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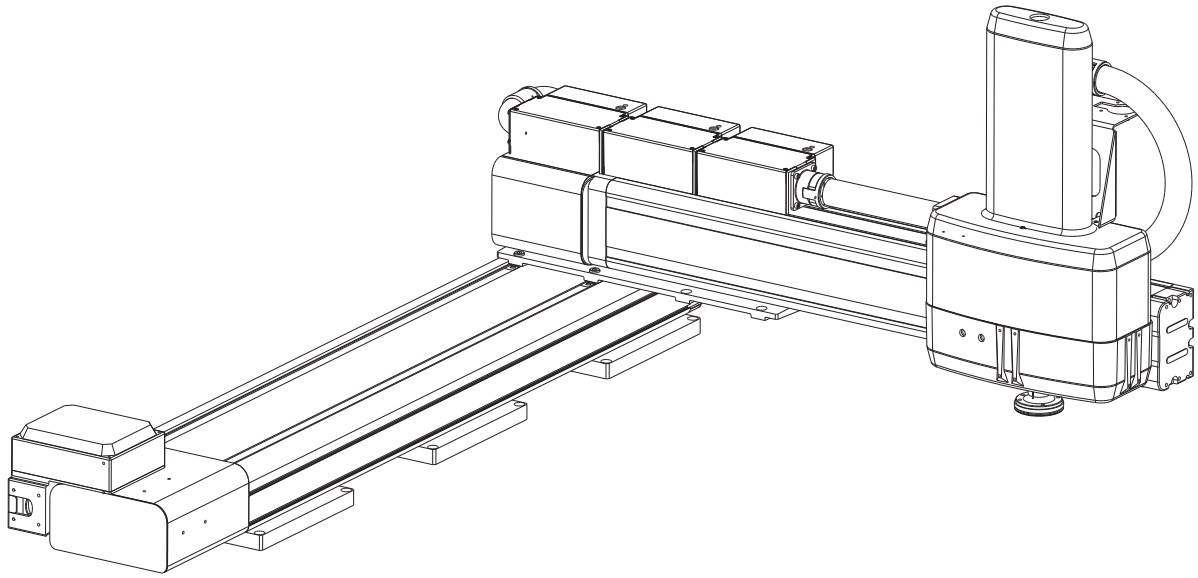
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Instruction Handbook

Adept SmartModules, Vol. 2

Mechanical Assembly

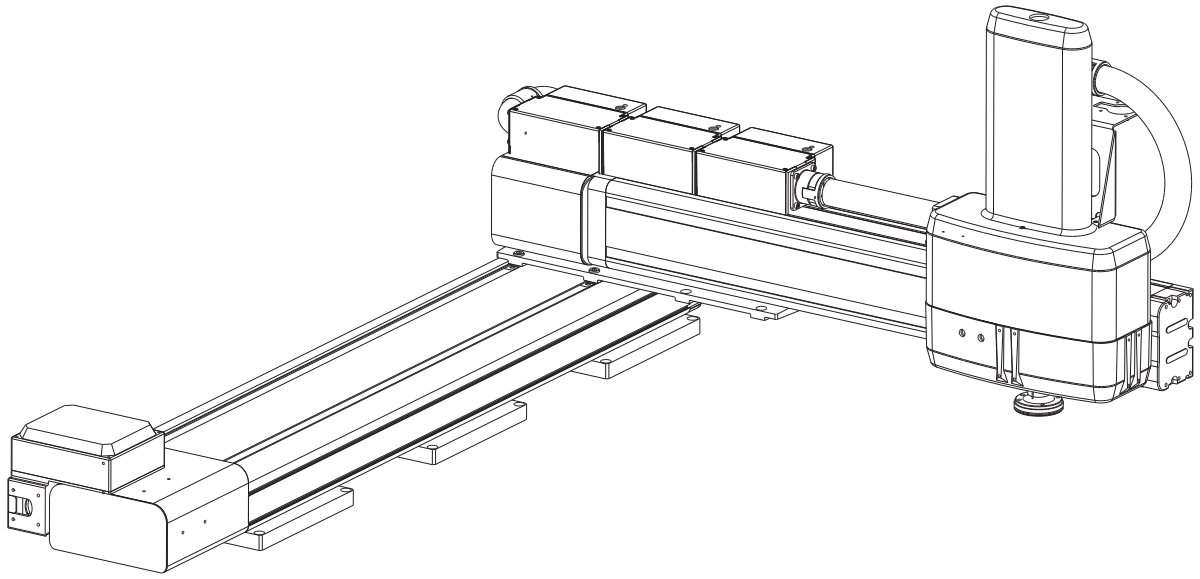


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Instruction Handbook

Adept SmartModules, Vol. 2

Mechanical Assembly



00410-00300, Rev. A
July, 2001

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Printed in the United States of America

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1 Introduction

1.1 Product Description

The Adept SmartModules are linear motion, servo actuators with dedicated onboard SmartAmps. A Digital Signal Processor (DSP) inside the amplifier executes the servo control processes. A SmartModule mechanism can have from 1 to 4 axes (along with 1 to 4 SmartAmps).

Adept SmartModules can be combined to build over 2,000 pre-engineered motion systems and are designed for small parts material handling and assembly applications.

Adept SmartModules are available in two versions, R-Series and V-Series:

- R-Series modules are refined versions of the earlier AdeptModules product.
- V-Series modules are Adept's medium-payload and value-priced line of AdeptModules.

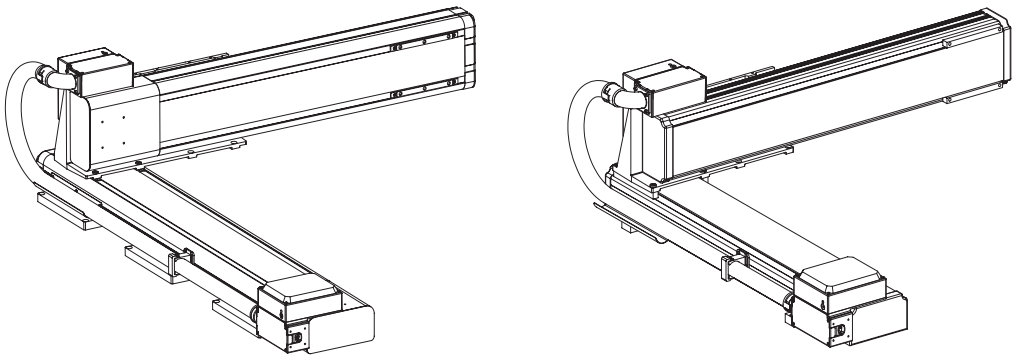


Figure 1-1. R-Series (Left) and V-Series (Right)

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1.2 How to Use This Manual

This manual is primarily organized by the various types of available SmartModule configurations. Separate chapters describe how to install one-axis R-Series configurations, two-axis R-Series configurations, three-axis R-series configurations, Adept Cartesian, and V-Series configurations.

To install your configuration, locate the section in this manual that applies to your configuration (using the table of contents and/or index), and then read the instructions in that section. To avoid redundancy, some sections in this manual contain cross references to other sections that contain information helpful for installing your configuration. Just refer to the information referenced and then continue with the installation.

See the *Adept SmartModules Instruction Handbook for Controller Installation* for details on installing the controller used to control the robot and for system safety information.

1.3 How Can I Get Help?

Refer to the *How to Get Help Resource Guide* (Adept P/N 00961-00700) for details on getting assistance with your Adept software or hardware. You can also find contact information for Adept at www.adept.com.

1.4 Related Manuals

This manual covers the installation and maintenance of an Adept SmartModules mechanism. There are additional manuals that cover programming the system, reconfiguring installed components, and adding other optional components. The following manuals (available on the documentation CD-ROMs provided with each system) provide information on advanced configurations and system specifications.

Table 1-1. Related Manuals

Manual Title	Description
Adept MV Controller User's Guide	Describes the configuration and interface options for all Adept-supplied processor boards and components that can be installed in an Adept control system.
Instructions for Adept Utility Programs	Describes the utility programs used for advanced system configurations, system upgrades, file copying, and other system configuration procedures.
V+ Operating System User's Guide	Describes the V+ operating system, including disk file operations, monitor commands, and monitor command programs.
V+ Language User's Guide	Describes the V+ language and programming of an Adept control system.

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Table 1-1. Related Manuals (Continued)

Manual Title	Description
Adept SmartModules Quick Setup Guide	Describes how to quickly set up the Adept SmartModules robot and connect it to the controller. There is a separate guide for each SmartModule configuration.
Adept SmartModules Instruction Handbook for Controller Installation	Describes how to set up, configure, and maintain the controller.
Adept SmartModules CD-ROM	Contains other Adept SmartModules documents.

1.5 Safety

Below are some general warnings about the SmartModules robots. See the *Adept SmartModules Instruction Handbook for Controller Installation* for system safety information.



WARNING: Turn off the power to the controller when personnel or tools are in the vicinity of the robot work area.



WARNING: Do not disassemble or modify the unit except as instructed in this manual.



WARNING: The V-Series modules are not sealed. Prevent foreign objects and liquids from entering the module body because these materials may damage the module.

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Overview 2

2.1 Module Types

The following types of modules are available for the R- and V-Series SmartModules.

R-Series Modules

The modules listed below are available for the R-Series SmartModules. All the R-Series modules are equipped with sealed belt covers to protect against harsh environments.

R-H Module

The R-H module is designed for heavy payloads (up to 80 kg (horizontal) and 40 kg (vertical)). R-H modules are equipped with 400W motors.

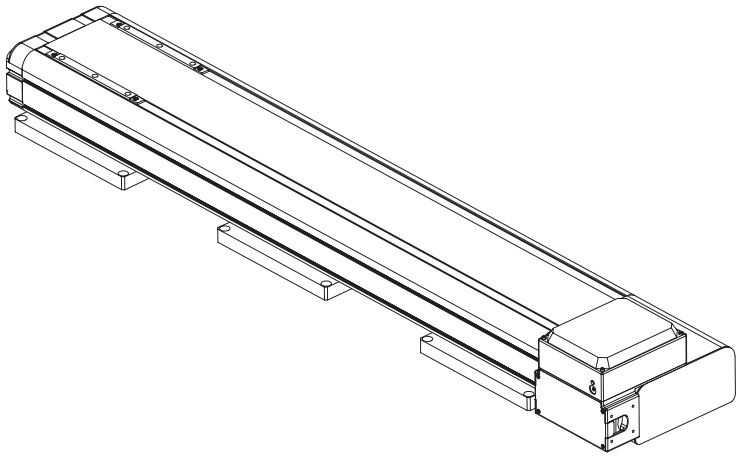


Figure 2-1. R-H Module

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R-M Module

The R-M module is designed for medium payloads (up to 40 kg horizontal and vertical). R-M modules are equipped with 400W motors

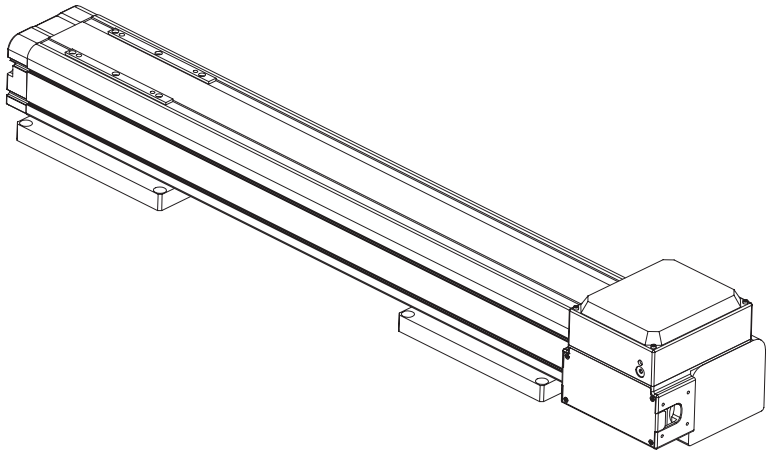


Figure 2-2. R-M Module

R-Sz Module

The R-Sz module is designed for payloads up to 20 kg (horizontal) and 20 kg (vertical)). R-Sz modules are equipped with 200W motors for heavy-duty vertical cycling.

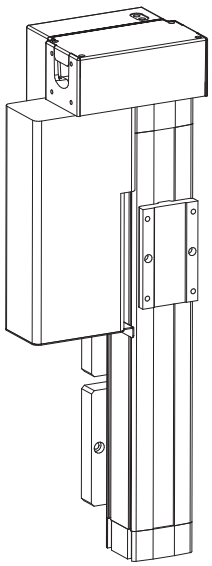


Figure 2-3. R-Sz Module

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V-Series Modules

The modules listed below are available for the V-Series SmartModules.

V-H Module

The V-H module is designed for medium payloads (up to 40 kg (horizontal) and 25 kg (vertical)).

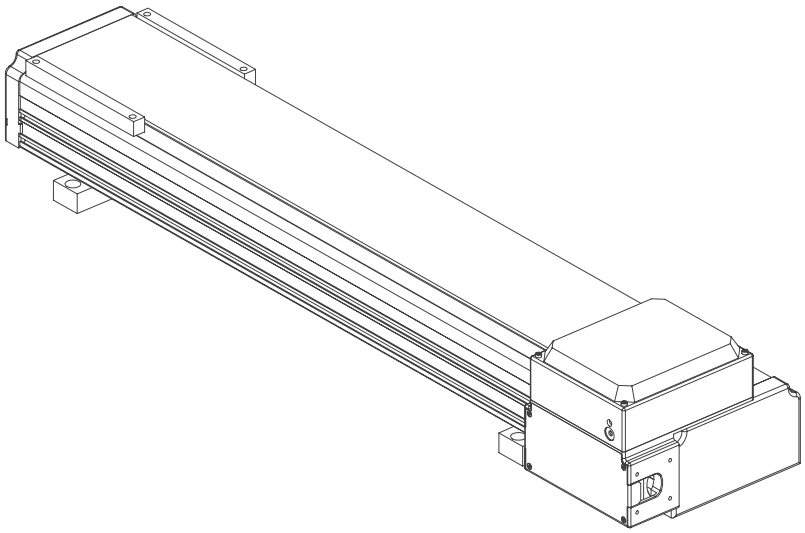


Figure 2-4. V-H Module

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V-M Module

The V-M module supports payloads up to 20 kg horizontal and 8 kg vertical.

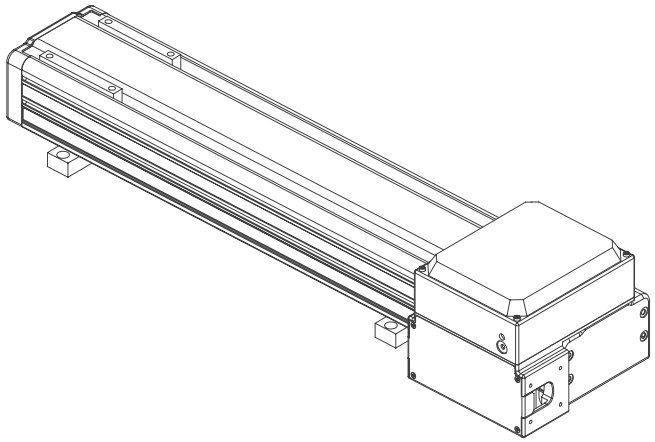


Figure 2-5. V-M Module

Adept SmartModules Options

The following optional equipment is available for the specified SmartModules configurations.

Gantry Support Module

The Gantry Support Module is available as an option for R-Series mechanisms with horizontally cantilevered axes. The Gantry Support Module improves system stiffness and bearing life. In some applications, the Gantry Support Module will improve system payload. The Gantry Support Module is included in all configurations that have a cantilevered Y axis with strokes exceeding 800 mm.

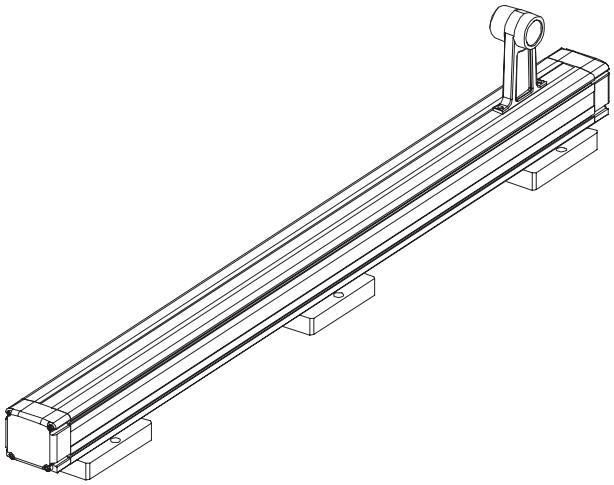


Figure 2-6. Gantry Support Module

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Class 10 Cleanroom Modules

Class 10 cleanroom modules are available for certain R-Series modules (see section 7.5 on page 294 for a list of supported modules). Cleanroom modules provide fittings that can be connected to a vacuum source via air lines to help remove particles from within the module. The Cleanroom Air Kit (included with the module) includes pneumatic tubing and extra fittings for connecting the modules to a vacuum source.

Extended Stroke R-H and R-M Modules

Extended stroke modules are available for certain R-H and R-M modules (see section 7.2 on page 278 and section 7.3 on page 286 for details).

RIO Kit - Remote I/O Module

The RIO (Remote Input/Output) module provides 12/8 I/O points near the end-effector mount plate of SmartModules systems. The RIO is interfaced to the SmartAmp by means of a small, easily attached, integrated circuit, thereby eliminating the need for an I/O cable. The RIO interface cable allows the RIO to be mounted in any convenient location on the SmartModule or any nearby structural surface. The RIO has 12 inputs and 8 outputs that can be configured by the user (PNP, NPN). The RIO kit includes connectors that can be used by the customer to build cables appropriate to the application. DC power is available from the SmartAmp to power most applications or customers can supply 24 volt DC power. Each SmartAmp can interface to only one RIO. Multi-axis systems can use one RIO interfaced to the last axis and one RIO interfaced to the first axis for a maximum of two RIOs per multi-axis system.

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2.2 Performance Specifications

Table 2-1. Specifications of Standard Module Main Unit (R-Series Modules)

		R-H Module	R-M Module	R-S Module-Vertical	R-Hz Module	R-Mz Module
Stroke (mm)		300, 400, 500, 600, 800, 1000	250, 350, 450, 550, 750, 950	100, 200, 300, 400, 500	300, 600	250, 350, 450, 550
Maximum speed (mm/s)		1200	1200	600	600	600
Horizontally transportable load (kg)		80	40	(Vertical) 20	(Vertical) 40	(Vertical) 40
Rated thrust force (N)		400	400	400	800	800
Transportable moment (See the **Transportable Moment** section)	Rolling (N - m)	600	70	32	600	70
	Pitching (N- m)	450	120	24	450	120
	Yawing (N- m)	400	120	24	400	120
Repeatability (mm)		±0.010	±0.010	±0.010	±0.010	±0.010
Motor output (W)		400	400	200 (With brake)	400	400
Ball screw lead (mm)		20	20	10	10	10
Motor mount position		Direct mount	Direct mount	Left side	Direct mount	Direct mount
Operating temperature		0-40°C				
Operating humidity		20-85% (Non condensing)				

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Table 2-2. Specifications of Standard Module Main Unit (V-Series Modules)

	V-H Module	V-Hz Module	V-M Module	V-Mz Module
Stroke (mm)	200, 300, 400, 500, 600, 700, 800	300, 500, 700	100, 200, 300, 400, 500, 600, 700, 800	100, 200, 300, 400, 500, 600, 700, 800
Maximum speed (mm/s)	1200	600	1200	600
Horizontally transportable load (kg)	40	(Vertical) 25	20	(Vertical) 8
Rated thrust force (N)	200	400	200	400
Transportable moment Rolling (N^2 m)	113	113	19	19
Pitching (N^2 m)	97	97	25	25
Yawing (N^2 m)	66	66	22	22
(See the **Transportable Moment** section)				
Repeatability (mm)	±0.020	±0.020	±0.020	±0.020
Motor output (W)	200	200	100	100
Ball screw lead (mm)	20	10	20	10
Motor mount position	Direct mount	Direct mount	Direct mount	Direct mount
Operating temperature	0-40°C			
Operating humidity	20-85% (Non condensing)			

SI Unit: 1N = 0.102kgf; 1N - m = 0.102kgf * m

Transportable Moment

The transportable moment denotes the maximum moment that the module can bear in operation. The estimated life distance is 5000 km, provided the module runs at the transportable moment.

If moments are applied simultaneously in two or three directions, each moment should not be more than 60% of the transportable moment. See Examples 1 and 2 in **Figure 2-7 on page 37**.)

The moment applied to the module depends on the "weight of the end effector installed on the slider", "position of the center of the gravity", and "operation acceleration (set on the controller)." This moment should be less than the transportable moment. (See **Figure 2-7 on page 37**.)

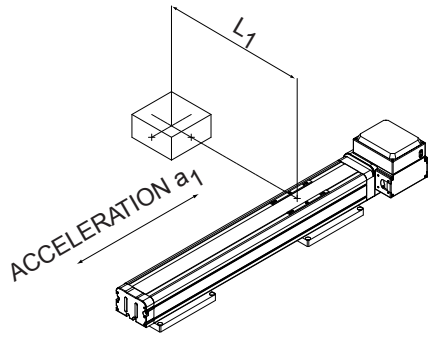
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CAUTION: If a moment exceeding the transportable moment is applied to the module, the module may be damaged. The moments caused by the weight of the Y and Z modules should be taken into account to find the X-axis moment in a multi-axis system. (The center of gravity of each module should be approximately the center of the overall length.)

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Example 1



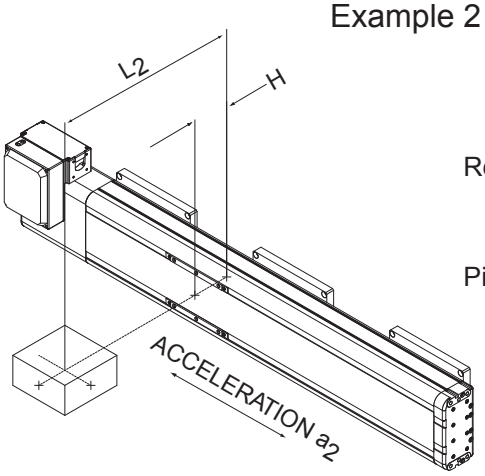
Rolling moment

M_{ROLL} [N • m] = W [kg] X L_1 [m] X 9.8 [m/s^2]

Yawing moment

M_{YAW} [N • m] = W [kg] X L_1 [m] X a_1 [m/s^2]

Example 2



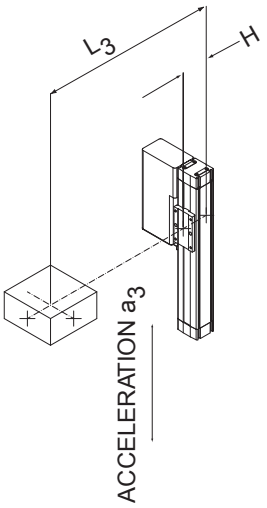
Rolling moment

M_{ROLL} [N • m] = W [kg] X L_2 [m] X 9.8 [m/s^2]

Pitching moment

M_{PITCH} [N • m] = W [kg] X L_2 [m] X a_2 [m/s^2]

Example 3



Pitching moment

M_{PITCH} [N • m] = W [kg] X L_3 [m] X (9.8+ a_3) [m/s^2]

Figure 2-7. Calculation of Moment (1)

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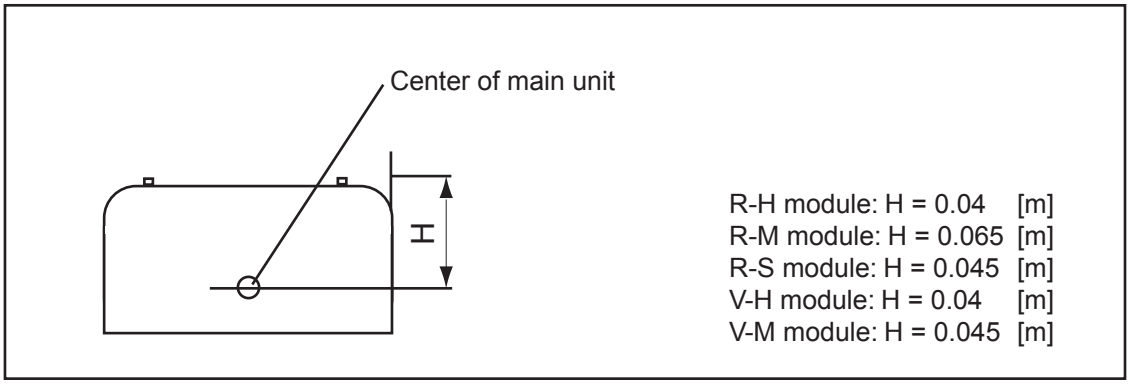
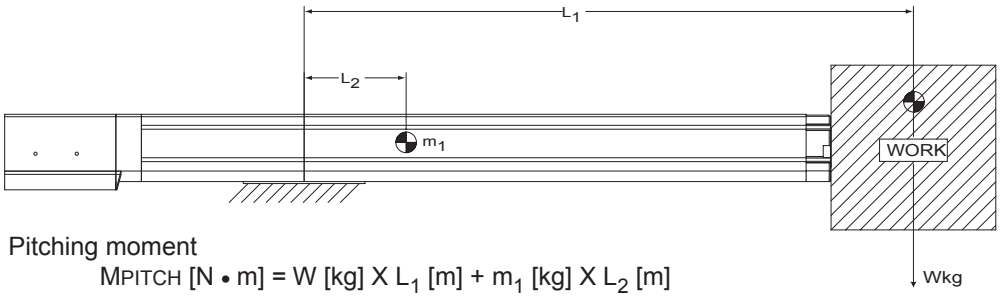


Figure 2-8. Position of Module Main Unit Center H

Table 2-3. Transportable Load of Moving Axis: R-Series Modules

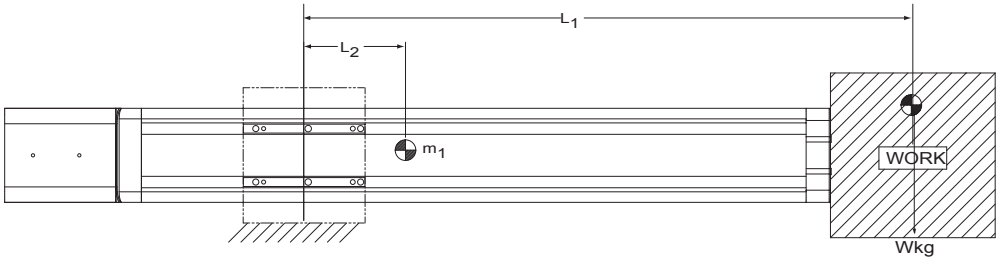
Horizontal Axis				Vertical		Vertical Axis	
R-H Module		R-M Module		R-Mz Module		R-Sz Module Vertical Axis	
Stroke (mm)	Transportable Load W (kg)	Stroke (mm)	Transportable Load W (kg)	Stroke (mm)	Transportable Load W (kg)	Stroke (mm)	Transportable Load W (kg)
300	37	250	23	250	27	100	12
400	35	350	17	350	26	200	11.5
500	33	450	13	450	25	300	11
600	31	550	10	550	24	400	10.5
						500	10

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Pitching moment

M_{PITCH} [N • m] = W [kg] X L_1 [m] + m_1 [kg] X L_2 [m]



Yawing moment

M_{YAW} [N • m] = W [kg] X L_1 [m] + m_1 [kg] X L_2 [m]

Figure 2-9. Calculation of Moment (2)



CAUTION: If the whole module main unit of a multi-axis system moves, the transportable load may be less than shown in **Table 2-3** due to the restrictions of the transportable moment. In such a case, investigate the moment. See **"Transportable Moment" on page 35** for more information.

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2.3 General Notes Regarding SmartModule Mechanisms

This section describes features and issues that affect several SmartModule mechanisms.

Trimming Cable Tubes to Optimal Length

In some cases, the cable tubes provided might be too long for your installation. In this case, you may want to remove the excess cable tube length. Below are some guidelines for this.

There are basically two types of cable tubes: rolling length (see **Figure 2-10**) and flyover (see **Figure 2-11**). For rolling length cable tubes, the point at which the cable begins to bend should be directly below the cable tube fitting at the extreme travel position. Trimming the cable tube to this length minimizes the amount of overhang. For flyover cable tubes, the cable tube should be trimmed such that it isn't too taut when the SmartModule reaches its extreme position of travel or so loose that it sags down on the mechanism (this length is equal to approximately 1.7 times the straight-line distance between two fittings).

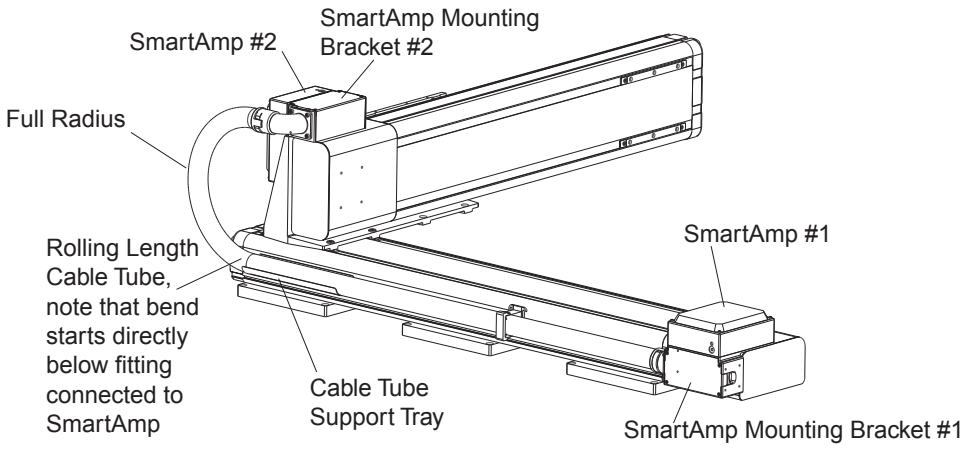


Figure 2-10. Cable Tube Example (Rolling Length)

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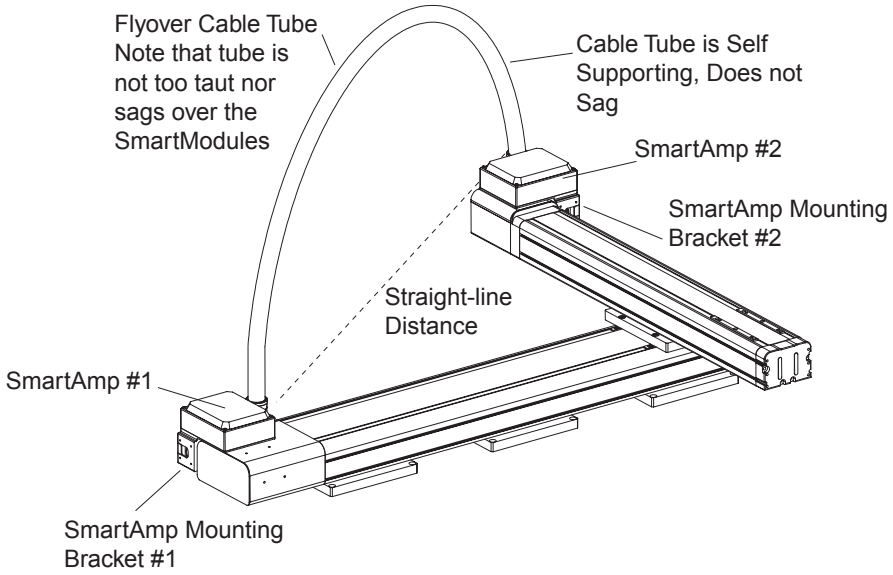


Figure 2-11. Cable Tube Example (Flyover)

If the cable tube requires trimming, perform the following steps:

1. See the section in this manual that describes how to assemble your SmartModule configuration and follow the steps for assembling the configuration. At the point that describes how to assemble the cable tube, perform the steps below.
2. Position the modules at their extreme position of travel to determine the minimum required length of the cable tube.
3. Roughly position the cable tube in its correct mounting position, with one end beside one SmartAmp mounting bracket and the other end beside the other SmartAmp mounting bracket.
4. Use an Exacto knife or similar cutting tool to trim off the excess length.

   NOTE: When trimming a cable tube, cut inside (not outside) one of the corrugations on the tube. See **Figure 2-12**.

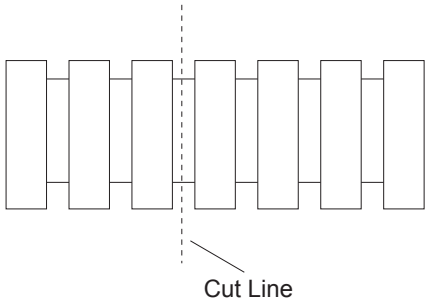


Figure 2-12. Cable Tube Trim Example

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5. Insert the SmartModule cables inside the cable tube or tubes (as described in the appropriate section). After you do this, the cables inside the tube will extend outside the ends of the cable tube.
6. When you connect the cables to each SmartAmp, loop the excess lengths of cable and insert them inside the SmartAmp mounting bracket enclosure.

   NOTE: Only install the cables inside the cable tube after trimming the cable tube to the desired length.

Long Modules Requiring Additional Cable Tube Clamps and Cable Tube Support Trays

Cable tube clamps and cable tube support trays are provided with certain SmartModules to support the cable tubes and cables therein. For SmartModules that require these components, the quantity of trays and clamps may vary depending on the lengths of the modules ordered. Longer modules may require more trays and clamps to support the longer tubes/cables.

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Installing One-Axis R-Series Configurations 3

3.1 Introduction

This chapter details how to assemble the one-axis R-Series Adept SmartModules systems.

Precautions

Observe the following precautions when configuring modules:

1. When assembling cables, avoid applying unreasonable force to cables.
2. Before applying power, check for correct cable connections.



WARNING: Improper connection may result in damage to the controller or module motor.

Mounting Screw Torque Specifications

When mounting screws used to install modules, mounting plates, and other components, apply the amount of torque specified in Table 3-1 and Table 3-2.

Table 3-1 applies to the following:

- Mounting plates attached to modules
- Mounting plates attached to the work surface
- Customer equipment attached to the end caps of R-Series modules

Table 3-1. Module Mounting Plate Torque Specifications

Module	Screw Diameter	Tightening Torque
R-H, V-H	M8	33.3 N•m
R-M, V-M	M6	14.7 N•m
R-Sz	M5	5.7 N•m

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Table 3-2 applies to any equipment attached to module sliders.

Table 3-2. Module Sliders Torque Specifications

Module	Screw Diameter	Tightening Torque
R-H, V-H	M8	33.3 N•m
R-M, V-M	M6	14.7 N•m
R-Sz	M5	11.7 N•m

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3.2 R-H Installation Procedure

Overview

This section describes the process of installing a one-axis R-H Adept SmartModules system. This configuration consists of one R-H module. The R-H module has a SmartAmp and SmartAmp mounting bracket. See **Figure 3-1** for an overview of the system components.

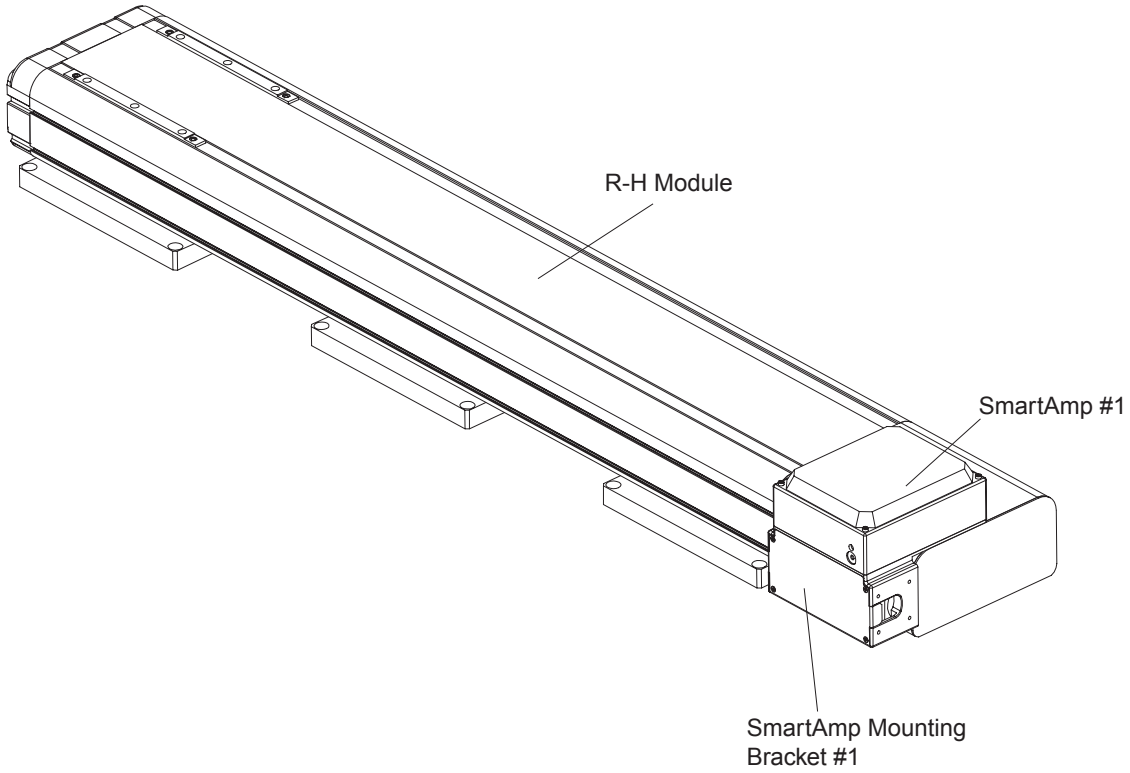


Figure 3-1. R-H: System Component Overview

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Table 3-3. R-H Parts List

Description	Part Number	Qty
R-H module	9040x-1xxxx	1
SmartAmp	30410-10000	1
SmartAmp mounting bracket	30410-20000	1
Mounting plate, RH	90400-01100	2[a]
Cable kit, controller AC power cable 24V DC cable IEEE 1394 cable Ferrite core	90410-200xx 10410-009xx 10410-010xx 10410-105xx 27200-00117	1
Hardware kit	90405-00200	1
Optional Items		
Remote I/O (RIO) kit	90410-20050	1[b]

[a] Quantity may vary according to module lengths.
[b] Quantity will vary according to order.

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Installing the R-H Module

NOTE: 300 to 600 mm R-H modules use two mounting plates; 800 mm and longer modules use three plates.

1. Prepare the work surface by drilling and tapping 8 or 12 M8 holes (depending on module length) for the R-H-module mounting plates. See **Figure 3-2**. See "**Chapter 10** - Technical Specifications" for dimensions of the R-H module and the plates.
2. Install R-H-module mounting plates (two or three, depending on module length) to the under side of the R-H module using four M8 x 20 screws provided for each plate. See **Figure 3-2**.
3. Mount the R-H module to the work surface using four M8 screws per mounting plate.

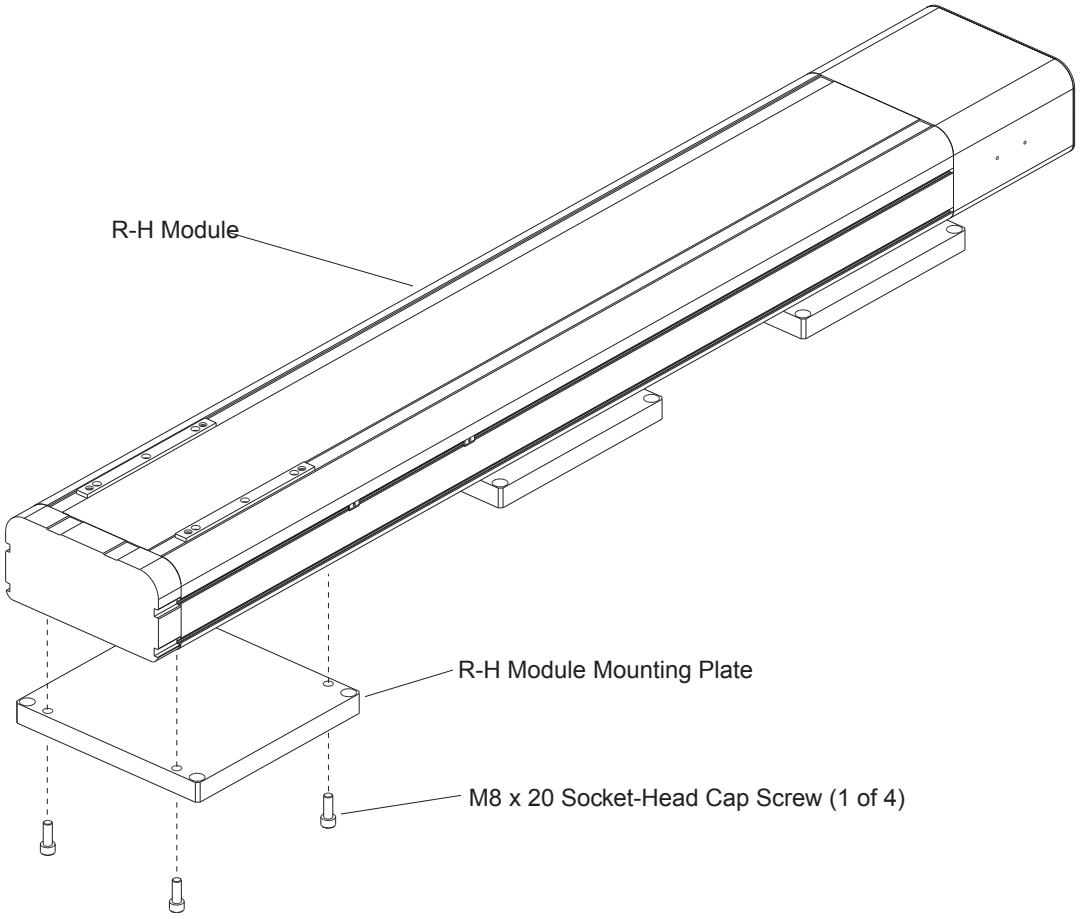


Figure 3-2. R-H: Installing the R-H Module

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Installing the Adept SmartAmp

Installing SmartAmp #1 on the R-H Module

1. Remove the cable cover from a SmartAmp mounting bracket by removing four M3 screws.
2. Install the mounting bracket onto the R-H module at the motor cover using four M4 x 10 flathead screws; see **Figure 3-3**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-H module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install the SmartAmp onto the mounting bracket.

