MKS P/N 20068380-001 Rev A

User Manual

# PSR1A/PSR4A POWER SUPPLY AND PRESSURE/FLOW READOUT

## SINGLE / MULTI-CHANNEL POWER SUPPLY / READOUT




2 TECH DRIVE SUITE 201
ANDOVER, MA 02810 USA
(978) 645.5500

FAX: (978) 557.5100
E-MAIL: MKS@MKSINST.COM
WWW.MKSINST.COM

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# 1 Warranty

## 1.1 Service and Warranty Guidelines

Some minor problems are readily corrected on site. If the product requires service, contact the MKS Technical Support Department at +1-833-986-1686. If the product must be returned to the factory for service, request a Return Material Authorization (RMA) from MKS. Do not return products without first obtaining an RMA. In some cases, a hazardous materials disclosure form may be required. The MKS Customer Service Representative will advise you if the hazardous materials document is required.

When returning products to MKS, be sure to package the products to prevent shipping damage. Shipping damage on returned products due to inadequate packaging is the Buyer's responsibility.

**For Customer Service / Technical Support:**

MKS Global Headquarters
2 Tech Drive, Suite 201
Andover MA, 01810 USA
Phone: +1-833-986-1686
Email: insidesales@mksinst.com
Visit our website at: www.mksinst.com

## 1.2 Warranty Information

MKS Instruments, Inc. provides an eighteen (18) month warranty from the date of shipment for new MKS products. The MKS Instruments, Inc. general terms and conditions of sale provide the complete and exclusive warranty for MKS products. This document is located on our web site at www.mksinst.com or may be obtained by a contacting an MKS customer service.

# 2 Safety Information

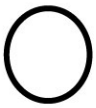
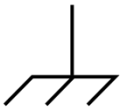
## 2.1 Symbols Used in This Instruction Manual

The following are definitions of WARNING, CAUTION, and NOTE messages used throughout the manual.

| | |
|---|---|
| ***NOTE*** | **The NOTE sign denotes important information. It calls attention to a procedure, practice, condition, or the like, which is essential to highlight.** |
| ***CAUTION*** | **The CAUTION sign denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of all or part of the product.** |
| ***WARNING*** | **The WARNING sign denotes a hazard. It calls attention to a procedure, practice, condition, or the like, which, if not correctly performed or adhered to, could result in injury to personnel.** |

## 2.2 Symbols Found on the Unit

The following table describes symbols that may be found on the unit.

| | | | |
|---|---|---|---|
|  ON (Supply) IEC 417, No. 5007 |  OFF (Supply) IEC 417, No. 5008 |  Earth (ground) IEC 417, No. 5017 |  Protective Earth (ground) IEC 417, No. 5019 |
|  Frame or Chassis IEC 417, No. 5020 |  Equipotentiality IEC 417, No. 5021 |  Direct Current IEC 417, No. 5031 |  Alternating Current IEC 417, No. 5032 |

| | | |
|---|---|---|
|  Both Direct and Alternating Current IEC 417, No. 5033-a |  Class II Equipment IEC 417, No. 5172-a |  Three Phase Alternating Current IEC 617-2, No. 020206 |
|  Caution (refer to accompanying documents) ISO 3864, No. B.3.1 |  Caution, Risk of Electric Shock ISO 3864, No. B.3.6 |  Caution Hot Surface IEC 417, No. 5041 |

## 2.3 Safety Procedures and Precautions

Observe the following general safety precautions during all phase of operation of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of intended use of the instrument and may impair the protection provided by the equipment. MKS Instruments, Inc. assumes no liability for the customer's failure to comply with these requirements.

### DO NOT SUBSTITUTE PARTS OR MODIFY INSTRUMENT

Do not install substitute parts or perform any unauthorized modification to the instrument. Return the instrument to an MKS Calibration and Service Center for service and repair to ensure that all safety features are maintained.

### SERVICE BY QUALIFIED PERSONNEL ONLY

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified service personnel only.

### PROPERLY GROUND THE CONTROLLER

This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting it to the product input terminals. A protective ground connection through the grounding conductor in the power cord is essential for safe operation.

Upon loss of the protective-ground connection, all accessible conductive parts (including knobs and controls that may appear to be insulating) can render an electrical shock.

All components of a vacuum system used with this or any similar high voltage product must be maintained at earth ground for safe operation. Be aware, however, that grounding this product does not

guarantee that other components of the vacuum system are maintained at earth ground. Connecting the power cable only to a properly grounded outlet is necessary but not sufficient for safe operation of a vacuum system with this or any similar high voltage producing product. Verify that the vacuum port to which sensors are mounted is electrically grounded.

Some of the sensors operated by the PSR1A/PSR4A Controller are highly gas sensitive and were calibrated with a specific gas. When used with other gases, the true pressure could be much higher than the indicated pressure. Read and understand the information provided in this manual about setting up, installing, and operating each sensor type with different gases.

