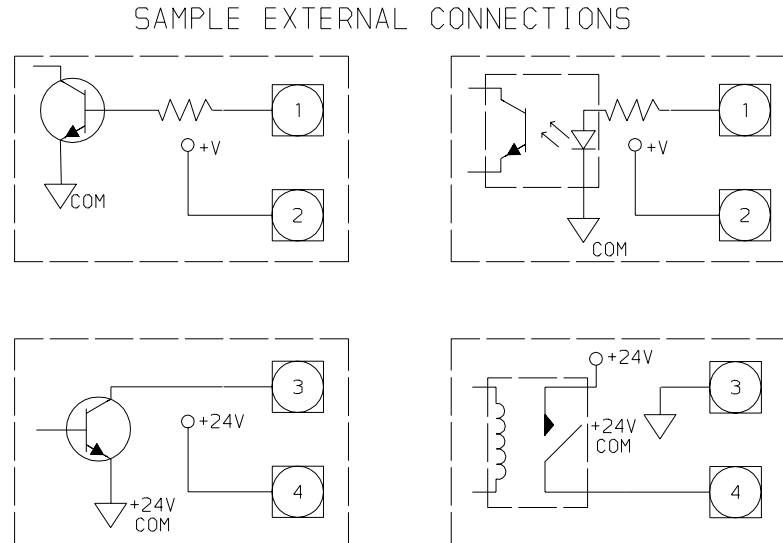


Figure 3.5
PSM Interface – External Connection Examples



Shield Termination of Power Cables

ATTENTION

Shielded power cables must be grounded at a minimum of one point for safety. Failure to ground a shielded power cable will result in potentially lethal voltages on the shield and anything connected to it.

Applying Power for the First Time

Outlined below are the steps that should be followed when applying power to the equipment for the first time. This procedure covers only the ULTRA Plus PSM-125C.

These start-up procedures assume that the equipment is properly mounted and wired, but power has not been applied.

Start-up Procedure for ULTRA Plus PSM-125C

Start-up of an ULTRA Plus PSM-125C involves starting a Power Supply Module (PSM) and the controller. The PSM is checked first and then the controller. Perform the start-up procedure on all controllers attached to the PSM at the same time.

ATTENTION

Dangerous voltages may exist after power is removed! Check DC bus voltage each time power is removed before working on the ULTRA Plus Power Supply Module.

Power Supply Module

1. Prior to applying power to the PSM, ensure that the supply voltage is in the proper range (100–240V ac 3 phase).
2. With power off, remove the PSM shunt connection and cover and ensure proper connections have been made to terminals L1, L2, and L3 and that a proper ground is connected. Phasing of the input power connections is arbitrary.

Note: Remove or disable any shunting (internal or external) of drives powered by the DC bus output of the ULTRA Plus PSM-125C, when an external shunt is connected to the PSM-125C. Refer to the drive's installation manual for instructions.

3. Disconnect all wires from the PSM DC bus terminal posts marked POS and NEG. Install the PSM cover and shunt connections, then turn on input power. Verify that:
 - DC bus voltage is in the proper range (325V dc nominal with 230V ac input).
 - The green PSM READY LED is on and that all three red LEDs are off.
 - The PSM fans are operating.
4. Disconnect input power and check that the green LED goes off and the DC bus voltage falls to less than 15V dc within one second.
5. Remove PSM cover and shunt connections.
6. Reconnect the DC bus wires to the POS and NEG terminals, ensuring that proper polarity is maintained.

ATTENTION

DC bus wires must meet the requirements stated in *Appendix A, Specifications*, as a minimum, and should always be installed per local codes.

7. Install the PSM cover and shunt connections.

Maintaining and Troubleshooting Your ULTRA Plus PSM-125C

Chapter Objectives

This chapter provides procedures for maintaining and troubleshooting your ULTRA Plus PSM-125C and making cable connections. This chapter includes:

- Diagnostic Light Emitting Diodes (LED)
- Maintaining Your PSM-125C

The ULTRA Plus PSM-125C is designed to provide troubleshooting aids that help isolate any problems to a “module” in the system. A module may be incoming power, PSM-125C, controller, motor and encoder, cables, or the mechanical system. The PSM circuitry is designed to prevent problems in any one module from damaging any other module. The modular package allows very simple field replacement.

Maintenance of the ULTRA Plus PSM-125C is virtually unnecessary. The primary consideration is to ensure that the fans are operational and PSM is operated in a properly sized and ventilated enclosure with proper fusing.

Diagnostic Light Emitting Diodes (LED)

The PSM front panel LEDs provide a first level of diagnostics.