3. Install SmartAmp #1 onto the mounting bracket using four M3 x 40 screws. See **Figure 3-4 on page 49**.
4. Plug the motor and encoder cables from the module into the mating receptacles in the SmartAmp. See **Figure 3-5 on page 50**. Attach the captive screws to secure the encoder connector.

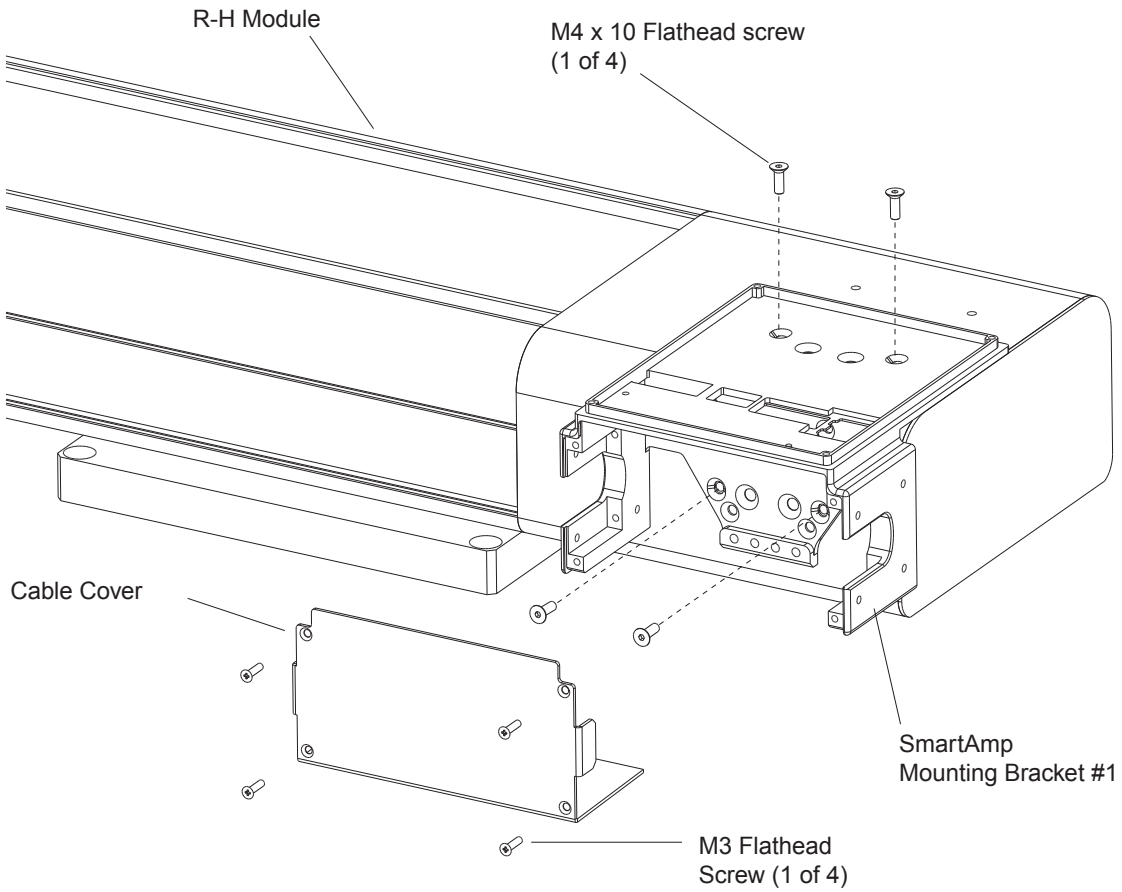


Figure 3-3. R-H: Installing SmartAmp Mounting Bracket #1 on the R-H Module

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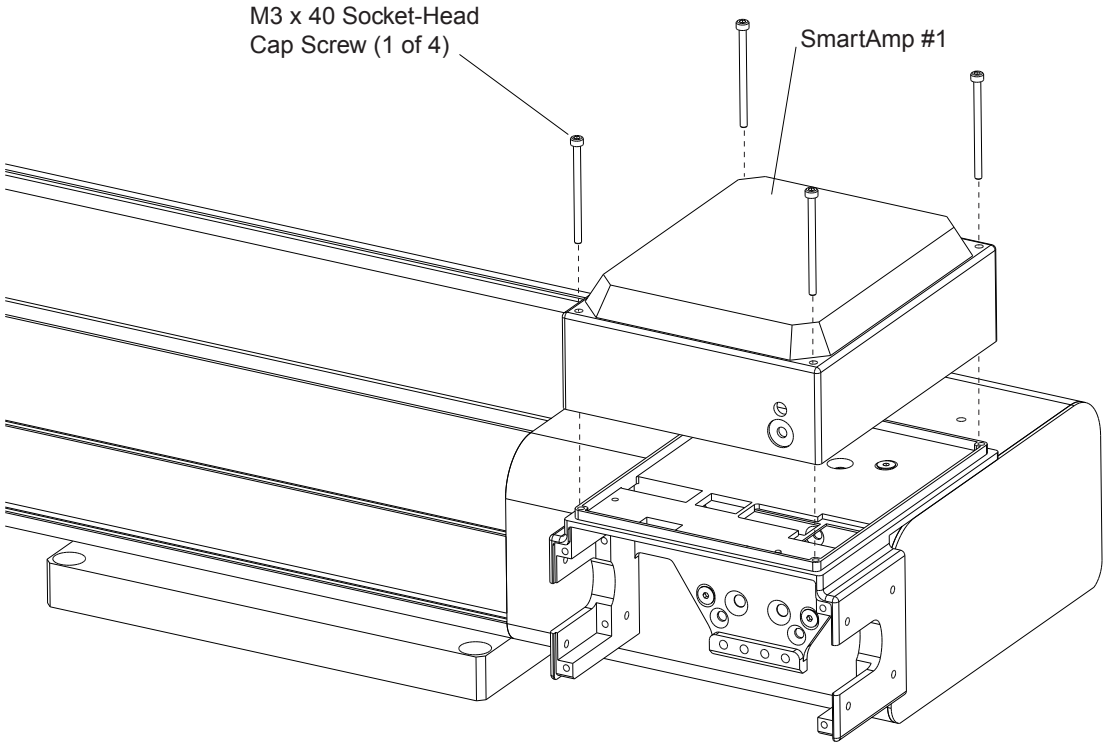


Figure 3-4. R-H: Installing SmartAmp #1 on the R-H Module

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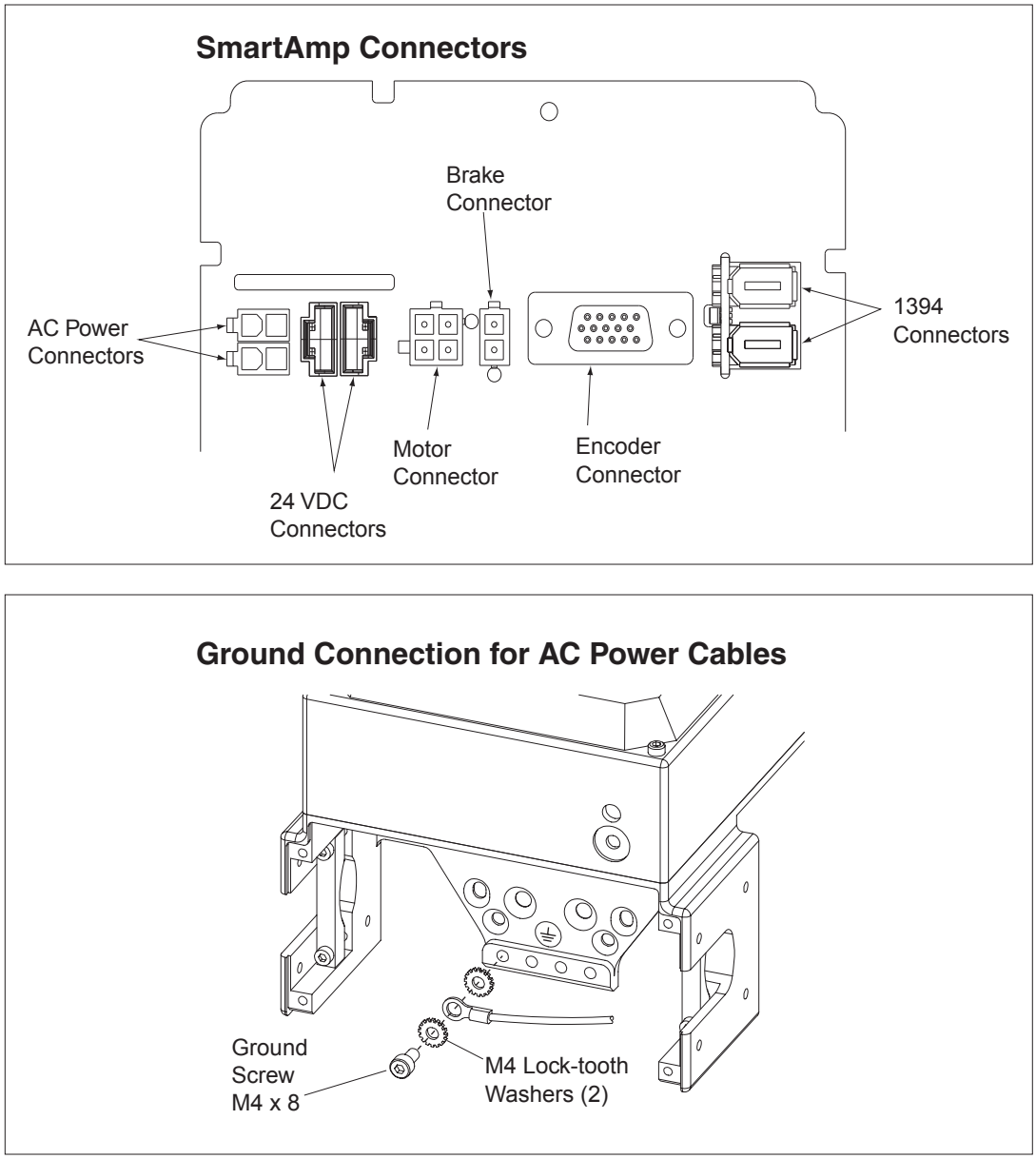


Figure 3-5. R-H: Connecting Cables to the SmartAmp

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3.3 Connecting Cables from Controller to SmartAmp #1



WARNING: Make sure the controller is turned off before connecting any cables.

1. Remove the cable clamp from inside mounting bracket #1 (at the open side on the end of the module) by removing the two M3 screws.
2. Locate a IEEE 1394 cable of correct length to reach from the AWC controller to SmartAmp #1.
3. Connect one end of the IEEE 1394 cable to the AWC board in the controller. See **Figure 3-6 on page 52**.
4. Route the IEEE 1394 cable to SmartAmp #1. (There are two identical mating connectors for each cable in the SmartAmp, you can use either one.) Connect the IEEE 1394 cable inside the SmartAmp. (See **Figure 3-5 on page 50** for an illustration of all the connectors on SmartAmp #1.)
5. Locate the correct length of 24VDC cable to reach from the PDU (Power Distribution Unit) to SmartAmp #1.
6. Connect one end of the 24VDC cable to the DC/Safety Output connector on the PDU.
7. Route the 24VDC cable to SmartAmp #1. Connect the cable inside the SmartAmp.
8. Locate the correct length of Switched AC Power cable to reach from the PDU to SmartAmp #1.
9. Connect one end of the Switched AC Power cable to the AC power connector on the PDU.
10. Route the Switched AC Power cable to SmartAmp #1. Connect the cable inside the SmartAmp and connect the ground ring lug. See **Figure 3-5 on page 50**.
11. Slide the cable clamp into the channel inside the mounting bracket.
12. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.
13. Install the provided ferrite core over all three wires at the entrance to SmartAmp #1. See **Figure 3-7 on page 53**.
14. Place a tie-wrap around the wires next to the ferrite core so it is held in place and will not move away from the SmartAmp.

    NOTE: The SmartModules hardware kit includes parts for all SmartModules configurations. There may be some parts left over after you complete the installation.

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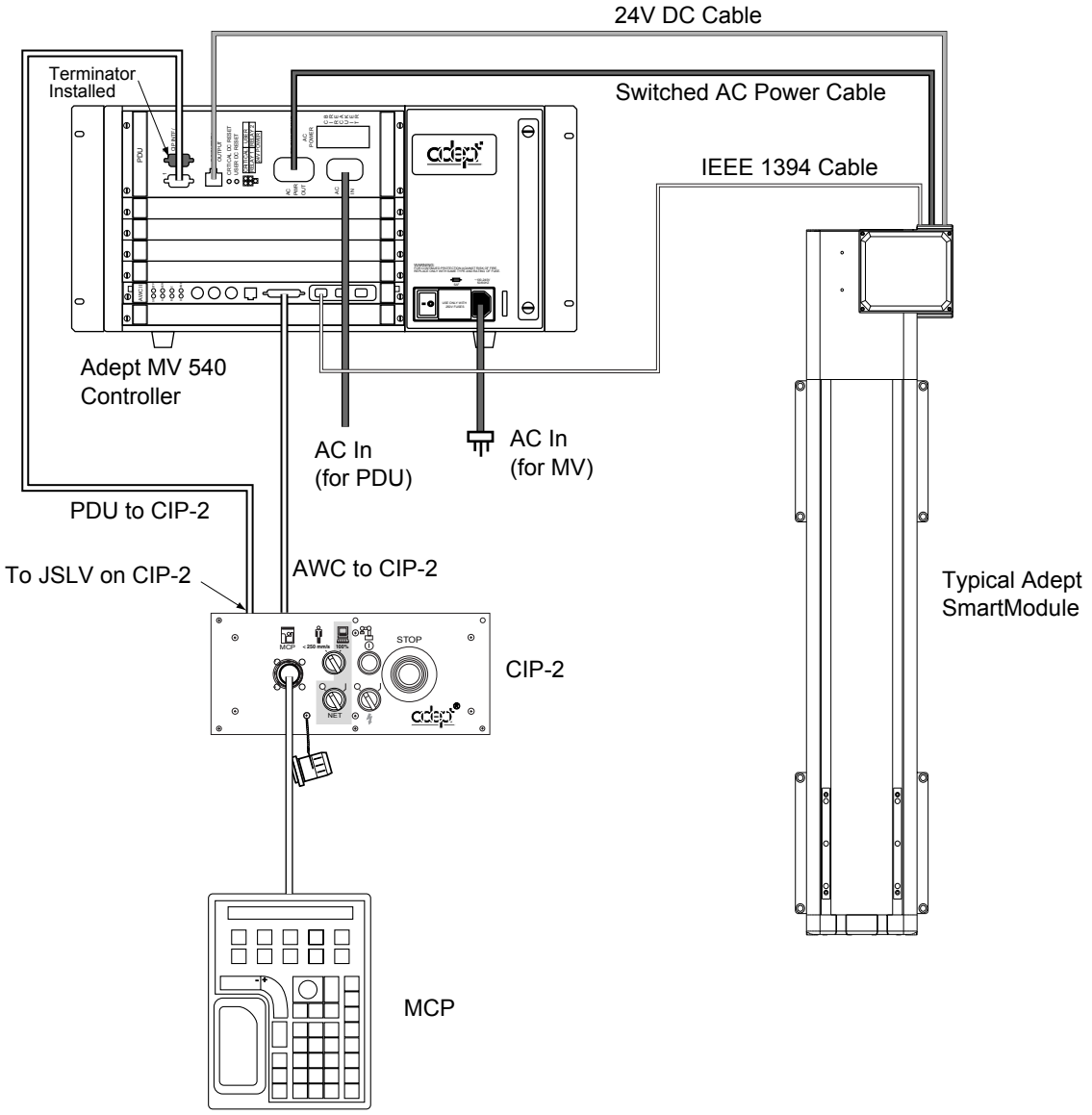


Figure 3-6. Connecting Cables from the Controller to SmartAmp #1

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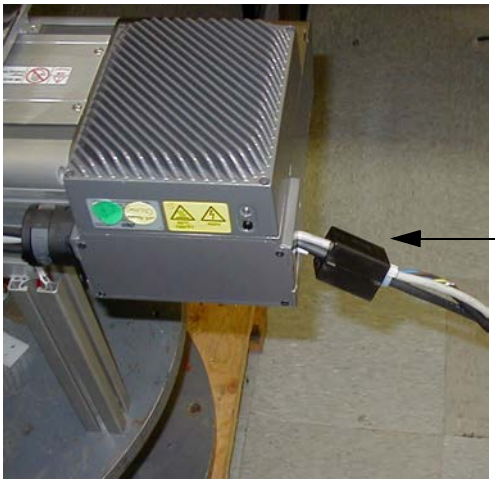


Figure 3-7. Ferrite Core Placed Over Wires to SmartAmp #1

3.4 Completing the Installation

Perform these steps to complete the installation.

- After you connect all the cables inside the SmartAmp, attach the cable cover to the SmartAmp bracket using four M3 screws.
- Attach the provided cover to the cable exit hole on the last SmartAmp in the chain. No cables exit from the last SmartAmp in the chain, so the exit hole on this SmartAmp should be covered to prevent foreign matter from entering the SmartAmp.
- Check the mechanical motion of the axis. (Modules with brakes must be checked when the power is turned on.)

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3.5 R-M Installation Procedure

Overview

This section describes the process of installing a one-axis R-M Adept SmartModules system. This configuration consists of one R-M module. The R-M module has a SmartAmp and SmartAmp mounting bracket. See **Figure 3-8** for an overview of the system components.

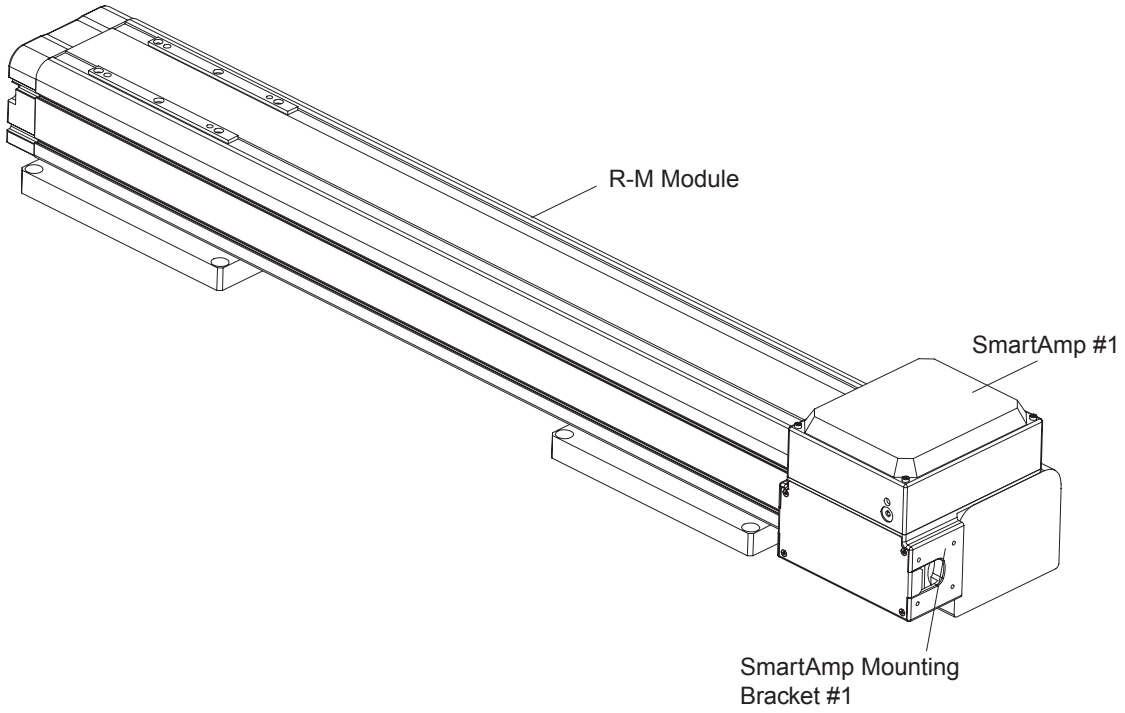


Figure 3-8. R-M: System Component Overview

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Table 3-4. R-M Parts List

Description	Part Number	Qty
R-M module	9040x-2xxxx	1
SmartAmp	30410-10000	1
SmartAmp mounting bracket	30410-20000	1
Mounting plate, RM	90400-01200	2[a]
Cable kit, controller AC power cable 24V DC cable IEEE 1394 cable Ferrite core	90410-200xx 10410-009xx 10410-010xx 10410-105xx 27200-00117	1
Hardware kit	90405-00200	1
Optional Items		
Remote I/O (RIO) kit	90410-20050	1[b]

[a] Quantity may vary according to module lengths.
[b] Quantity will vary according to order.

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Installing the R-M Module

NOTE: R-M modules less than 750 mm long require two mounting plates; R-M modules longer than 750 mm require three mounting plates.

1. Prepare the work surface by drilling and tapping eight or twelve M8 holes (depending on the number of mounting plates required) for the R-M module mounting plates. See **Figure 3-9**. See "**Chapter 10** - Technical Specifications" for dimensions of the R-M module and the plates.
2. Install two or three R-M module mounting plates to the under side of the R-M module using four M6 x 20 screws provided for each plate. See **Figure 3-9**.
3. Mount the R-M module to the work surface using four M8 screws per mounting plate.

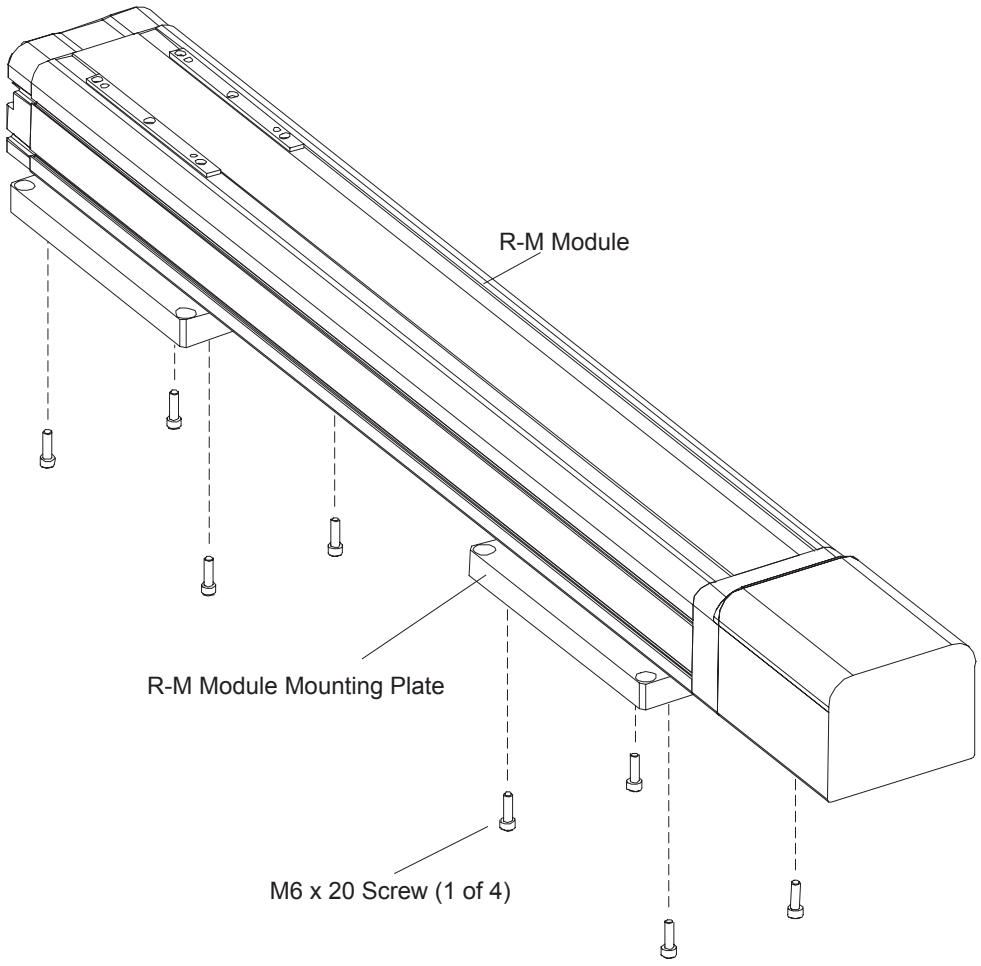


Figure 3-9. R-M: Installing the R-M Module

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Installing the Adept SmartAmp

Installing SmartAmp #1 on the R-M Module

1. Remove the cable cover from a SmartAmp mounting bracket by removing four M3 screws.
2. Install the mounting bracket onto the R-M module at the motor cover using four M4 x 10 flathead screws; see **Figure 3-10**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-M module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install the SmartAmp onto the mounting bracket.

3. Install SmartAmp #1 onto the mounting bracket using four M3 x 40 screws. See **Figure 3-11**.
4. Plug the motor and encoder cables from the module into the mating receptacles in the SmartAmp. See **Figure 3-5 on page 50**. Attach the captive screws to secure the encoder connector.

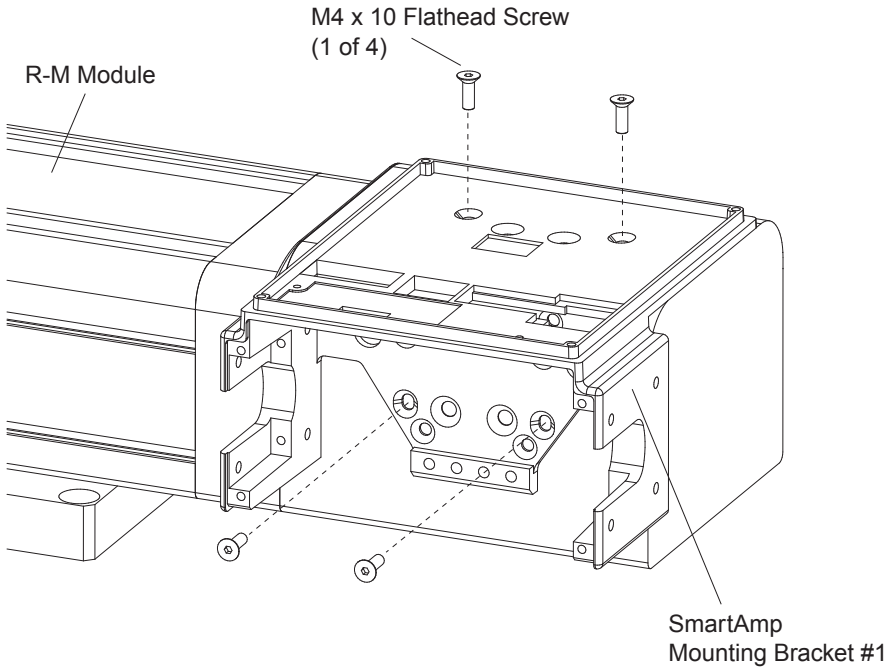


Figure 3-10. R-M: Installing SmartAmp Mounting Bracket #1 on the R-M Module

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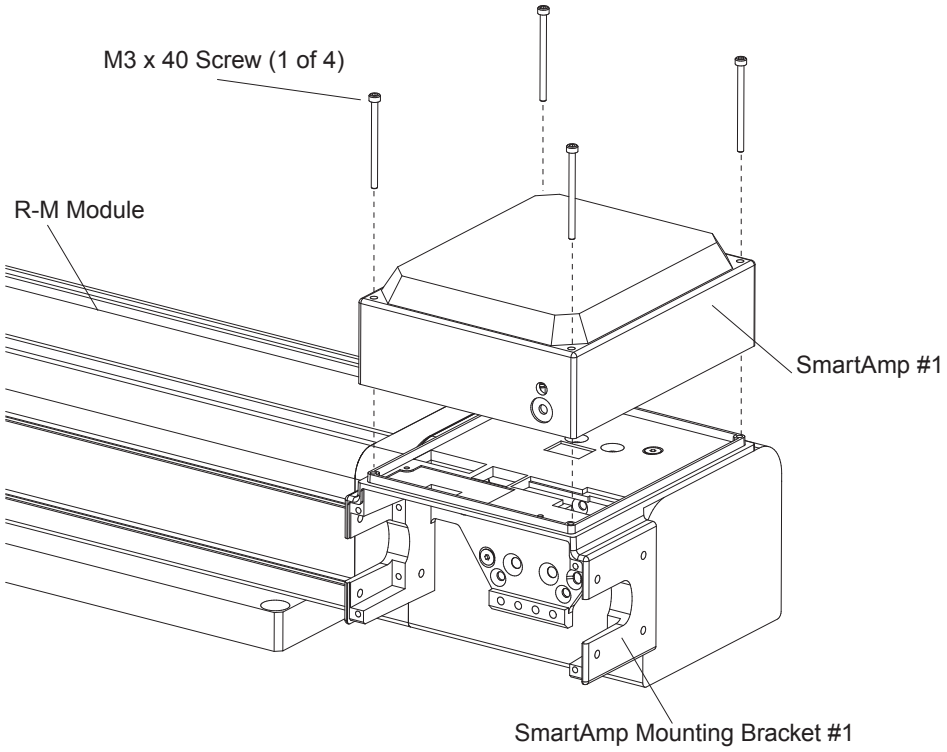


Figure 3-11. R-M: Installing SmartAmp #1 on the R-M Module

Connecting Cables from Controller to SmartAmp #1

See "Connecting Cables from Controller to SmartAmp #1" on page 51 for instructions.

Completing the Installation

Perform these steps to complete the installation.

- After you connect all the cables inside the SmartAmp, attach the cable cover to the SmartAmp bracket using four M3 screws.
- Check the mechanical motion of the axis. (Modules with brakes must be checked when the power is turned on.)

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3.6 R-Sz Installation Procedure

Overview

This section describes the process of installing a one-axis R-Sz Adept SmartModules system. This configuration consists of one R-Sz module. The R-Sz module has a SmartAmp and SmartAmp mounting bracket. See **Figure 3-12** for an overview of the system components.

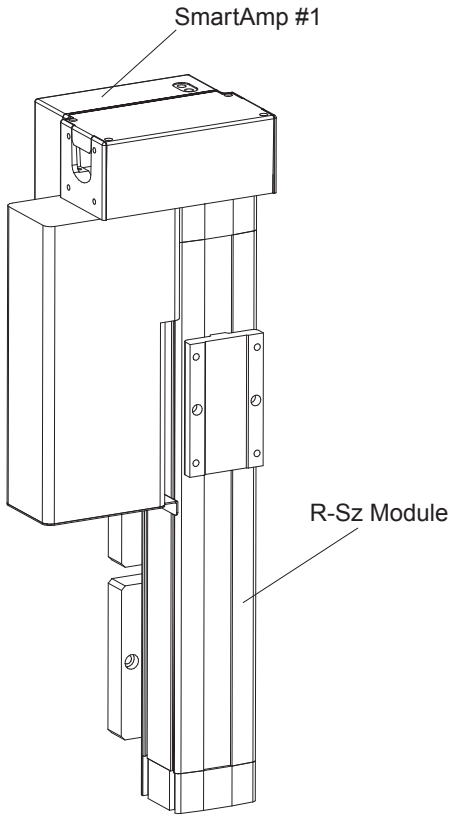


Figure 3-12. R-Sz: System Component Overview

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Table 3-5. R-Sz Parts List

Description	Part Number	Qty
R-Sz module	9040x-4xxxx	1
SmartAmp	30410-10000	1
SmartAmp mounting bracket	30410-20000	1
Mounting plate, RSz	90400-01300	2[a]
Cable kit, controller AC power cable 24V DC cable IEEE 1394 cable Ferrite core	90410-200xx 10410-009xx 10410-010xx 10410-105xx 27200-00117	1
Hardware kit	90405-00200	1
Optional Items		
Remote I/O (RIO) kit	90410-20050	1[b]

[a] Quantity may vary according to module lengths.
[b] Quantity will vary according to order.

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Installing the R-Sz Module

1. Prepare the work surface by drilling and tapping two M6 holes per mounting plate (the number of mounting plates required depends on the length of the module). See **Figure 3-13**. See "**Chapter 10** - Technical Specifications"for dimensions of the R-Sz module and the plates.
2. Install two or three R-Sz-module mounting plates to the under side of the R-Sz module using four M5 x 16 screws provided for each plate. See **Figure 3-13**.
3. Mount the R-Sz module to the work surface using two M6 screws per mounting plate.

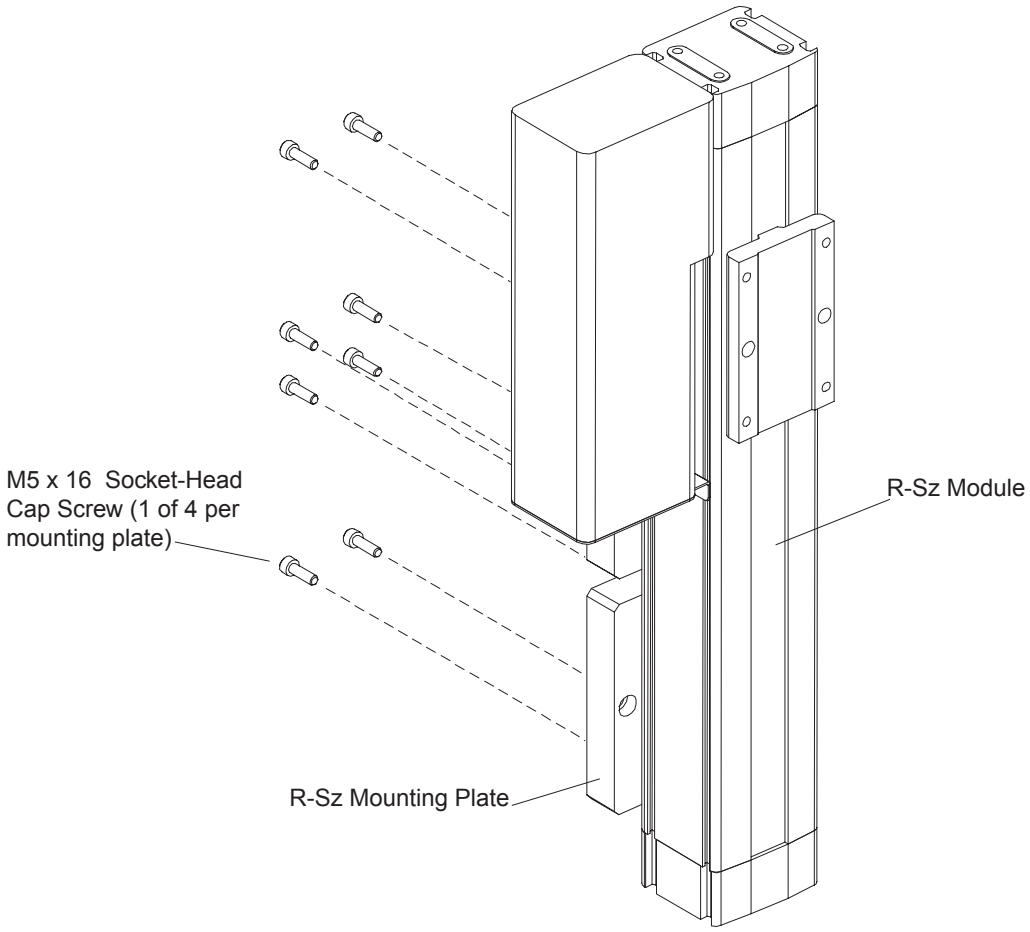


Figure 3-13. R-Sz: Installing the R-Sz Module

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Installing the Adept SmartAmp

Installing SmartAmp #1 on the R-Sz Module

1. Remove the cable cover from a SmartAmp mounting bracket by removing four M3 screws.
2. Install the mounting bracket onto the R-Sz module at the motor cover using four M5 x 10 flathead screws; see **Figure 3-14**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-Sz module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install the SmartAmp onto the mounting bracket.

3. Install SmartAmp #1 onto the mounting bracket using four M3 x 40 screws. See **Figure 3-15**.
4. Plug the motor and encoder cables from the module into the mating receptacles in the SmartAmp. See **Figure 3-5 on page 50**. Attach the captive screws to secure the encoder connector.

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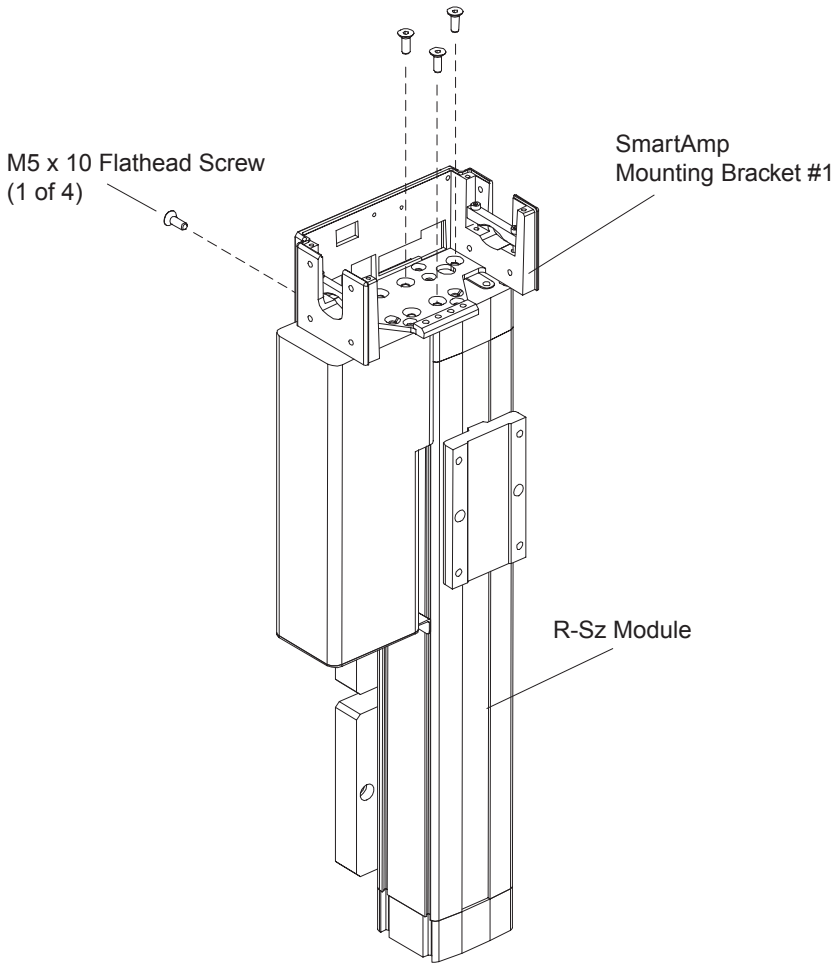


Figure 3-14. R-Sz: Installing SmartAmp Mounting Bracket #1 on the R-Sz Module

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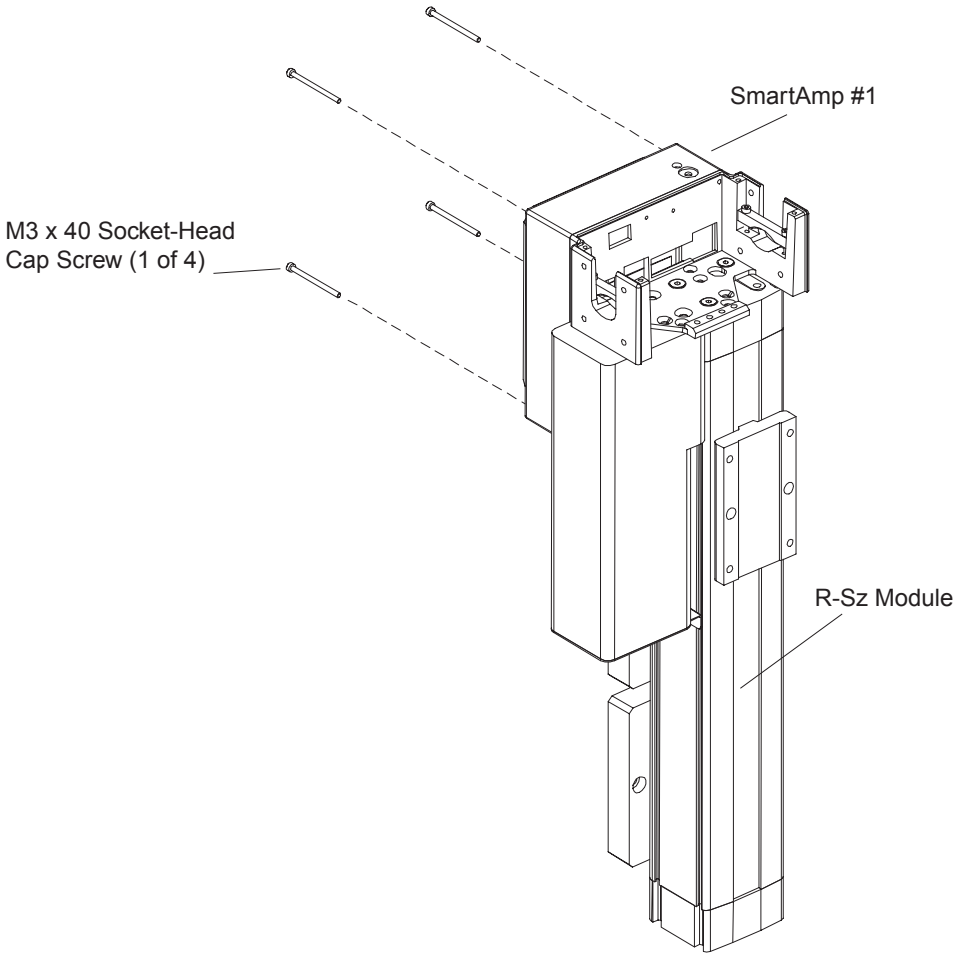


Figure 3-15. R-Sz: Installing SmartAmp #1 on the R-Sz Module

Connecting Cables from Controller to SmartAmp #1

See **"Connecting Cables from Controller to SmartAmp #1" on page 51** for instructions.