### DO NOT SUBSTITUTE PARTS OR MODIFY THE INSTRUMENT

Do not install substitute parts or perform any unauthorized modification to the instrument. Return the instrument to an MKS Calibration and Service Center for service and repair to ensure that all safety features are maintained.

### USE PROPER ELECTRICAL FITTINGS

Dangerous voltages are contained within this instrument. All electrical fittings and cables must be of the type specified, and in good condition. All electrical fittings must be properly connected and grounded.

High voltage is present in the cable and a Cold Cathode sensor when the Controller is turned on.

### USE PROPER ELECTRICAL POWER SOURCE

This product is intended to operate from a power source that applies a voltage between the supply conductors, or between either of the supply conductors and ground, not more than that specified in the manual.

### USE PROPER ELECTRICAL FUSE

Only use a fuse of the type, voltage rating, and current rating specified for your product.

### DO NOT OPERATE IN EXPLOSIVE ENVIRONMENT.

To avoid explosion, do not operate this product in an explosive environment unless it has been specially certified for such operation.

### SERVICE BY QUALIFIED PERSONNEL ONLY

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must only be made by qualified service personnel.

### USE PROPER ELECTRICAL POWER CORD

Only use a power cord that is in good condition and that meets the input power requirements specified in the manual.

Only use a detachable cord set with conductors having a cross-sectional area equal to or greater than 0.75 mm2. The power cable should be approved by a qualified agency such as VDE, Semko, or SEV.

# 3 General Information and Product Overview

## 3.1 Product Description

The PSR1A and PSR4A are compact, portable, and versatile full-featured measurement and control instruments, with precision multiple ports and a single channel (PSR1A) or four channel (PSR4A) capability. The operating controls primarily support point-and-click navigation. They support independent full function input measurement ports and advanced technology output ports. Extensive local and remote information communication is provided. Superior technology is combined with operating simplicity, versatility, and ruggedness. The PSR1A and PSR4A are easy to install and operate. An extensive open architecture enables a wide range of special operating capabilities organized to meet the needs of nearly any high-accuracy precision measure, process, alarm monitoring, and communication application requirements.

## 3.2 How the PSR1A/PSR4A Works

The PSR1A and PSR4A are microprocessor based, with no power or selection switches, jumpers, or potentiometers. Universal input and output signals support a wide range of measurements for flow and pressure control and measurement, and services include quantity accumulation, rate measurements, and scalar measurements.

Digital signal processing reduces ambient noise and interference, and advanced signal output ports provide extremely stable voltages, currents, and support isolated relay contacts.

Communication and data acquisition is initiated by command (solicited), alarms (unsolicited), and real-time scheduled reporting using its internal date-time clock. Independent user-programmable alarm threshold limits are available for every measured value. Alarms are programmable to activate local annunciation, local display alert, and drive relay or analog output.

## 3.3 Abbreviations Used in this Manual

Some abbreviations and acronyms are used in this user manual. A list is below, and may not be totally inclusive of all:

| Abbreviation | Meaning |
|---|---|
| PV | Process Variable |
| SP | Setpoint |
| VOR | Valve Override (valve open/valve close) |
| VDC | DC Voltage |
| SigTyp | Signal Type, mA or VDC |
| Func | Function |

# 4 Installation

## 4.1 Unpacking the PSR1A or PSR4A Power Supply and Readout

MKS has carefully packed the PSR1A or PSR4A unit so that it will reach you in perfect operating order. Upon receiving the unit, however, you should check for defects, cracks, broken connectors, etc., to be certain that damage has not occurred during shipment.

***NOTE*** **Do not discard any packing materials until you have completed your inspection and are sure the unit arrived safely.**

If you find any damage, notify your carrier and MKS immediately. If it is necessary to return the unit to MKS, obtain an RMA Number (Return Material Authorization Number) from the MKS Calibration and Service Center before shipping. Please refer to the inside of the back cover of this manual for a list of MKS Calibration and Service Centers.

### 4.1.1 Opening the Package

The PSR1A or PSR4A kit will contain the following parts:

- PSR1A single-channel or PSR4A four-channel power supply and readout
- Power supply and cord, according to voltage and current configuration
- Interface cable (PSR1A) or cables (PSR4A) to connect to flow or pressure instrument(s)
- Brackets and hardware for panel mounting or desktop mount

## 4.2 Product Location and Requirements

- Ventilation requirements for proper air circulation
- Maintain the normal operating temperature between 0° and 50° C (32° and 122° F)
- Refer to requirements for devices attached to the PSR1A/PSR4A Power Supply and Readout
- Mount the PSR1A/PSR4A in a rack or desktop as described below in Section 4.4

***WARNING*** **Follow your corporate policy for handling toxic or hazardous gases. Your corporate policy on handling these gases supersedes the instructions in this manual. MKS assumes no liability for the safe handling of such materirials.**

