



## Drive-Rack with Motion Controller

# Automation1 iXR3

### Machine Control That Stands Alone

The Automation1 iXR3 is two solutions in one: a high-performance, six-axis drive rack with an integrated motion controller—meaning it's capable of complete machine control—and a multi-axis servo motor drive rack with configurable and field-replaceable, front-mounted amplifier cards.

The iXR3 runs the full [Automation1-iSMC](#) motion controller, offers industry-best sub-nanometer levels of position control for servo motors and stages, connects to other Automation1 drives over HyperWire and connects to other automation devices over EtherCAT, EtherNet/IP™, Modbus TCP/IP or a TCP Socket interface. Multi-axis PSO enables precision control of your industrial laser or process tool synchronized with your motion trajectory.

### Automation1

The iXR3 is a part of the user-friendly Automation1 motion control platform, which includes the following:

- ◆ **Development Software**
- ◆ **Controls**
- ◆ **Motor Drives**
- ◆ **Fiber-Optic HyperWire® Communication Bus**



### KEY FEATURES:

- ◆ Unlock the full **MOTION CONTROL** power of our Automation1-iSMC intelligent software-based motion controller
- ◆ Features **COMPLETE CONFIGURATION & PERFORMANCE** capability of the XR3 drive rack
- ◆ **CONNECT TO THE CONTROLLER** using **EtherNet/IP™** | **EtherCAT®** Modbus TCP/IP or TCP Socket interface
- ◆ Plug-in **AMPLIFIERS WITH DEDICATED CONTROL** cards drive brush, brushless, stepper, voice coil or piezo motors
- ◆ Enjoy up to **12 AXES OF CONTROL** by connecting more Automation1 drives over the HyperWire fiber-optic bus
- ◆ Includes PSO, the **ULTIMATE IN POSITION-BASED CONTROL** for industrial lasers, cameras & more
- ◆ Features **SAFE TORQUE OFF (STO)** functional safety (certification pending)

## AUTOMATION1 iXR3 GENERAL SPECIFICATIONS

Description	(Option)	iXR3
<b>Motion Controller<sup>(1)</sup></b>		Aerotech's <a href="#">Automation1-iSMC</a> Intelligent Software-Based Motion Controller (version 2.1 and above)
<b>Connectivity to other Automation1 drives</b>		HyperWire
<b>Number of Amplifiers</b>		1 to 6 (Each amplifier requires a controller card in order to be used).
<b>Number of Controller Cards</b>		1 to 6
<b>Encoder Inputs</b>		2 per controller card.
<b>Motor Style</b>		Brush, Brushless, Stepper, Voice Coil
<b>Input Current</b>	<b>-VL1</b>	120 VAC, 10 A Maximum
	<b>-VL2</b>	240 VAC, 5 A Maximum
	<b>-VL3</b>	100 VAC, 10 A Maximum
	<b>-VL4</b>	200/208 VAC, 5 A Maximum
<b>Bus Voltage Options</b>	<b>-VB1</b>	$\pm 10$ VDC (200 W Power Supply), bipolar
	<b>-VB2</b>	$\pm 20$ VDC (200 W Power Supply), bipolar
	<b>-VB3</b>	$\pm 30$ VDC (200 W Power Supply), bipolar
	<b>-VB4</b>	$\pm 40$ VDC (300 W Power Supply), bipolar
	<b>-VB5</b>	$\pm 80$ VDC (300 W Power Supply), bipolar
	<b>-VB7</b>	+160 VDC, unipolar
	<b>-VB8</b>	+320 VDC, unipolar
<b>AC Power Input</b>		AC input (Switch Selectable): AC Hi, AC Lo, Earth Ground (⏚), <ul style="list-style-type: none"> <li>• 100 VAC (90-110 VAC, 50/60 Hz)</li> <li>• 120 VAC (108-132 VAC, 50/60 Hz)</li> <li>• 200/208 VAC (180-220 VAC, 50/60 Hz)</li> <li>• 240 VAC (216-264 VAC, 50/60 Hz)</li> </ul> <p>Note: If the iXR3/XR3 contains an offline Bus power supply, the AC Input will be limited to one AC input range.</p>
<b>Inrush Current</b>		32 A <sub>pk</sub>
<b>Auxiliary Power Outputs</b>		+5 V provided on all axis feedback connectors for encoder, Hall, and limit power. +5 V provided on I/O connectors
<b>Protection</b>		The AC power cord serves as the mains breaker and provides 10 A, Supplemental Protection only. Internal Bus supply fusing. Amplifier Output short circuit protection. Peak and RMS over current limit. Over Temperature shutdown. Bus supply inrush current limit during initial power-on.
<b>Internal Shunt Resistor</b>		40 W Continuous; 400 W Peak (5 seconds)
<b>Safe Torque Off (STO)</b>		Yes
<b>Digital I/O</b>		16x digital inputs, optically isolated 16x digital outputs, optically isolated
<b>Position Synchronized Output (PSO)</b>		3x PSO isolated outputs 3x PSO TTL outputs 3x PSO synchronization inputs
<b>Data Acquisition</b>		1x high-speed input (50 nsec latency)
<b>Sync Ports</b>		2
<b>Operating Temperature</b>		0 to 50°C
<b>Storage Temperature</b>		-30 to 85°C
<b>Weight</b>		25 kg. (55 lb.)