Completing the Installation

Perform these steps to complete the installation.

- After you connect all the cables inside the SmartAmp, attach the cable cover to the SmartAmp bracket using four M3 screws.
- Check the mechanical motion of the axis. (Modules with brakes must be checked when the power is turned on.)

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Installing Two-Axis R-Series Configurations 4

4.1 Introduction

This chapter details how to assemble two-axis R-Series Adept SmartModules systems.

> **NOTE:** Certain systems (such as the R-G(HH), R-G(HM), and R-G(MSzr)) offer an extended X-axis option. In addition, the R-G(HH) and R-G(HM) systems offer an extended Y-axis option. In the standard configuration, the motor is in-line with the module. In the extended X- or Y-axis configuration, the motor is on the side of the module. Also, a Gantry Support Module (to support one end of the Y-axis module) is available for certain systems (including the R-G(HH) and R-G(HM) systems). If your system includes an extended X- or Y-axis option or a Gantry Support Module, see "**Chapter 7** - Installing Optional R-Series Equipment" for information on how to install this equipment.

Precautions

Observe the following precautions when configuring modules in multi-axis combinations:

1. Some systems include alignment pins on the combining bracket. The chamfered pin of the combining bracket and the pin hole on the main unit are high-precision mating surfaces and you may experience some resistance in positioning the pin in the hole. Carefully press the bracket and main unit together firmly, using care to avoid damaging the hole in the process.
2. When assembling cables, avoid applying unreasonable force to cables.

   NOTE: Combinations other than those illustrated are possible.

3. Before applying power, check for correct cable connections.



WARNING: Improper connection may result in damage to the controller or module motor.

Mounting Screw Torque Specifications

When mounting screws used to install modules, mounting plates, and other components, apply the amount of torque specified in **Table 3-1 on page 43** and **Table 3-2 on page 44**.

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4.2 R-G(HH) Installation Procedure

Overview

This section describes the process of installing a two-axis R-G(HH) Adept SmartModules system. This configuration consists of two R-H modules joined together with an R-GHH combining bracket. Each R-H module has a SmartAmp and SmartAmp mounting bracket. A cable tube assembly contains the cabling to interconnect the SmartAmps. See **Figure 4-1** for an overview of the system components.

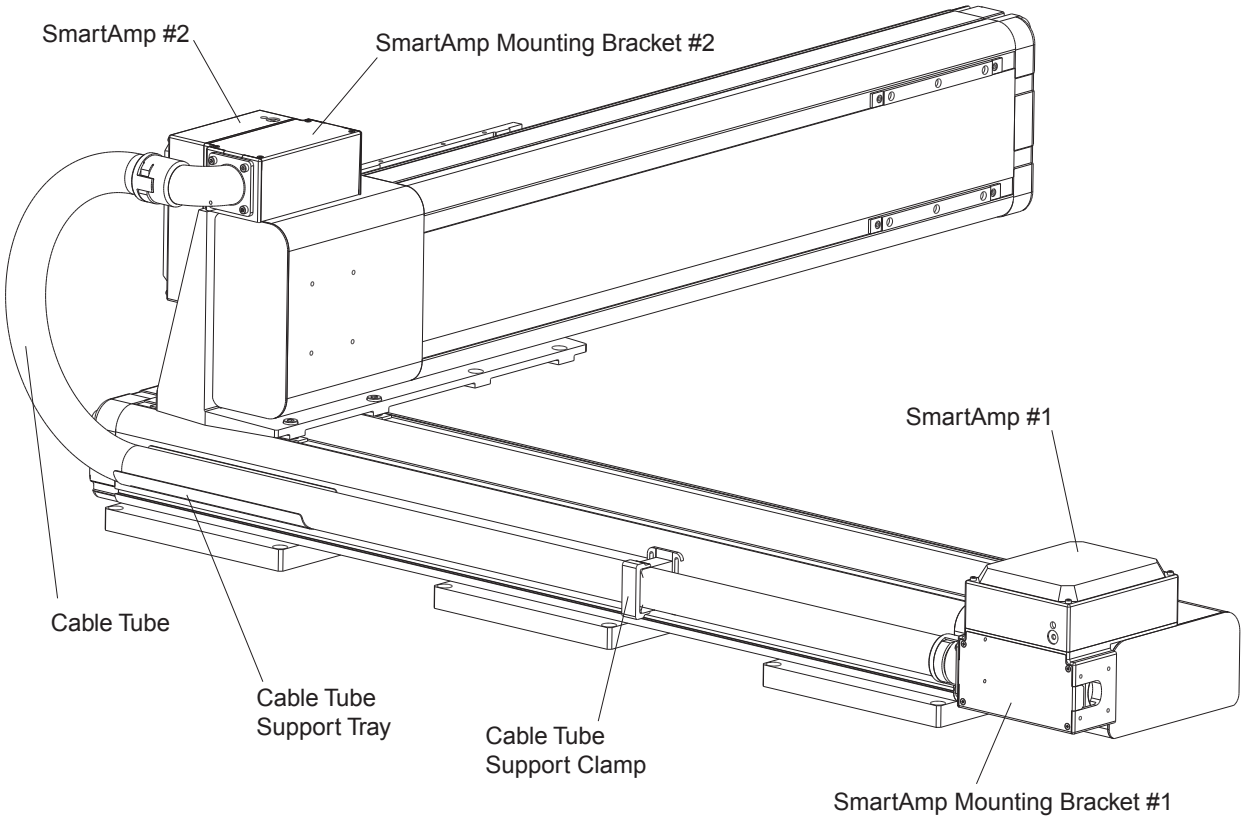


Figure 4-1. R-G(HH): System Component Overview

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Table 4-1. R-G(HH) Parts List

Description	Part Number	Qty
R-H module	9040x-1xxxx	2
SmartAmp	30410-10000	2
SmartAmp mounting bracket	30410-20000	2
Combining bracket, R-GHH	40405-05000	1
Mounting plate, RH	90400-01100	2/3[a]
Cable tube fitting, elbow	40410-40090	1[a]
Cable tube fitting, straight	40410-40000	1[a]
Cable tube, hi-flex	40410-310xx	1
Cable tube clamp	30410-42000	1[a]
Cable tube support tray	30410-60000	1[a]
Cable kit, amp to amp AC power cable 24V DC cable IEEE 1394 cable	90410-100xx 10410-006xx 10410-007xx 10410-005xx	1
Cable kit, controller AC power cable 24V DC cable IEEE 1394 cable Ferrite core	90410-200xx 10410-009xx 10410-010xx 10410-105xx 27200-00117	1
Hardware kit	90405-00200	1
Optional Items		
Gantry support module	90405-50xxx	1
Gantry support bracket, RH	40405-04200	1
Remote I/O (RIO) kit	90410-20050	1[b]
Extended stroke Y-axis kit	90405-00400	1

[a] Quantity will vary depending on module length.
[b] Quantity will vary according to order.

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Installing the First R-H Module

NOTE: 300 to 600 mm R-H modules use two mounting plates; 800 mm and longer modules use three plates.

1. Prepare the work surface by drilling and tapping eight or twelve M8 holes (depending on module length) for the R-H-module mounting plates. See **Figure 4-2**. See "**Chapter 10** - Technical Specifications" for dimensions of the R-H module and the plates.
2. Install R-H-module mounting plates (two or three, depending on module length) to the under side of the R-H module using four M8 x 20 screws provided for each plate. See **Figure 4-2**.
3. Mount the R-H module to the work surface using four M8 screws per mounting plate.

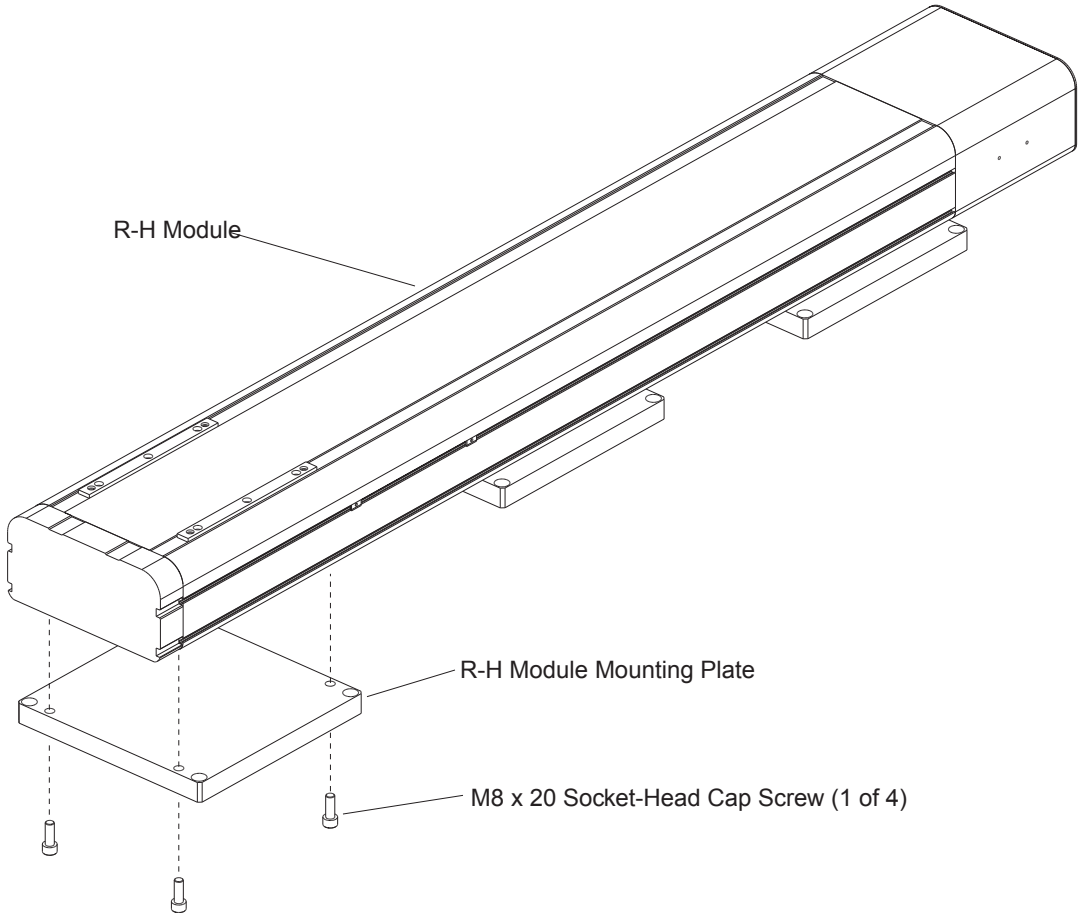


Figure 4-2. R-G(HH): Installing the R-H Module

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Installing Alignment Pins on R-GHH Combining Bracket

1. Locate the R-GHH combining bracket, two 8mm round pins, and two 8mm diamond pins.
2. Install a round pin and a diamond pin in the bottom face of the R-GHH combining bracket. See **Figure 4-3**. Note the orientation of the diamond pin in the drawing. Use Loctite 609 sealant or equivalent to secure the pin in place.

   NOTE: The pin locations shown in **Figure 4-3** and **Figure 4-4** are for a "right-hand" configuration. For a "left-hand" configuration, see "**Appendix A** - Configuration Options".

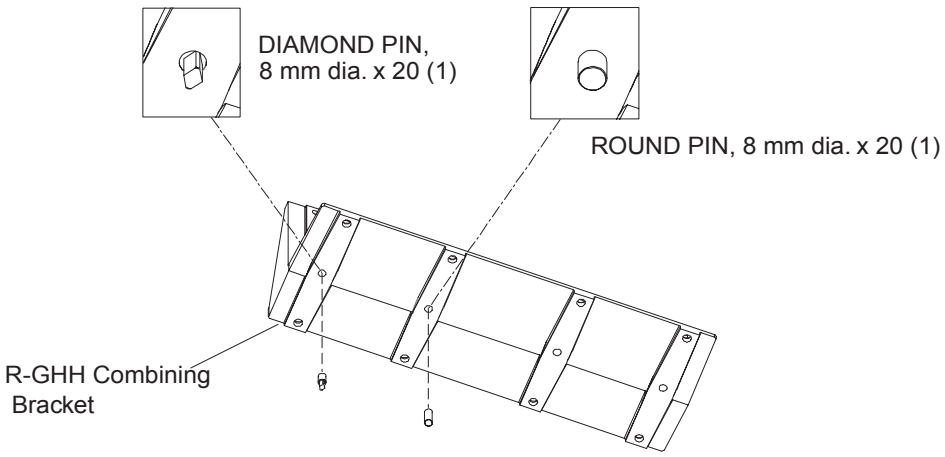


Figure 4-3. R-G(HH): Installing Alignment Pins on the R-GHH Combining Bracket (1)

3. Install a round pin and a diamond pin in the side face of the R-GHH combining bracket. See **Figure 4-4 on page 70**. Note the orientation of the diamond pin in the drawing. Use Loctite 609 sealant or equivalent to secure the pin in place.

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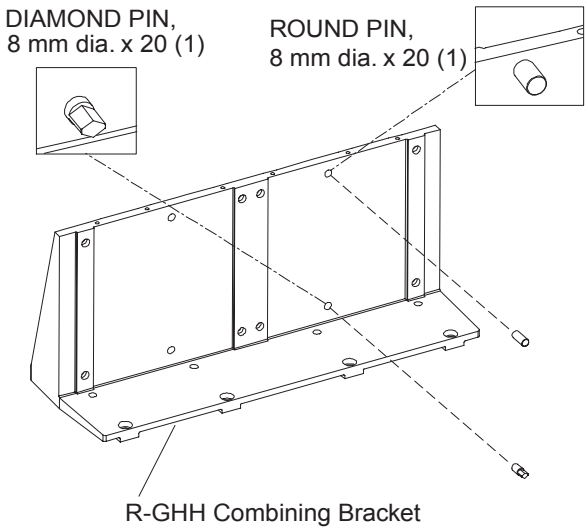


Figure 4-4. R-G(HH): Installing Alignment Pins on the R-GHH Combining Bracket (2)

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Installing the Second R-H Module

1. Mount the R-GHH combining bracket to the R-H-module #1's slider with four M8 x 20 screws. Position the bracket as shown in **Figure 4-5**. Carefully insert the pins into pin holes to avoid damaging the pin holes.
2. Mount R-H module #2 on the R-GHH combining bracket with four M8 x 14 screws. Align the pins on the bracket with the mating holes in the module.

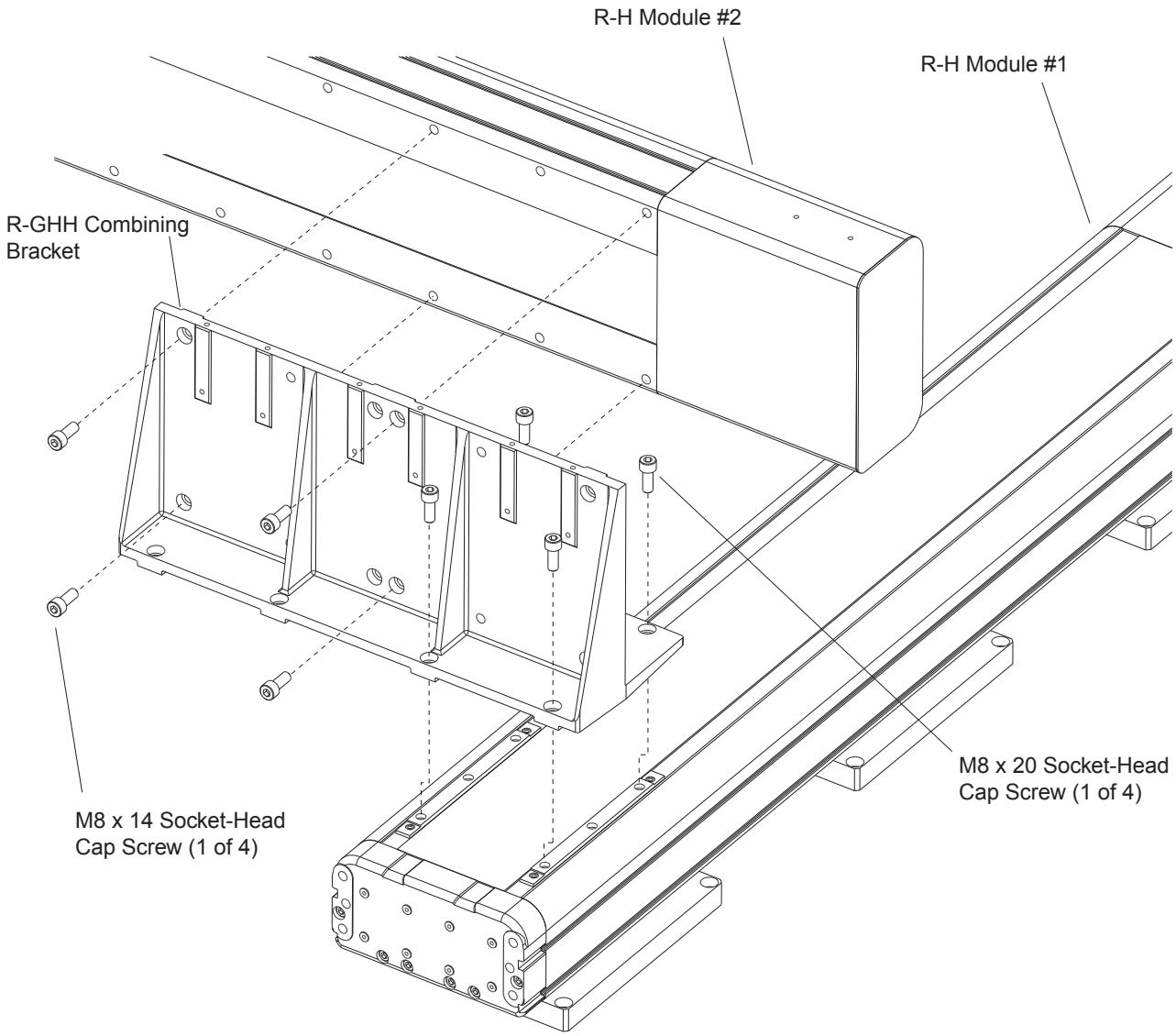


Figure 4-5. R-G(HH): Installing the Second R-H Module

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Installing Adept SmartAmps

Installing SmartAmp #1 on First R-H Module

1. Remove the cable cover from a SmartAmp mounting bracket by removing four M3 screws.
2. Install the mounting bracket onto the R-H module #1 at the motor cover using four M4 x 10 flathead screws; see **Figure 4-6**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-H module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install the SmartAmp onto the mounting bracket.

3. Install SmartAmp #1 onto the mounting bracket using four M3 x 40 screws. See **Figure 4-7 on page 73**.
4. Plug the motor and encoder cables from the module into the mating receptacles in the SmartAmp. See **Figure 4-8 on page 73**. Attach the captive screws to secure the encoder connector.

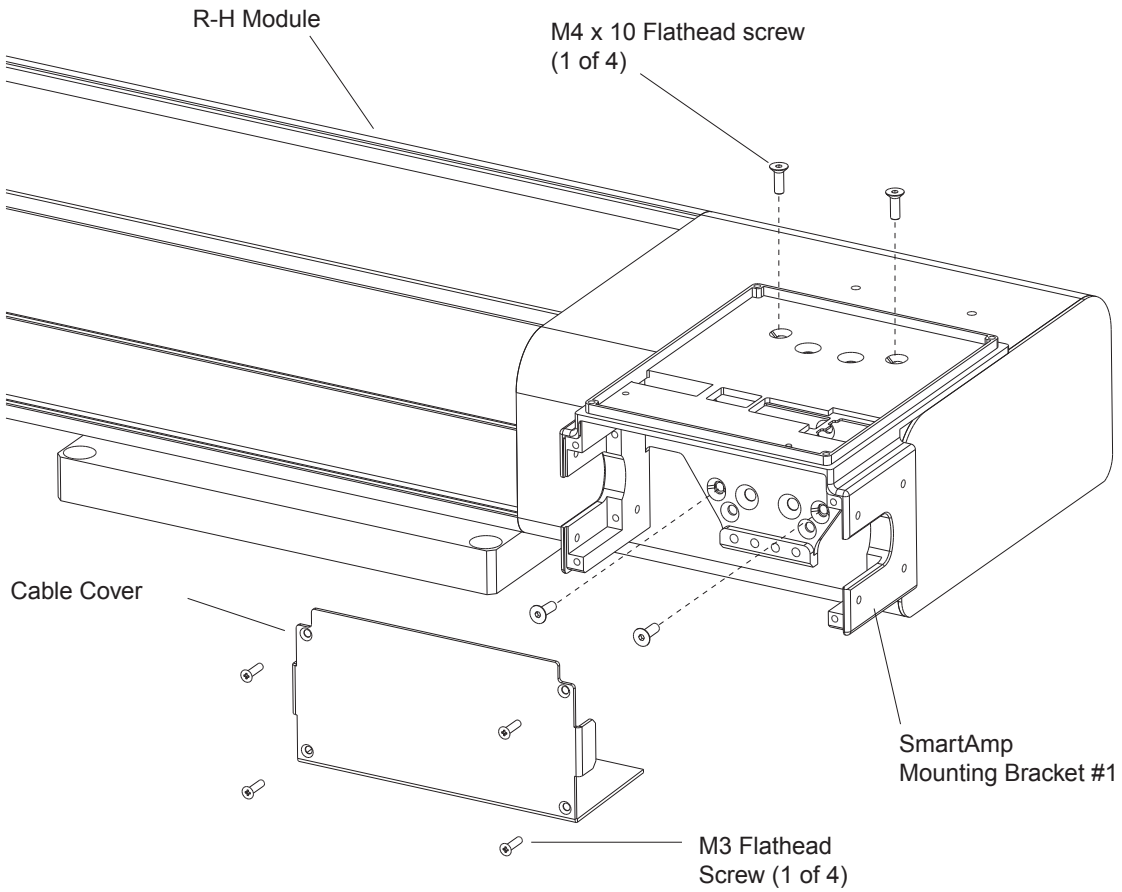


Figure 4-6. R-G(HH): Installing SmartAmp Mounting Bracket #1 on the First R-H Module

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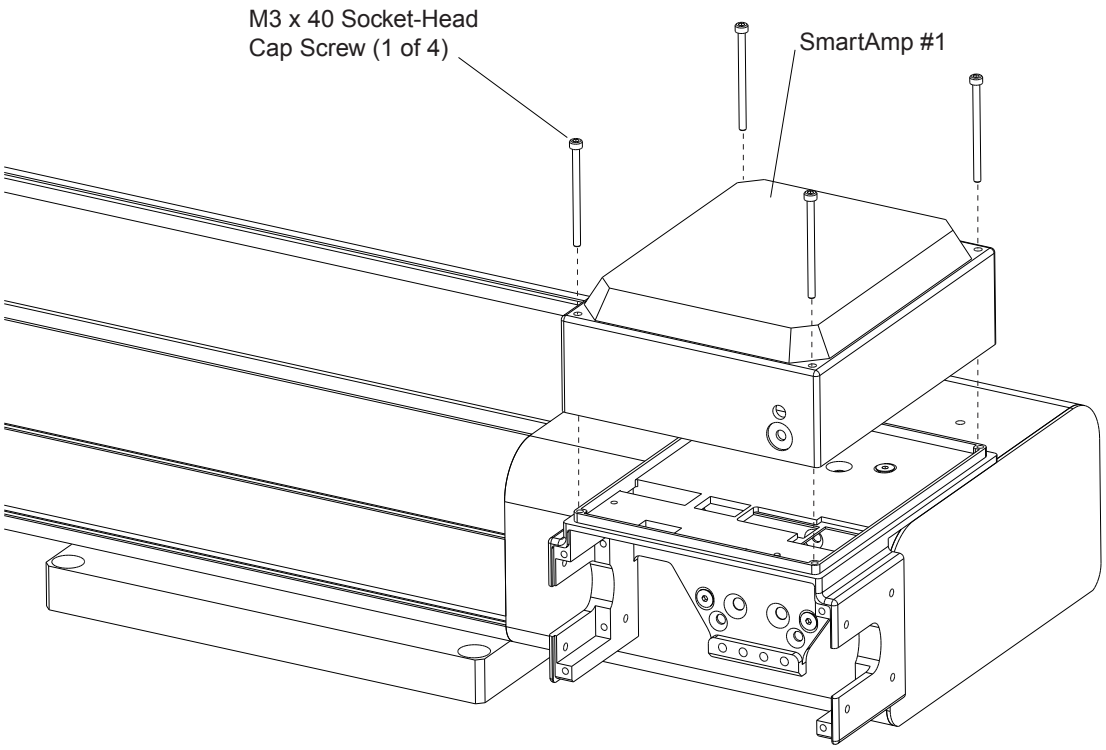


Figure 4-7. R-G(HH): Installing SmartAmp #1 on the First R-H Module

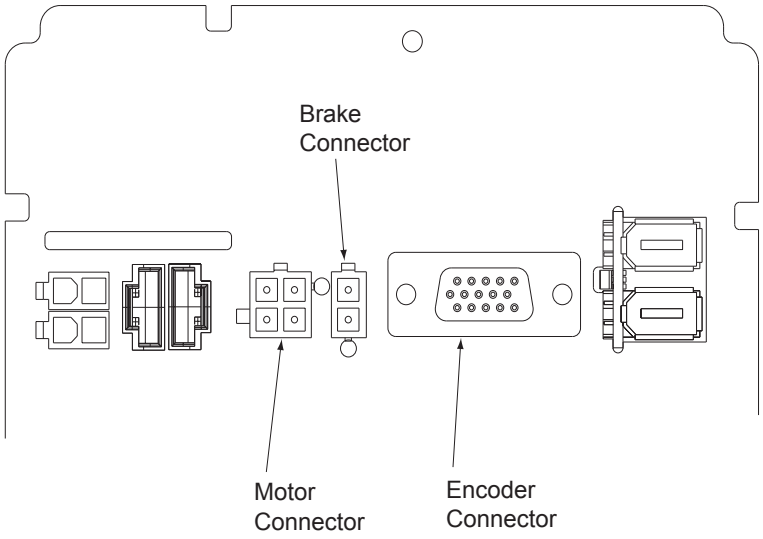


Figure 4-8. R-G(HH): Connecting Motor and Encoder Cables to SmartAmp

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Installing SmartAmp #2 on Second R-H Module

1. Remove the front cover from the SmartAmp mounting bracket by removing four M3 screws.
2. Install SmartAmp mounting bracket #2 onto the R-GHH combining bracket using four M4 x 10 flathead screws; see **Figure 4-9**. Route the motor and encoder cables from the module through the opening in the SmartAmp mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the second R-H module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install the SmartAmp onto the mounting bracket.

3. Install SmartAmp #2 onto the SmartAmp mounting bracket using four M3 x 40 screws. Position the SmartAmp so that the connectors extend through the SmartAmp mounting bracket. See **Figure 4-10 on page 75**.
4. Plug the motor and encoder cables from the module into the mating receptacles in SmartAmp #2. See **Figure 4-8 on page 73**. Attach the captive screws to secure the encoder connector.

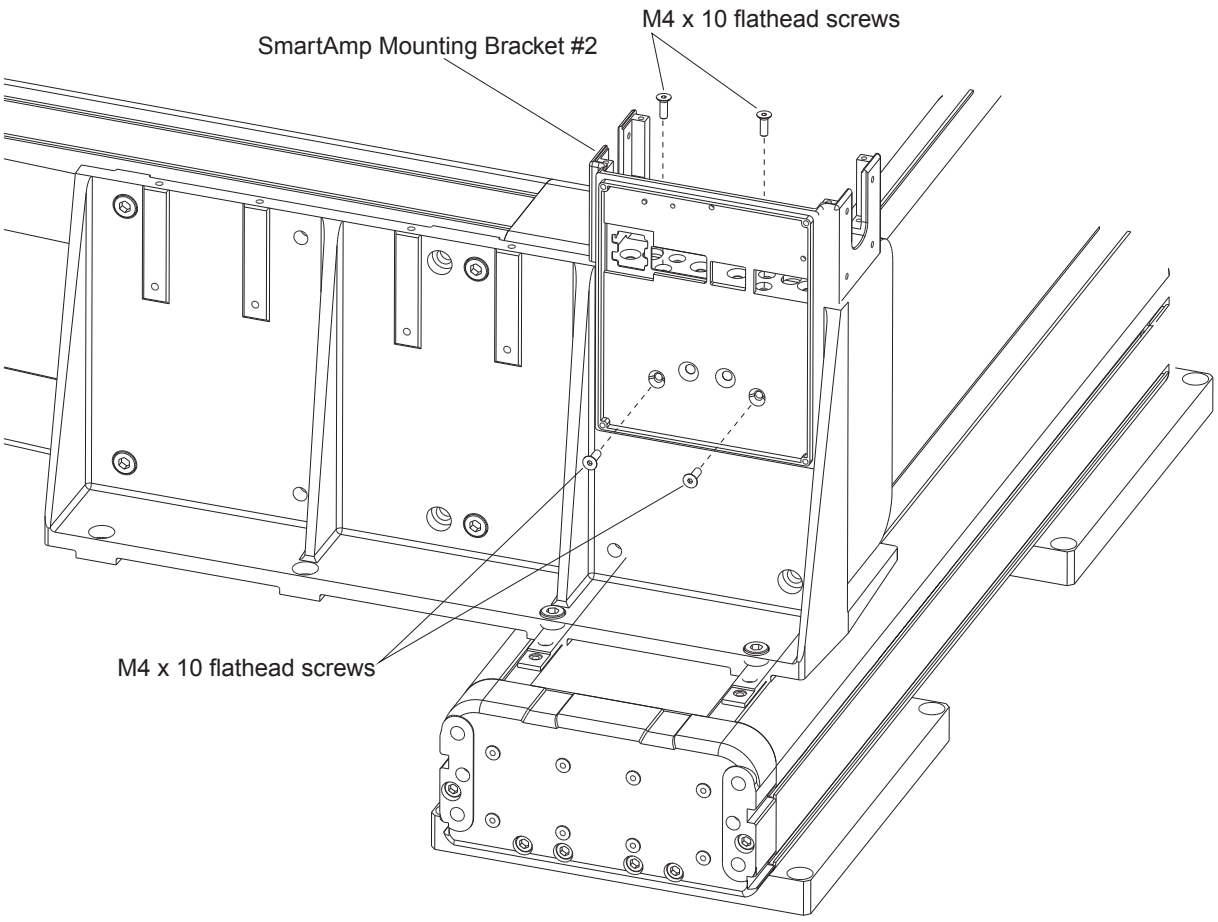


Figure 4-9. R-G(HH): Installing SmartAmp Mounting Bracket #2 on the Second R-H Module

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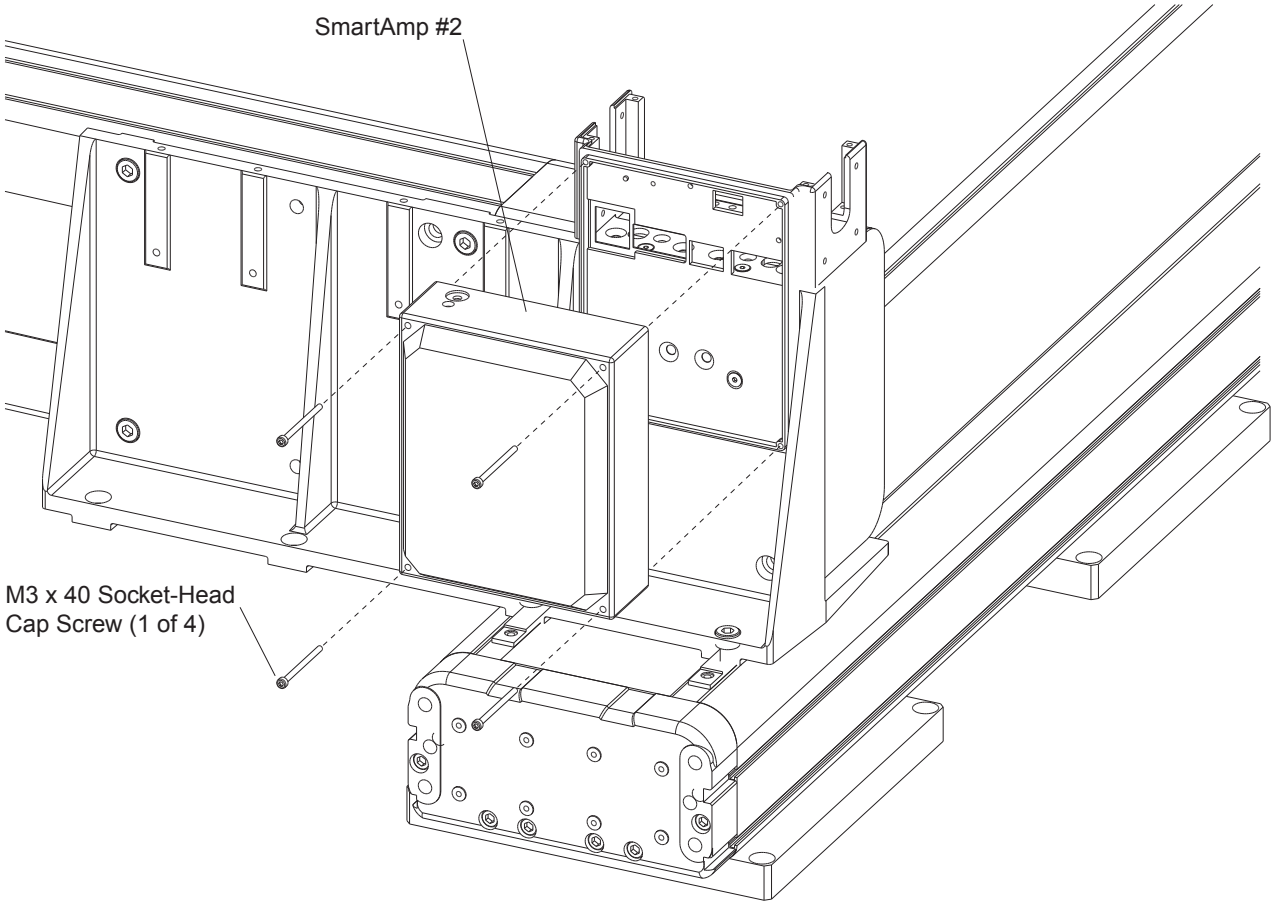


Figure 4-10. R-G(HH): Installing SmartAmp #2 on the Second R-H Module

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Installing the Cable Tube Support Clamp on R-H Module

1. Slide two T-slot nuts into the upper side channel in the R-H module; see **Figure 4-11**. Position the nuts for installing the cable tube support clamp.
2. Install the cable tube support clamp using two M4 x 8 screws. Leave the M4 screws loose for repositioning later after the cable tube has been installed.

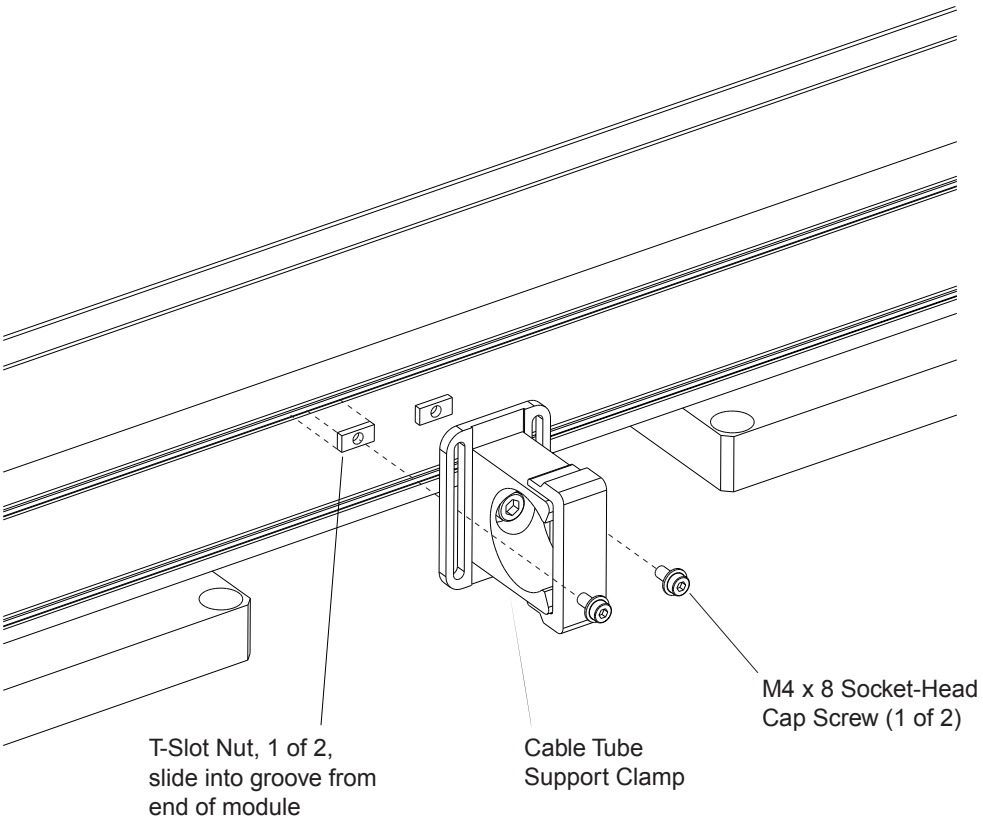


Figure 4-11. R-G(HH): Installing the Cable Tube Support Clamp

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Installing the Cable Tube Support Tray

1. Slide three T-slot nuts into the upper side channel in the R-H module; see **Figure 4-12**. Position the nuts for installing the cable tube support tray.
2. Install the cable tube support tray using three M4 x 6 screws.

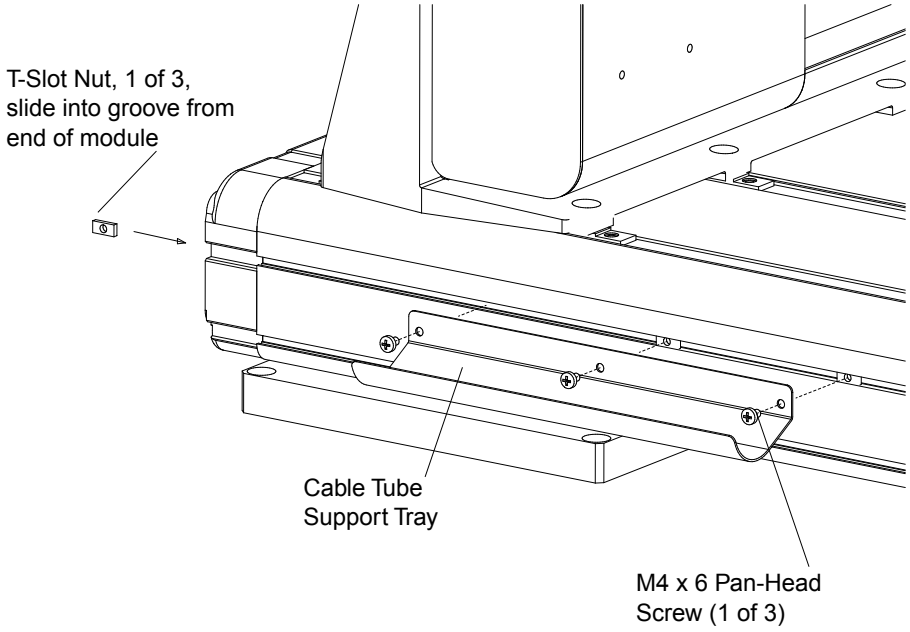


Figure 4-12. R-G(HH): Installing the Cable Tube Support Tray

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Installing Cable Tube Assembly Between Amp #1 and Amp #2

The procedure to install cables consists of these steps:

- route cables through the cable tube
- install cable tube fittings on cable tube
- install assembled cable tube on SmartAmp mounting bracket and plug in all cables

The lengths of the cables and cable tube depend on which modules you have ordered.

Routing Cables Through Cable Tube

1. Locate three cables in the cable kit.
   - AC power cable
   - 24VDC cable
   - IEEE 1394 cable

   See **Figure 4-13 on page 79**.
2. Group the three cables together, plus any additional user cables or air lines, and slide them through the cable tube.
3. Gently pull the cables through the tube until they are evenly spaced at each end. Try to make sure the cables do not get twisted or tangled as you pull them through the tube.