## 4.3 Dimensions

**NOTE** All dimensions are listed in inches with millimeters referenced in parentheses.

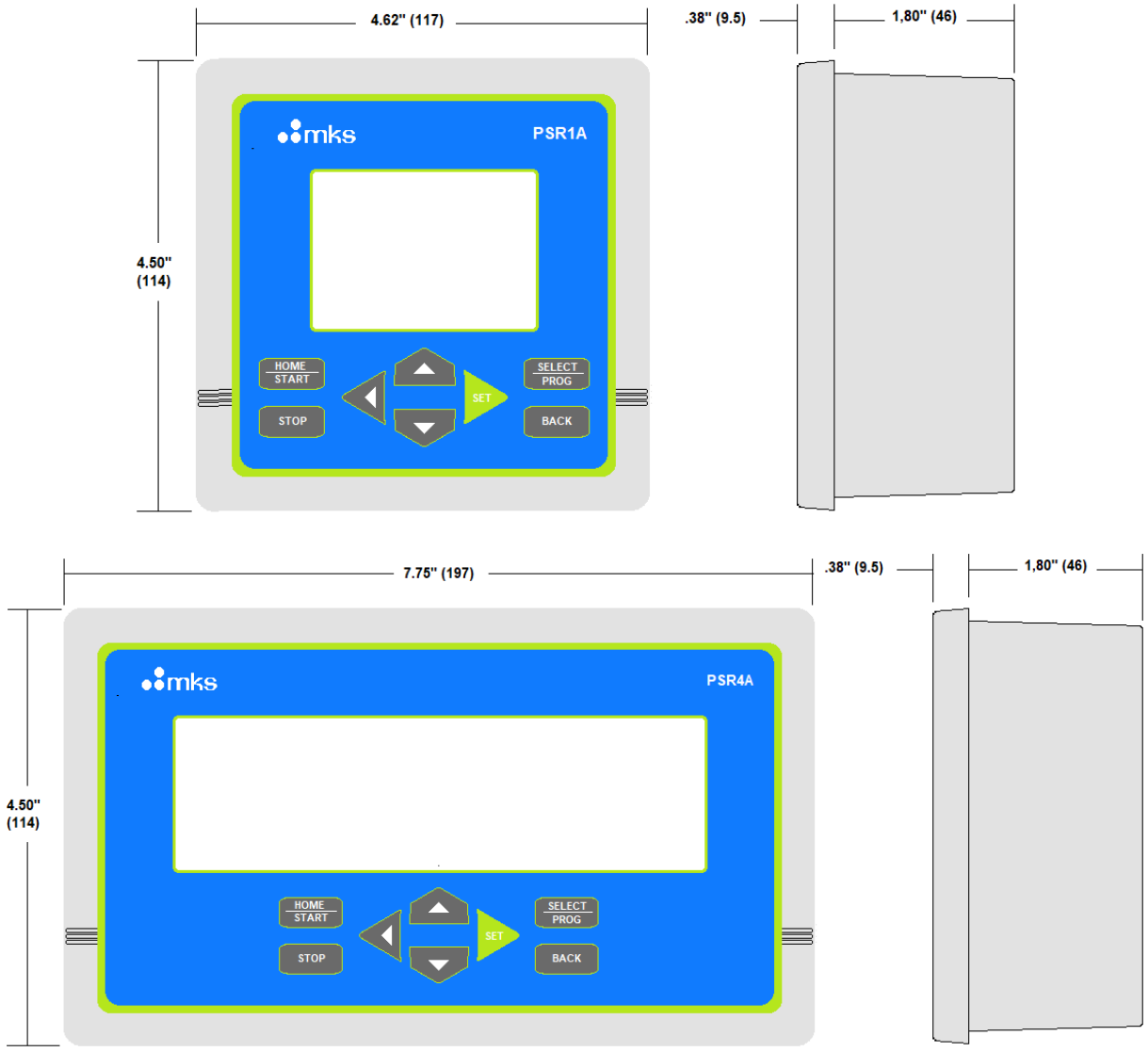



*Figure 1: Dimensions, PSR1A and PSR4A*

## 4.4 Setup

### 4.4.1 Panel Mounting

The PSR1A/PSR4A comes standard with hardware for panel mounting and are available with brackets to assemble for desktop use. Use the two enclosed angle brackets and #6-32 screws to secure the unit to a panel cutout. Be sure to not overtighten the screws as this may damage the threaded holes in the PSR1A/PSR4A. Recommended panel cutout dimensions are shown below.