LED Label	LED Color	Description
PHASE LOSS	RED	OFF = OK (Normal Operation)
		ON = Loss of one phase of incoming AC power. The PSM will continue to run on two phases and the fault LED remains ON.
OVERTEMP	RED	OFF = OK (Normal Operation)
		ON = Excessive main heatsink temperature
DISABLED	RED	OFF = Not disabled (Normal Operation)
		ON = DC bus disabled by external enable input
PSM READY	GREEN	OFF = No DC bus voltage
		ON = DC bus charged (Normal Operation)

If all LEDs are OFF (red and green), and incoming line voltages are found to be correct, there may be a PSM failure. Replace the PSM with another module.

Maintaining Your PSM-125C

This section details common maintenance and fault correction actions for the ULTRA Plus PSM-125C.

ATTENTION

This product contains stored energy devices. To avoid hazard of electrical shock, verify that all voltages on the system bus network have been discharged before attempting to service, repair or remove this unit.

Only qualified personnel familiar with solid state control equipment and safety procedures in publication NFPA 70E or applicable local codes should attempt this procedure.

Failure to observe this precaution could result in damage to the equipment or severe bodily injury.

Replacing the PSM Shunt Fuse

A DC Bus shunt fuse is located in the Power Supply Module. Refer to *Shunt Fuse Location* on page 5-3 for the location. To check and/or replace this fuse:

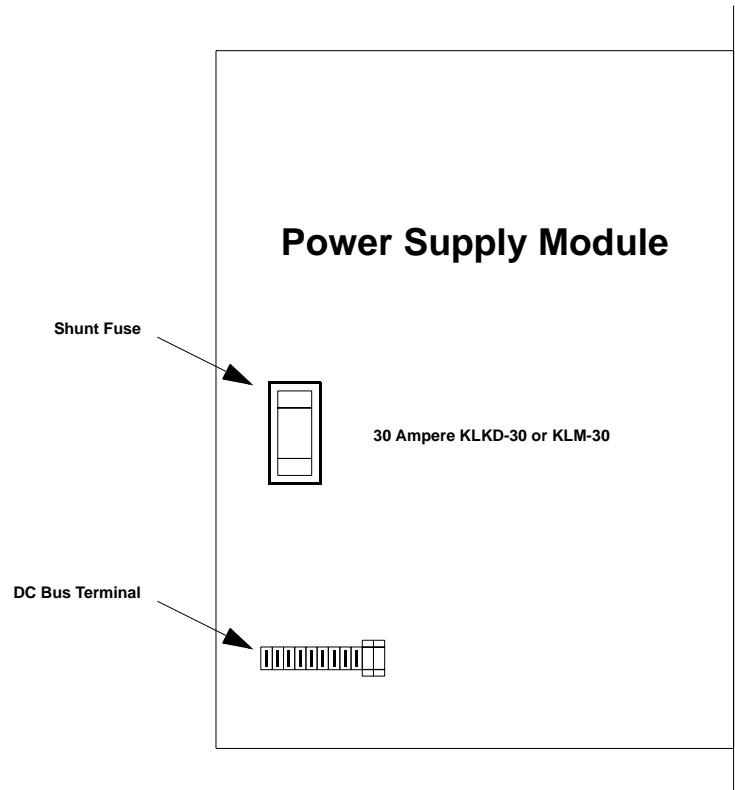
1. Measure voltages at L1, L2, and L3 phase-to-phase to ensure incoming power is OFF. Make sure that the green PSM READY LED is OFF.
2. Remove the shunt connections, PSM cover, and the shunt fuse and test with an ohmmeter.

IMPORTANT

Always replace the shunt fuse with a DC rated fuse.

3. Test the continuity and resistance of the shunt fuse with an ohmmeter.
4. If necessary, replace the fuse, and then reinstall the PSM cover and shunt connections.

Figure 5.1
Shunt Fuse Location



Specifications

Chapter Objectives

This appendix provides information on the following topics:

- General Power
- Physical and Environmental
- Power Dissipation
- Connector and Wire Requirements

The following sections provide specifications and requirements for the ULTRA Plus PSM-125C.

General Power

The table below lists general power specifications and requirements for the ULTRA Plus PSM-125C.