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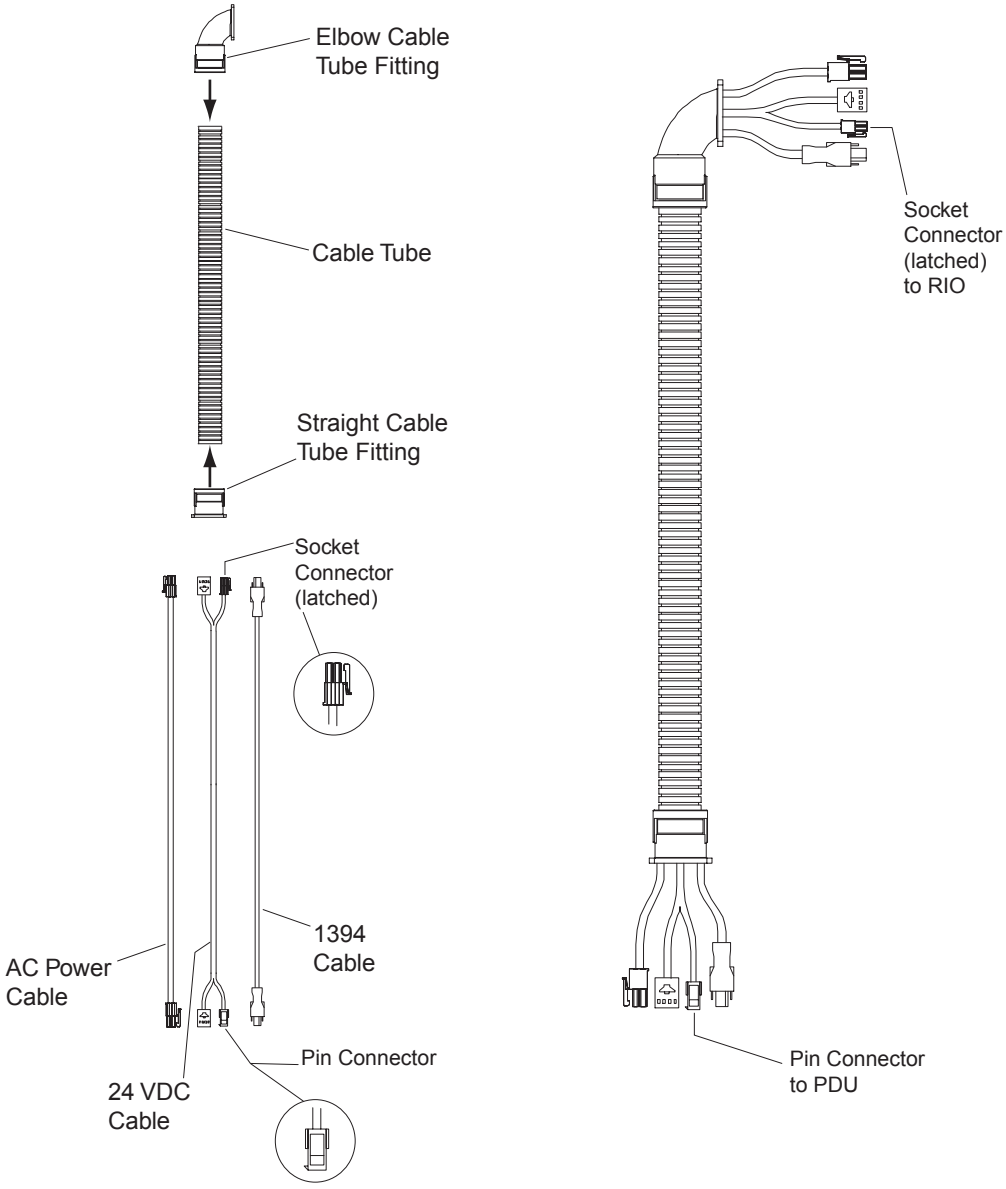


Figure 4-13. R-G(HH): Cable Tube Assembly (One Straight/One Elbow Fitting)

Installing Cable Tube Fittings on Cable Tube

NOTE: For both cable tube fittings, make sure the arrows on the fitting clamp are pointing toward the end of the tube.

1. Locate a straight cable tube fitting.

   NOTE: The 24V cable has two additional connectors for the optional RIO system. There is a socket (latched) connector at one end of the cable and a pin connector at the other end. Install the straight cable tube fitting on the end near the 24V pin connector; install the elbow fitting on the other end. See **Figure 4-13**.

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2. Install the fitting by pushing it onto the end of the cable tube until the fitting has fully snapped into place inside the fitting. See **Figure 4-13 on page 79**.
3. Locate an elbow cable tube fitting.
4. Install the fitting by pushing it onto the opposite end of the cable tube until the fitting has fully snapped into place inside the fitting.

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #1

1. Remove the cable clamp from inside the mounting bracket by removing the two M3 screws. See **Figure 4-15 on page 82**.
2. Position the cable tube assembly next to the first module assembled, with the straight fitting near SmartAmp #1.
3. Install the straight fitting on the outside of the mounting bracket. Make sure the fitting clamp is accessible. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See **Figure 4-16 on page 82**.
4. In SmartAmp #1, connect these cables:
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable

   There are two identical mating connectors for each cable in the SmartAmp, you can use either one. See **Figure 4-14 on page 81**.

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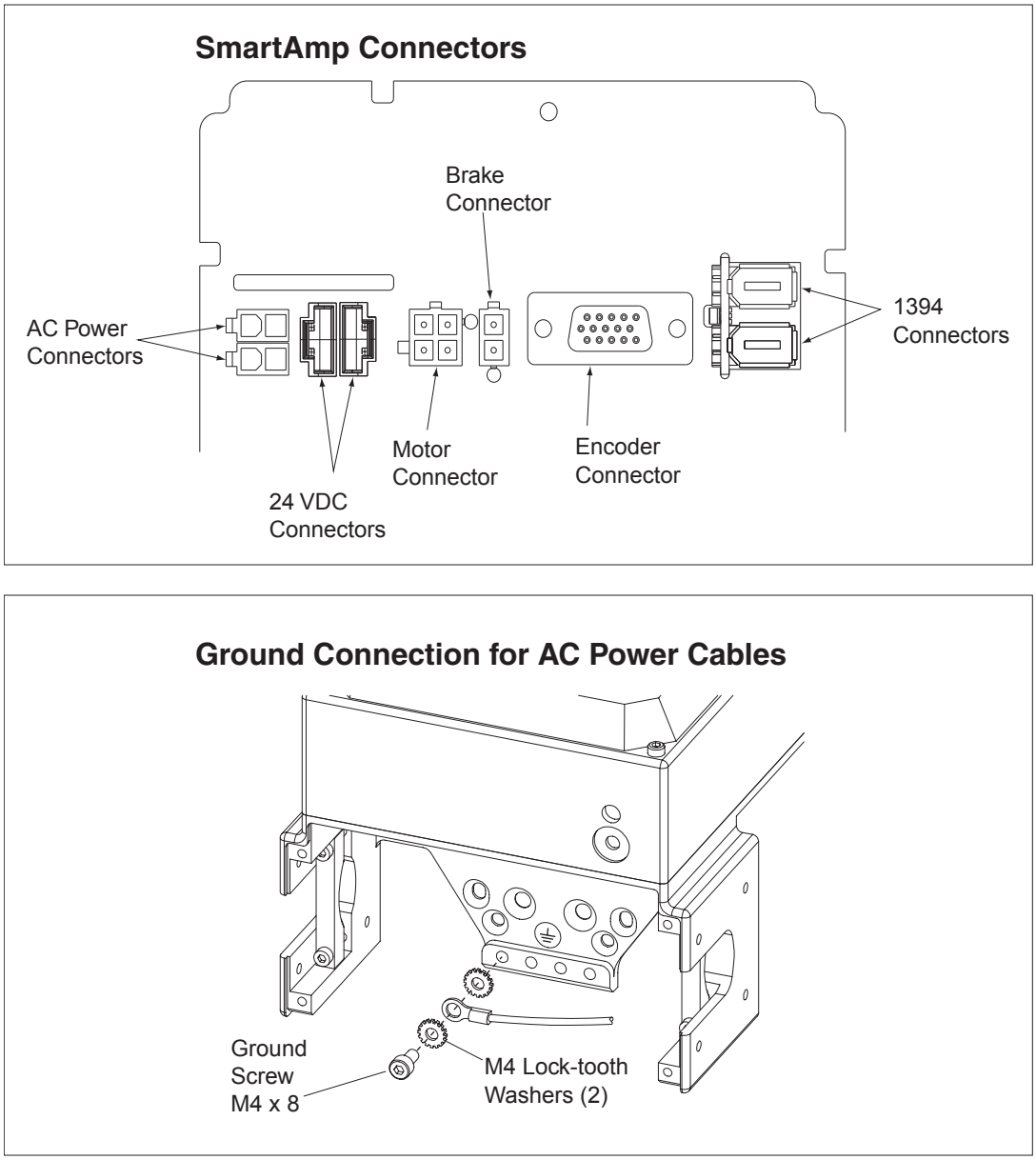


Figure 4-14. R-G(HH): Connecting Cables to SmartAmp

5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

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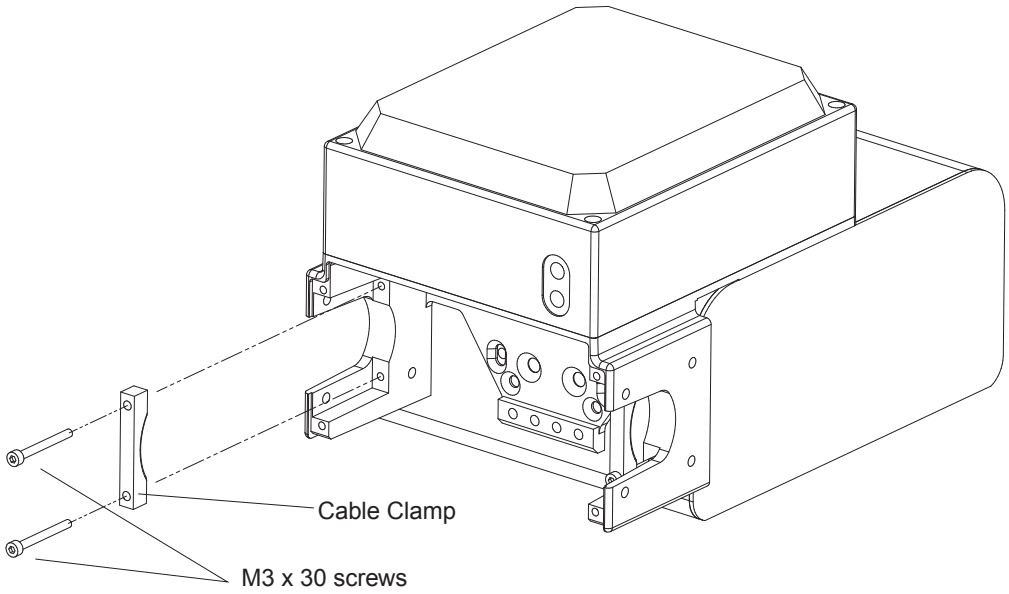


Figure 4-15. R-G(HH): Removing the Cable Clamp

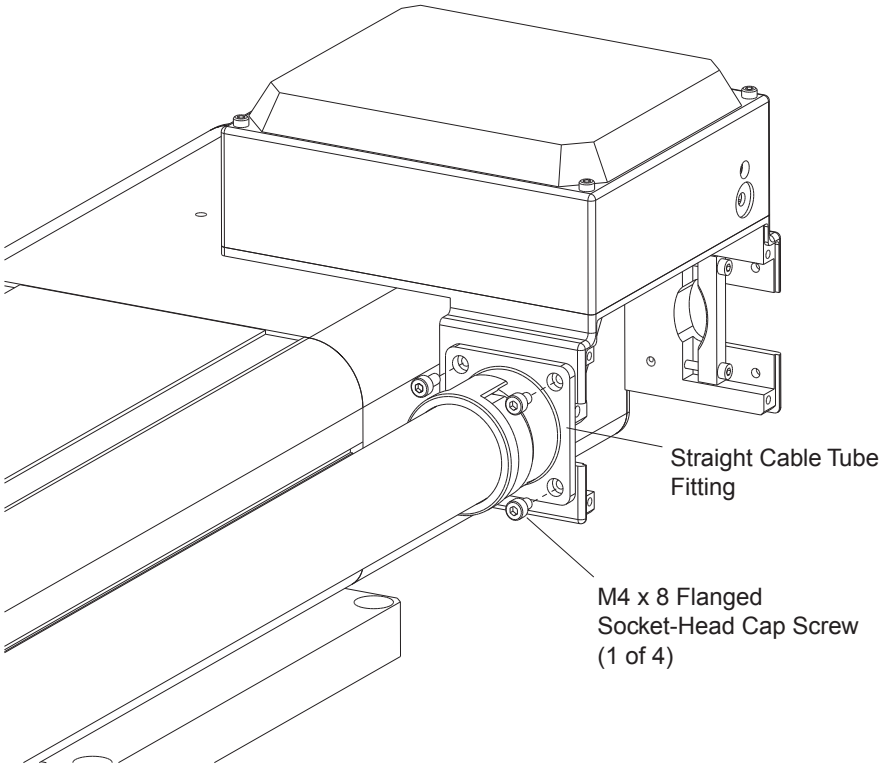


Figure 4-16. R-G(HH): Installing Cable Tube Fitting on SmartAmp Mounting Bracket #1

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Installing Cable Tube Fitting on SmartAmp Mounting Bracket #2

1. Remove the cable clamp from inside mounting bracket #2 by removing the two M3 screws.
2. Rest the cable tube in the support tray. Fold the cable tube up 180 degrees so the elbow fitting is positioned next to mounting bracket #2. See **Figure 4-17**.
3. Install the elbow fitting on the outside of the mounting bracket. See **Figure 4-17**. Use four M4 x 8 screws to secure the fitting to the mounting bracket.
4. In SmartAmp #2, connect these cables (see **Figure 4-14 on page 81**):
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

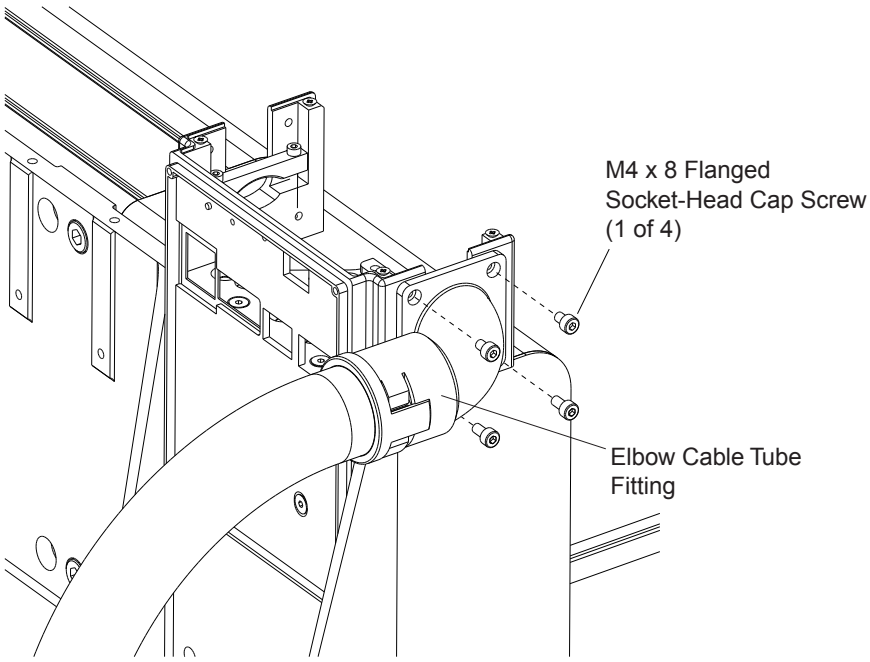


Figure 4-17. R-G(HH): Installing Cable Tube Fitting on SmartAmp Mounting Bracket #2

7. Slide the cable tube support clamp to the desired position and snap the tube into place. The clamp should be positioned just past the point where the cable tube bends when the other module is closest to SmartAmp #1. Tighten the screws on the clamp to secure it.
8. Slide the cable tube support tray into place near the end of the module so that the tube is supported at the end of travel. Tighten the screws on the tray to secure it.

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Connecting Cables from Controller to SmartAmp #1

See "Connecting Cables from Controller to SmartAmp #1" on page 51 for instructions.

Completing the Installation

Perform these steps to complete the installation.

- After you connect all the cables inside the SmartAmp, attach the cable cover to the SmartAmp bracket using four M3 screws.
- Check the mechanical motion of each axis. (Modules with brakes must be checked when the power is turned on.)

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4.3 R-G(HM) Installation Procedure

Overview

This section describes the process of installing a two-axis R-G(HM) Adept SmartModules system. This configuration consists of one R-H and one R-M module joined together with an R-GHM combining bracket. Each R-H and R-M module has a SmartAmp and a SmartAmp mounting bracket. A cable tube assembly contains the cabling to interconnect the SmartAmps. See **Figure 4-18** for an overview of the system components.

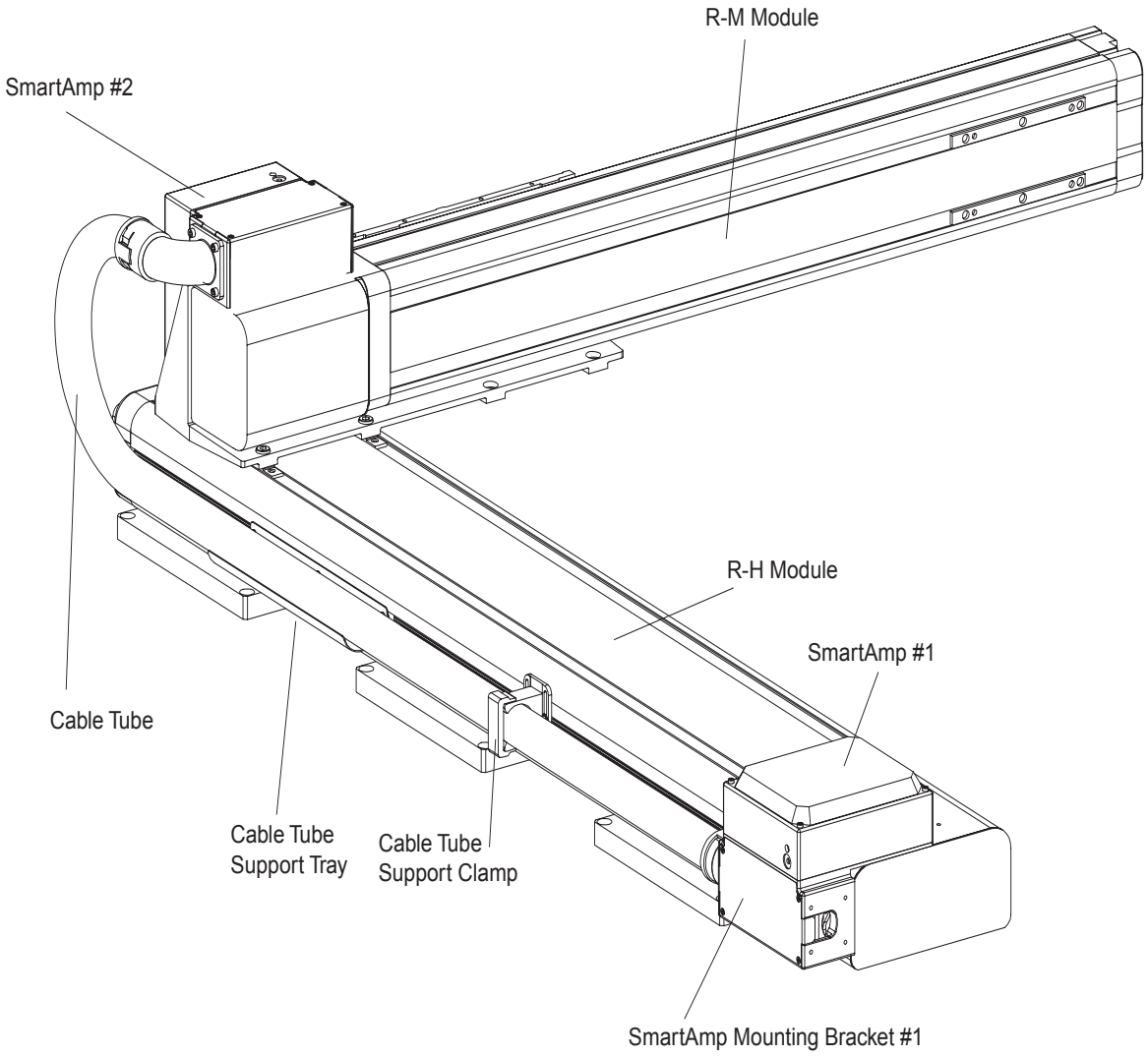


Figure 4-18. R-G(HM): System Component Overview

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Table 4-2. R-G(HM) Parts List

Description	Part Number	Qty
R-H module	9040x-1xxxx	1
R-M module	9040x-2xxxx	1
SmartAmp	30410-10000	2
SmartAmp mounting bracket	30410-20000	2
Combining bracket, R-GHM	40405-05002	1
Mounting plate, RH	90400-01100	2/3[a]
Cable tube fitting, elbow	40410-40090	1[a]
Cable tube fitting, straight	40410-40000	1[a]
Cable tube, hi-flex	40410-310xx	1
Cable tube clamp	30410-42000	1[a]
Cable tube support tray	30410-60000	1[a]
Cable kit, amp to amp AC power cable 24V DC cable IEEE 1394 cable	90410-100xx 10410-006xx 10410-007xx 10410-005xx	1
Cable kit, controller AC power cable 24V DC cable IEEE 1394 cable Ferrite core	90410-200xx 10410-009xx 10410-010xx 10410-105xx 27200-00117	1
Hardware kit	90405-00200	1
Optional Items		
Gantry support module	90405-50xxx	1
Gantry support bracket, RM	40405-04100	1
Remote I/O (RIO) kit	90410-20050	1[b]
Extended stroke Y-axis kit	90405-00400	1

[a] Quantity will vary depending on module length.
[b] Quantity will vary according to order.

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Installing the R-H Module

NOTE: 300 to 600 mm R-H modules use two mounting plates; 800 mm and longer modules use three plates.

1. Prepare the work surface by drilling and tapping eight or twelve M8 holes (depending on module length) for the R-H-module mounting plates. See "**Chapter 10** - Technical Specifications" for dimensions of the R-H module and the plates.
2. Install R-H-module mounting plates (two or three, depending on module length) to the under side of the R-H module using four M8 x 20 screws provided for each plate. See **Figure 4-2 on page 68**.
3. Mount the R-H module to the work surface using four M8 screws per mounting plate.

Installing Alignment Pins on R-GHM Combining Bracket

1. Locate the R-GHM combining bracket, two 8mm round pins, and two 8mm diamond pins.
2. Install a round pin and a diamond pin in the bottom face of the R-GHM combining bracket. See **Figure 4-19**. Note the orientation of the diamond pin in the drawing. Use Loctite 609 sealant or equivalent to secure the pin in place.

   NOTE: The pin locations shown in **Figure 4-19** and **Figure 4-20** are for a "right-hand" configuration. For a "left-hand" configuration, see "**Appendix A** - Configuration Options".

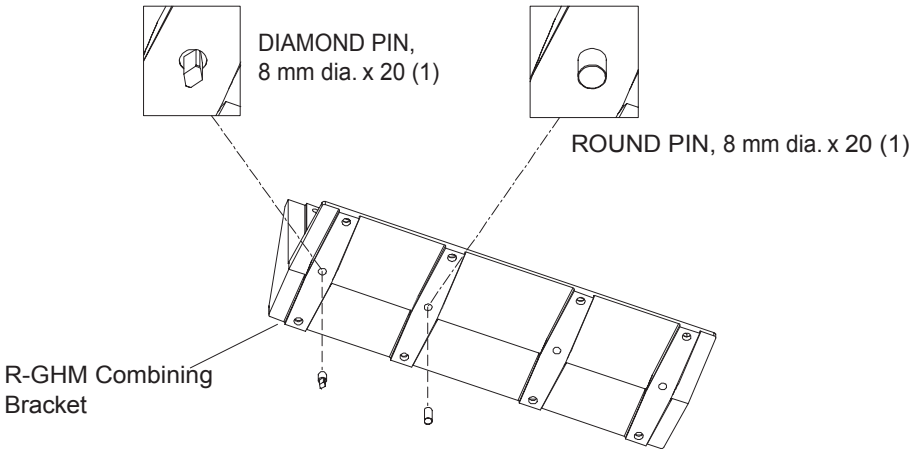


Figure 4-19. R-G(HM): Installing Alignment Pins on the R-GHM Combining Bracket (1)

3. Install a round pin and a diamond pin in the vertical face of the R-GHM combining bracket. See **Figure 4-20**. Note the orientation of the diamond pin in the drawing. Use Loctite 609 sealant or equivalent to secure the pin in place.

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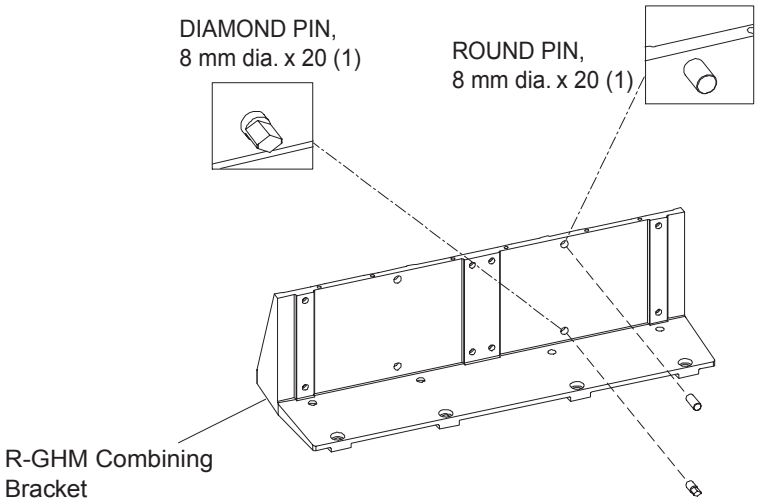


Figure 4-20. R-G(HM): Installing Alignment Pins on the R-GHM Combining Bracket (2)

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Installing the R-M Module

1. Mount the R-GHM combining bracket to the R-H-module slider with four M8 x 20 screws. Position the bracket as shown in **Figure 4-21**. Carefully insert the pins into pin holes to avoid damaging the pin holes.
2. Mount the R-M module on the R-GHM combining bracket with four M6 x 16 screws. Align the pins on the bracket with the mating holes in the module.

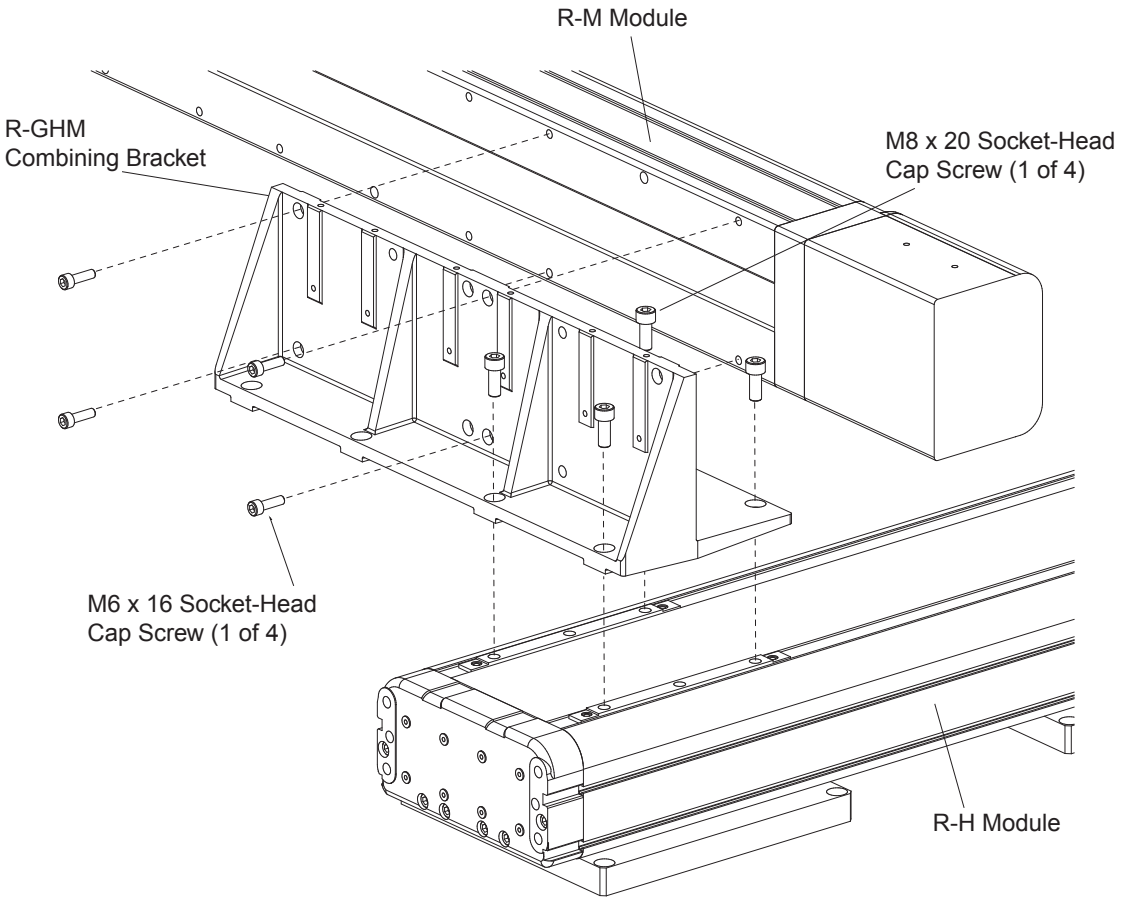


Figure 4-21. R-G(HM): Installing the R-M Module

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Installing Adept SmartAmps

Installing SmartAmp #1 on R-H Module

1. Remove the cable cover from a SmartAmp mounting bracket by removing four M3 screws.
2. Install the mounting bracket onto the R-H module at the motor cover using four M4 x 10 flathead screws; see **Figure 4-6 on page 72**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-H module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install the SmartAmp onto the mounting bracket.

3. Install SmartAmp #1 onto the mounting bracket using four M3 x 40 screws. See **Figure 4-7 on page 73**.
4. Plug the motor and encoder cables from the module into the mating receptacles in the SmartAmp. See **Figure 4-8 on page 73**. Attach the captive screws to secure the encoder connector.

Installing SmartAmp on R-GHM Combining Bracket

1. Remove the cable cover from the other SmartAmp mounting bracket by removing four M3 screws.
2. Install a mounting bracket onto the R-GHM combining bracket in position #2 using four M4 x 10 flathead screws; see **Figure 4-22 on page 91**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-M module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install SmartAmp #2 onto the mounting bracket.

3. Install a SmartAmp onto the mounting bracket in position #2 using four M3 x 40 screws. Position the SmartAmp so that the connectors extend through the mounting bracket. See **Figure 4-23 on page 92**.
4. Plug the motor and encoder cables from the module into the mating receptacles in SmartAmp #2. See **Figure 4-8 on page 73**. Attach the captive screws to secure the encoder connector.

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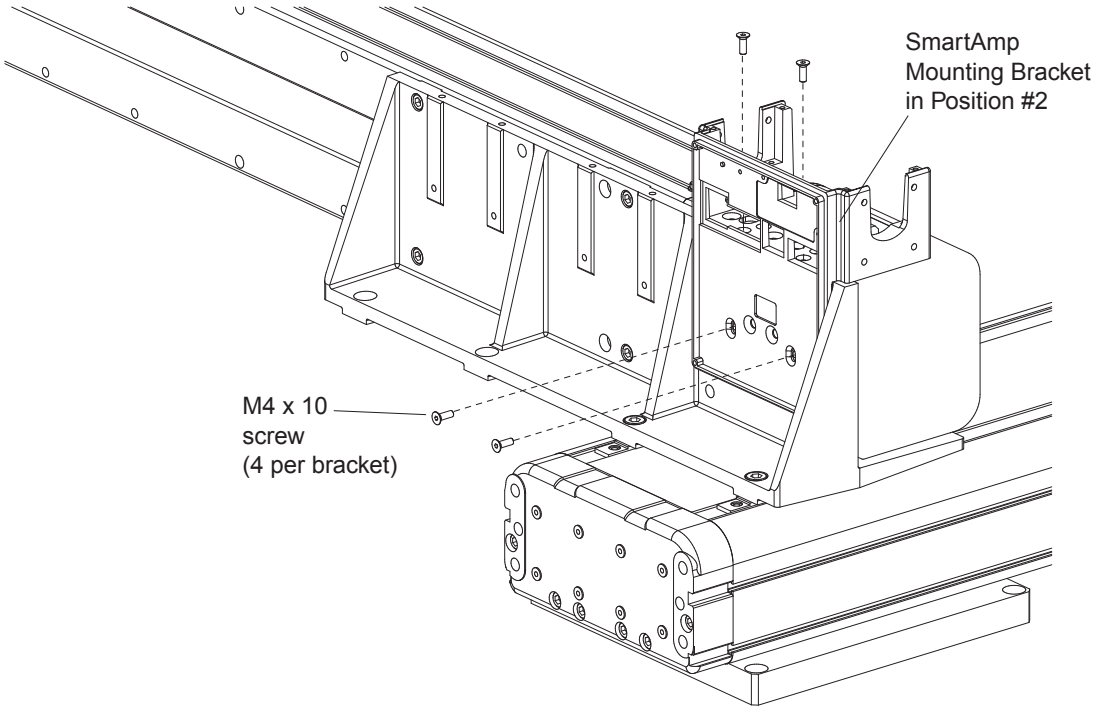


Figure 4-22. R-G(HM): Installing SmartAmp Mounting Bracket #2 on the R-GHM Bracket

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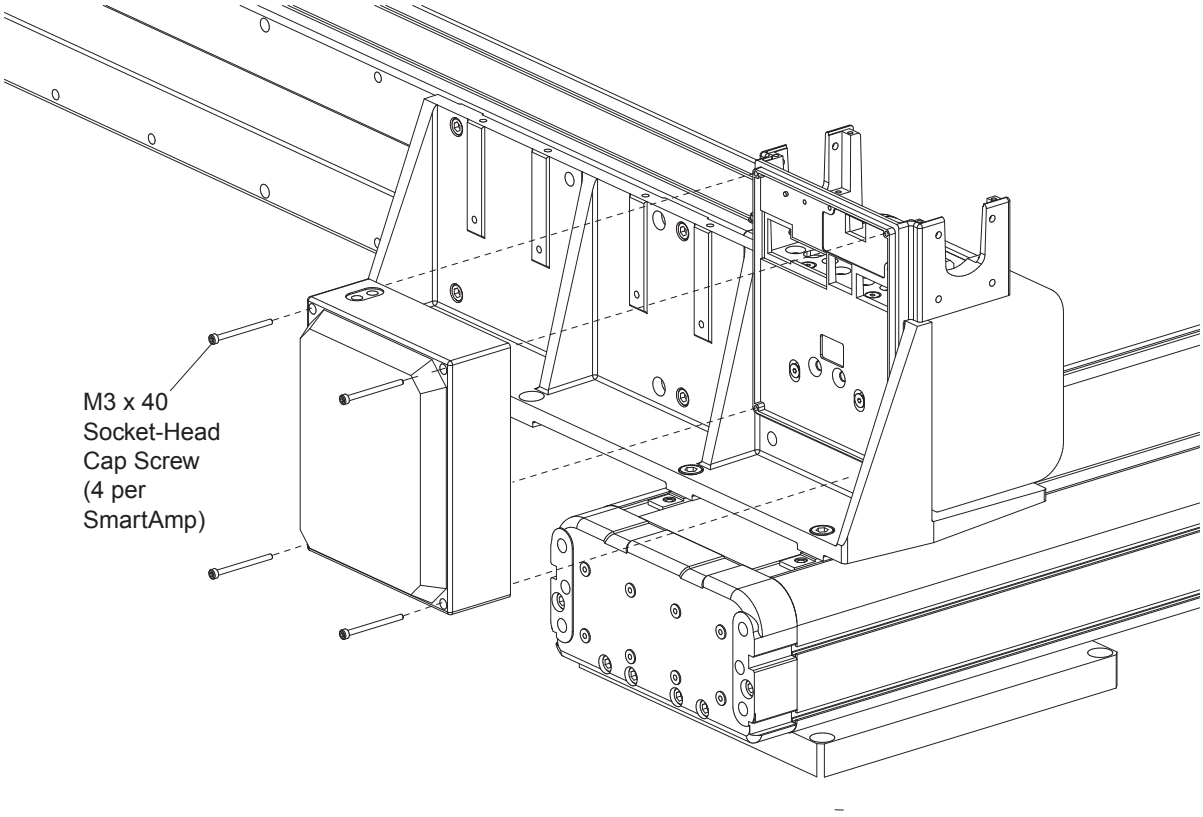


Figure 4-23. R-G(HM): Installing SmartAmp #2 on the R-GHM Combining Bracket

Installing the Cable Tube Support Clamp on R-H Module

1. Slide two T-slot nuts into the upper side channel in the R-H module; see **Figure 4-11 on page 76**. Position the nuts for installing the cable tube support clamp.
2. Install the cable tube support clamp using two M4 x 8 screws. Leave the M4 screws loose for repositioning later after the cable tube has been installed.

Installing the Cable Tube Support Tray

1. Slide three T-slot nuts into the upper side channel in the R-H module; see **Figure 4-12 on page 77**. Position the nuts for installing the cable tube support tray.
2. Install the cable tube support tray using three M4 x 6 screws.

Installing Cable Tube Assembly Between Amp #1 and Amp #2

See **"Installing Cable Tube Assembly Between Amp #1 and Amp #2" on page 78** for instructions.

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Connecting Cables from Controller to SmartAmp #1

See "Connecting Cables from Controller to SmartAmp #1" on page 51 for instructions.

Completing the Installation

Perform these steps to complete the installation.

- After you connect all the cables inside the SmartAmp, attach the cable cover to the SmartAmp bracket using four M3 screws.
- Tighten the screws on the cable tube support clamp and tray to secure them.
- Check the mechanical motion of each axis. (Modules with brakes must be checked when the power is turned on.)

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4.4 R-G(MSzr) Installation Procedure

Overview

This section describes the process of installing a two-axis R-G(MSzr) Adept SmartModules system. This configuration consists of one R-M and one R-Szr module joined together with an R-GMS combining bracket. Each R-M and R-Sz module has a SmartAmp and a SmartAmp mounting bracket. A cable tube assembly contains the cabling to interconnect the SmartAmps. See **Figure 4-24** for an overview of the system components.

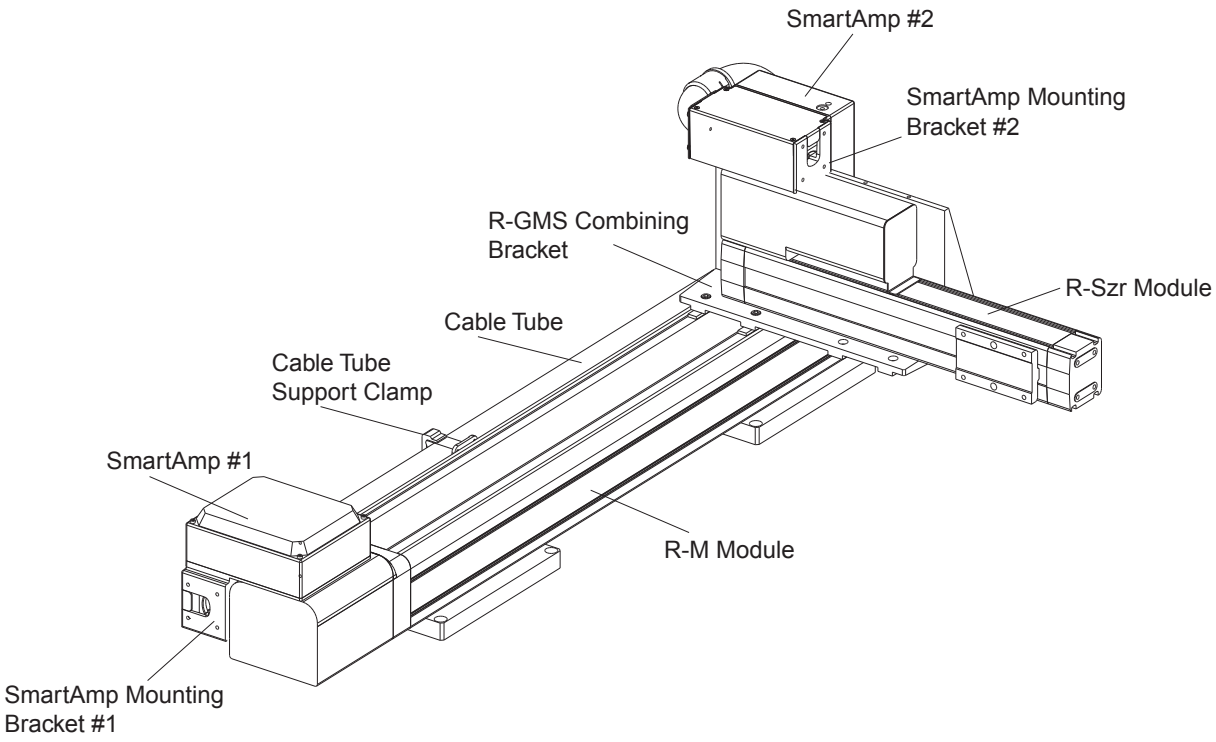


Figure 4-24. R-G(MSzr): System Component Overview

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Table 4-3. R-G(MSzr) Parts List

Description	Part Number	Qty
R-Szr module	9040x-4xxxx	1
R-M module	9040x-2xxxx	1
SmartAmp	30410-10000	2
SmartAmp mounting bracket	30410-20000	2
Combining bracket, R-GMS	40405-05020	1
Mounting plate, RM	90400-01200	2/3[a]
Cable tube fitting, elbow	40410-40090	1[a]
Cable tube fitting, straight	40410-40000	1[a]
Cable tube, hi-flex	40410-310xx	1
Cable tube clamp	30410-42000	1[a]
Cable tube support tray	30410-60000	1[a]
Cable kit, amp to amp AC power cable 24V DC cable IEEE 1394 cable	90410-100xx 10410-006xx 10410-007xx 10410-005xx	1
Cable kit, controller AC power cable 24V DC cable IEEE 1394 cable Ferrite core	90410-200xx 10410-009xx 10410-010xx 10410-105xx 27200-00117	1
Hardware kit	90405-00200	1
Optional Items		
Remote I/O (RIO) kit	90410-20050	1[b]

[a] Quantity will vary depending on module length.
[b] Quantity will vary according to order.