**CAUTION** **Only qualified individuals should perform the installation and any adjustments. They must comply with all the necessary ESD and handling precautions while installing and adjusting the instrument. Proper handling is essential when working with all highly sensitive precision electronic instruments.**

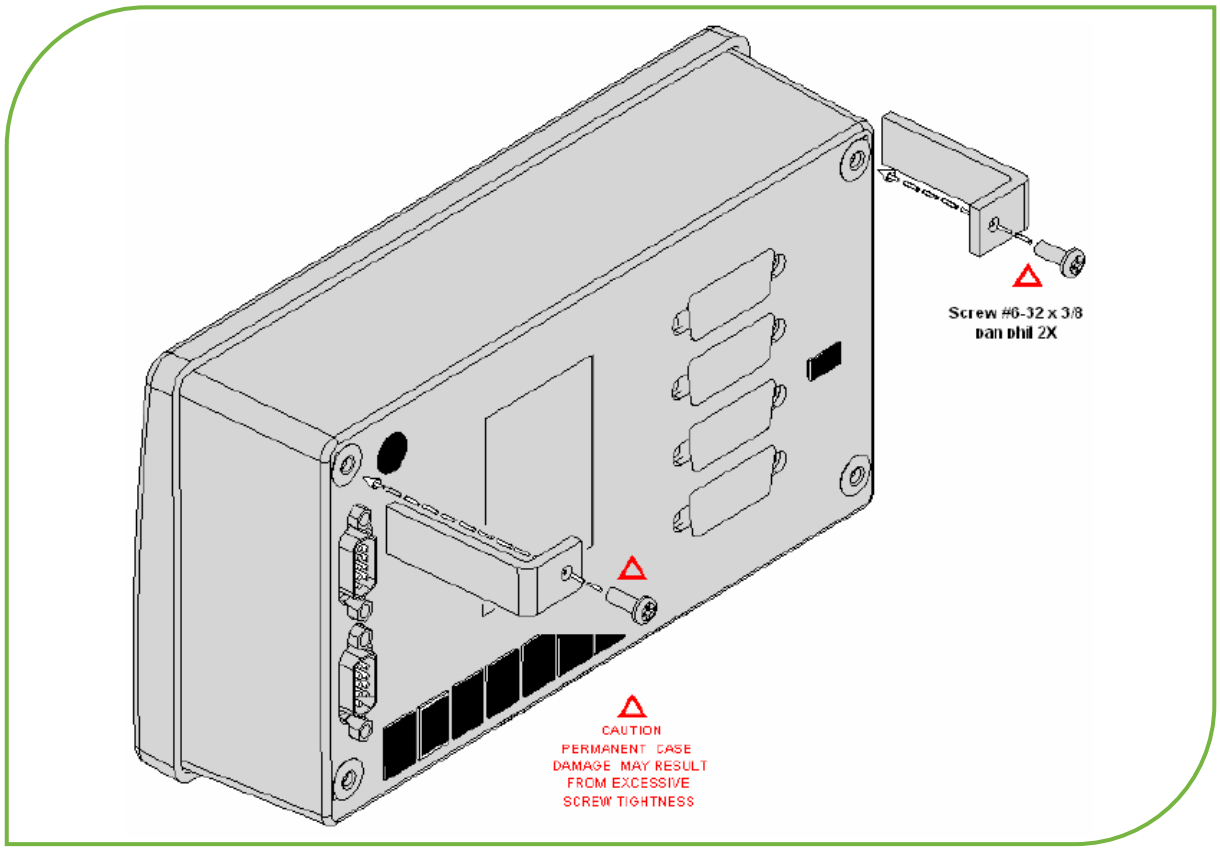



*Figure 2: Panel Mounting*

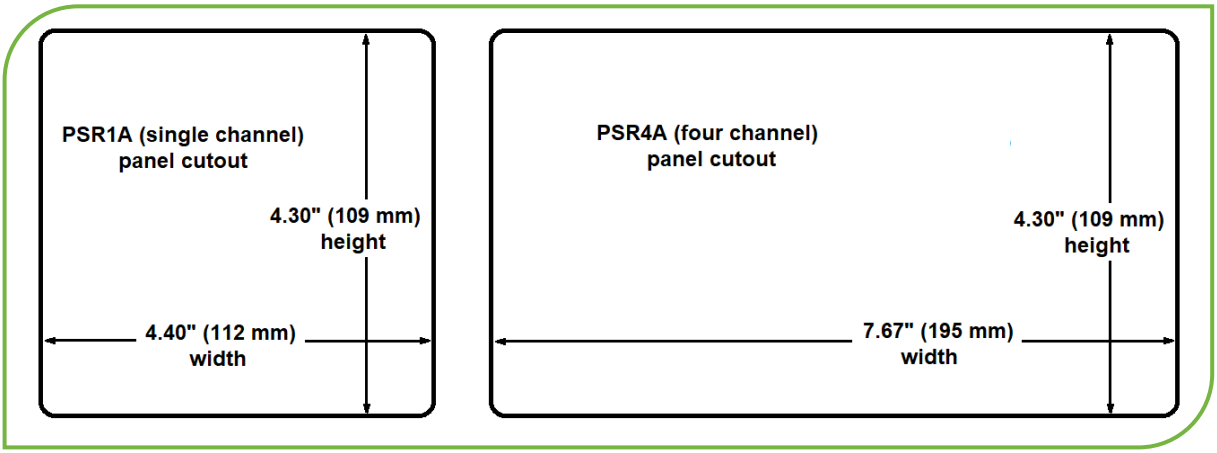



*Figure 3: Panel Cutout Dimensions*

### 4.4.2 Tabletop Mounting

The PSR1A/PSR4A also comes with tabletop mounting bracketry and hardware, as shown below.