## AUTOMATION1 iXR3 CONTROL CARD SPECIFICATIONS

Each controller card configured on the Automation1-iXR3 includes the following options:

	<b>-CTN</b>	<b>-CT1</b>	<b>-CT2</b>	<b>-CT4</b>
<b>Current Loop Update Rate</b>	20 kHz			
<b>Servo Loop Update Rate kHz 8</b>	20 kHz			
<b>High-Speed Outputs</b>	2x high-speed RS-422 differential outputs (per controller card)			
<b>25-Pin Motor Feedback Connector<sup>(2)</sup></b>	High-speed differential inputs (encoder sin, cos and marker; absolute clk and data) CW and CCW limits Hall effect sensor inputs (A, B, and C) Analog motor temperature input (accepts digital) Brake output			
<b>9-Pin Aux Encoder Feedback Connector</b>	High-speed differential inputs (encoder sin, cos and marker; absolute clk and data)			
<b>15-Pin Analog I/O Connector</b>	2x 16-bit differential ±10 V analog input 2x 16-bit single-ended ±10 V analog output Joystick: Button A, Button B, and Interlock			
<b>5-Pin How Powered Motor Connector<sup>(2)</sup></b>	Brushless Phase A, B, and C Connections or DC Brush +/- Connections or Stepper (2 phases with return)			
<b>Primary encoder input specifications</b>	<u>Square-wave Encoder</u> 40 million counts-per-second input  <u>Absolute Encoder</u> Yes  <u>Sine-wave Encoder</u> n/a	<u>Square-wave Encoder</u> 40 million counts-per-second input  <u>Absolute Encoder</u> Yes  <u>Sine-wave Encoder</u> 2 MHz / 450 kHz (bandwidth selectable) input with up to 16,384 multiplication	<u>Square-wave Encoder</u> 40 million counts-per-second input  <u>Absolute Encoder</u> Yes  <u>Sine-wave Encoder</u> 2 MHz / 450 kHz (bandwidth selectable) input with up to 65,536 multiplication	<u>Square-wave Encoder</u> 40 million counts-per-second input  <u>Absolute Encoder</u> Yes  <u>Sine-wave Encoder</u> 2 MHz / 450 kHz (bandwidth selectable) input with up to 65,536 multiplication
<b>Auxiliary encoder input specifications</b>	<u>Square-wave Encoder</u> 40 million counts-per-second input  <u>Absolute Encoder</u> Yes  <u>Sine-wave Encoder</u> n/a	<u>Square-wave Encoder</u> 40 million counts-per-second input  <u>Absolute Encoder</u> Yes  <u>Sine-wave Encoder</u> n/a	<u>Square-wave Encoder</u> 40 million counts-per-second input  <u>Absolute Encoder</u> Yes  <u>Sine-wave Encoder</u> n/a	<u>Square-wave Encoder</u> 40 million counts-per-second input  <u>Absolute Encoder</u> Yes  <u>Sine-wave Encoder</u> 2 MHz / 450 kHz (bandwidth selectable) input with up to 65,536 multiplication
<b>Can Output Multiplied Encoder</b>	n/a	No	Yes	Yes