Specification	Description
AC Input Voltage ¹	100-240V ac, three phase ²
AC Input Frequency	47 - 63 Hz
AC Input Current Nominal (230V ac, three phase input) Maximum inrush (230V ac, three phase input)	82Arms 100A (0-peak)
Peak Output Current (dc)	450A
Continuous Output Current (dc)	100A
Output Voltage	100-340V dc (325V dc with 230V ac Input)
Shunt Power ³ Peak Continuous	40kW 1.2kW
Fuse: Class RK5 rated 90A (5000 AIC).	Suitable for use on a circuit capable of delivering not more than 5,000 rms symmetrical amperes, 240V maximum, when protected by high interrupting capacity, current limiting fuses.

¹ Specification is for nominal voltage. The absolute limits are 58-265V ac, three phase, 50/50 Hz, 100A.

² Single phase power may be used, with reduced capability. Refer to *AC Input Power* on page 3-5 for limitations.

³ The PSM-125C may use an external shunt rated at 4 Ohm, 600 Watt minimum.

Physical and Environmental

The table below lists physical and environmental specifications and requirements.

Specification	Description
Weight	11.9 kg (26.2 lb)
Operating Temperature	0° C to 55° C (32° F to 131° F)
Storage Temperature	-40° C to 70° C (-40° F to 158° F)
Humidity	5% to 95% non-condensing
Altitude	1500m (5000 ft) Derate 3% for each 300 m above 1500m
Vibration Operating/Non-operating	5 to 2000 Hz, 2.5 g peak, 0.015 in. maximum displacement
Shock Non-operating	15 g 11 ms half sine
Field Wiring AC Power Shunt	Copper, rated 75° C (167° F) minimum Stranded wire rated to 600 V, 250° C (482° F) minimum
UL Listed to U.S. and Canadian safety standards	UL 508 C File E145959, Vol. 1, Section 3

Power Dissipation

Use the following table to size an enclosure and calculate required ventilation for the ULTRA Plus PSM-125C. Typical heat losses run approximately one-half maximum power losses. The maximum power losses are shown below.

Catalog Number	Maximum Loss (Watts)
ULTRA Plus PSM-125C	240
3.0 kVA Transformer	350
TF-03 (3 kW transformer)	350
TF-06 (6 kW transformer)	600
TF-18 (18 kW transformer)	1200

As an additional aid in sizing an enclosure, with no active method of heat dissipation, the following approximate equation is used:

$$T = 4.08 (Q/A) + 1.1$$

Where T is temperature difference between inside air and outside ambient (°F), Q is heat generated in enclosure (Watts), and A is enclosure surface area (ft²).

The exterior surface of all six sides of an enclosure is calculated as

$$A = (2dw + 2dh + 2wh)/144$$

Where d (depth), w (width), and h (height) are in inches.

Connector and Wire Requirements

The table below lists connector and wire specifications for the ULTRA Plus PSM-125C.

Connector	Terminal / Pin	Connector Type	Wire Gauge ¹		Terminal Torque		Description
			mm ²	(AWG)	Nm	(lb-in)	
TB1	1 - 4	4-position screw style barrier terminal strip	1.5	(16)	2.71	(24.0)	User Input/Output
TB2	L1 - L3	3-position screw style barrier terminal strip	16 - 50	(6 - 0)	2.71	(24.0)	AC power
	POS/NEG	Screw terminal posts	8 - 14	(12 - 6)	4.0	(36.0)	DC bus
	GND	Screw terminal post	16 - 50	(6 - 0)	4.0	(36.0)	Safety (Earth) Ground
TB3	1 - 2 (both sides)	2-position screw style barrier terminal strip	2.5	(14)	1.5 - 1.8	(13.0 - 16.0)	Shunt Resistor

¹ Wire sizes are minimum recommended values. Local regulations should be observed.
Refer to *Physical and Environmental*, *Field Wiring* for recommended minimum wire ratings.