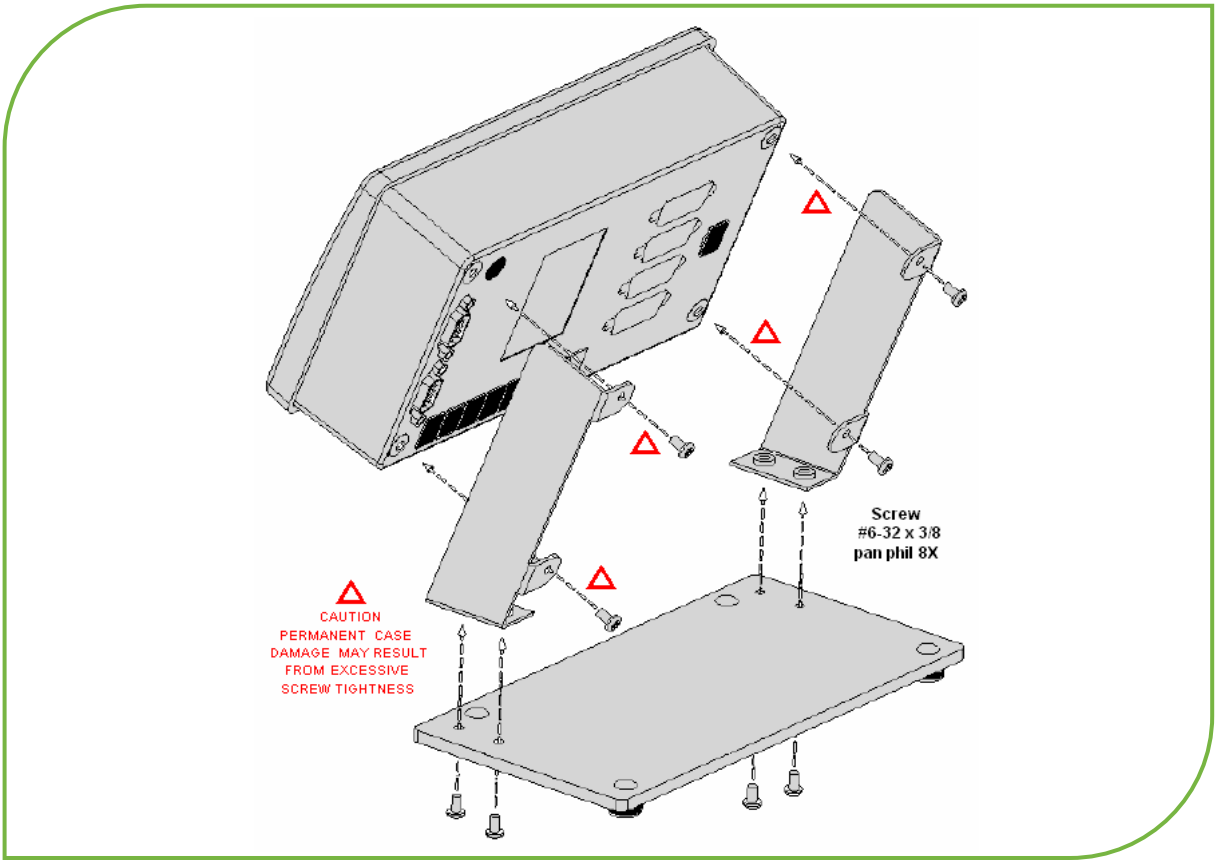



*Figure 4: Tabletop Mounting*

## 4.5 Rear Panel Connections

The rear panel of the PSR1A/PSR4A has connections for power, analog and serial communication, and LAN ports.