1. See the [Automation1-iSMC](#) controller page for more information.

2. Available with the CTN, CT1, CT2, and CT4 options.

## AUTOMATION1 iXR3 PWM AMPLIFIER SPECIFICATIONS

	XSP3-10	XSP3-20	XSP3-30
<b>Option Code</b>	-P1	-P2	-P3
<b>Peak Motor Output Current (2 sec)<sup>(1)(2)</sup></b>	10 A <sub>pk</sub>	20 A <sub>pk</sub>	30 A <sub>pk</sub>
<b>Continuous Current<sup>(2)</sup></b>	5 A	10 A	10 A
<b>Maximum Bus Voltage</b>	320 VDC		
<b>Maximum Power Amplifier Bandwidth<sup>(3)</sup></b>	2 kHz		
<b>PWM Switching Frequency</b>	20 kHz		
<b>Minimum Load Inductance</b>	0.1 mH @ 160 VDC bus (1.0 mH @320 VDC bus)		
<b>Heat Sink Temperature (maximum allowable)</b>	75°C (All Amplifiers)		

1. AC voltage, Bus supply / load may result in significantly lower maximum peak currents.
2. Peak and continuous output current are load dependent. The controller will limit its output current based on velocity and motor resistance.
3. Selectable through parameters.

## AUTOMATION1 iXR3 PWM+ AMPLIFIER SPECIFICATIONS

	XSP3+10	XSP3+20	XSP3+30
<b>Option Code</b>	-P4	-P5	-P6
<b>Peak Motor Output Current (2 sec)<sup>(1)(2)</sup></b>	10 A <sub>pk</sub>	20 A <sub>pk</sub>	30 A <sub>pk</sub>
<b>Continuous Current<sup>(2)</sup></b>	5 A	10 A	10 A
<b>Maximum Bus Voltage</b>	320 VDC		
<b>Maximum Power Amplifier Bandwidth<sup>(3)</sup></b>	2 kHz		
<b>PWM Switching Frequency</b>	20 kHz		
<b>Minimum Load Inductance</b>	0.1 mH @ 160 VDC bus (1.0 mH @320 VDC bus)		
<b>Heat Sink Temperature (maximum allowable)</b>	75°C (All Amplifiers)		

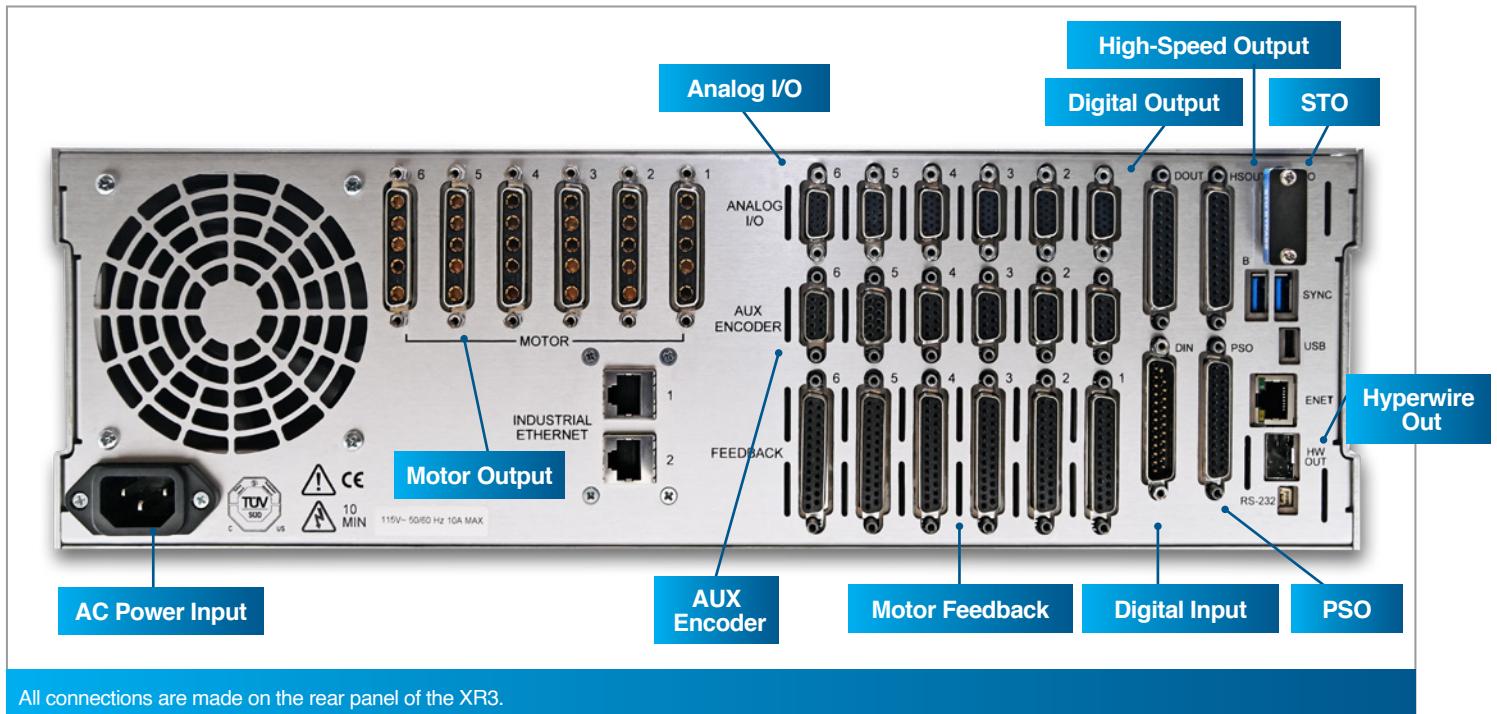
1. AC voltage, Bus supply / load may result in significantly lower maximum peak currents.
2. Peak and continuous output current are load dependent. The controller will limit its output current based on velocity and motor resistance.
3. Selectable through parameters.