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Installing the R-M Module

NOTE: R-M modules less than 750 mm long require two mounting plates; R-M modules longer than 750 mm require three mounting plates.

1. Prepare the work surface by drilling and tapping eight or twelve M8 holes (depending on the number of mounting plates required) for the R-M-module mounting plates. See **Figure 4-25**. See "**Chapter 10** - Technical Specifications" for dimensions of the R-M module and the plates.
2. Install two or three R-M-module mounting plates to the under side of the R-M module using four M6 x 20 screws provided for each plate. See **Figure 4-25**.
3. Mount the R-M module to the work surface using four M8 screws per mounting plate.

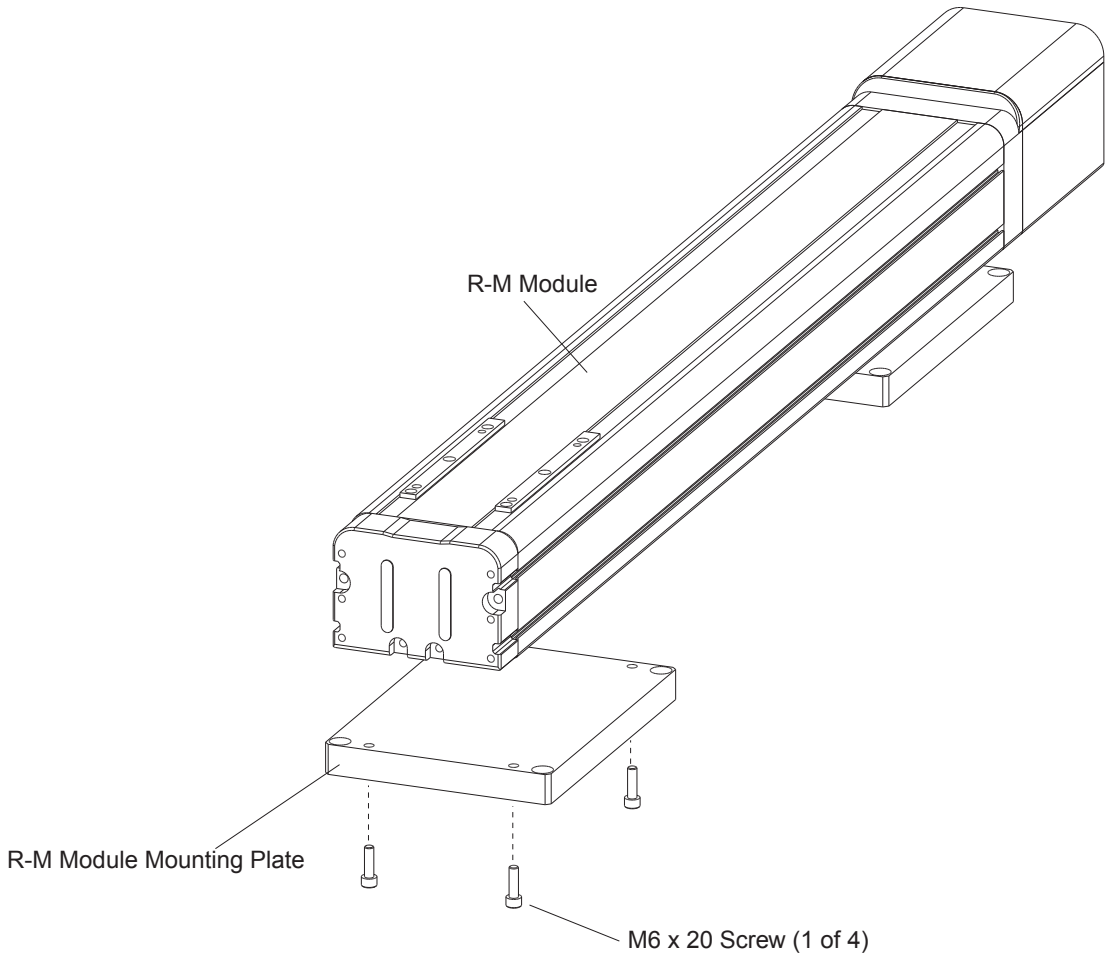


Figure 4-25. R-G(MSzr): Installing the R-M Module

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Installing the R-Szr Module

1. Mount the R-GMS combining bracket to the R-M-module slider with four M6 x 16 screws. See **Figure 4-26**. Align the pins on the combining bracket with the mating holes in the module's slider.
2. Mount the R-Szr module on the R-GMS combining bracket with four M5 x 16 screws. See **Figure 4-26**. Align the pins on the combining bracket with the mating holes in the module's slider.

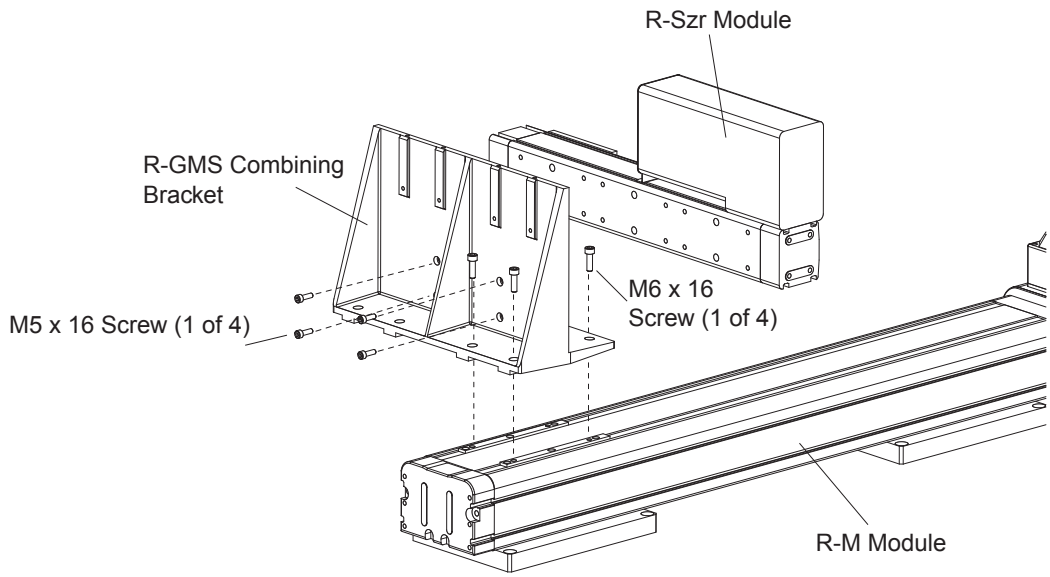


Figure 4-26. R-G(MSzr): Installing the R-GMS Combining Bracket and R-Szr Module

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Installing Adept SmartAmps

Installing SmartAmp #1 on R-M Module

1. Remove the cable cover from a SmartAmp mounting bracket by removing four M3 screws.
2. Install the mounting bracket onto the R-M module at the motor cover using four M4 x 10 flathead screws; see **Figure 4-27**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-M module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install the SmartAmp onto the mounting bracket.
3. Install SmartAmp #1 onto the mounting bracket using four M3 x 40 screws. See **Figure 4-28 on page 99**.
4. Plug the motor and encoder cables from the module into the mating receptacles in the SmartAmp. See **Figure 4-8 on page 73**. Attach the captive screws to secure the encoder connector.

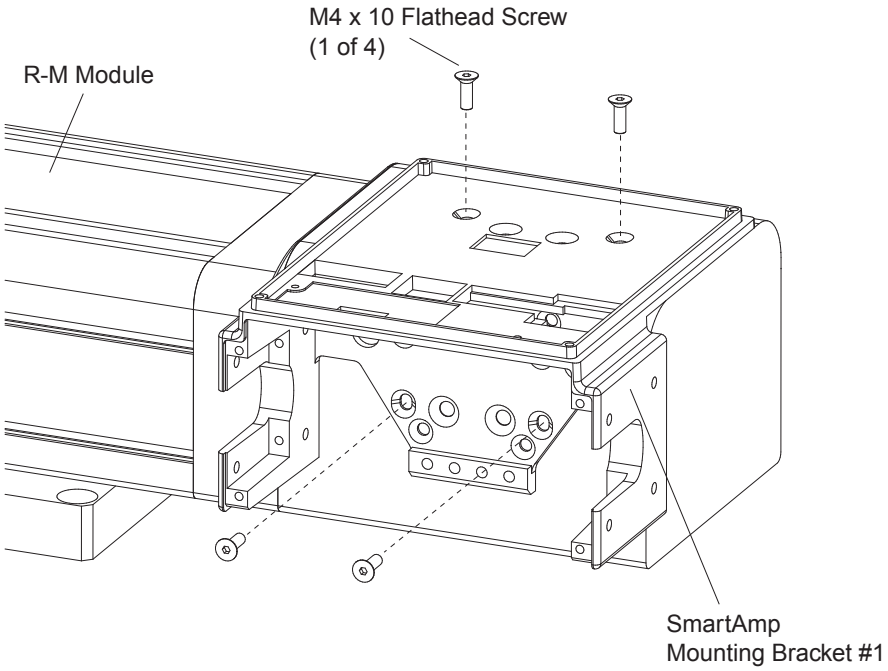


Figure 4-27. R-G(MSzr): Installing SmartAmp Mounting Bracket #1 on the R-M Module

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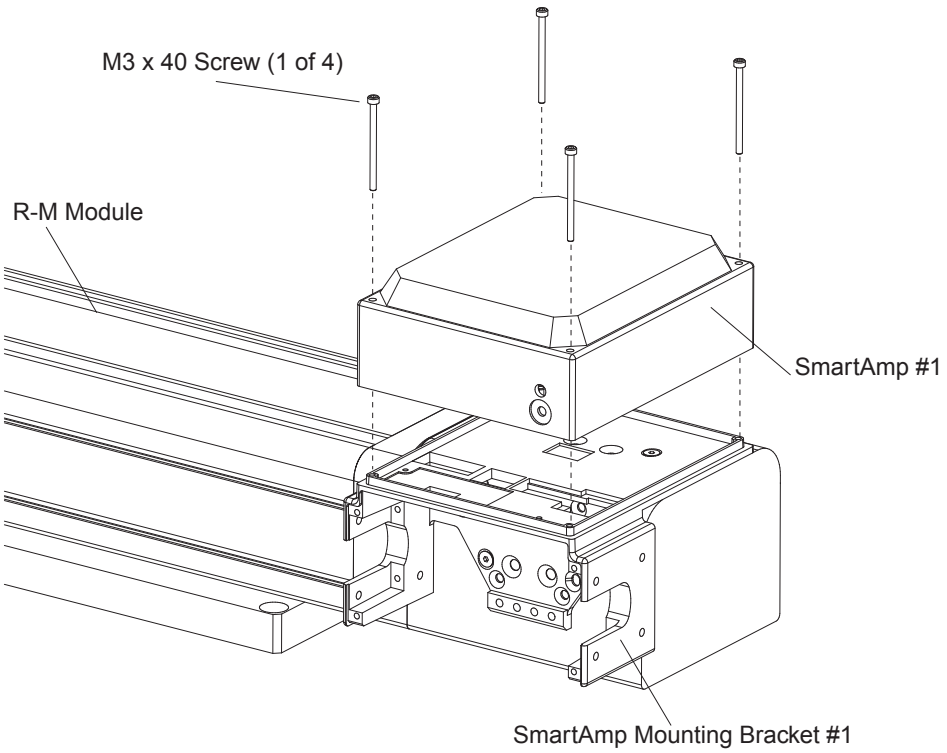


Figure 4-28. R-G(MSzr): Installing SmartAmp #1 on the R-M Module

Installing SmartAmp on R-GMS Combining Bracket

1. Remove the cable cover from the other SmartAmp mounting bracket by removing four M3 screws.
2. Install a mounting bracket onto the R-GMS combining bracket in position #2 using four M4 x 10 flathead screws; see **Figure 4-29 on page 100**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-Szr module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install SmartAmp #2 onto the mounting bracket.

3. Install a SmartAmp onto the mounting bracket in position #2 using four M3 x 40 screws. Position the SmartAmp so that the connectors extend through the mounting bracket. See **Figure 4-30 on page 101**.
4. Plug the motor and encoder cables from the module into the mating receptacles in SmartAmp #2. See **Figure 4-8 on page 73**. Attach the captive screws to secure the encoder connector.

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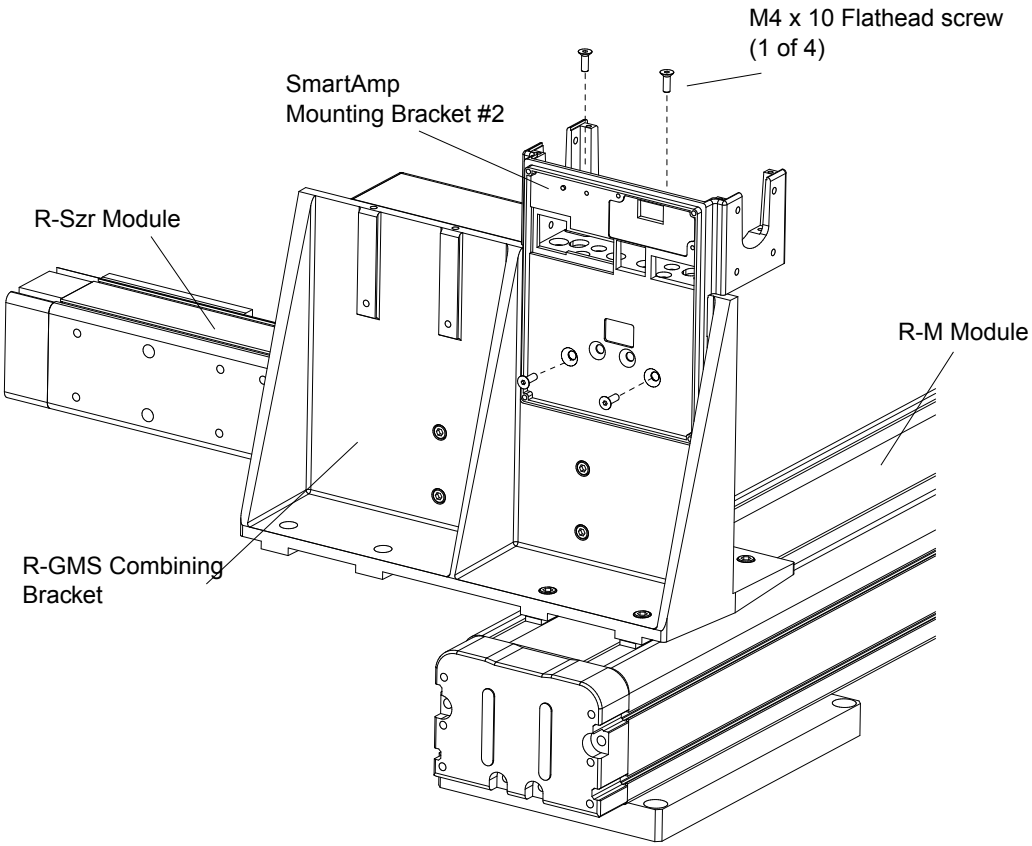


Figure 4-29. R-G(MSzr): Installing SmartAmp Mounting Bracket #2 on the R-GMS Bracket

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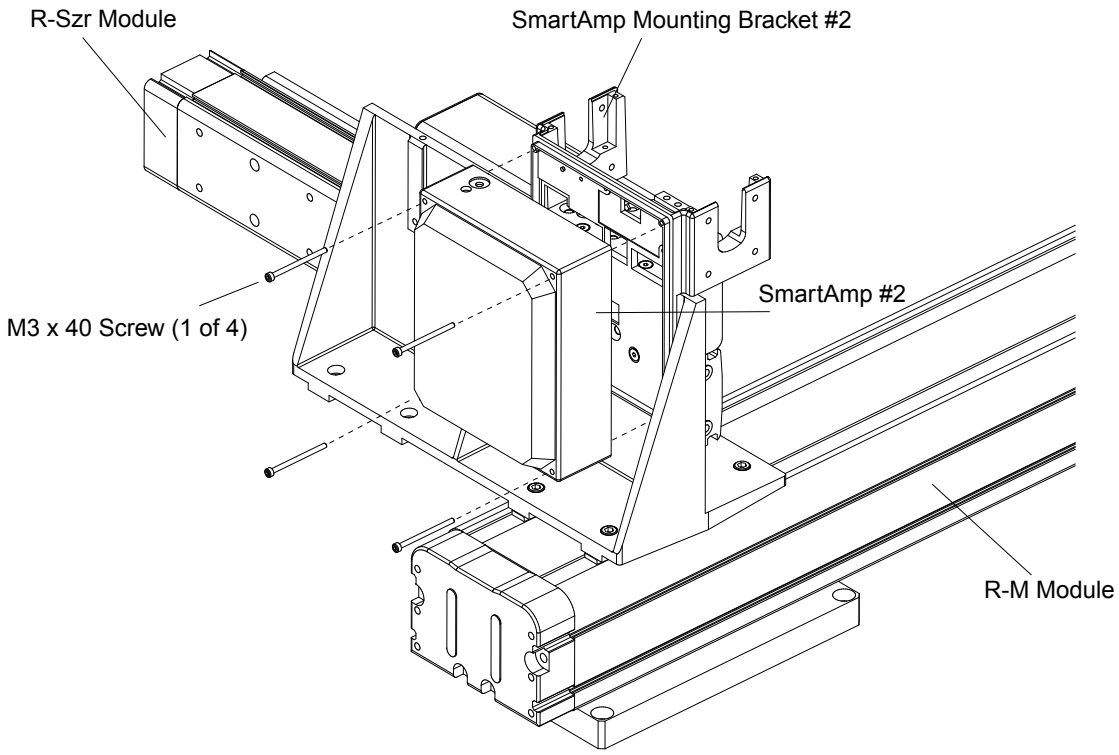


Figure 4-30. R-G(MSzr): Installing SmartAmp #2 on Mounting Bracket #2

Installing the Cable Tube Support Clamp on R-M Module

1. Slide two T-slot nuts into the upper side channel in the R-M module; see **Figure 4-11 on page 76**. Position the nuts for installing the cable tube support clamp.

   NOTE: **Figure 4-11** shows the cable tube support clamp mounted on an R-H module, instead of the R-M module on the R-G(MSzr). However, the other information in the figure is correct for the R-G(MSzr).

2. Install the cable tube support clamp using two M4 x 8 screws. Leave the M4 screws loose for repositioning later after the cable tube has been installed.

Installing the Cable Tube Support Tray

1. Slide three T-slot nuts into the upper side channel in the R-M module; see **Figure 4-31**. Position the nuts for installing the cable tube support tray.
2. Install the cable tube support tray using three M4 x 6 screws.

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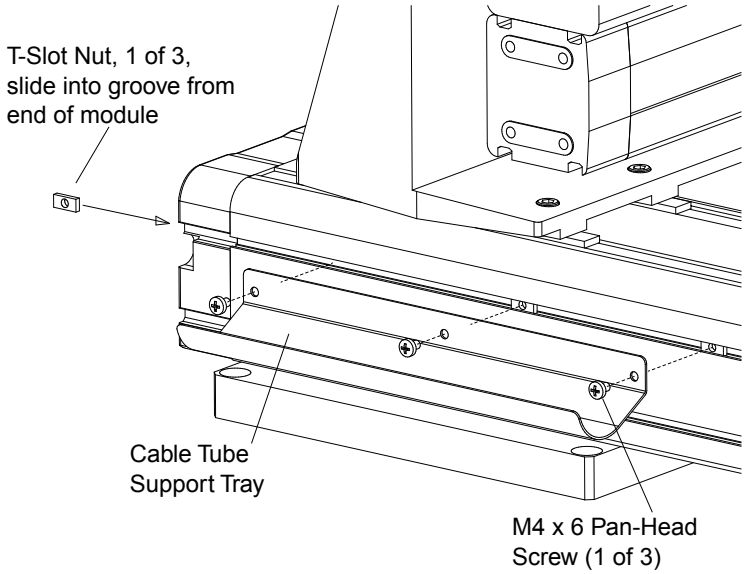


Figure 4-31. R-G(MSzr): Installing the Cable Tube Support Tray

Installing Cable Tube Assembly Between Amp #1 and Amp #2

The procedure to install cables consists of these steps:

- route cables through the cable tube
- install cable tube fittings on cable tube
- install assembled cable tube on SmartAmp mounting bracket and plug in all cables

The lengths of the cables and cable tube depend on which modules you have ordered.

Routing Cables Through Cable Tube

1. Locate three cables in the cable kit.
   - AC power cable
   - 24VDC cable
   - IEEE 1394 cable

   See **Figure 4-13 on page 79**.
2. Group the three cables together, plus any additional user cables or air lines, and slide them through the cable tube.
3. Gently pull the cables through the tube until they are evenly spaced at each end. Try to make sure the cables do not get twisted or tangled as you pull them through the tube.

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Installing Cable Tube Fittings on Cable Tube

NOTE: For both cable tube fittings, make sure the arrows on the fitting clamp are pointing toward the end of the tube.

1. Locate the straight cable tube fitting.

   NOTE: The 24V cable has two additional connectors for the optional RIO system. There is a socket (latched) connector at one end of the cable and a pin connector at the other end. Install the straight cable tube fitting on the end with the pin connector; install the elbow fitting on the other end. See **Figure 4-13 on page 79**.

2. Install the fitting by pushing it onto the end of the cable tube until the fitting has fully snapped into place inside the fitting. See **Figure 4-13 on page 79**.
3. Locate the elbow cable tube fitting.
4. Install the fitting by pushing it onto the opposite end of the cable tube until the fitting has fully snapped into place inside the fitting.

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #1

1. Remove the cable clamp from inside the mounting bracket by removing the two M3 screws. See **Figure 4-32**.

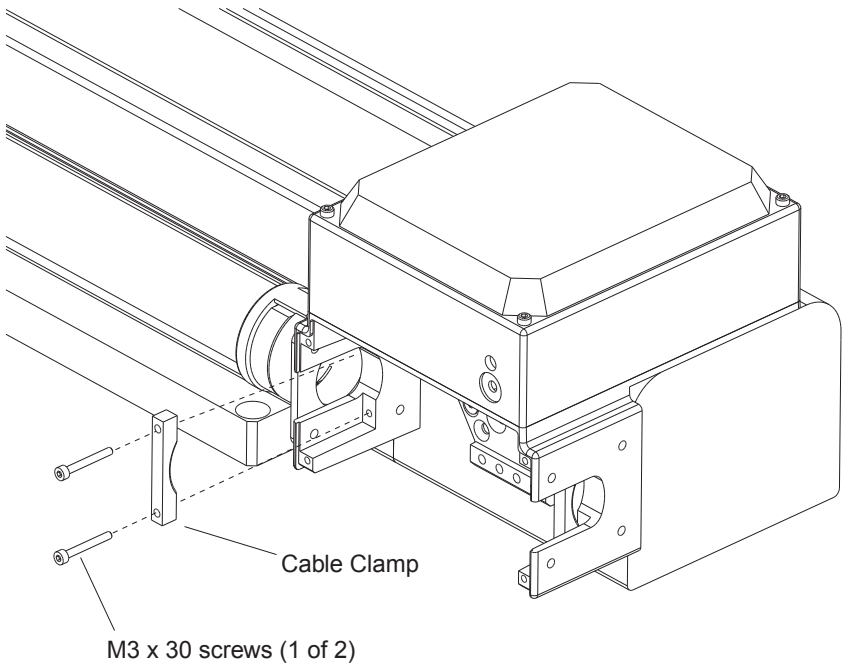


Figure 4-32. R-G(MSzr): Removing the Cable Clamp

2. Position the cable tube assembly next to the R-M module with the straight cable tube fitting near SmartAmp #1.

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3. Install the fitting on the outside of the mounting bracket. Make sure the fitting clamp is accessible. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See **Figure 4-33**.

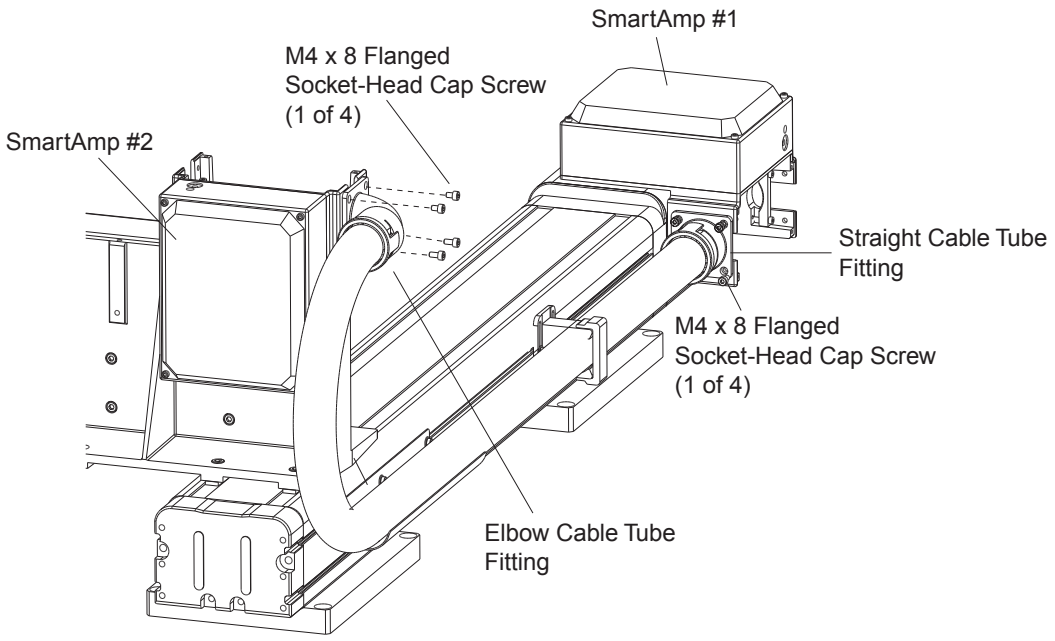


Figure 4-33. R-G(MSzr): Installing Cable Tube Fittings

4. In SmartAmp #1, connect these cables:
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable

   There are two identical mating connectors for each cable in the SmartAmp, you can use either one. See **Figure 4-14 on page 81**.
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #2

1. Remove the cable clamp from inside mounting bracket #2 by removing the two M3 screws.
2. Fold the cable tube up 180 degrees so the elbow fitting is positioned next to mounting bracket #2. See **Figure 4-33**.
3. Install the cable tube fitting on the outside of the mounting bracket. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See **Figure 4-33**.

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4. In SmartAmp #2, connect these cables (see **Figure 4-14 on page 81**):
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.
7. Slide the cable tube support clamp to the desired position and snap the tube into place. Tighten the screws on the clamp to secure it.

Connecting Cables from Controller to SmartAmp #1

See **"Connecting Cables from Controller to SmartAmp #1" on page 51** for instructions.

Completing the Installation

Perform these steps to complete the installation.

- After you connect all the cables inside the SmartAmp, attach the cable cover to the SmartAmp bracket using four M3 screws.
- Check the mechanical motion of each axis. (Modules with brakes must be checked when the power is turned on.)

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4.5 R-K(HMz) Installation Procedure

Overview

This section describes the process of installing a two-axis R-K(HMz) Adept SmartModules system. This configuration consists of one R-H and one R-Mz module joined together with a R-DHM combining bracket. Each R-H and R-Mz module has a SmartAmp and a SmartAmp mounting bracket. A cable tube assembly contains the cabling to interconnect the SmartAmps. See **Figure 4-34** for an overview of the system components.

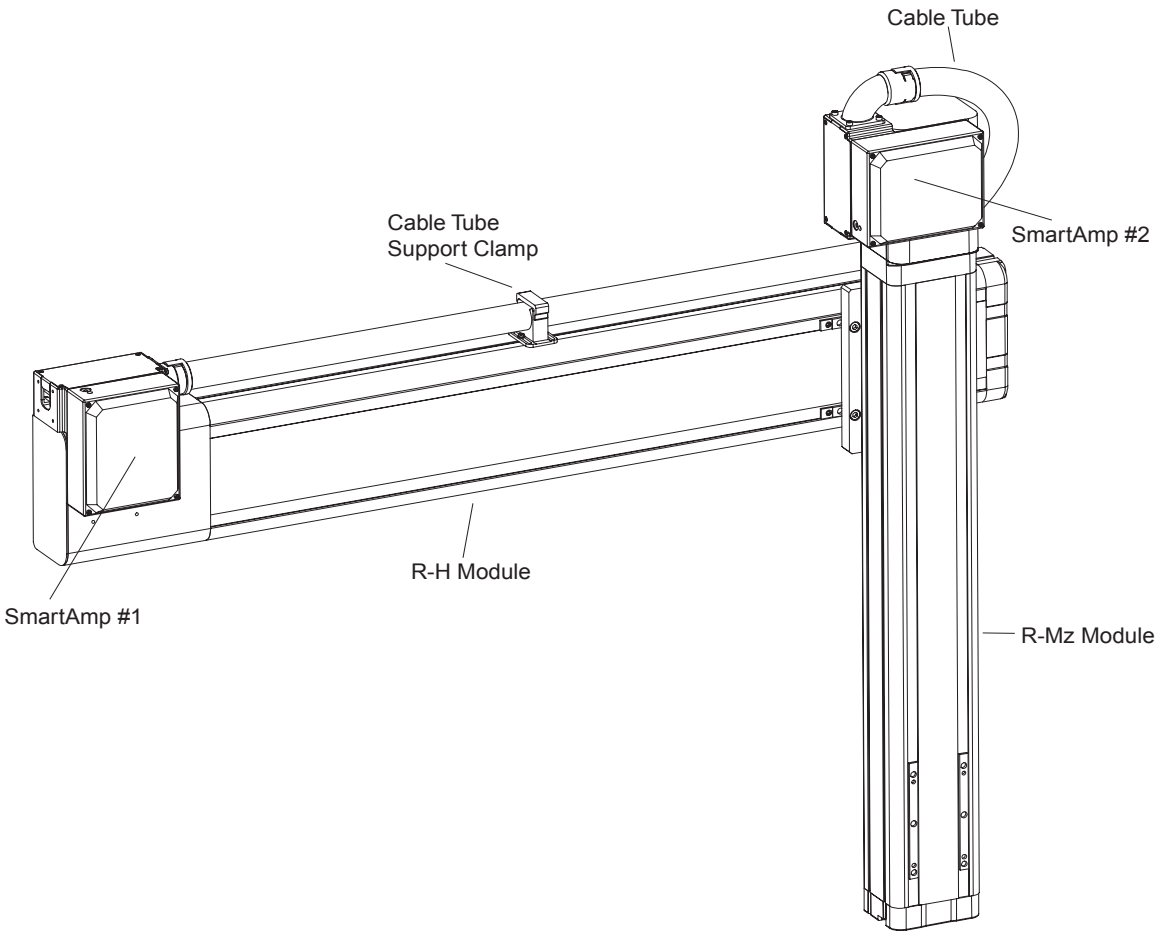


Figure 4-34. R-K(HMz): System Component Overview

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Table 4-4. R-K(HMz) Parts List

Description	Part Number	Qty
R-H module	9040x-1xxxx	1
R-Mz module	9040x-2xxxx	1
SmartAmp	30410-10000	2
SmartAmp mounting bracket	30410-20000	2
Combining bracket, R-DHM	90400-05004	1
Mounting plate, RH	90400-01100	2/3[a]
Cable tube fitting, elbow	40410-40090	1[a]
Cable tube fitting, straight	40410-40000	1[a]
Cable tube, hi-flex	40410-310xx	1
Cable tube clamp	30410-42000	1[a]
Cable kit, amp to amp AC power cable 24V DC cable IEEE 1394 cable	90410-100xx 10410-006xx 10410-007xx 10410-005xx	1
Cable kit, controller AC power cable 24V DC cable IEEE 1394 cable Ferrite core	90410-200xx 10410-009xx 10410-010xx 10410-105xx 27200-00117	1
Hardware kit	90405-00200	1
Optional Items		
Remote I/O (RIO) kit	90410-20050	1[b]

[a] Quantity will vary depending on module length.
[b] Quantity will vary according to order.

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Installing the R-H Module

NOTE: 300 to 600 mm R-H modules use two mounting plates; 800 mm and longer modules use three plates.

1. Prepare the work surface by drilling and tapping eight or twelve M8 holes (depending on module length) for the R-H module mounting plates. See "**Chapter 10** - Technical Specifications" for dimensions of the R-H module and the plates.
2. Install R-H module mounting plates (two or three, depending on module length) to the under side of the R-H module using four M8 x 20 screws provided for each plate. See **Figure 4-35**.

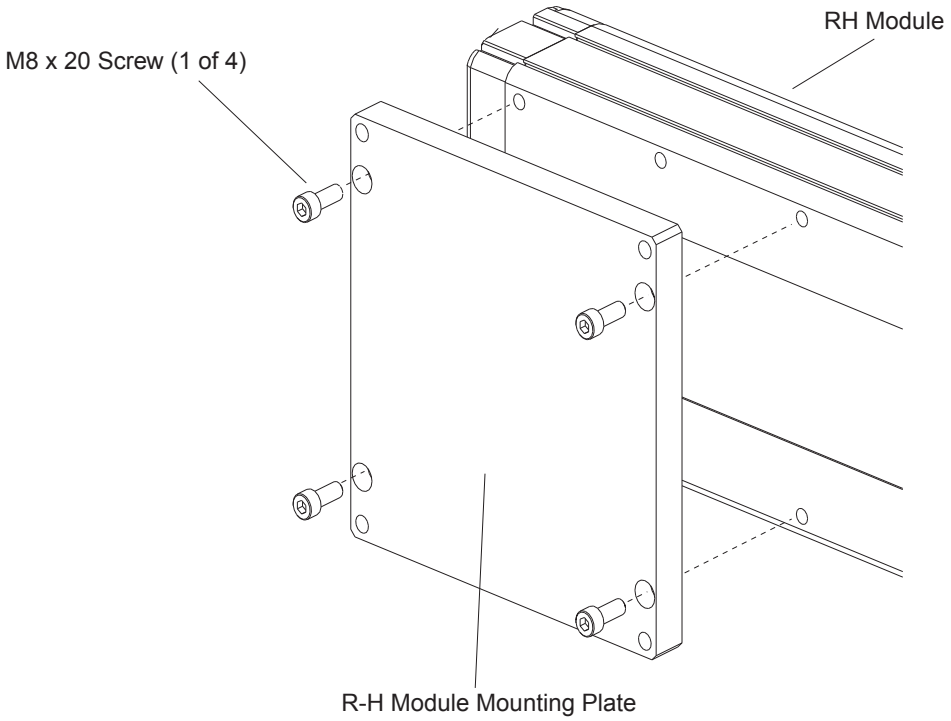


Figure 4-35. R-K(HMz): Installing the R-H Module

3. Mount the R-H module to the work surface using four M8 screws per R-H-module mounting plate.

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Installing the R-Mz Module

1. Mount the R-DHM combining bracket to the R-Mz module with four M6 x 20 screws. Position the bracket as shown in **Figure 4-36**. Align the pins on the combining bracket with the mating holes in the module.

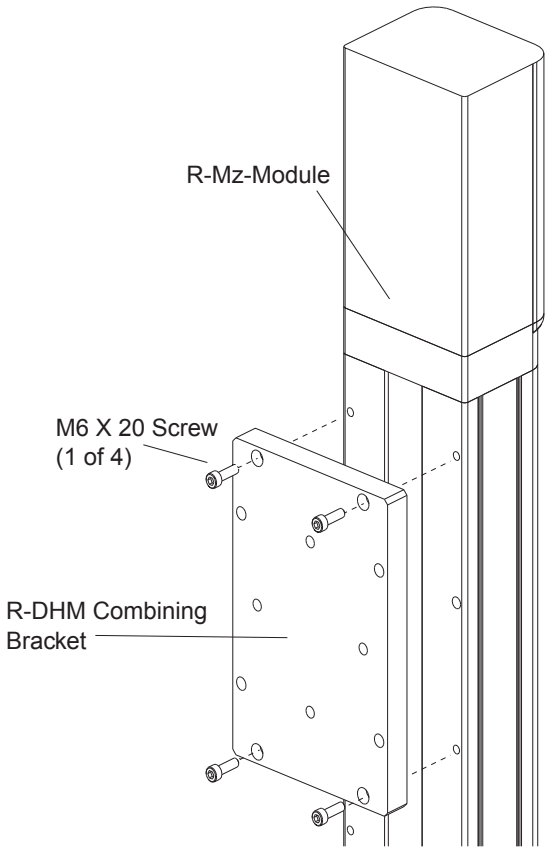


Figure 4-36. R-K(HMz): Installing the R-DHM Combining Bracket

2. Using the R-DHM combining bracket, mount the R-Mz module on the R-H module's slider with four M8 x 20 screws. See **Figure 4-37**. Align the pins on the combining bracket with the mating holes in the module's slider.

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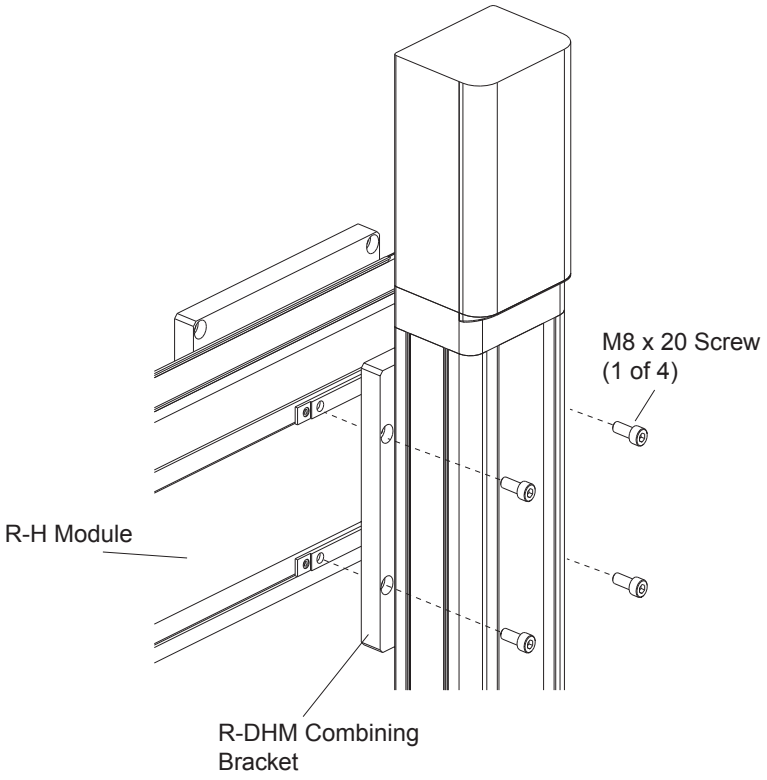


Figure 4-37. R-K(HMz): Installing the R-Mz Module

Installing Adept SmartAmps

Installing SmartAmp #1 on the R-H Module

1. Remove the cable cover from a SmartAmp mounting bracket by removing four M3 screws.
2. Install the mounting bracket onto the R-H module at the motor cover using four M4 x 10 flathead screws; see **Figure 4-38 on page 111**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-H module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install the SmartAmp onto the mounting bracket.
3. Install SmartAmp #1 onto the mounting bracket using four M3 x 40 screws. See **Figure 4-39 on page 112**.
4. Plug the motor and encoder cables from the module into the mating receptacles in the SmartAmp. See **Figure 4-8 on page 73**. Attach the captive screws to secure the encoder connector.