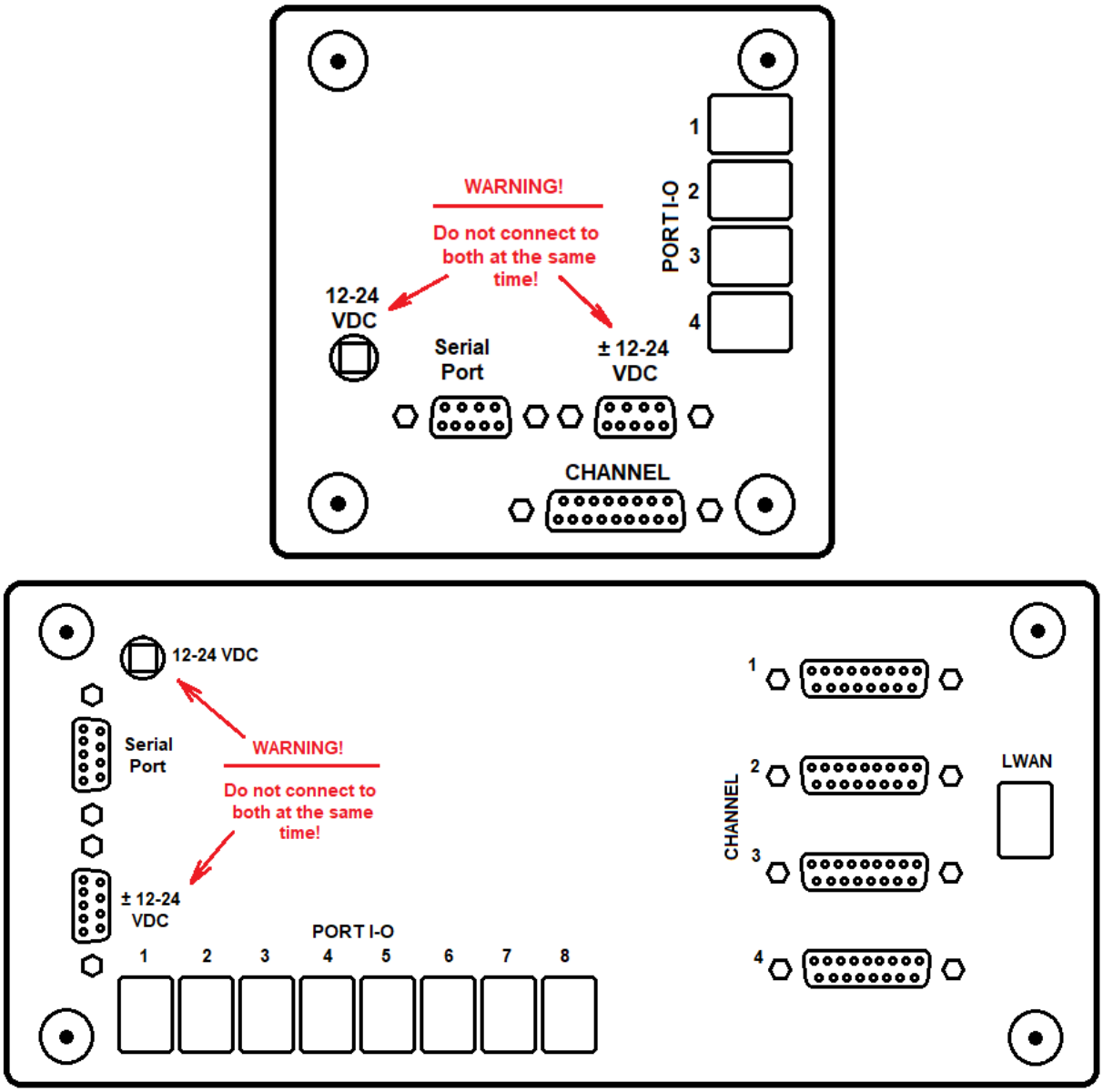



*Figure 5: Rear Panel Connectors PSR1A and PSR4A*

### 4.5.1 Rear Panel Connections

The rear panel of the PSR1A or PSR4A will contain the following connections.

- 12-24 VDC round plug – this plug accepts the enclosed 85-265 VAC power supply, allowing the user to utilize the PSR1A/PSR4A with AC voltage from standard wall outlets.

- Serial Port – this 9-pin D connector allows the user to control the PSR1A/PSR4A via RS-232. The connections of this connector are:

| Pin | Signal |
|---|---|
| 2 | RXD |
| 3 | TXD |
| 5 | GND |

- 15- pin D Channel connector – the PSR1A has one channel connector, and the PSR4A has four, one for each channel. These channel connectors are used to interface with external devices such as mass flow controllers and pressure transducers. Special adapters are required to adapt to external instruments, included in your package if ordered with MKS devices. Pin assignments for the 15-pin D connector(s) on the PSR1A/PSR4A are:

| Pin | Signal |
|---|---|
| 2 | PV signal input |
| 3 | SP signal output |
| 6 | SP output return |
| 7 | Valve override<br>Not connected – normal operation<br>< -4 VDC – valve closed<br>< +8 VDC to > +1 VDC – valve open |
| 8 | PV input return |
| 9 | SP signal input |
| 12 | Power common |
| 13 | +15 to +24 VDC power |
| 14 | -15 VDC power |

- ± 12-24 VDC 9-pin D connector – as an alternative to the round power plug, the user can use 85-265 VAC for power with the following connections:

| Pin | Signal |
|---|---|
| 1 | Shield |
| 2 | Common |
| 4 | +V |

5 -V
6 Common
8 +V
9 -V

- +12 – 24 VDC power supply – the included power supply assembly plugs into this rear panel connector, allowing the user to utilize the PSR1A/PSR4A with AC voltage from standard wall outlets. Power options include US, EU, Japan, and UK style, and are specified at order.

| ***WARNING*** | **Do not connect both the round power plug and the 9-pin D power connector at the same time.** |
|---|---|

# 5 Operation

## 5.1 Buttons

The front panel of the PSR1A/PSR4A has four buttons in a central cluster and two buttons on either side of the cluster, as shown below.