Interconnect Diagrams

Chapter Objectives

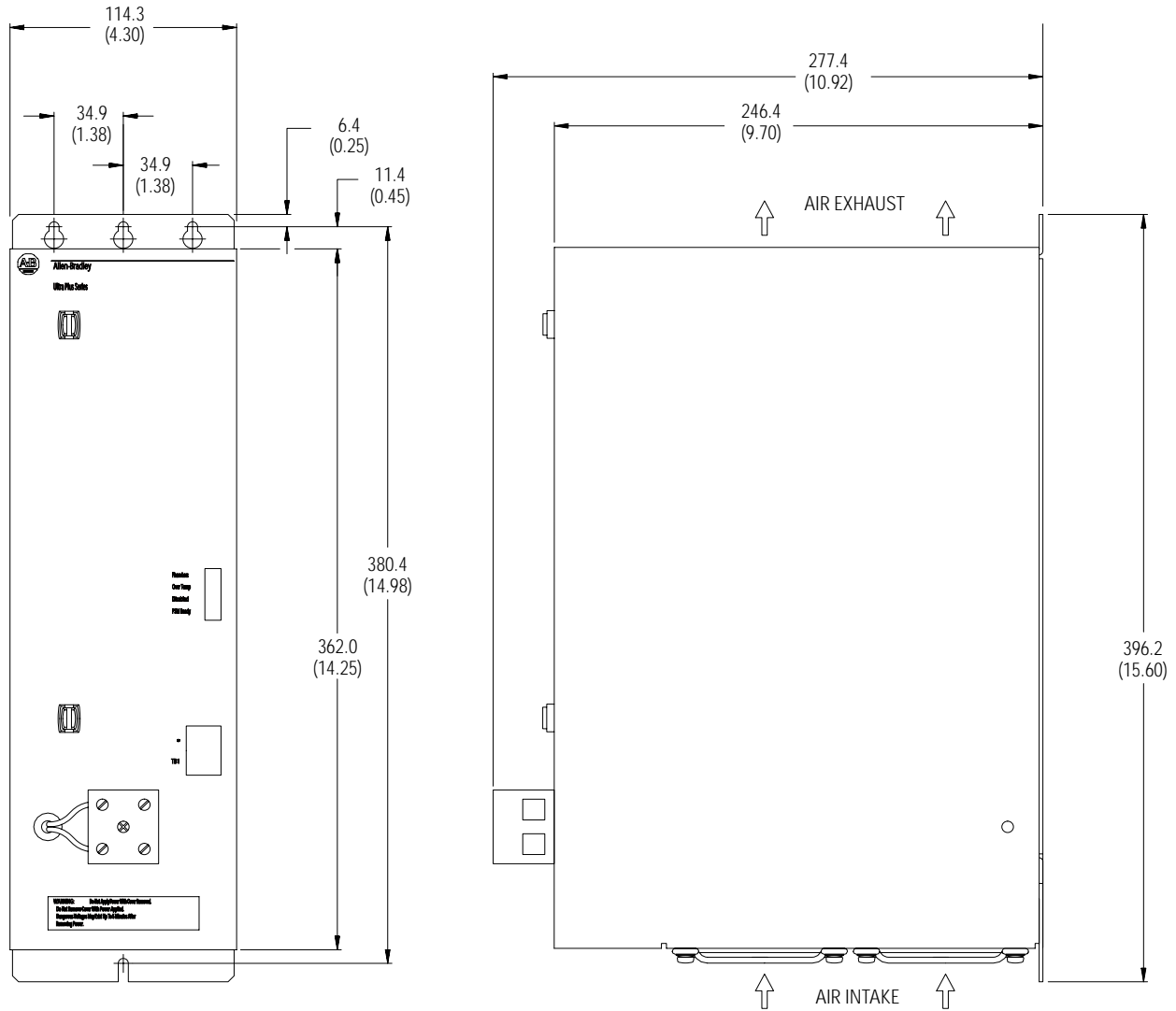
This appendix provides the following drawings:

- Outline and Mounting Diagram - ULTRA Plus PSM-125C (9101-0456)
- Outline and Mounting Diagram - ULTRA Plus PSM Auxiliary Transformer Mounting
- Chassis Wiring Diagram - ULTRA Plus PSM-125C (9101-0454)
- Power Wiring Connection Diagram - ULTRA Plus PSM-125C System (9101-0462)

Dimensions

The following diagrams show the dimensions and mounting hole locations for the PSM-125C and optional Auxiliary Transformer. Chassis and Power Wiring diagrams for the PSM-125C are also included.

Figure B.1
Outline and Mounting Diagram - ULTRA Plus PSM-125C
(9101-0456)



Minimum Clearances:
 102.0 (4.0) above and below unit for airflow.
 13.0 (0.50) both sides and between adjacent units for air flow.
 280 (11.0) from backpanel to front of unit for cable clearance.

Dimensions are in millimeters (inches).