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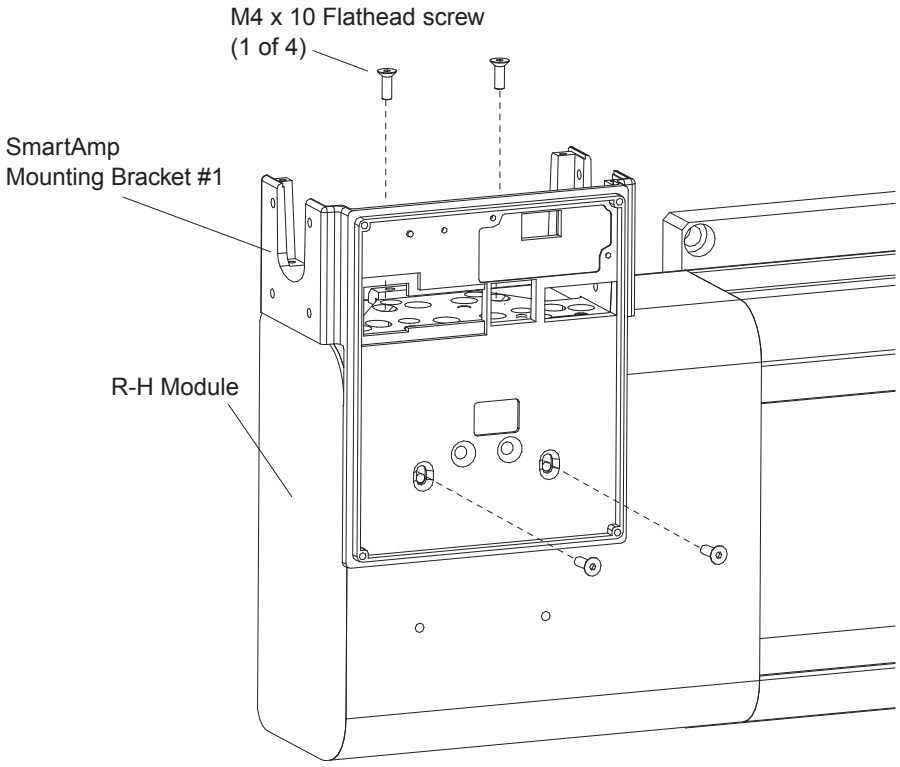


Figure 4-38. R-K(HMz): Installing SmartAmp Mounting Bracket #1 on the R-H Module

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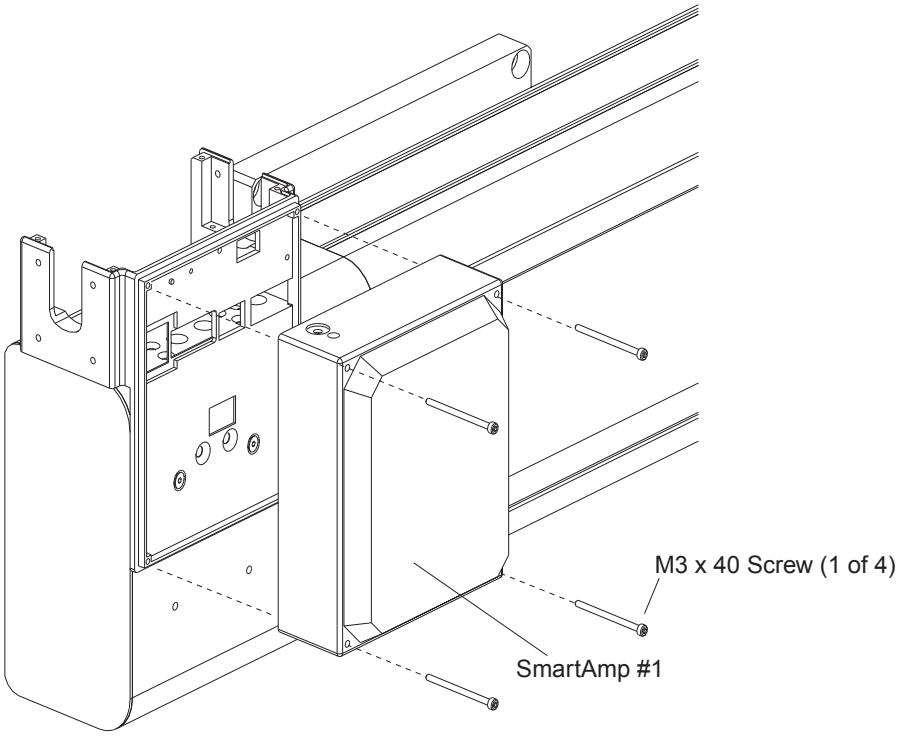


Figure 4-39. R-K(HMz): Installing SmartAmp #1 on the R-H Module

Installing SmartAmp #2 on the R-Mz Module

1. Remove the cable cover from the other SmartAmp mounting bracket by removing four M3 screws.
2. Install a SmartAmp mounting bracket onto the R-Mz module using four M4 x 10 flathead screws; see **Figure 4-40**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-Mz module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install SmartAmp #2 onto the mounting bracket.

3. Install SmartAmp #2 onto the mounting bracket using four M3 x 40 screws. Position the SmartAmp so that the connectors extend through the mounting bracket. See **Figure 4-41 on page 113**.
4. Plug the motor and encoder cables from the module into the mating receptacles in SmartAmp #2. See **Figure 4-8 on page 73**. Attach the captive screws to secure the encoder connector.

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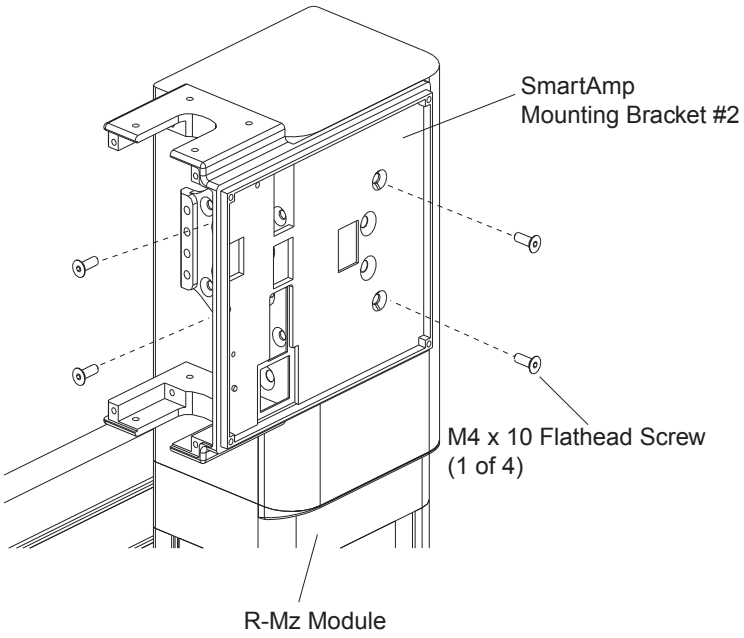


Figure 4-40. R-K(HMz): Installing SmartAmp Mounting Bracket #2 on the R-Mz Module

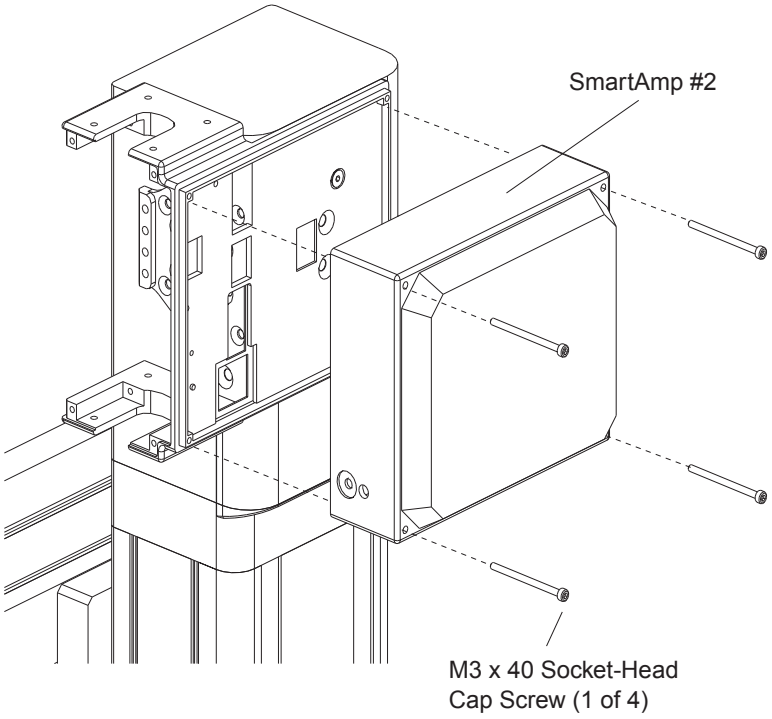


Figure 4-41. R-K(HMz): Installing SmartAmp #2 on the R-Mz Module

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Installing the Cable Tube Support Clamp on R-H Module

1. Slide two T-slot nuts into the upper side channel in the R-H module; see **Figure 4-11 on page 76**. (Note that this illustration shows the cable tube clamp rotated 90 degrees. **Figure 4-42** shows the correct orientation for the cable tube support clamp.) Position the nuts for installing the cable tube support clamp.

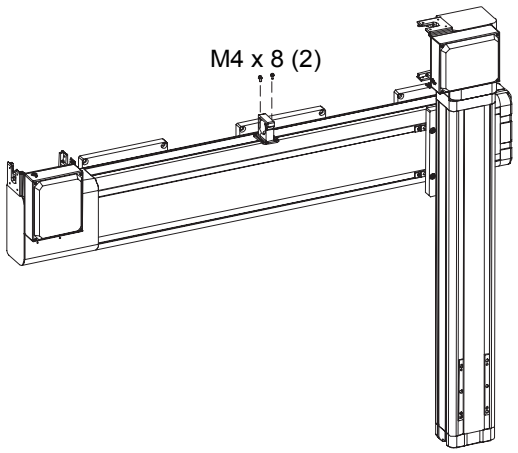


Figure 4-42. R-K(HMz): Cable Tube Support Clamp

2. Install the cable tube support clamp using two M4 x 8 screws. Leave the M4 screws loose for repositioning later after the cable tube has been installed.

Installing Cable Tube Assembly Between Amp #1 and Amp #2

The procedure to install cables consists of these steps:

- route cables through the cable tube
- install cable tube fittings on cable tube
- install assembled cable tube on SmartAmp mounting bracket and plug in all cables

The lengths of the cables and cable tube depend on which modules you have ordered.

Routing Cables Through Cable Tube

1. Locate three cables in the cable kit.
   - AC power cable
   - 24VDC cable
   - IEEE 1394 cable

   See **Figure 4-13 on page 79**.
2. Group the three cables together, plus any additional user cables or air lines, and slide them through the cable tube.

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3. Gently pull the cables through the tube until they are evenly spaced at each end. Try to make sure the cables do not get twisted or tangled as you pull them through the tube.

Installing Cable Tube Fittings on Cable Tube

NOTE: For both cable tube fittings, make sure the arrows on the fitting clamp are pointing toward the end of the tube.

1. Locate a straight cable tube fitting.

   NOTE: The 24V cable has two additional connectors for the optional RIO system. There is a socket (latched) connector at one end of the cable and a pin connector at the other end. Install the straight cable tube fitting on the end near the 24V pin connector; install the elbow fitting on the other end. See **Figure 4-13 on page 79**.

2. Install the fitting by pushing it onto the end of the cable tube until the fitting has fully snapped into place inside the fitting. See **Figure 4-13 on page 79**.
3. Locate an elbow cable tube fitting.
4. Install the fitting by pushing it onto the opposite end of the cable tube until the fitting has fully snapped into place inside the fitting.

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #1

1. Remove the cable clamp from inside the mounting bracket by removing the two M3 screws. See **Figure 4-15 on page 82** for reference.
2. Position the cable tube assembly next to the R-H module with the straight fitting near SmartAmp #1.
3. Install the straight fitting on the outside of the mounting bracket. Make sure the fitting clamp is accessible. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See **Figure 4-16 on page 82** for reference.

   NOTE: **Figure 4-15** and **Figure 4-16** show the module rotated 90 degrees. See **Figure 4-43** for the proper orientation of the cable tube.

4. In SmartAmp #1, connect these cables:
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable

   There are two identical mating connectors for each cable in the SmartAmp, you can use either one. See **Figure 4-14 on page 81**.

5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

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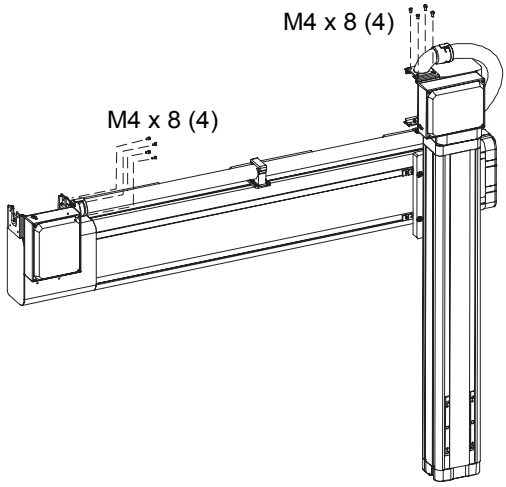


Figure 4-43. R-K(HMz): Cable Tube Fittings

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #2

1. Remove the cable clamp from inside mounting bracket #2 by removing the two M3 screws.
2. Fold the cable tube up 180 degrees so the elbow fitting is positioned next to mounting bracket #2. See **Figure 4-44**.
3. Install the elbow fitting on the outside of the mounting bracket. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See **Figure 4-44**.
4. In SmartAmp #2, connect these cables (see **Figure 4-14 on page 81**):
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

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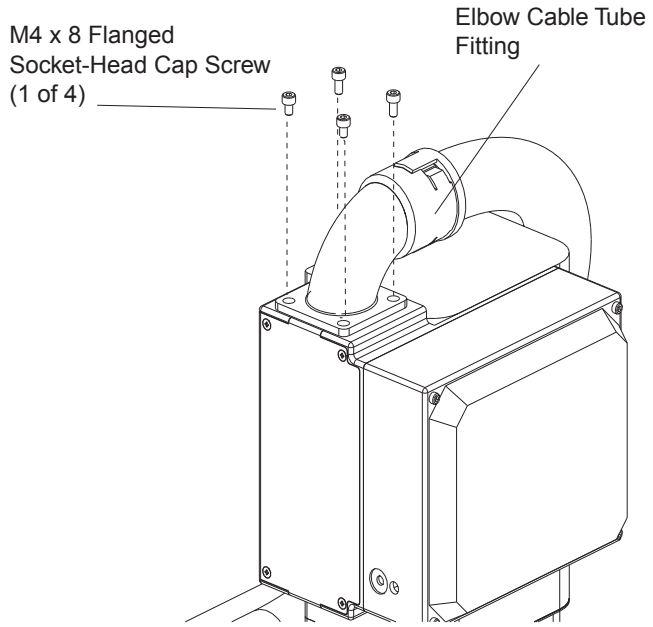


Figure 4-44. R-K(HMz): Installing the Elbow Cable Tube Fitting on SmartAmp Bracket #2

7. Slide the cable tube support clamp to the desired position and snap the tube into place. Tighten the screws on the clamp to secure it.

Connecting Cables from Controller to SmartAmp #1

See **"Connecting Cables from Controller to SmartAmp #1" on page 51** for instructions.

Completing the Installation

Perform these steps to complete the installation.

- After you connect all the cables inside the SmartAmp, attach the cable cover to the SmartAmp bracket using four M3 screws.
- Check the mechanical motion of each axis. (Modules with brakes must be checked when the power is turned on.)

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4.6 R-K(MSz) Installation Procedure

Overview

This section describes the process of installing a two-axis R-K(MSz) Adept SmartModules system. This configuration consists of one R-M and one R-Sz module joined together with a R-DMS combining bracket. Each R-M and R-Sz module has a SmartAmp and a SmartAmp mounting bracket. A cable tube assembly contains the cabling to interconnect the SmartAmps. See **Figure 4-45** for an overview of the system components.

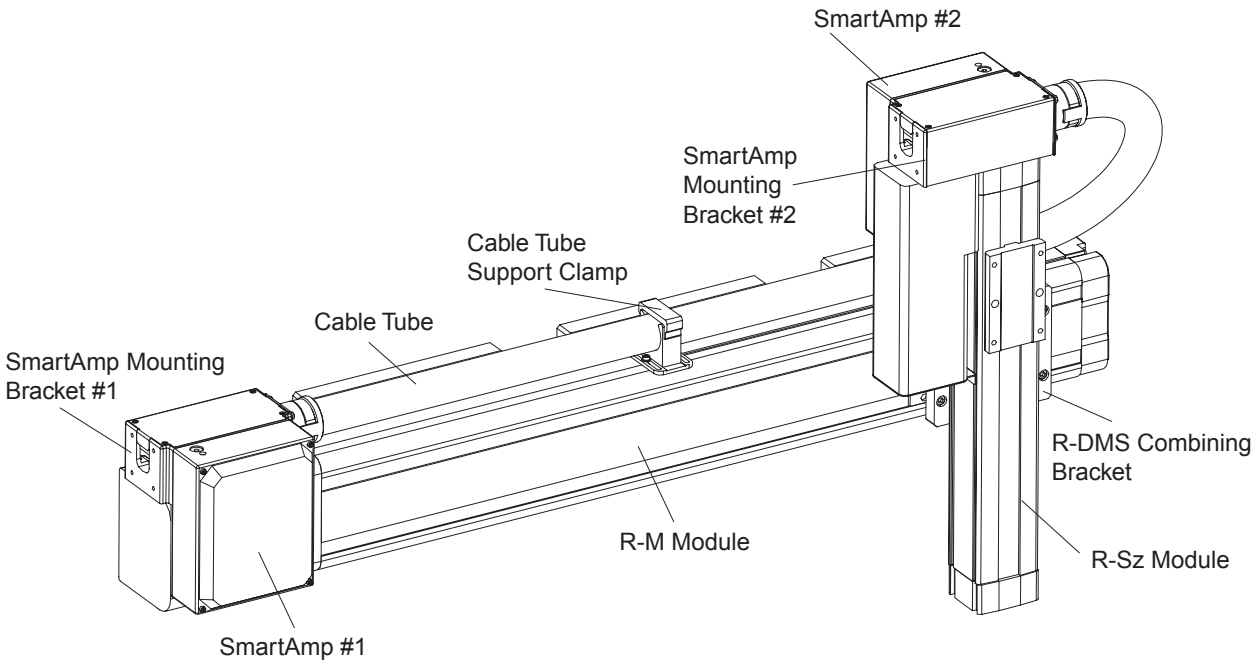


Figure 4-45. R-K(MSz): System Component Overview

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Table 4-5. R-K(MSz) Parts List

Description	Part Number	Qty
R-Sz module	9040x-4xxxx	1
R-M module	9040x-2xxxx	1
SmartAmp	30410-10000	2
SmartAmp mounting bracket	30410-20000	2
Combining bracket, R-DMS	90400-05006	1
Mounting plate, RM	90400-01200	2/3[a]
Cable tube fitting, elbow	40410-40090	0[a]
Cable tube fitting, straight	40410-40000	2[a]
Cable tube, hi-flex	40410-310xx	1
Cable tube clamp	30410-42000	1[a]
Cable kit, amp to amp AC power cable 24V DC cable IEEE 1394 cable	90410-100xx 10410-006xx 10410-007xx 10410-005xx	1
Cable kit, controller AC power cable 24V DC cable IEEE 1394 cable Ferrite core	90410-200xx 10410-009xx 10410-010xx 10410-105xx 27200-00117	1
Hardware kit	90405-00200	1
Optional Items		
Remote I/O (RIO) kit	90410-20050	1[b]

[a] Quantity will vary depending on module length.
[b] Quantity will vary according to order.

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Installing the R-M Module

NOTE: R-M modules less than 750 mm long require two mounting plates; R-M modules longer than 750 mm require three mounting plates.

1. Prepare the work surface by drilling and tapping eight or twelve M8 holes (depending on the number of mounting plates required) for the R-M-module mounting plates. See **Figure 4-46**. See "**Chapter 10** - Technical Specifications" for dimensions of the R-M module and the plates.
2. Install two or three R-M-module mounting plates to the back side of the R-M module using four M6 x 20 screws provided for each plate. See **Figure 4-46**.
3. Mount the R-M module to the work surface using four M8 screws per mounting plate.

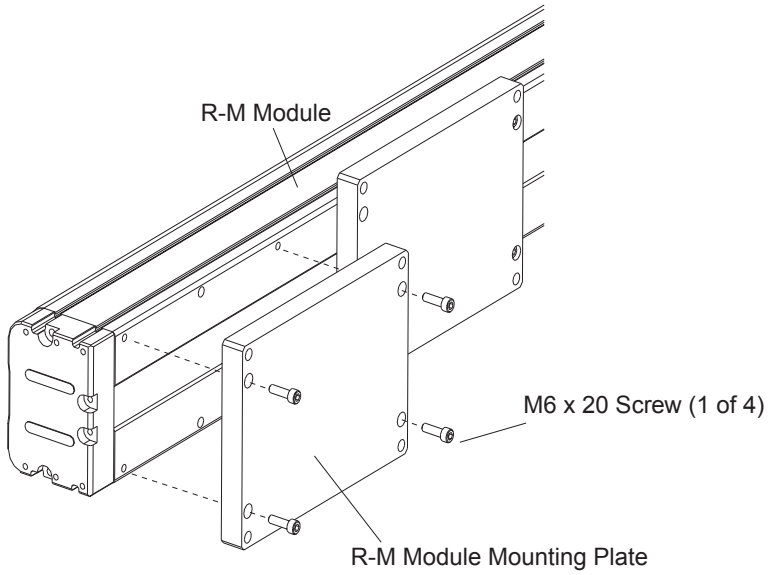


Figure 4-46. R-K(MSz): Installing the R-M Module

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Installing Alignment Pins on the R-DMS Bracket

1. Locate the R-DMS combining bracket, two 8mm round pins, and two 8mm diamond pins.
2. Install a round pin and a diamond pin on each side of the R-DMS combining bracket. See **Figure 4-47**. Note the hole configuration shown in the drawing to identify where to install the pins. Also, note the orientation of the diamond pins in the drawing. Use Loctite 609 sealant or equivalent to secure the pins in place.

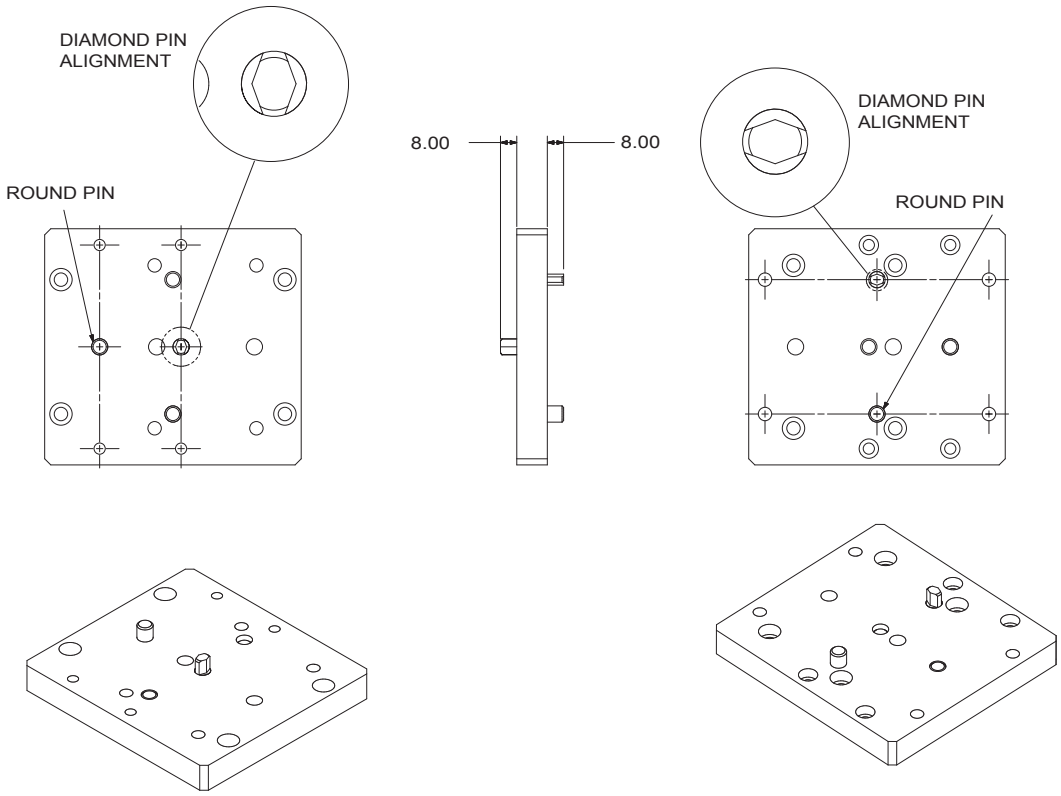


Figure 4-47. R-K(MSz): Installing Alignment Pins on the R-DMS Combining Bracket

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Installing the R-Sz Module

1. Mount the R-DMS combining bracket to the R-Sz module with four M5 x 16 screws. Position the bracket as shown in **Figure 4-48**. Align the pins on the bracket with the mating holes in the module.

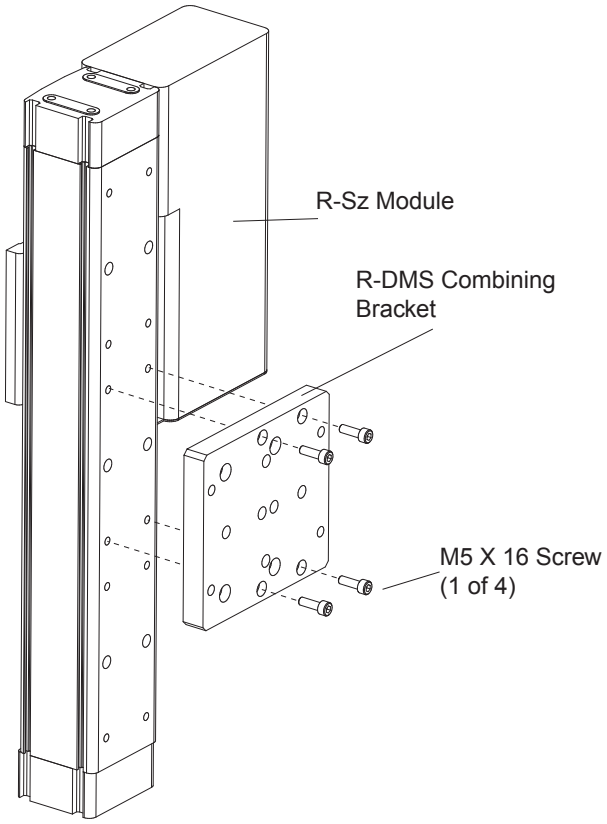


Figure 4-48. R-K(MSz): Installing the R-DMS Combining Bracket

2. Using the R-DMS combining bracket, mount the R-Sz module on the R-M module's slider with four M6 x 20 screws. See **Figure 4-49**. Align the pins on the bracket with the mating holes in the module's slider.

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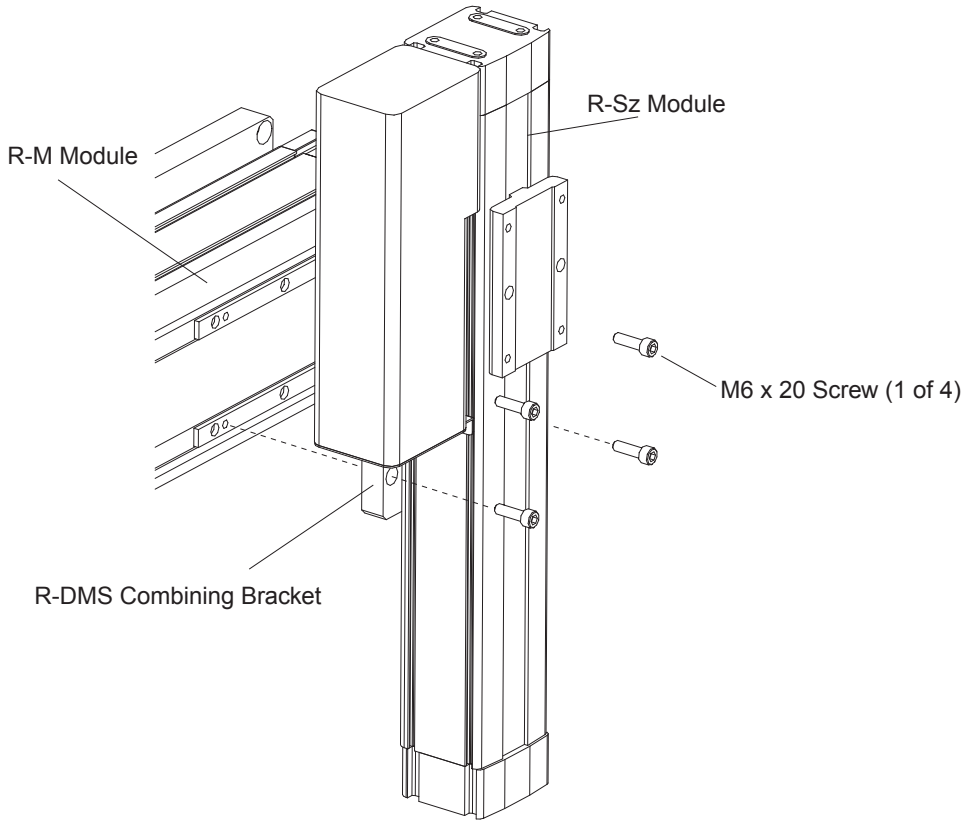


Figure 4-49. R-K(MSz): Installing the R-Sz Module

Installing Adept SmartAmps

Installing SmartAmp #1 on the R-M Module

1. Remove the cable cover from a SmartAmp mounting bracket by removing four M3 screws.
2. Install the mounting bracket onto the R-M module at the motor cover using four M4 x 10 flathead screws; see **Figure 4-50 on page 124**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-M module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install the SmartAmp onto the mounting bracket.

3. Install SmartAmp #1 onto the mounting bracket using four M3 x 40 screws. See **Figure 4-51 on page 124**.
4. Plug the motor and encoder cables from the module into the mating receptacles in the SmartAmp. See **Figure 4-8 on page 73**. Attach the captive screws to secure the encoder connector.

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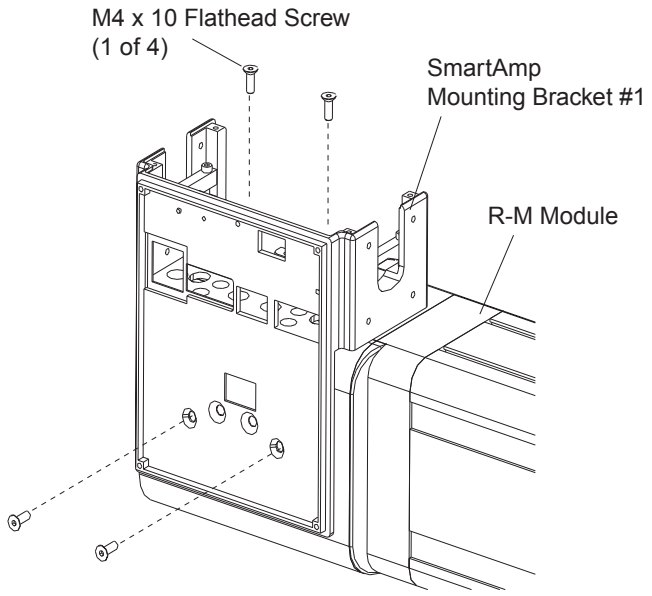


Figure 4-50. R-K(MSz): Installing SmartAmp Mounting Bracket #1 on the R-M Module

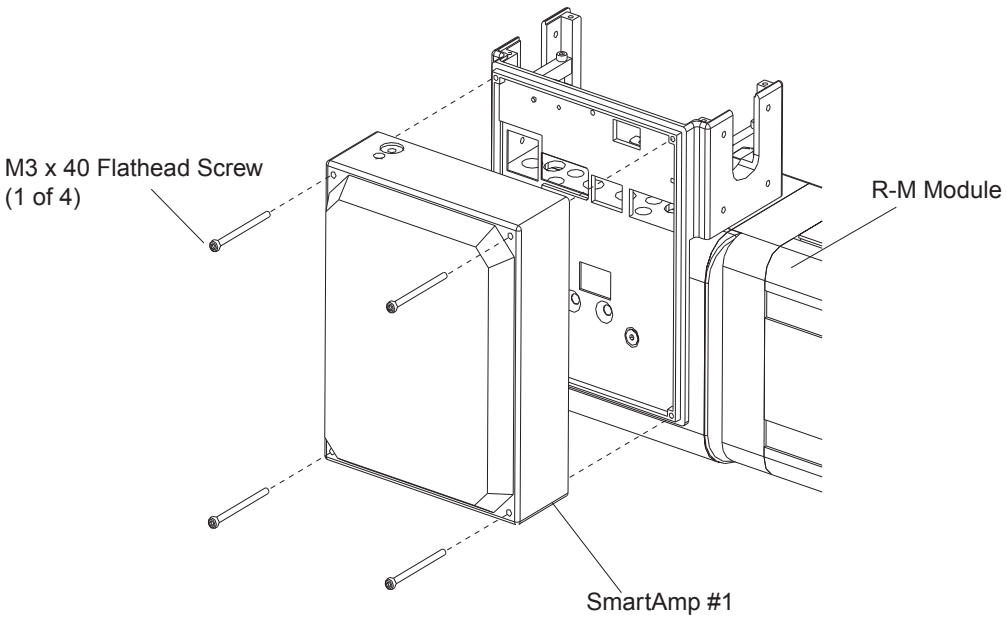


Figure 4-51. R-K(MSz): Installing SmartAmp #1 on the R-M Module

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Installing SmartAmp #2 on the R-Sz Module

1. Remove the cable cover from the other SmartAmp mounting bracket by removing four M3 screws.
2. Install a SmartAmp mounting bracket onto the R-Sz module using four M5 x 10 flathead screws; see **Figure 4-52**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-Sz module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install SmartAmp #2 onto the mounting bracket.

3. Install SmartAmp #2 onto the mounting bracket using four M3 x 40 screws. Position the SmartAmp so that the connectors extend through the mounting bracket. See **Figure 4-53 on page 126**.
4. Plug the motor and encoder cables from the module into the mating receptacles in SmartAmp #2. See **Figure 4-8 on page 73**. Attach the captive screws to secure the encoder connector.

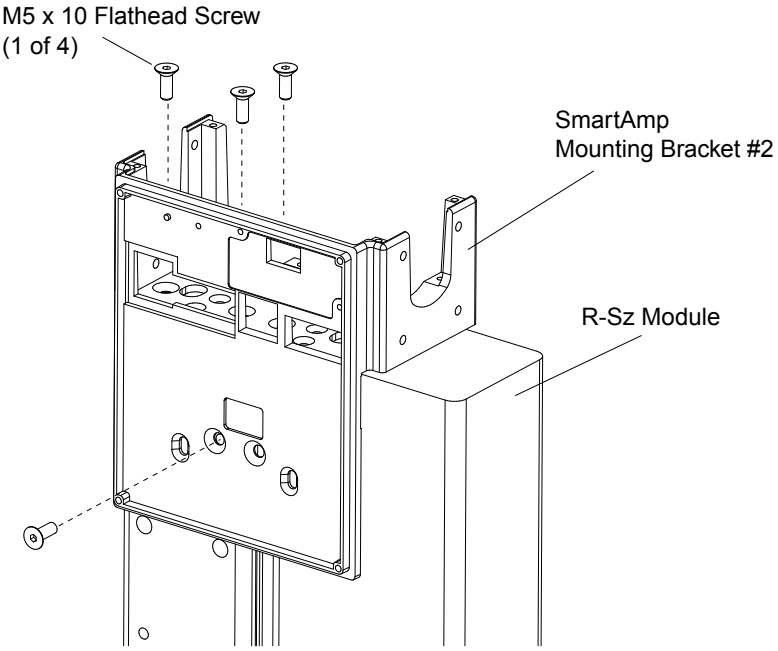


Figure 4-52. R-K(MSz): Installing SmartAmp Mounting Bracket #2 on the R-Sz Module

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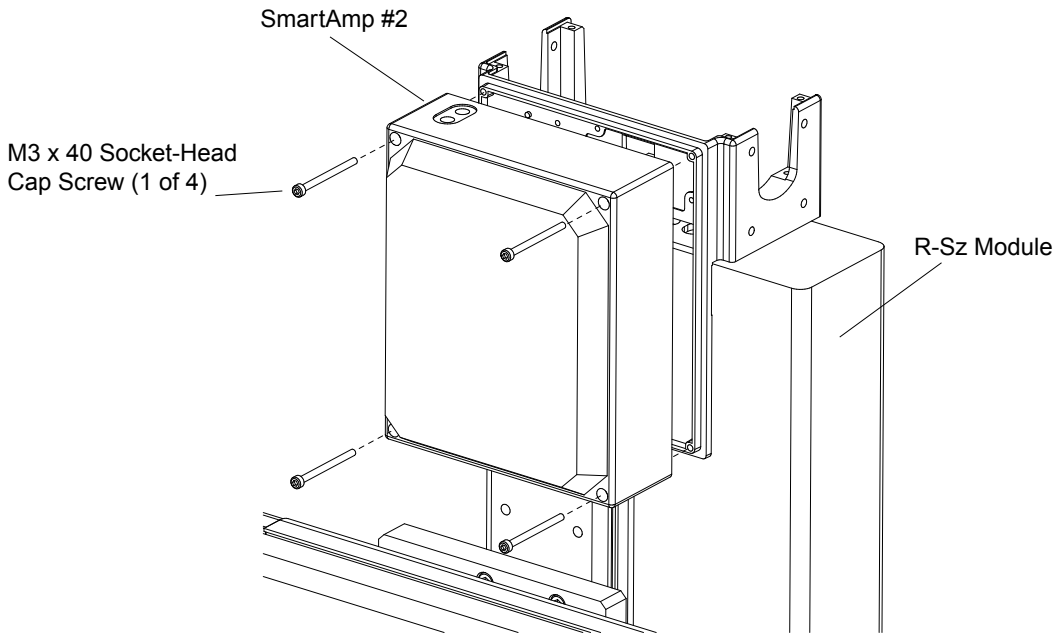


Figure 4-53. R-K(MSz): Installing SmartAmp #2 on the R-Sz Module

Installing the Cable Tube Support Clamp on R-M Module

1. Slide two T-slot nuts into the upper side channel in the R-M module. Position the nuts for installing the cable tube support clamp. See **Figure 4-54**. (See **Figure 4-11 on page 76** for an illustration of how to install the T-Slot Nuts.)

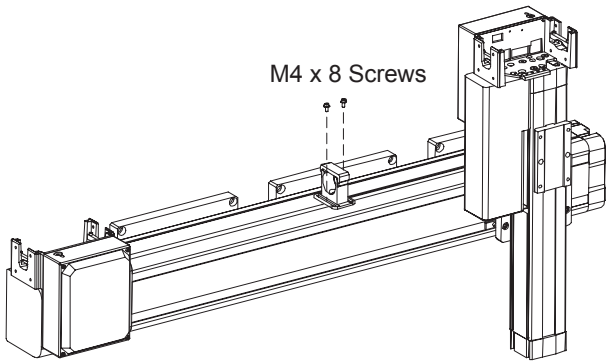


Figure 4-54. R-K(MSz): Cable Tube Support Clamp

2. Install the cable tube support clamp using two M4 x 8 screws. Leave the M4 screws loose for repositioning later after the cable tube has been installed.

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Installing Cable Tube Assembly Between Amp #1 and Amp #2

The procedure to install cables consists of these steps:

- route cables through the cable tube
- install cable tube fittings on cable tube
- install assembled cable tube on SmartAmp mounting brackets and plug in all cables

The lengths of the cables and cable tube depend on which modules you have ordered.

Routing Cables Through Cable Tube

1. Locate three cables in the cable kit.
   - AC power cable
   - 24VDC cable
   - IEEE 1394 cable

   See **Figure 4-55 on page 128**.
2. Group the three cables together, plus any additional user cables or air lines, and slide them through the cable tube.
3. Gently pull the cables through the tube until they are evenly spaced at each end. Try to make sure the cables do not get twisted or tangled as you pull them through the tube.

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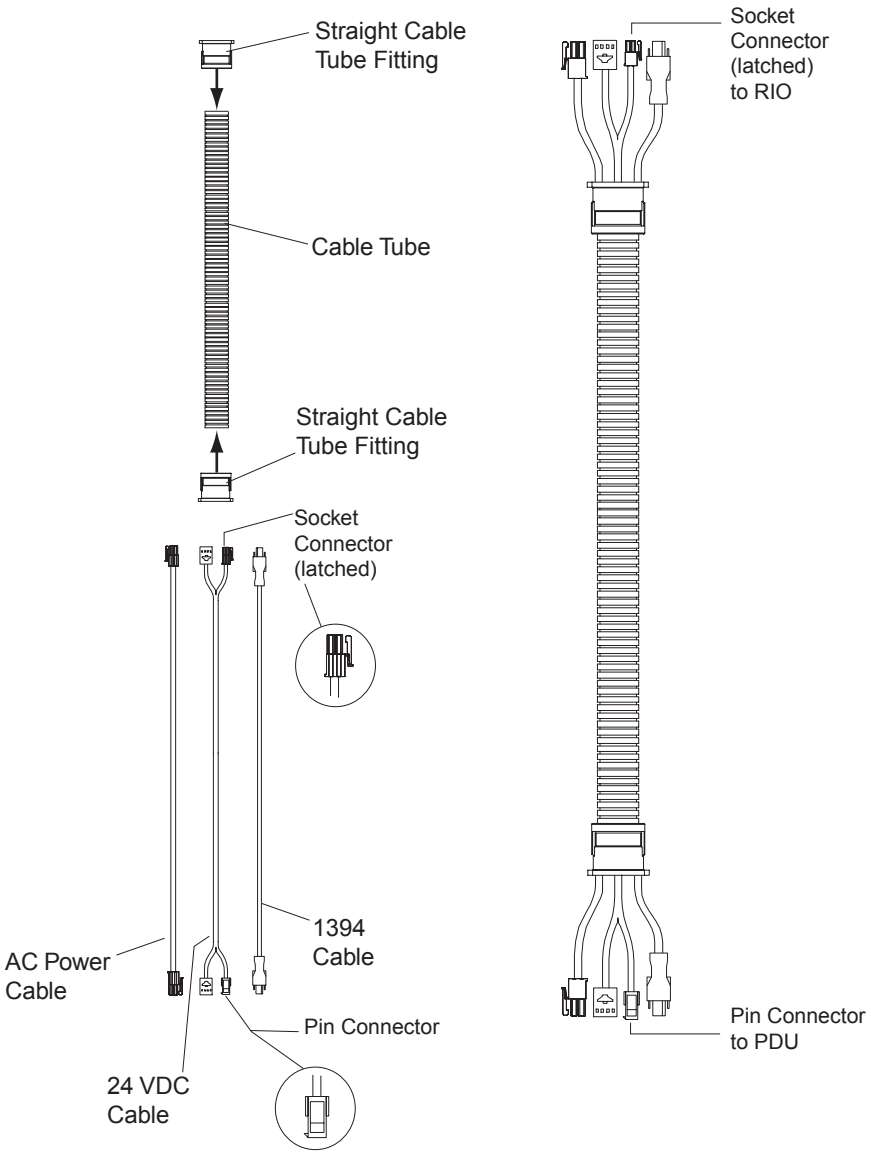


Figure 4-55. R-K(MSz): Cable Tube Assembly (Two Straight Fittings)

Installing Cable Tube Fittings on Cable Tube

NOTE: For both cable tube fittings, make sure the arrows on the fitting clamp are pointing toward the end of the tube.