*Figure 6: Front Panel Buttons*

The central cluster consists of a green SET button, and three directional arrow buttons, UP, DOWN, and BACK. The left two buttons are HOME | START and STOP, and the right two buttons are SELECT | PROG and BACK.

### 5.1.1 Center Cluster Buttons

The arrow directional buttons UP and DOWN are used to scroll up or down in a menu to display or choose a function. The BACK button is used to return to the previous screen. The SET button is used to change a setting.

### 5.1.2 Left Side Buttons

The HOME | START button can be used to return to the home screen, or to start logging in future releases. The STOP button would be used to stop logging data.

### 5.1.3 Right Side Buttons

The SELECT | PROG button can be used to change a selected setting, or to start programming in future releases. The BACK button is used to return to the previous screen.

## 5.2 Home Screen

When the PSR1A/PSR4A is powered up, a home screen is displayed as shown below.

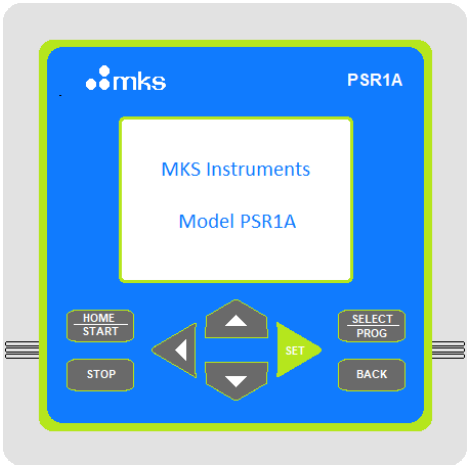



*Figure 7: Home Screen*

## 5.3 Startup Menu

After a short time, the screen will change to indicate the status of each channel as shown below in Figure 8. “PV” refers to “Process Variable” and will display the current value of this process variable along with the units of measure and time base (if applicable) for that PV. Process variables are determined by the user and the type of device for that channel. They could be mass flow rates such as scc/min, or pressure such as kPa.

”SP” refers to “Setpoint”, and if the attached device is a controller the setpoint is also a unit of measure and time base similar to the PV. It is possible to set the PV and SP to different units of measure, but it is strongly recommended that they are the same to avoid confusion. See choices for units of measure in the next section, Configuration Menus.

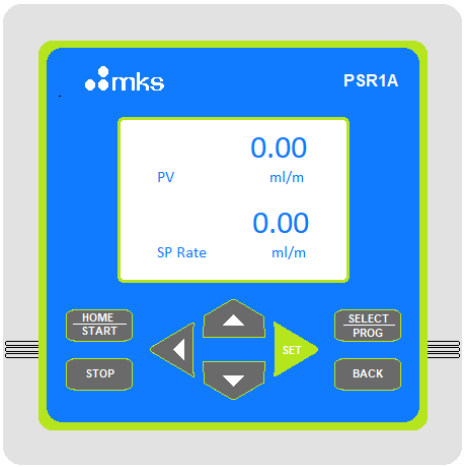



*Figure 8: Startup Menu*

## 5.4 Configuration Menus

The user can press the SELECT | PROG button or the SET button to get to the configuration screen, shown below, and choose between Display Configuration and Instrument Configuration.




*Figure 9: Configuration Menu*

### 5.4.1 Display Configuration Menu

In Display Configuration option, you can choose which values are displayed on the home screen. An asterisk signifies that PV or SP value is currently displayed. Toggle up or down and press SELECT | PROG to change the values displayed on the home screen. Press HOME | START to return to the home screen.

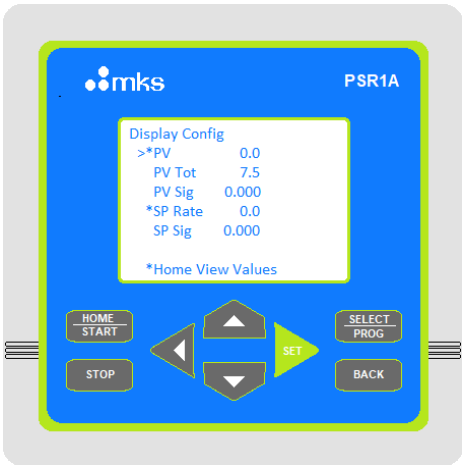



*Figure 10: Display Configuration Menu*

### 5.4.2 Instrument Configuration Menu

To change instrument configuration options from the home screen, toggle to “Instrument Config” and press SELECT | PROG. The list of available options is long, and the first two sub-lists are shown below. Toggle up or down to reach the desired setting on the menu list, and press SET to display options for that parameter. Be aware that MKS does not offer devices to measure or control many of these parameters, and care must be taken when using any devices for compatibility.