## AUTOMATION1 iXR3 LINEAR AMPLIFIER SPECIFICATIONS

XSL3-10-40 <sup>(5)(6)(7)(8)</sup>	
<b>Option Code</b>	-L1
<b>Continuous Output Current, <math>\pm 40V</math> bus (<math>A_{pk}</math>)<sup>(2)(3)(4)</sup></b>	1.5 A   2.0 A
<b>Peak Current (<math>A_{pk}</math>)</b>	10 $A_{pk}$ <sup>(1)</sup>
<b>Maximum Continuous Total Power Dissipation<sup>(3)(4)</sup></b>	120 W   160 W
<b>Peak Amplifier Power Dissipation per phase</b>	400 W
<b>Effective Heatsink Thermal Resistance</b>	0.42°C/W   0.31°C/W
<b>Maximum Transistor Temperature</b>	75°C
<b>Time to reach maximum temperature at maximum continuous power</b>	20 minutes

1. This specification depends on the motor supply voltage, the motor speed, and motor resistance. Contact an Aerotech sales engineer for more information.
2. This specification assumes that an AC or DC motor type with a  $0 \Omega$  winding resistance is used.
3. The first number is for a stationary AC or DC motor. The second number is for an AC motor that is in motion.
4. The specification will de-rate when the ambient temperature exceeds 25°C.
5. The XSL3 amplifier has circuitry that will limit peak power to protect itself from damage. In the Status Utility, the Power Limiting bit under Drive Status monitors the condition of the circuitry. If the circuit is open, the Power Limiting bit will show as "ON".
6. All linear amplifier (XSL3-10-40) specifications assume that the fan tray is installed, the fans are set to full-speed mode, and the ambient temperature is 25°C.
7. The transistor temperature can be up to 25°C higher than the heat sink temperature that is shown in the Status Utility. Set the AverageCurrentFault parameter to ensure that the heat sink power dissipation is not exceeded.
8. Aerotech recommends that you do not use high-current stepper motors with the XSL3-10-40 linear amplifier because of high-power dissipation. Contact Aerotech for additional information.

## AUTOMATION1 iXR3 SPECIFICATIONS



All connections are made on the rear panel of the XR3.



PWM+ and linear amplifiers available in the same form factor.

## AUTOMATION1 iXR3 ORDERING OPTIONS

### Controller Configuration

To configure and load the motion controller on the iXR3 drive, please configure and order an Automation1-iSMC intelligent controller with your iXR3 drive. The Automation1-iSMC configuration should include the iXR3 as the "hardware platform.

### Automation1 iXR3

**Automation1-iXR3** Automation1-iXR3 - 3U, 19" Multi-Axis Servo Drive Rack with Motion Controller

#### Line Voltage

- VL1** 120 VAC Input
- VL2** 240 VAC Input
- VL3** 100 VAC Input
- VL4** 200/208 VAC Input

*Notes: Line voltages VL2 and VL4 are not available with bus voltage selection VB7. Line voltages VL1 and VL3 are not available with bus voltage VB8.*

#### Bus Voltage 1

- VB1** +/- 10 VDC (200 W Power Supply ), Bipolar
- VB2** +/- 20 VDC (200 W Power Supply ), Bipolar
- VB3** +/- 30 VDC (200 W Power Supply ), Bipolar
- VB4** +/- 40 VDC (300 W Power Supply ), Bipolar
- VB5** +/- 80 VDC (300 W Power Supply ), Bipolar
- VB7** 160 VDC Unipolar
- VB8** 320 VDC Unipolar