1. Locate one of the straight cable tube fittings.

   NOTE: The 24V cable has two additional connectors for the optional RIO system. There is a socket (latched) connector at one end of the cable and a pin connector at the other end. Install the straight cable tube fitting with the 24V pin connector on SmartAmp #1; install the other straight fitting on SmartAmp #2. See **Figure 4-55**.

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2. Install the fitting by pushing it onto the end of the cable tube until the fitting has fully snapped into place inside the fitting. See **Figure 4-55**.
3. Locate the other straight cable tube fitting.
4. Install the fitting by pushing it onto the opposite end of the cable tube until the fitting has fully snapped into place inside the fitting.

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #1

1. Remove the cable clamp from inside the mounting bracket by removing the two M3 screws. See **Figure 4-15 on page 82** for an illustration of the cable clamp.
2. Position the cable tube assembly next to the R-M module with the pin connector end of the 24V cable near SmartAmp #1.
3. Install the fitting on the outside of the mounting bracket. Make sure the fitting clamp is accessible. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See **Figure 4-56**.

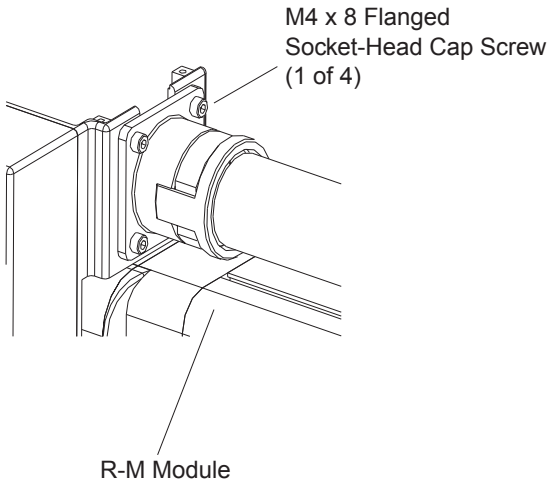


Figure 4-56. R-K(MSz): Installing Cable Tube Fitting on SmartAmp Mounting Bracket #1

4. In SmartAmp #1, connect these cables:
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable

   There are two identical mating connectors for each cable in the SmartAmp, you can use either one. See **Figure 4-14 on page 81**.
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

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Installing Cable Tube Fitting on SmartAmp Mounting Bracket #2

1. Remove the cable clamp from inside mounting bracket #2 by removing the two M3 screws.
2. Fold the cable tube up 180 degrees so the other straight fitting is positioned next to mounting bracket #2. See **Figure 4-57**.
3. Install the cable tube fitting on the outside of the mounting bracket. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See **Figure 4-57**.
4. In SmartAmp #2, connect these cables (see **Figure 4-14 on page 81**):
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

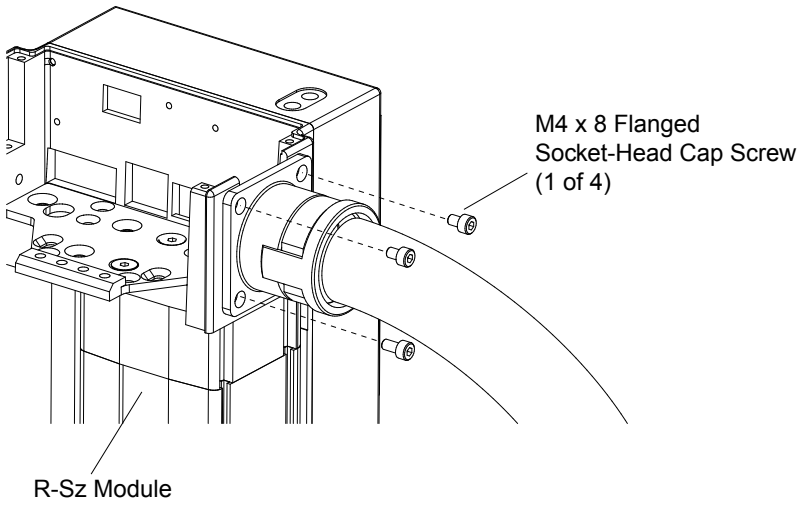


Figure 4-57. R-K(MSz): Installing Cable Tube Fitting on SmartAmp Mounting Bracket #2

7. Slide the cable tube support clamp to the desired position and snap the tube into place. Tighten the screws on the clamp to secure it.

Connecting Cables from Controller to SmartAmp #1

See **"Connecting Cables from Controller to SmartAmp #1" on page 51** for instructions.

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Completing the Installation

Perform these steps to complete the installation.

- After you connect all the cables inside the SmartAmp, attach the cable cover to the SmartAmp bracket using four M3 screws.
- Check the mechanical motion of each axis. (Modules with brakes must be checked when the power is turned on.)

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4.7 R-Z(HMz) Installation Procedure

Overview

This section describes the process of installing a two-axis R-Z(HMz) Adept SmartModules system. This configuration consists of one R-H and one R-Mz module joined together with an R-XHM combining bracket. Each R-H and R-Mz module has a SmartAmp and a SmartAmp mounting bracket. A cable tube assembly contains the cabling to interconnect the SmartAmps. See **Figure 4-58** for an overview of the system components.

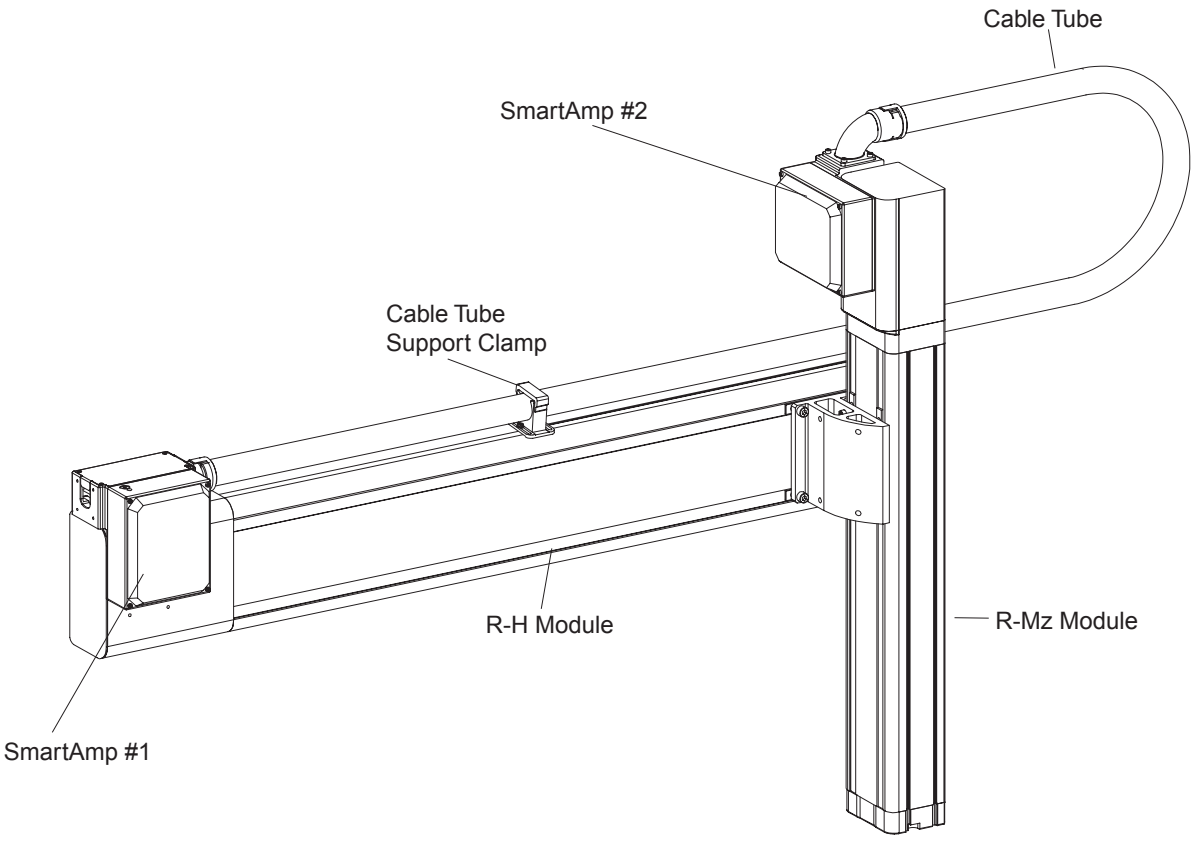


Figure 4-58. R-Z(HMz): System Component Overview

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Table 4-6. R-Z(HMz) Parts List

Description	Part Number	Qty
R-H module	9040x-1xxxx	1
R-Mz module	9040x-2xxxx	1
SmartAmp	30410-10000	2
SmartAmp mounting bracket	30410-20000	2
Combining bracket, R-XHM	90400-05009	1
Mounting plate, RH	90400-01100	2/3[a]
Cable tube fitting, elbow	40410-40090	1[a]
Cable tube fitting, straight	40410-40000	1[a]
Cable tube, hi-flex	40410-310xx	1
Cable tube clamp	30410-42000	1[a]
Cable kit, amp to amp AC power cable 24V DC cable IEEE 1394 cable	90410-100xx 10410-006xx 10410-007xx 10410-005xx	1
Cable kit, controller AC power cable 24V DC cable IEEE 1394 cable Ferrite core	90410-200xx 10410-009xx 10410-010xx 10410-105xx 27200-00117	1
Hardware kit	90405-00200	1
Optional Items		
Remote I/O (RIO) kit	90410-20050	1[b]

[a] Quantity will vary depending on module length.
[b] Quantity will vary according to order.

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Installing the R-H Module

NOTE: 300 to 600 mm R-H modules use two mounting plates; 800 mm and longer modules use three plates.

1. Prepare the work surface by drilling and tapping eight or twelve M8 holes (depending on module length) for the R-H-module mounting plates. See "**Chapter 10** - Technical Specifications" for dimensions of the R-H module and the plates.
2. Install R-H-module mounting plates (two or three, depending on module length) to the back side of the R-H module using four M8 x 20 screws provided for each plate. See **Figure 4-35 on page 108**.
3. Mount the R-H module to the work surface using four M8 screws per R-H-module mounting plate.

Installing the R-Mz Module

1. Mount the R-XHM combining bracket to the R-H module with four M8 x 20 screws. Position the bracket as shown in **Figure 4-59**. Align the pins on the combining bracket with the mating holes in the module's slider.

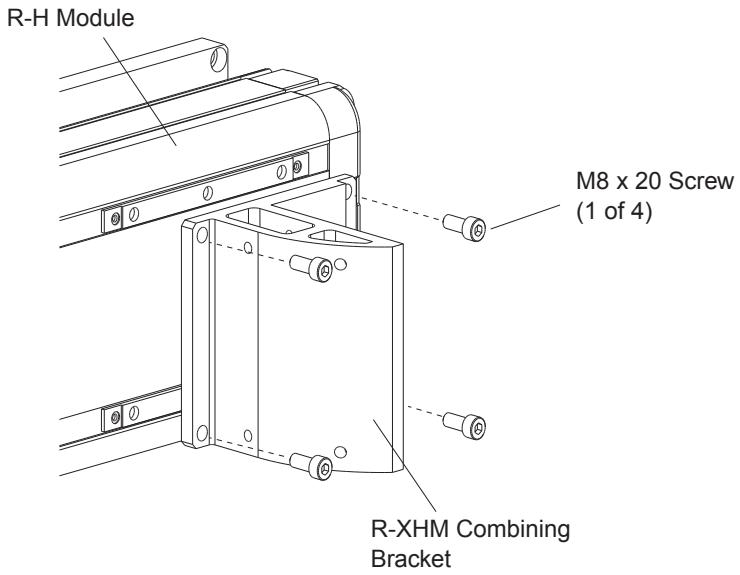


Figure 4-59. R-Z(HMz): Installing the R-XHM Combining Bracket

2. Mount the R-Mz module on the R-XHM combining bracket with four M6 x 20 screws. See **Figure 4-60 on page 135**. Align the pins on the combining bracket with the mating holes in the module's slider.

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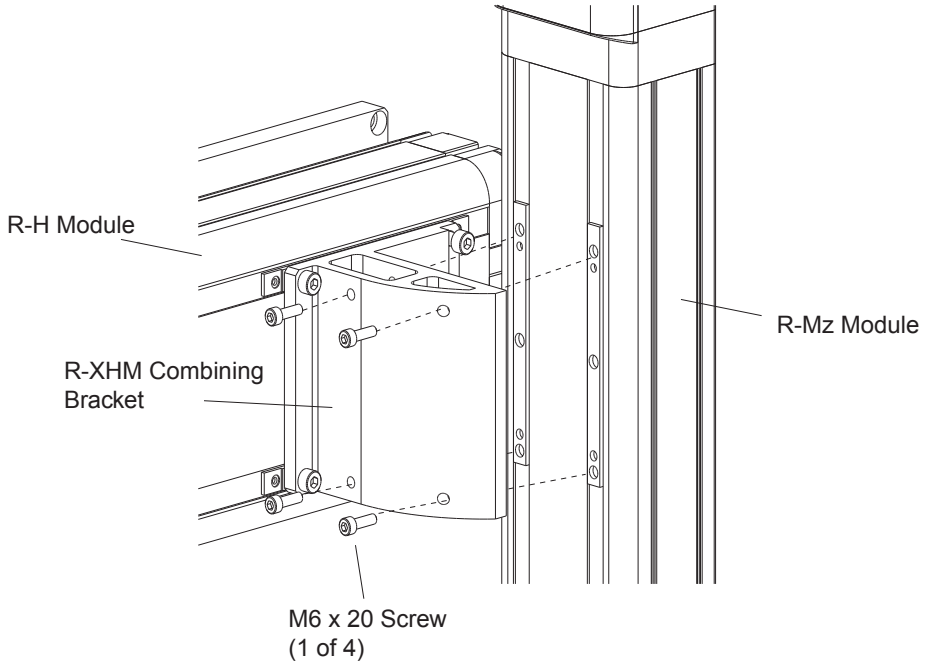


Figure 4-60. R-Z(HMz): Installing the R-Mz Module

Installing Adept SmartAmps

Installing SmartAmp #1 on the R-H Module

1. Remove the cable cover from a SmartAmp mounting bracket by removing four M3 screws.
2. Install the mounting bracket onto the R-H module at the motor cover using four M4 x 10 flathead screws; see **Figure 4-38 on page 111**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-H module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install the SmartAmp onto the mounting bracket.
3. Install SmartAmp #1 onto the mounting bracket using four M3 x 40 screws. See **Figure 4-61 on page 136**.
4. Plug the motor and encoder cables from the module into the mating receptacles in the SmartAmp. See **Figure 4-8 on page 73**. Attach the captive screws to secure the encoder connector.

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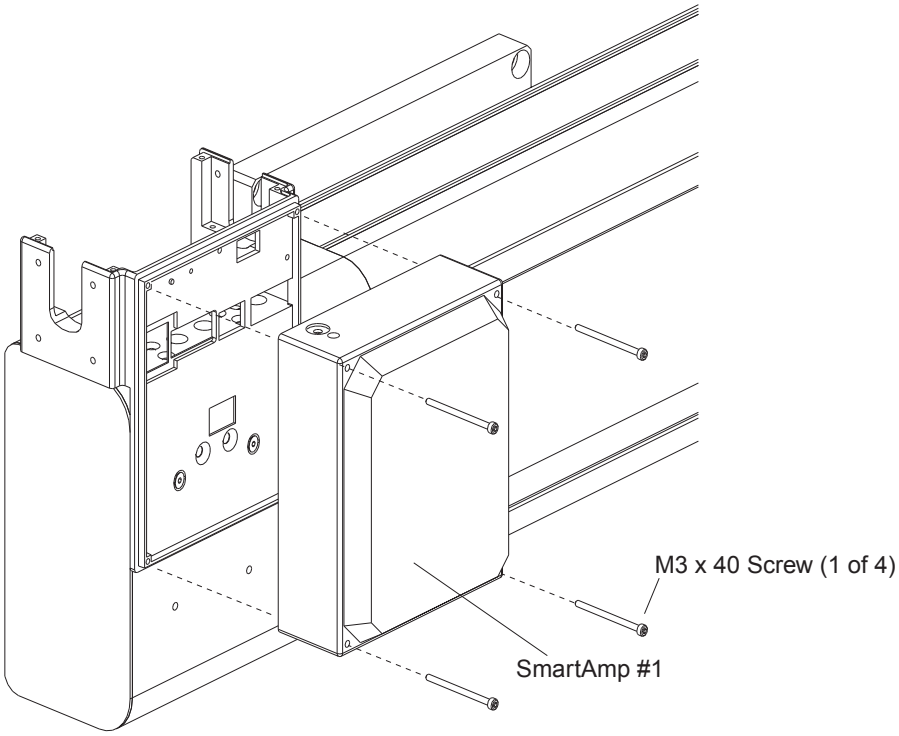


Figure 4-61. R-Z(HMz): Installing SmartAmp #1 on the R-H Module

Installing SmartAmp #2 on the R-Mz Module

1. Remove the cable cover from the other SmartAmp mounting bracket by removing four M3 screws.
2. Install a SmartAmp mounting bracket onto the R-Mz module using four M4 x 10 flathead screws; see **Figure 4-62 on page 137**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-Mz module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install SmartAmp #2 onto the mounting bracket.

3. Install SmartAmp #2 onto the mounting bracket using four M3 x 40 screws. Position the SmartAmp so that the connectors extend through the mounting bracket. See **Figure 4-63 on page 138**.
4. Plug the motor and encoder cables from the module into the mating receptacles in SmartAmp #2. See **Figure 4-8 on page 73**. Attach the captive screws to secure the encoder connector.

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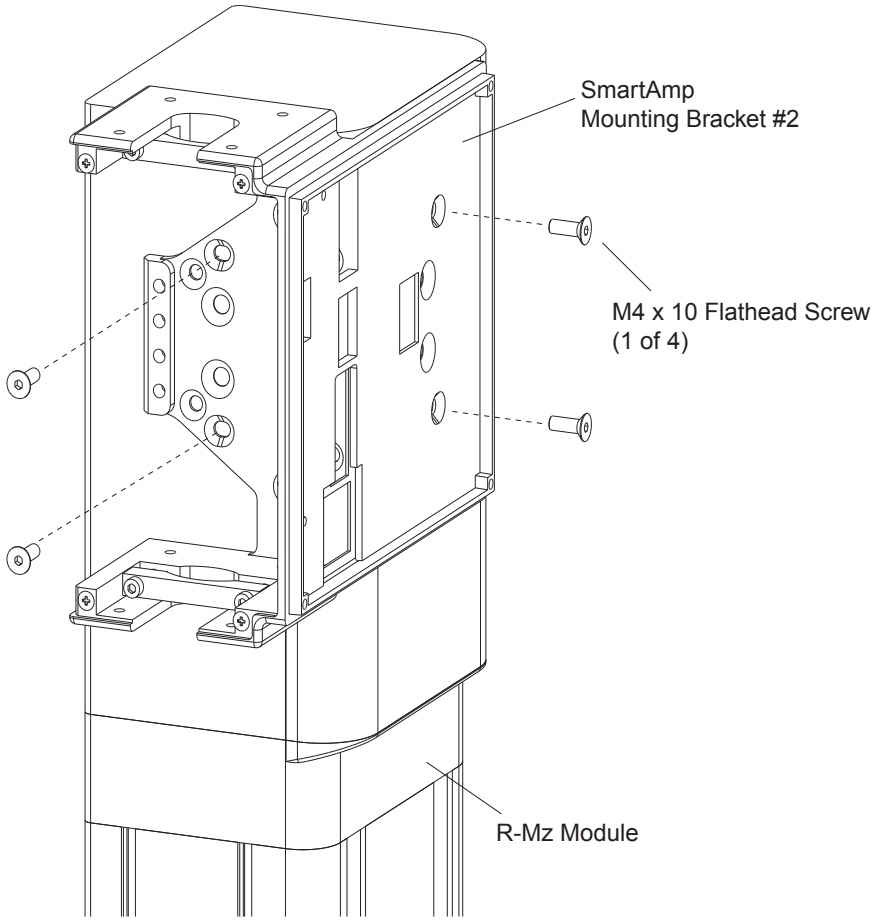


Figure 4-62. R-Z(HMz): Installing SmartAmp Mounting Bracket #2 on the R-Mz Module

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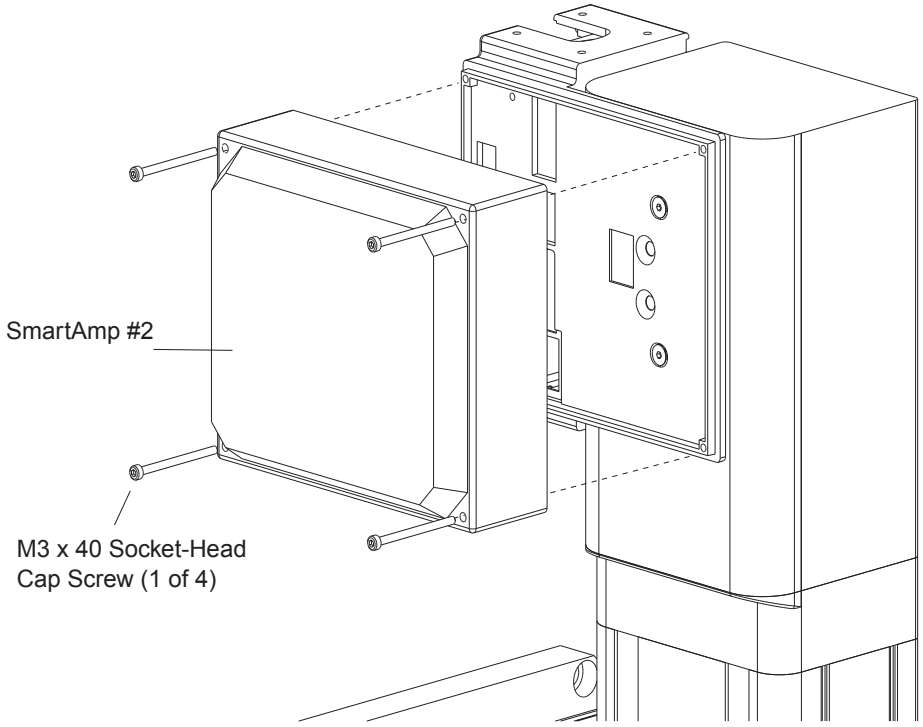


Figure 4-63. R-Z(HMz): Installing SmartAmp #2 on the R-Mz Module

Installing the Cable Tube Support Clamp on the R-H Module

1. Slide two T-slot nuts into the upper side channel in the R-H module; see **Figure 4-11 on page 76**. (Note that this illustration shows the cable tube support clamp rotated 90 degrees. **Figure 4-64** shows the correct orientation for the cable tube support clamp.) Position the nuts for installing the cable tube support clamp.

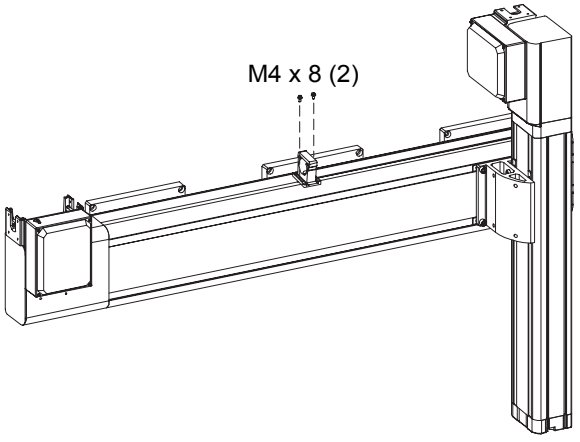


Figure 4-64. R-Z(HMz): Cable Tube Support Clamp

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2. Install the cable tube support clamp using two M4 x 8 screws. Leave the M4 screws loose for repositioning later after the cable tube has been installed.

Installing the Cable Tube Assembly Between Amp #1 and Amp #2

The procedure to install cables consists of these steps:

- route cables through the cable tube
- install cable tube fittings on cable tube
- install assembled cable tube on SmartAmp mounting brackets and plug in all cables

The lengths of the cables and cable tube depend on which modules you have ordered.

Routing Cables Through Cable Tube

1. Locate three cables in the cable kit.
   - AC power cable
   - 24VDC cable
   - IEEE 1394 cable

   See **Figure 4-13 on page 79**.
2. Group the three cables together, plus any additional user cables or air lines, and slide them through the cable tube.
3. Gently pull the cables through the tube until they are evenly spaced at each end. Try to make sure the cables do not get twisted or tangled as you pull them through the tube.

Installing Cable Tube Fittings on Cable Tube

NOTE: For both cable tube fittings, make sure the arrows on the fitting clamp are pointing toward the end of the tube.

1. Locate a straight cable tube fitting.

   NOTE: The 24V cable has two additional connectors for the optional RIO system. There is a socket (latched) connector at one end of the cable and a pin connector at the other end. Install the straight cable tube fitting on the end near the 24V pin connector; install the elbow fitting on the other end. See **Figure 4-13 on page 79**.
2. Install the fitting by pushing it onto the end of the cable tube until the fitting has fully snapped into place inside the fitting. See **Figure 4-13 on page 79**.
3. Locate an elbow cable tube fitting.
4. Install the fitting by pushing it onto the opposite end of the cable tube until the fitting has fully snapped into place inside the fitting.

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Installing Cable Tube Fitting on SmartAmp Mounting Bracket #1

1. Remove the cable clamp from inside the mounting bracket by removing the two M3 screws. See Figure 4-15 on page 82 for reference.
2. Position the cable tube assembly next to the R-H module with the straight fitting near SmartAmp #1.
3. Install the straight fitting on the outside of the mounting bracket. Make sure the fitting clamp is accessible. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See Figure 4-16 on page 82.

   NOTE: Figure 4-15 and Figure 4-16 show the module rotated 90 degrees. See Figure 4-65 for the proper orientation of the cable tube.

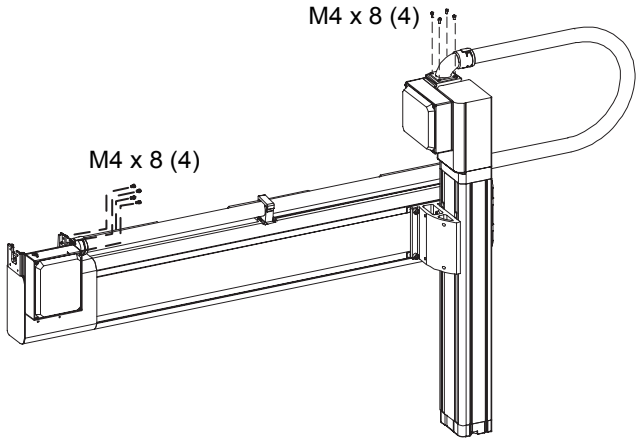


Figure 4-65. R-Z(HMz): Cable Tube Assembly

4. In SmartAmp #1, connect these cables:
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable

   There are two identical mating connectors for each cable in the SmartAmp, you can use either one. See Figure 4-14 on page 81.
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #2

1. Remove the cable clamp from inside mounting bracket #2 by removing the two M3 screws.
2. Fold the cable tube up 180 degrees so the elbow fitting is positioned next to mounting bracket #2. See Figure 4-66 on page 141.
3. Install the elbow fitting on the outside of the mounting bracket. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See Figure 4-66 on page 141.

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4. In SmartAmp #2, connect these cables (see **Figure 4-14 on page 81**):
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

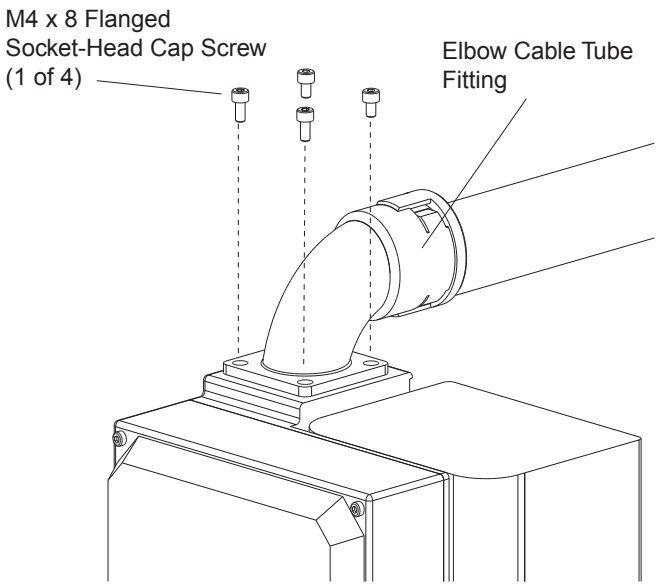


Figure 4-66. R-Z(HMz): Installing Cable Tube Fitting on SmartAmp Mounting Bracket #2

7. Slide the cable tube support clamp to the desired position and snap the tube into place. Tighten the screws on the clamp to secure it.

Connecting Cables from Controller to SmartAmp #1

See **"Connecting Cables from Controller to SmartAmp #1" on page 51** for instructions.

Completing the Installation

Perform these steps to complete the installation.

- After you connect all the cables inside the SmartAmp, attach the cable cover to the SmartAmp bracket using four M3 screws.
- Check the mechanical motion of each axis. (Modules with brakes must be checked when the power is turned on.)

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4.8 R-D(HM) Installation Procedure

Overview

This section describes the process of installing a two-axis R-D(HM) Adept SmartModules system. This configuration consists of one R-H and one R-M module joined together with a R-DHM combining bracket. Each R-H and R-M module has a SmartAmp and a SmartAmp mounting bracket. A cable tube assembly contains the cabling to interconnect the SmartAmps. See **Figure 4-67** for an overview of the system components.

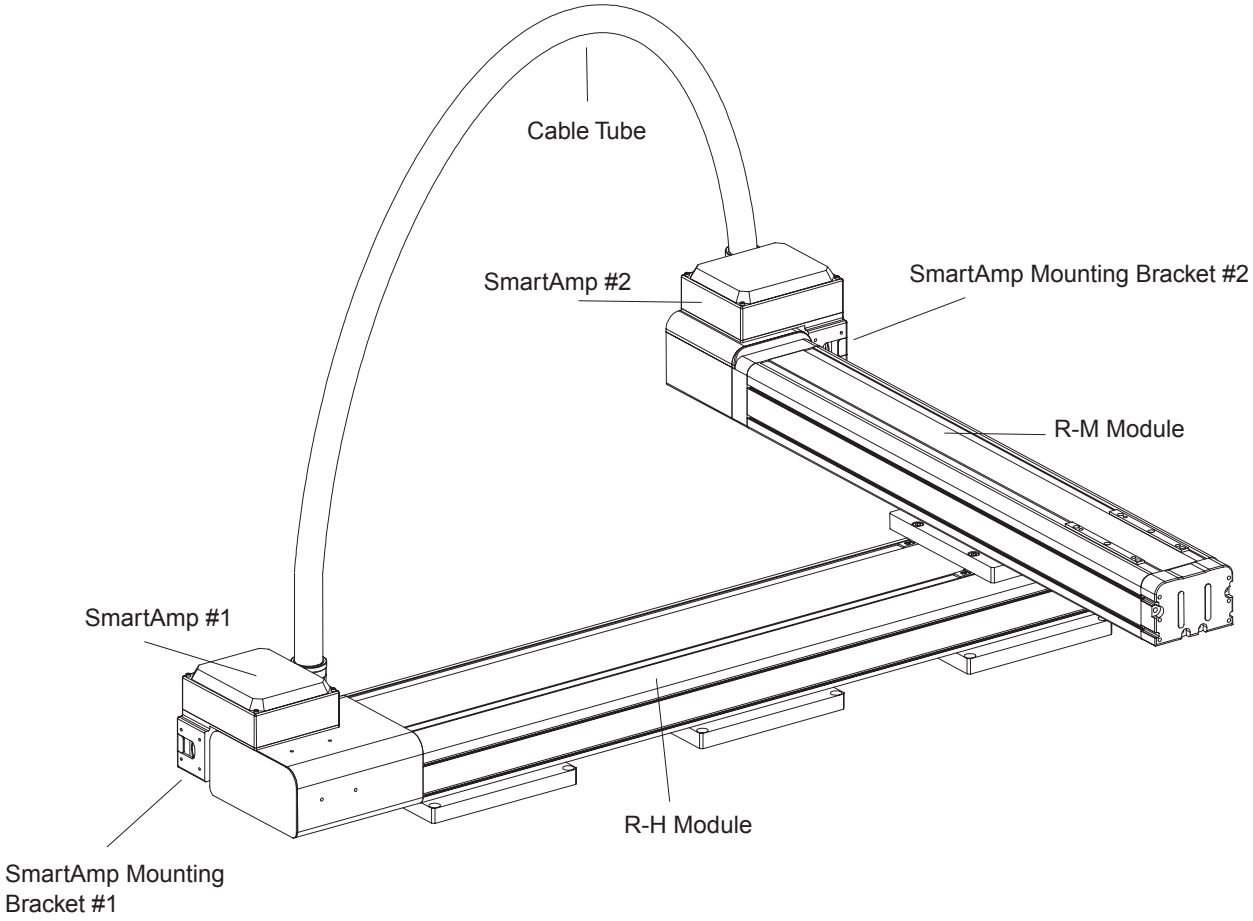


Figure 4-67. R-D(HM): System Component Overview

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Table 4-7. R-D(HM) Parts List

Description	Part Number	Qty
R-H module	9040x-1xxxx	1
R-M module	9040x-2xxxx	1
SmartAmp	30410-10000	2
SmartAmp mounting bracket	30410-20000	2
Combining bracket, R-DHM	90400-05004	1
Mounting plate, RH	90400-01100	2/3[a]
Cable tube fitting, elbow	40410-40090	2
Cable tube, flyover	40410-320xx	1
Cable kit, amp to amp AC power cable 24V DC cable IEEE 1394 cable	90410-100xx 10410-006xx 10410-007xx 10410-005xx	1
Cable kit, controller AC power cable 24V DC cable IEEE 1394 cable Ferrite core	90410-200xx 10410-009xx 10410-010xx 10410-105xx 27200-00117	1
Hardware kit	90405-00200	1
Optional Items		
Remote I/O (RIO) kit	90410-20050	1[b]

[a] Quantity will vary depending on module length.
[b] Quantity will vary according to order.

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Installing the R-H Module

NOTE: 300 to 600 mm R-H modules use two mounting plates; 800 mm and longer modules use three plates.

1. Prepare the work surface by drilling and tapping eight or twelve M8 holes (depending on module length) for the R-H-module mounting plates. See "**Chapter 10** - Technical Specifications" for dimensions of the R-H module and the plates.
2. Install R-H-module mounting plates (two or three, depending on module length) to the under side of the R-H module using four M8 x 20 screws provided for each plate. See **Figure 4-2 on page 68**.
3. Mount the R-H module to the work surface using four M8 screws per R-H-module mounting plate.

Installing the R-M Module

1. Mount the R-DHM combining bracket to the R-M module with four M6 x 20 screws. Position the bracket as shown in **Figure 4-68**. Align the pins on the combining bracket with the mating holes in the module.

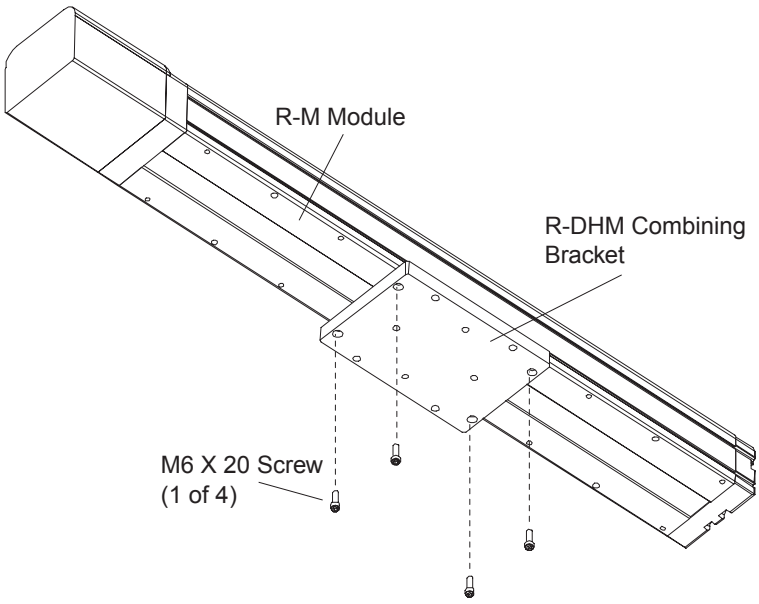


Figure 4-68. R-D(HM): Installing the R-DHM Combining Bracket

2. Using the R-DHM combining bracket. mount the R-M module on the R-H module's slider with four M8 x 20 screws. See **Figure 4-69 on page 145**. Align the pins on the combining bracket with the mating holes in the module's slider.

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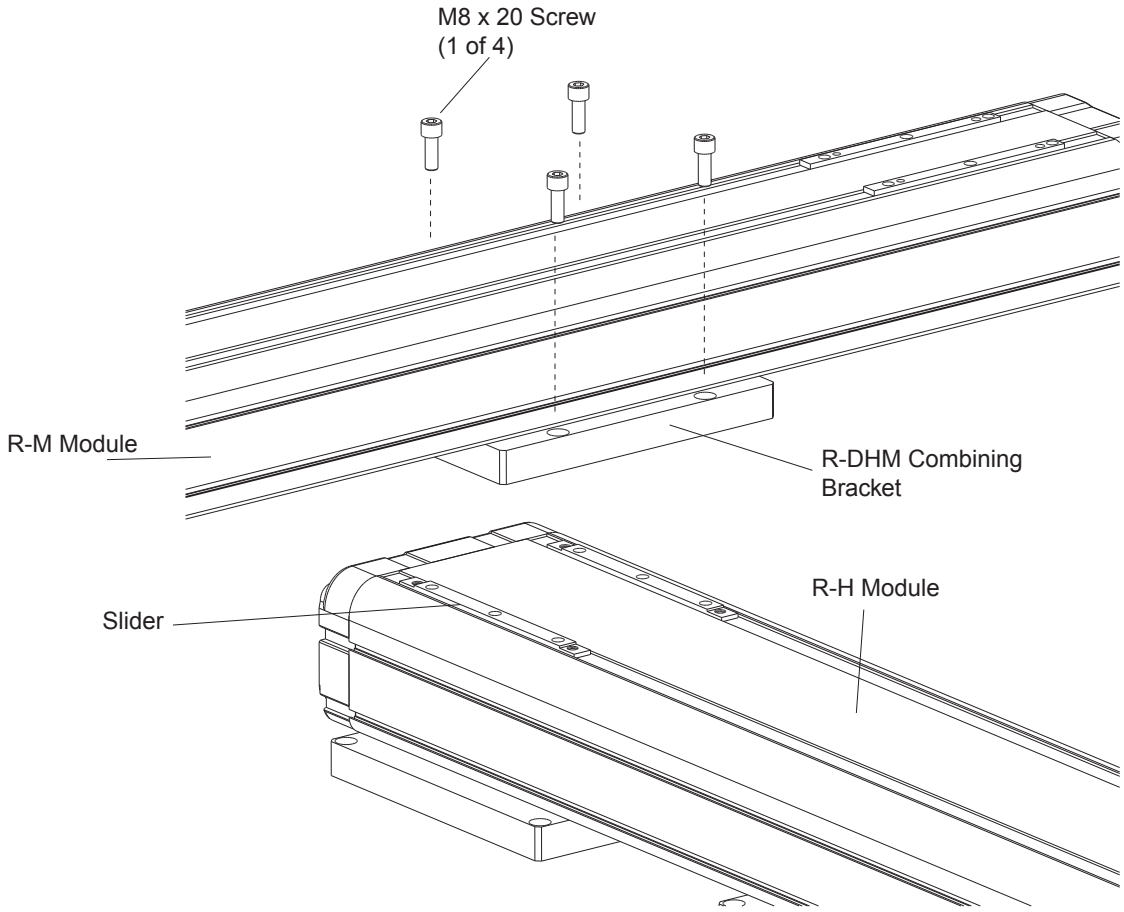


Figure 4-69. R-D(HM): Installing the R-M Module

Installing Adept SmartAmps

Installing SmartAmp #1 on the R-H Module

1. Remove the cable cover from a SmartAmp mounting bracket by removing four M3 screws.
2. Install the mounting bracket onto the R-H module at the motor cover using four M4 x 10 flathead screws; see **Figure 4-6 on page 72**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-H module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install the SmartAmp onto the mounting bracket.
3. Install SmartAmp #1 onto the mounting bracket using four M3 x 40 screws. See **Figure 4-7 on page 73**.