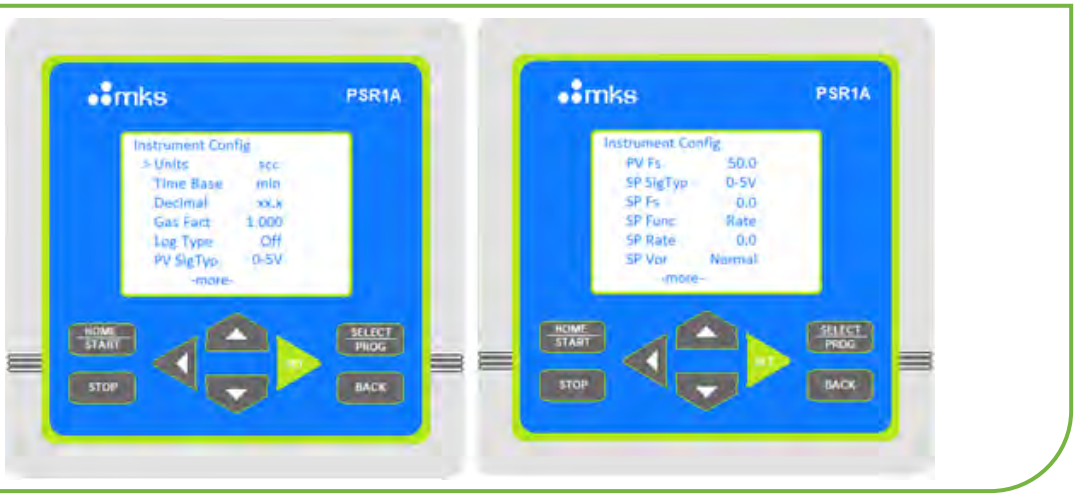



*Figure 11: Instrument Configuration Menu*

***Units***

Units can be units of measure for volume, pressure, mass/weight, density, temperature, and electrical units. Available choices for each include:

Volume – sl (standard liters), scc (standard cubic centimeters), ft^3n (nrmal cubic feet), ft^3s (standard cubic feet), ft^3 (cubic feet), m^3n (normal cubic meters), m^3s (standard cubic meters), m^3 (cubic meters), cm^3n (normal cubic centimeters), cm^3s (standard cubic centimeters), cm^3 (cubic centimeters), ln (normal liters), ls (standard liters), l (liters), mln (normal milliliters), mls (standard milliliters), ml (milliliters)

Pressure – atm (atmospheres), Torr (torr or mm Hg), kPa (kilopascals), psi (pounds per square inch), mbar (millibar), bar

Mass/weight – kg (kilograms), lb (pounds), g (grams)

Density – g/l (grams per liter), kg/l (kilograms per liter), g/ml (grams per millilter), kg/m^3 (kilograms per cubic meter), lb/gal (pounds per gallon), lb/in^3 (pounds per cubic inch), lb/ft^3 (pounds per cubic foot), % (percent), sg (specific gravity), g/cc (grams per cubic centimeter)

Temperature – °F (Fahrenheit), °R (Rankine), °K (Kelvin), °C (Celsius)

Electrical units – mA (milliamps), Volt (volts)

***Time Base***
For time dependent processes such as flow rate, time units are selectable from day, hrs, min, sec, or None (for static units of measure).

***Decimal***
Each channel of the PSR1A/PSR4A can display PV and SP with three significant places and a decimal point in any of four positions – xxx, xx.x, x.xx, .or .xxx

***Gas Fact***
For mass flow controllers and meters being operated with a material other than the active or calibration gas, you can enter a GCF (gas correction factor).

***Log Type***
For logging data, you can choose between Off, PV, Qty1, or Qty2

***PV SigTyp and SP SigTyp***
For the attached device choose the signal type - Off, 0-20mA, 4-20mA, 0-10V, 2-10V, 0-5V, or 1-5V

***SP Func***
The allowable set-point Functions are Rate, Batch or Blend. Set-point values are bipolar and are required to be positive values for correct control function performance.

***SP Rate***
This control type ignores the channel PV Rate. The value set in the SP Rate register is set to the nearest corresponding analog signal which is directly sent to the channel analog signal output.

***SP VOR***

This value (Setpoint Valve Override) is set to Normal for standard operation. VOR Normal causes a VOR signal output voltage to be disconnected - floating. The VOR function is used in applications to override the normal analog command signals and finds use for installation and system diagnostic purposes.

***SP Batch***

Batching is a discontinuous control process that delivers the quantity set in the SP Batch register. This process is started using either the keypad or a serial communication command. Batching is terminated when the desired batch quantity has been delivered - or any time before delivery is complete by pressing the [STOP] key.

***SP Source***

This control enables selection of the source from which setpoints may be entered as either Keypad or Serial. When set for Serial, changing a setpoint using the keypad is prohibited.