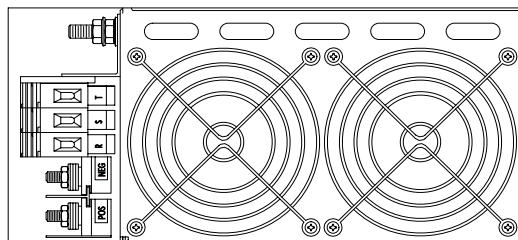
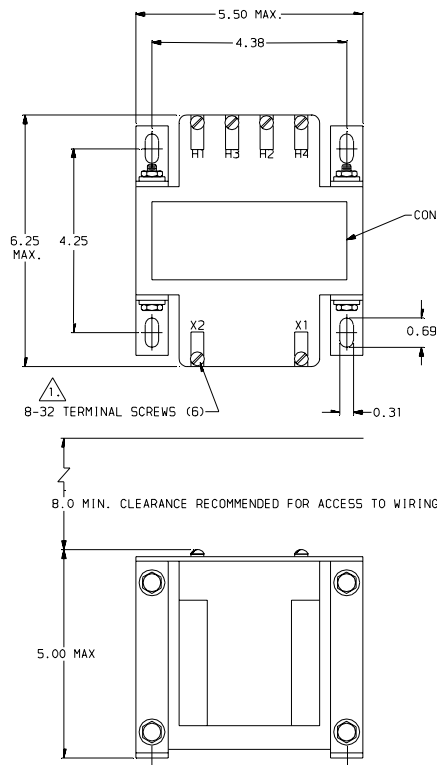


Figure B.2
Outline and Mounting Diagram -
ULTRA Plus PSM Auxiliary Transformer Mounting

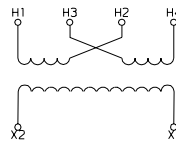


SPECIFICATIONS:

OUTPUT POWER ■ 50/60Hz
 110 VAC OUTPUT VOLTAGE
 50°C MAX. TEMPERATURE RISE ----- 500 VA MIN.

NOMINAL OPERATING VOLTAGES ----- 480 OR 240 INPUT, 120 OUTPUT
 460 OR 230 INPUT, 115 OUTPUT
 440 OR 220 INPUT, 110 OUTPUT

SCHEMATIC SYMBOL



INPUT (PRIMARY) CONNECTIONS: H1, H4
 480 VAC INPUT; JUMPER H3 to H2
 240 VAC INPUT; JUMPER H1 to H3 AND H2 to H4
 OUTPUT (SECONDARY) CONNECTIONS: X1, X2
 120 VAC

NOTES:

- △ RING OR SPADE LUG CONNECTORS (NOT PROVIDED) ARE REQUIRED FOR WIRING CONNECTIONS TO THE TRANSFORMER.

Dimensions are in inches

Wiring Diagrams

The diagrams starting page B-4 on show suggested Chassis and Power Wiring diagrams for the PSM-125C.

Catalog Numbers and Accessories

Chapter Objectives

This appendix lists the ULTRA PSM-125C and accessory item catalog numbers. It provides a brief description of the following components:

- ULTRA Plus PSM-125C Power Supply Module
- Transformers

Contact your local Allen-Bradley sales office for additional information. Refer to the *Motion Control Selection Guide* (publication GMC-SG001x-EN-P) for details on products.

ULTRA Plus PSM-125C Power Supply Module

Use the following table to identify an ULTRA Plus PSM-125C 240V Power Supply Module.

Description	Catalog Number
ULTRA Plus PSM-125C Power Supply Module	1398-PSM-125C

Transformers

Use the following table to identify transformers compatible with an ULTRA Plus PSM-125C.

Part Number	Description
0020-5093	Auxiliary PSM transformer (ULTRA Plus PDM-25, 50, 100 or 150)

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For Allen-Bradley Technical Support information refer to: www.ab.com/support or Tel: (1) 440.646.5800

www.rockwellautomation.com

Corporate Headquarters

Rockwell Automation, 777 East Wisconsin Avenue, Suite 1400, Milwaukee, WI, 53202-5302 USA, Tel: (1) 414.212.5200, Fax: (1) 414.212.5201

Headquarters for Allen-Bradley Products, Rockwell Software Products and Global Manufacturing Solutions

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444

Europe/Middle East/Africa: Rockwell Automation SA/NV, Vorstlaan/Boulevard du Souverain 36, 1170 Brussels, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640

Asia Pacific: Rockwell Automation, 27/F Citicorp Centre, 18 Whitfield Road, Causeway Bay, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

Headquarters for Dodge and Reliance Electric Products

Americas: Rockwell Automation, 6040 Ponders Court, Greenville, SC 29615-4617 USA, Tel: (1) 864.297.4800, Fax: (1) 864.281.2433

Europe/Middle East/Africa: Rockwell Automation, Brühlstraße 22, D-74834 Elztal-Dallau, Germany, Tel: (49) 6261 9410, Fax: (49) 6261 17741

Asia Pacific: Rockwell Automation, 55 Newton Road, #11-01/02 Revenue House, Singapore 307987, Tel: (65) 6356-9077, Fax: (65) 6356-9011