*Note: Bus voltages options are limited based upon other configuration selections.*

#### Bus Voltage 2

- VB0** Not Wired
- VB1** +/- 10 VDC (200 W Power Supply ), Bipolar
- VB2** +/- 20 VDC (200 W Power Supply ), Bipolar
- VB3** +/- 30 VDC (200 W Power Supply ), Bipolar
- VB4** +/- 40 VDC (300 W Power Supply ), Bipolar
- VB5** +/- 80 VDC (300 W Power Supply ), Bipolar
- VB6** Future +150 VDC / -30 VDC Piezo
- VB7** 160 VDC Unipolar
- VB8** 320 VDC Unipolar

*Note: Bus voltages options are limited based upon other configuration selections.*

#### Split Bus

- SB0** Axis 1-6 Bus Voltage 1 (/SPLIT BUS 1-6
- SB1** Axis 1 Bus Voltage 1, Axis 2-6 Bus Voltage 2
- SB2** Axis 1-2 Bus Voltage 1, Axis 3-6 Bus Voltage 2
- SB3** Axis 1-3 Bus Voltage 1, Axis 4-6 Bus Voltage 2
- SB4** Axis 1-4 Bus Voltage 1, Axis 5-6 Bus Voltage 2
- SB5** Axis 1-5 Bus Voltage 1, Axis 6 Bus Voltage 2

**Controller Cards**

- CT0** No Controller Card
- CTN** Controller Card without Multiplier
- CT1** Controller Card with MX1 Multiplier
- CT2** Controller Card with MX2 Multiplier
- CT4** Controller Card with MX4 Multiplier

**Amplifier Cards**

- P0** No Amplifier
- P1** XSP3-10 Amplifier
- P2** XSP3-20 Amplifier
- P3** XSP3-30 Amplifier
- P4** XSP3+, PWM+ Amplifier, 10 A Peak (-P4)
- P5** XSP3+, PWM+ Amplifier, 20 A Peak (-P5)
- P6** XSP3+, PWM+ Amplifier, 30 A Peak (-P6)
- L1** XSL3e-10-40 Amplifier

*Note: Linear amplifier option L1 requires bus voltage VB1, VB2 or VB4 and requires cooling option C1 or C2.*

**Cooling**

- C0** Built-In Fan Pulls Cooling Air from Left Side
- C1** Perforated Covers Above and Below Amp
- C2** 1U-High Fan Tray for Cooling

*Note: For C1 option, refer to the hardware manual for the external cooling requirements.*

**Line Cord**

- LC0** No Line Cord
- LC1** USA 120 VAC Compatible Line Cord
- LC2** USA 240 VAC Compatible Line Cord
- LC3** German Compatible Line Cord
- LC4** U.K. Compatible Line Cord
- LC5** Israel Compatible Line Cord
- LC6** India Compatible Line Cord
- LC7** Australia Compatible Line Cord

**PSO**

- PSO0** One-axis PSO Firing (Default)
- PSO2** Two-axis PSO Firing
- PSO3** Three-axis PSO Firing

*Note: Up to 3 independent PSO outputs can be programmed and used. Each independent PSO output requires an independent controller card.*

**Internal Shunt (Optional)**

- SI1** Internal Shunt, First Bus
- SI2** Internal Shunt, Second Bus
- SI3** Internal Shunt, First and Second Bus

*Note: Internal shunts not available for all voltage bus options.*

### **Integration (Required)**

Aerotech offers both standard and custom integration services to help you get your system fully operational as quickly as possible. The following standard integration options are available for this system. Please consult Aerotech if you are unsure what level of integration is required, or if you desire custom integration support with your system.

#### **-TAS Integration - Test as system**

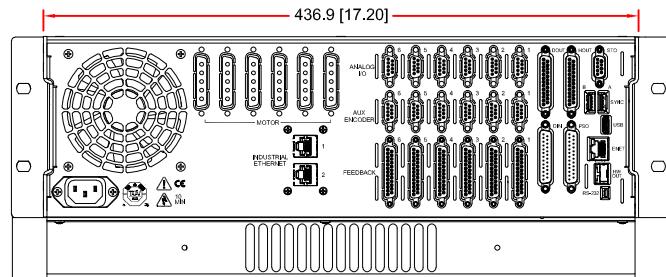
Testing, integration, and documentation of a group of components as a complete system that will be used together (ex: drive, controller, and stage). This includes parameter file generation, system tuning, and documentation of the system configuration.

#### **-TAC Integration - Test as components**

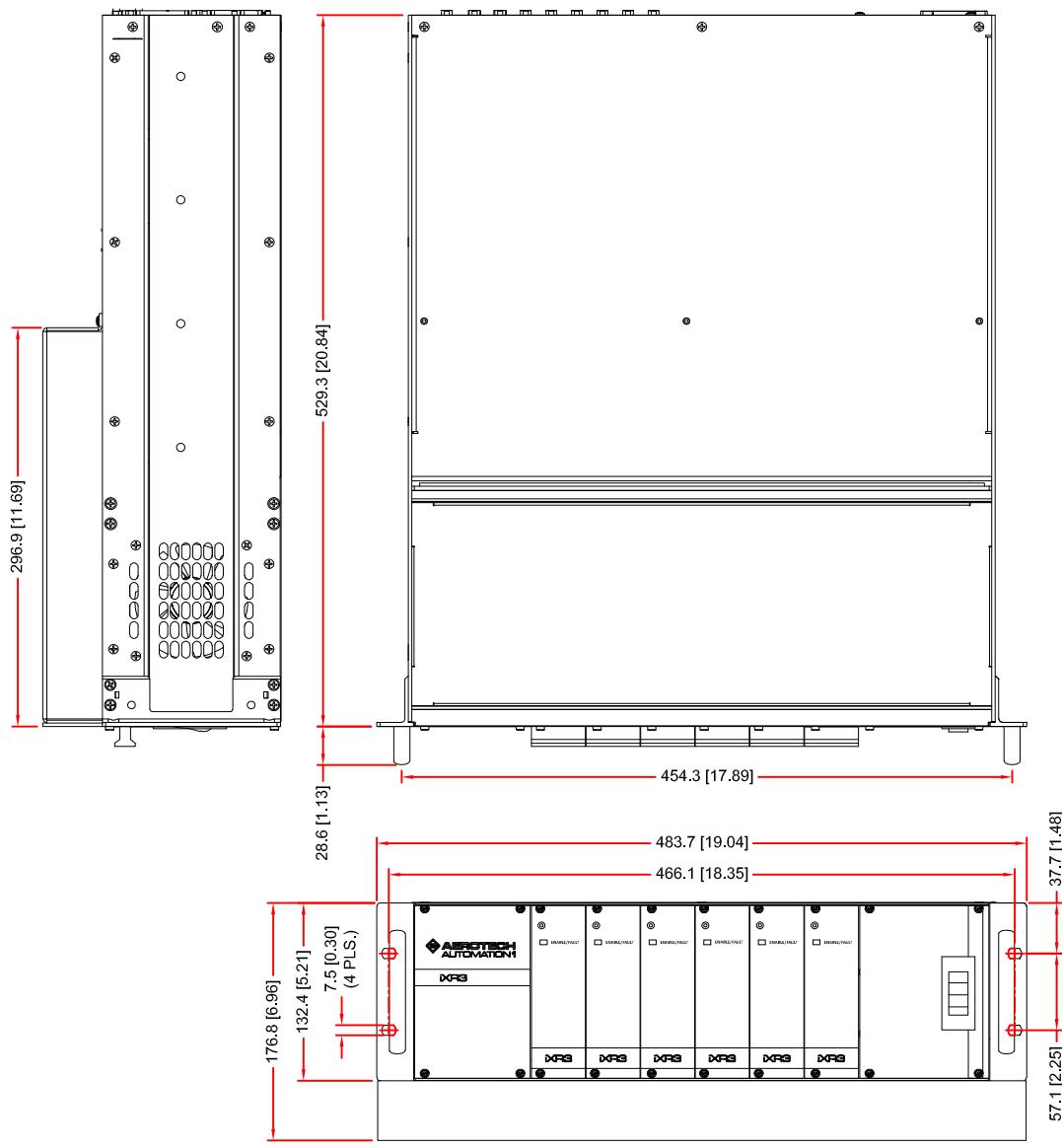
Testing and integration of individual items as discrete components that ship together. This is typically used for spare parts, replacement parts, or items that will not be used together. These components may or may not be part of a larger system.

## AUTOMATION1 iXR3 DIMENSIONS

AUTOMATION1-iXR3, Rack-Mounted



REAR VIEW ROTATED 180°



## AUTOMATION1 iXR3 DIMENSIONS

AUTOMATION1-iXR3, Rack-Mounted with Drawer Slides