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4. Plug the motor and encoder cables from the module into the mating receptacles in the SmartAmp. See **Figure 4-8 on page 73**. Attach the captive screws to secure the encoder connector.

Installing SmartAmp #2 on the R-M Module

1. Remove the cable cover from the other SmartAmp mounting bracket by removing four M3 screws.
2. Install a SmartAmp mounting bracket onto the R-M module using four M4 x 10 flathead screws; see **Figure 4-70**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-M module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install SmartAmp #2 onto the mounting bracket.

3. Install SmartAmp #2 onto the mounting bracket using four M3 x 40 screws. Position the SmartAmp so that the connectors extend through the mounting bracket. See **Figure 4-71 on page 147**.
4. Plug the motor and encoder cables from the module into the mating receptacles in SmartAmp #2. See **Figure 4-8 on page 73**. Attach the captive screws to secure the encoder connector.

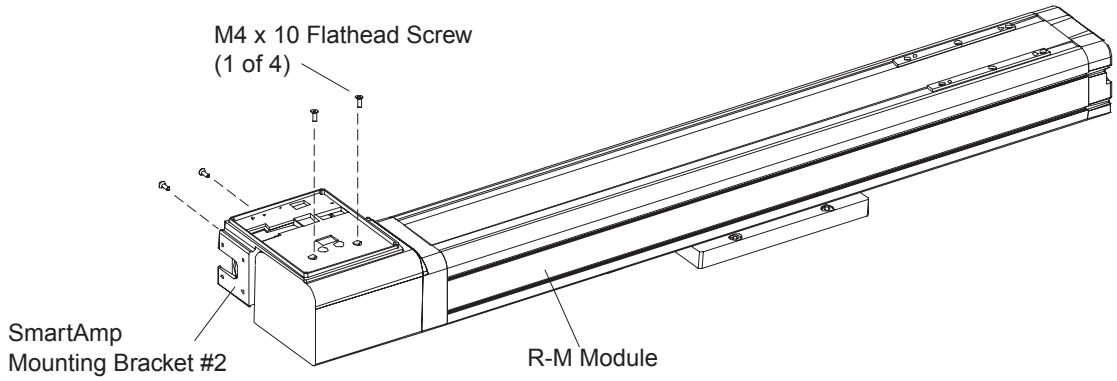


Figure 4-70. R-D(HM): Installing SmartAmp Mounting Bracket #2 on the R-M Module

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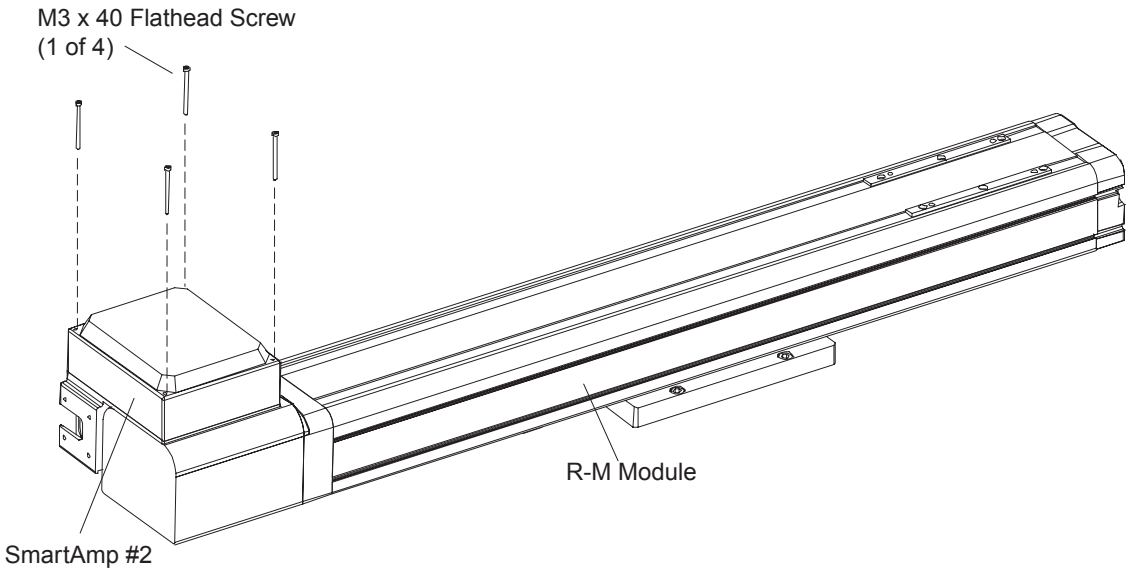


Figure 4-71. R-D(HM): Installing SmartAmp #2 on the R-M Module

Installing Cable Tube Assembly Between Amp #1 and Amp #2

The procedure to install cables consists of these steps:

- route cables through the cable tube
- install cable tube fittings on cable tube
- install assembled cable tube on SmartAmp mounting brackets and plug in all cables

The lengths of the cables and cable tube depend on which modules you have ordered.

Routing Cables Through Cable Tube

1. Locate three cables in the cable kit.
   - AC power cable
   - 24VDC cable
   - IEEE 1394 cable

   See **Figure 4-72 on page 148**.
2. Group the three cables together, plus any additional user cables or air lines, and slide them through the cable tube.
3. Gently pull the cables through the tube until they are evenly spaced at each end. Try to make sure the cables do not get twisted or tangled as you pull them through the tube.

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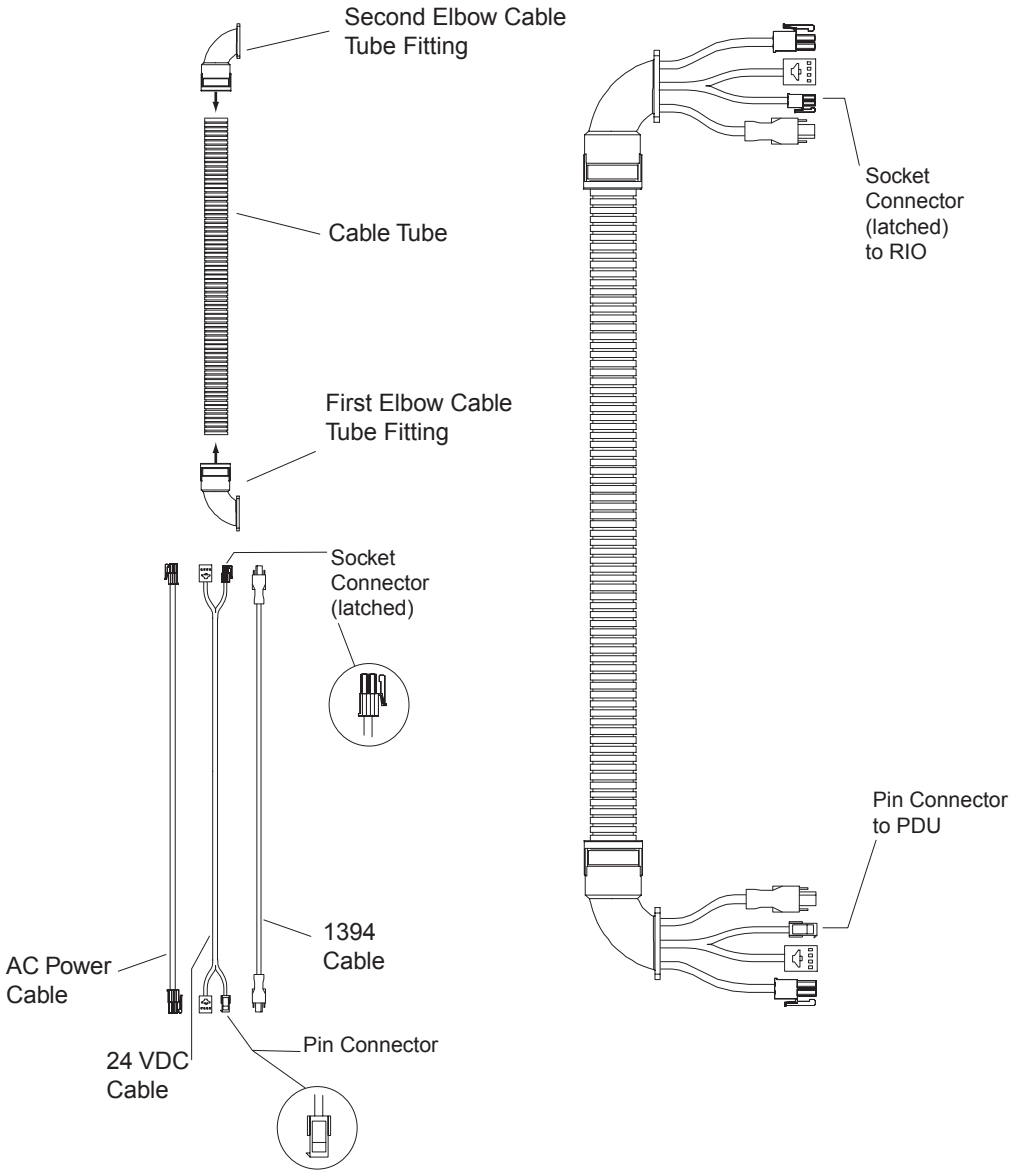


Figure 4-72. R-D(HM): Cable Tube Assembly (Two Elbow Fittings)

Installing Cable Tube Fittings on Cable Tube

NOTE: For both cable tube fittings, make sure the arrows on the fitting clamp are pointing toward the end of the tube.

1. Locate one of the elbow cable tube fittings.

   NOTE: The 24V cable has two additional connectors for the optional RIO system. There is a socket (latched) connector at one end of the cable and a pin connector at the other end. Install the elbow cable tube fitting with the 24V pin connector on SmartAmp #1; install the other elbow fitting onto SmartAmp #2. See **Figure 4-72**.

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2. Install the fitting by pushing it onto the end of the cable tube until the fitting has fully snapped into place inside the fitting. See **Figure 4-72 on page 148**.
3. Locate the other elbow cable tube fitting.
4. Install the fitting by pushing it onto the opposite end of the cable tube until the fitting has fully snapped into place inside the fitting.

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #1

1. Remove the cable clamp from inside the mounting bracket by removing the two M3 screws. See **Figure 4-15 on page 82** for reference.

   NOTE: **Figure 4-15** shows a straight cable tube fitting instead of the elbow cable tube fitting used on the R-D(HM). However, the illustration of the cable clamp is correct.

2. Position the cable tube assembly next to the R-H module with the pin end of the 24V cable near SmartAmp #1.
3. Install the cable fitting on the outside of the mounting bracket. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See **Figure 4-73 on page 150**.
4. In SmartAmp #1, connect these cables:
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable

   There are two identical mating connectors for each cable in the SmartAmp, you can use either one. See **Figure 4-14 on page 81**.
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

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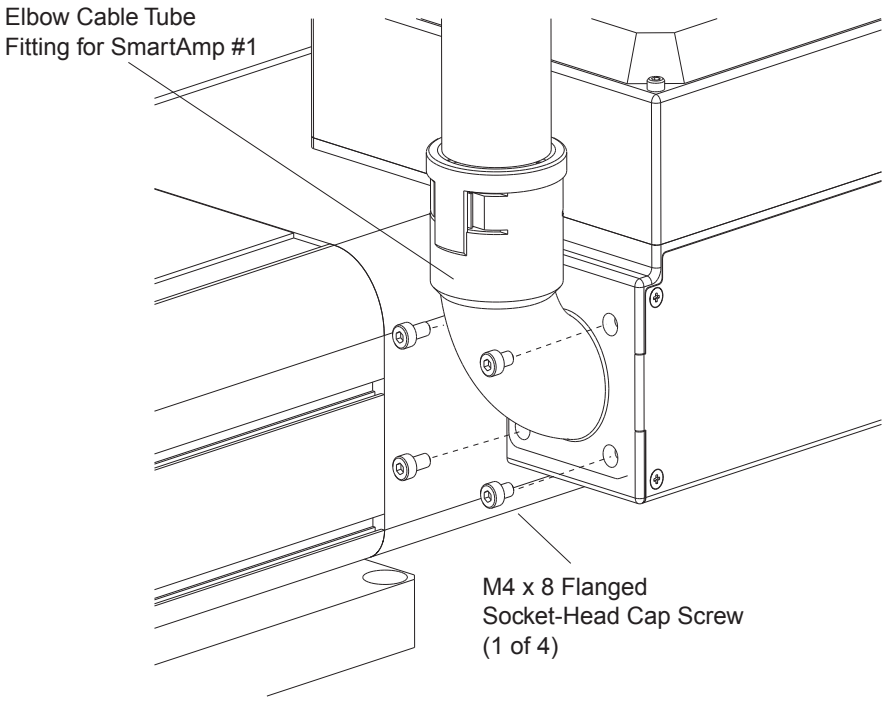


Figure 4-73. R-D(HM): Installing Cable Tube Fitting on SmartAmp Mounting Bracket #1

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #2

1. Remove the cable clamp from inside mounting bracket #2 by removing the two M3 screws.
2. Fold the cable tube over so the elbow fitting is positioned next to mounting bracket #2 on SmartAmp #2. See **Figure 4-74 on page 151**.
3. Install the elbow fitting on the outside of the mounting bracket. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See **Figure 4-74 on page 151**.
4. In SmartAmp #2, connect these cables (see **Figure 4-14 on page 81**):
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

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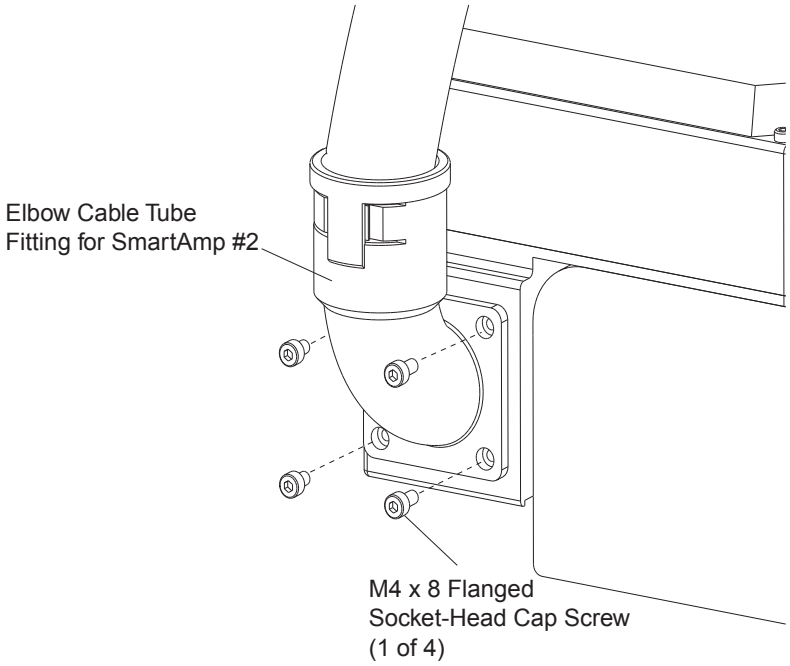


Figure 4-74. R-D(HM): Installing Cable Tube Fitting on SmartAmp Mounting Bracket #2

Connecting Cables from Controller to SmartAmp #1

See "Connecting Cables from Controller to SmartAmp #1" on page 51 for instructions.

Completing the Installation

Perform these steps to complete the installation.

- After you connect all the cables inside the SmartAmp, attach the cable cover to the SmartAmp bracket using four M3 screws.
- Check the mechanical motion of each axis. (Modules with brakes must be checked when the power is turned on.)

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4.9 R-D(MS) Installation Procedure

Overview

This section describes the process of installing a two-axis R-D(MS) Adept SmartModules system. This configuration consists of one R-M and one R-Sz module joined together with a R-DMS combining bracket. Each R-M and R-Sz module has a SmartAmp and a SmartAmp mounting bracket. A cable tube assembly contains the cabling to interconnect the SmartAmps. See **Figure 4-75** for an overview of the system components.

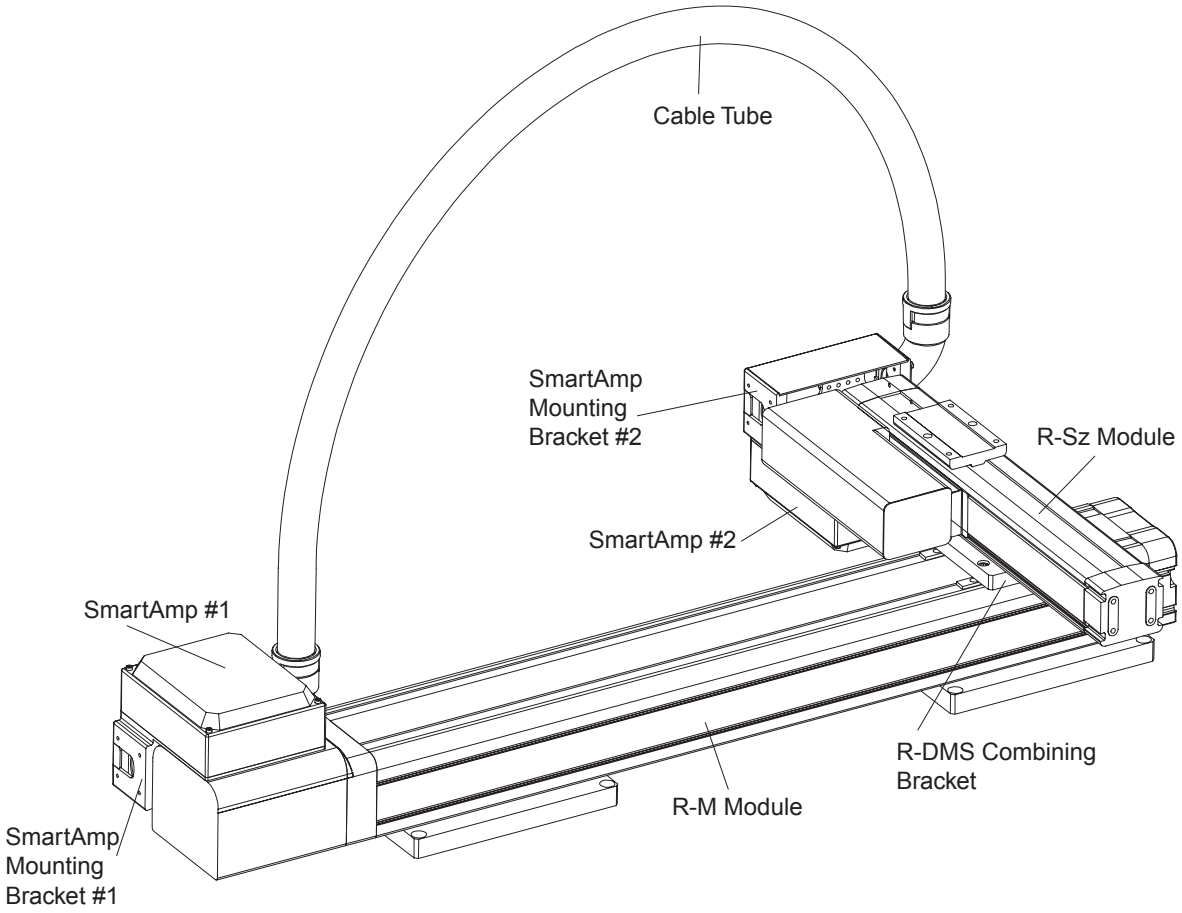


Figure 4-75. R-D(MS): System Component Overview

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Table 4-8. R-D(MS) Parts List

Description	Part Number	Qty
R-Sz module	9040x-4xxxx	1
R-M module	9040x-2xxxx	1
SmartAmp	30410-10000	2
SmartAmp mounting bracket	30410-20000	2
Combining bracket, R-DMS	90400-05006	1
Mounting plate, RM	90400-01200	2/3[a]
Cable tube fitting, elbow	40410-40090	2
Cable tube, flyover	40410-320xx	1
Cable kit, amp to amp AC power cable 24V DC cable IEEE 1394 cable	90410-100xx 10410-006xx 10410-007xx 10410-005xx	1
Cable kit, controller AC power cable 24V DC cable IEEE 1394 cable Ferrite core	90410-200xx 10410-009xx 10410-010xx 10410-105xx 27200-00117	1
Hardware kit	90405-00200	1
Optional Items		
Remote I/O (RIO) kit	90410-20050	1[b]

[a] Quantity will vary depending on module length.
[b] Quantity will vary according to order.

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Installing the R-M Module

NOTE: R-M modules less than 750 mm long require two mounting plates; R-M modules longer than 750 mm require three mounting plates.

1. Prepare the work surface by drilling and tapping eight or twelve M8 holes (depending on the number of mounting plates required) for the R-M-module mounting plates. See "**Chapter 10** - Technical Specifications" for dimensions of the R-M module and the plates.
2. Install two or three R-M-module mounting plates to the under side of the R-M module using four M6 x 20 screws provided for each plate. See **Figure 4-25 on page 96**.
3. Mount the R-M module to the work surface using four M8 screws per R-M-module mounting plate.

Installing Alignment Pins on the R-DMS Bracket

1. Locate the R-DMS combining bracket, two 8mm round pins, and two 8mm diamond pins.
2. Install a round pin and a diamond pin on each side of the R-DMS combining bracket. See **Figure 4-47**. Note the hole configuration shown in the drawing to identify where to install the pins. Also, note the orientation of the diamond pins in the drawing. Use Loctite 609 sealant or equivalent to secure the pins in place.

Installing the R-Sz Module

1. Mount the R-DMS combining bracket to the R-Sz module with four M5 x 16 screws. Position the bracket as shown in **Figure 4-48 on page 122**. Align the pins on the bracket with the mating holes in the module.
2. Using the R-DMS combining bracket, mount the R-Sz module to the R-M module's slider with three M6 x 16 screws. See **Figure 4-76 on page 155**.

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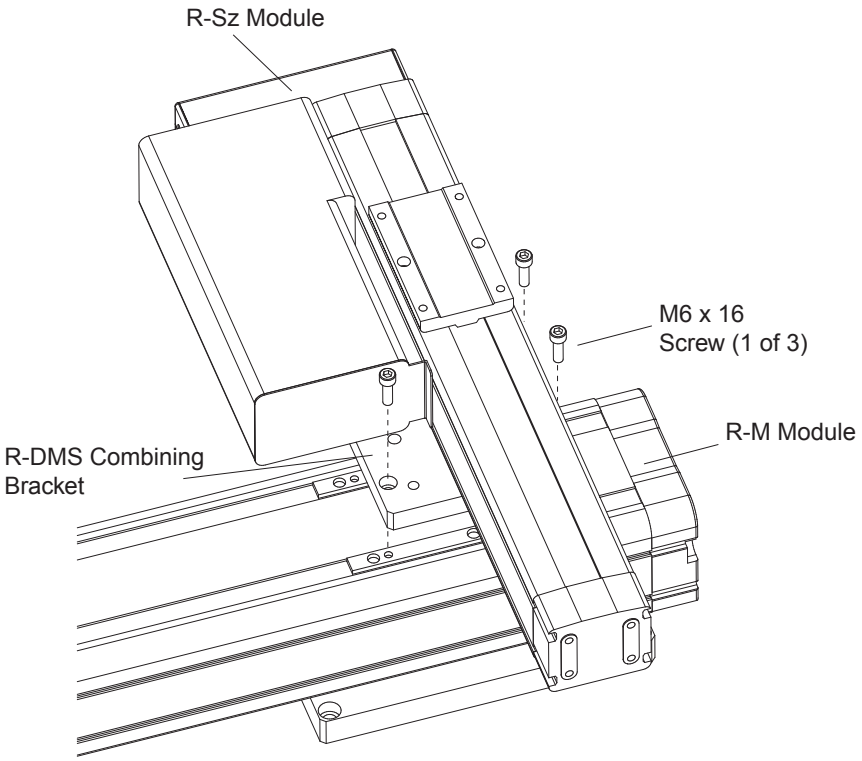


Figure 4-76. R-D(MS): Installing the R-Sz Module

Installing Adept SmartAmps

Installing SmartAmp #1 on the R-M Module

1. Remove the cable cover from a SmartAmp mounting bracket by removing four M3 screws.
2. Install the mounting bracket onto the R-M module at the motor cover using four M4 x 10 flathead screws; see **Figure 4-27 on page 98**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-M module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install the SmartAmp onto the mounting bracket.
3. Install SmartAmp #1 onto the mounting bracket using four M3 x 40 screws. See **Figure 4-28 on page 99**.
4. Plug the motor and encoder cables from the module into the mating receptacles in the SmartAmp. See **Figure 4-8 on page 73**. Attach the captive screws to secure the encoder connector.

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Installing SmartAmp #2 on the R-Sz Module

1. Remove the cable cover from the other SmartAmp mounting bracket by removing four M3 screws.
2. Install a SmartAmp mounting bracket onto the R-Sz module using four M5 x 10 flathead screws; see **Figure 4-77**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-Sz module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install SmartAmp #2 onto the mounting bracket.

3. Install SmartAmp #2 onto the mounting bracket using four M3 x 40 screws. Position the SmartAmp so that the connectors extend through the mounting bracket. See **Figure 4-78 on page 157**.
4. Plug the motor and encoder cables from the module into the mating receptacles in SmartAmp #2. See **Figure 4-8 on page 73**. Attach the captive screws to secure the encoder connector.

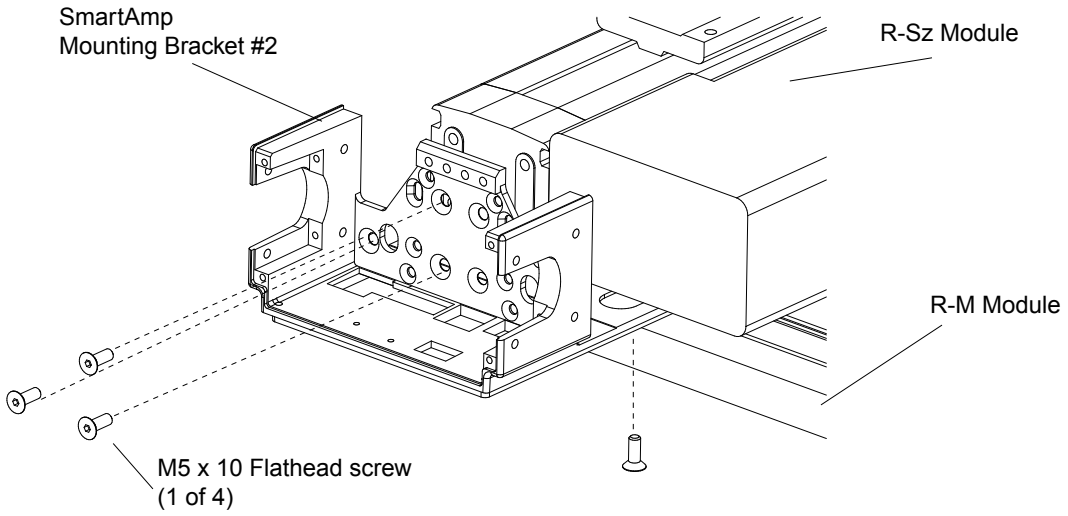


Figure 4-77. R-D(MS): Installing SmartAmp Mounting Bracket #2 on the R-Sz Module

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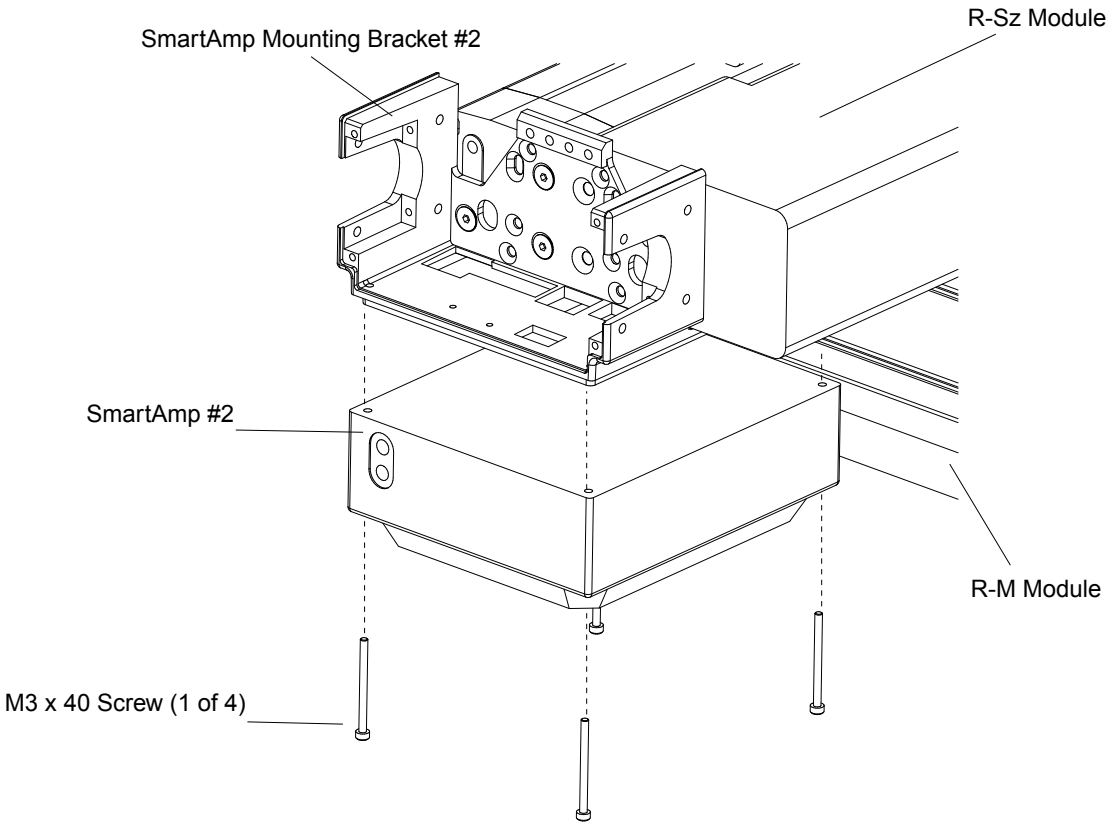


Figure 4-78. R-D(MS): Installing SmartAmp #2 on the R-Sz Module

Installing Cable Tube Assembly Between Amp #1 and Amp #2

The procedure to install cables consists of these steps:

- route cables through the cable tube
- install cable tube fittings on cable tube
- install assembled cable tube on SmartAmp mounting brackets and plug in all cables

The lengths of the cables and cable tube depend on which modules you have ordered.

Routing Cables Through Cable Tube

1. Locate three cables in the cable kit.
   - AC power cable
   - 24VDC cable
   - IEEE 1394 cable

   See **Figure 4-72 on page 148**.

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2. Group the three cables together, plus any additional user cables or air lines, and slide them through the cable tube.
3. Gently pull the cables through the tube until they are evenly spaced at each end. Try to make sure the cables do not get twisted or tangled as you pull them through the tube.

Installing Cable Tube Fittings on Cable Tube

NOTE: For both cable tube fittings, make sure the arrows on the fitting clamp are pointing toward the end of the tube.

1. Locate one of the elbow cable tube fittings.

   NOTE: The 24V cable has two additional connectors for the optional RIO system. There is a socket (latched) connector at one end of the cable and a pin connector at the other end. Install the elbow cable tube fitting with the 24V pin connector on SmartAmp #1; install the other elbow fitting onto SmartAmp #2. See **Figure 4-72 on page 148**.

2. Install the fitting by pushing it onto the end of the cable tube until the fitting has fully snapped into place inside the fitting. See **Figure 4-72 on page 148**.
3. Locate the other elbow cable tube fitting.
4. Install the fitting by pushing it onto the opposite end of the cable tube until the fitting has fully snapped into place inside the fitting.

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #1

1. Remove the cable clamp from inside the mounting bracket by removing the two M3 screws. See **Figure 4-32 on page 103** for reference.

   NOTE: **Figure 4-32** shows a straight cable tube fitting instead of the elbow cable tube fitting used on the R-D(MS). However, the illustration of the cable clamp is correct.

2. Position the cable tube assembly next to the R-M module with the pin end of the 24V cable near SmartAmp #1.
3. Install the cable tube fitting on the outside of the mounting bracket. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See **Figure 4-79**.
4. In SmartAmp #1, connect these cables:
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable

   There are two identical mating connectors for each cable in the SmartAmp, you can use either one. See **Figure 4-14 on page 81**.
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

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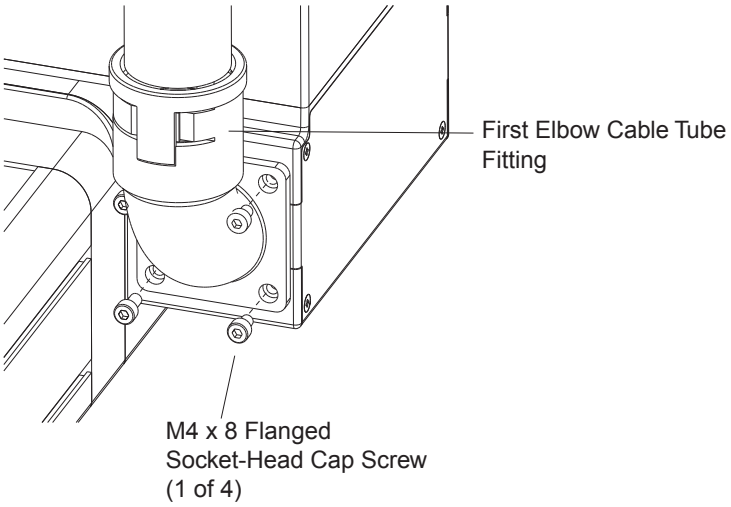


Figure 4-79. R-D(MS): Installing Cable Tube Fitting on SmartAmp Mounting Bracket #1

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #2

1. Remove the cable clamp from inside mounting bracket #2 by removing the two M3 screws.
2. Fold the cable tube over so the other elbow fitting is positioned next to mounting bracket #2.
3. Install the elbow fitting on the outside of the mounting bracket. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See **Figure 4-80**.
4. In SmartAmp #2, connect these cables (see **Figure 4-14 on page 81**):
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

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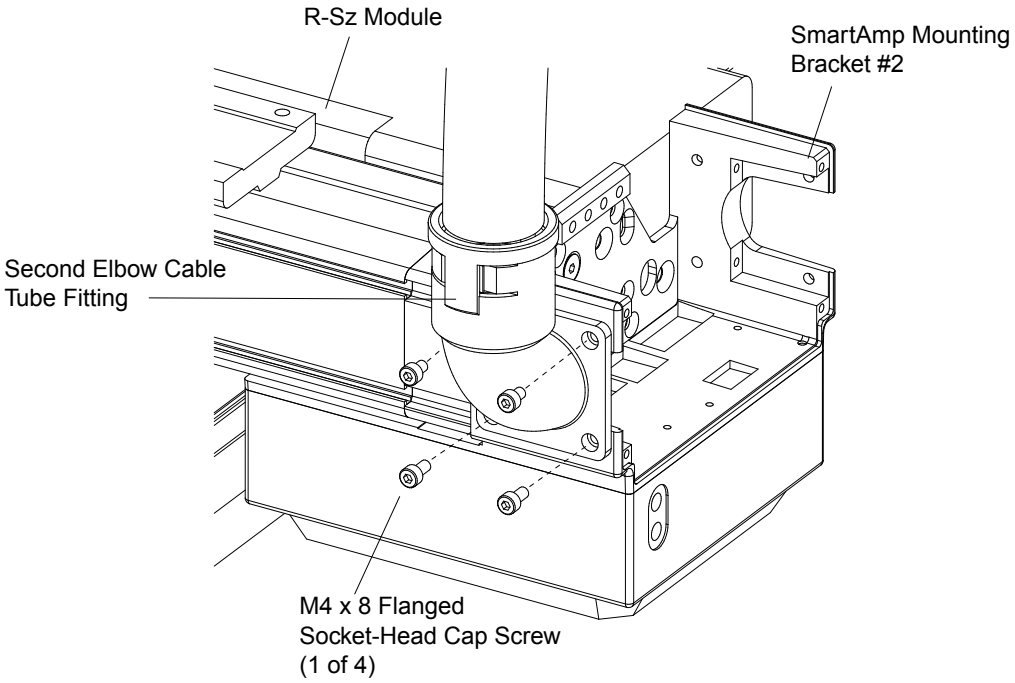


Figure 4-80. R-D(MS): Installing Cable Tube Fitting on SmartAmp Mounting Bracket #2

Connecting Cables from Controller to SmartAmp #1

See "Connecting Cables from Controller to SmartAmp #1" on page 51 for instructions.

Completing the Installation

Perform these steps to complete the installation.

- After you connect all the cables inside the SmartAmp, attach the cable cover to the SmartAmp bracket using four M3 screws.
- Check the mechanical motion of each axis. (Modules with brakes must be checked when the power is turned on.)

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4.10 R-X(HH) Installation Procedure

Overview

This section describes the process of installing a two-axis R-X(HH) Adept SmartModules system. This configuration consists of two R-H modules joined together with an R-XHH combining bracket. Each R-H module has a SmartAmp and a SmartAmp mounting bracket. A cable tube assembly contains the cabling to interconnect the SmartAmps. See **Figure 4-81** for an overview of the system components.

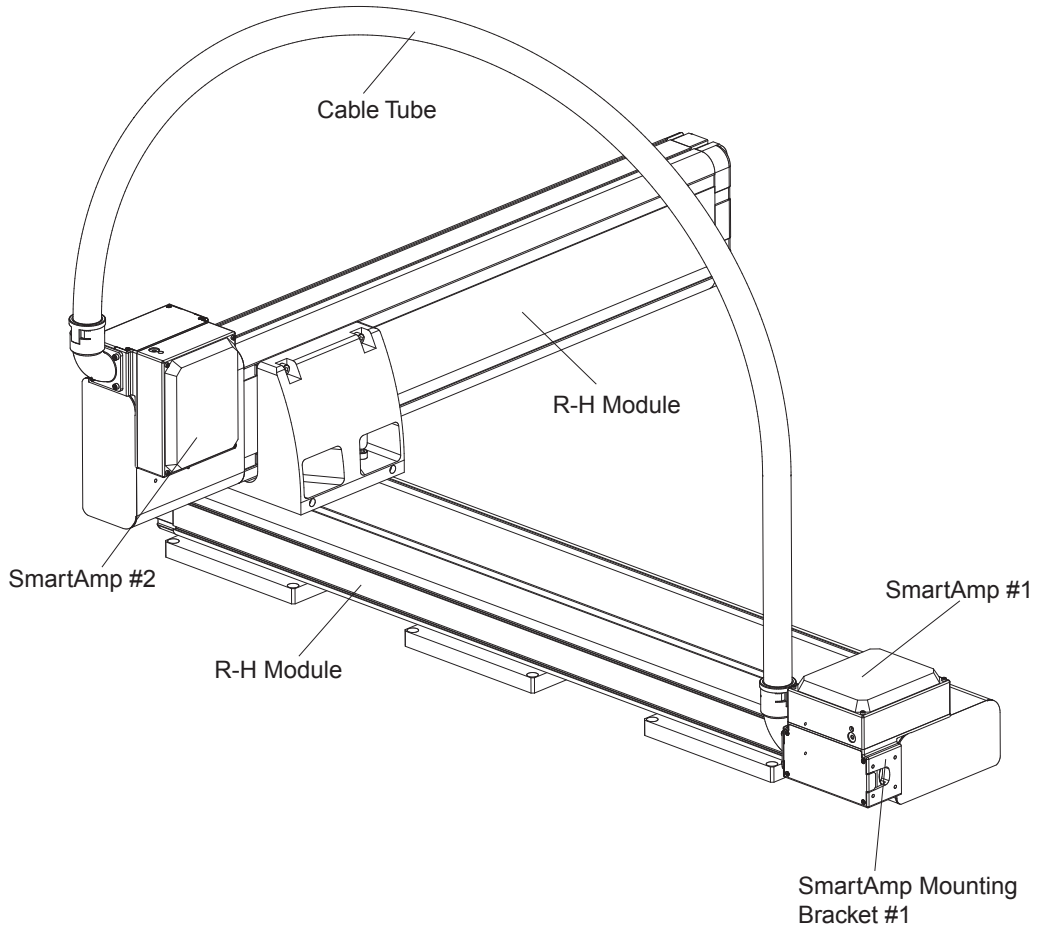


Figure 4-81. R-X(HH): System Component Overview

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Table 4-9. R-X(HH) Parts List

Description	Part Number	Qty
R-H module	9040x-1xxxx	2
SmartAmp	30410-10000	2
SmartAmp mounting bracket	30410-20000	2
Combining bracket, R-XHH	90400-05008	1
Mounting plate, RH	90400-01100	2/3[a]
Cable tube fitting, elbow	40410-40090	2
Cable tube, flyover	40410-320xx	1
Cable kit, amp to amp AC power cable 24V DC cable IEEE 1394 cable	90410-100xx 10410-006xx 10410-007xx 10410-005xx	1
Cable kit, controller AC power cable 24V DC cable IEEE 1394 cable Ferrite core	90410-200xx 10410-009xx 10410-010xx 10410-105xx 27200-00117	1
Hardware kit	90405-00200	1
Optional Items		
Remote I/O (RIO) kit	90410-20050	1[b]

[a] Quantity will vary depending on module length.
[b] Quantity will vary according to order.

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Installing the First R-H Module

NOTE: 300 to 600 mm R-H modules use two mounting plates; 800 mm and longer modules use three plates.

1. Prepare the work surface by drilling and tapping eight or twelve M8 holes (depending on module length) for the R-H-module mounting plates. See "**Chapter 10** - Technical Specifications" for dimensions of the R-H module and the plates.
2. Install R-H-module mounting plates (two or three, depending on module length) to the under side of the R-H module using four M8 x 20 screws provided for each plate. See **Figure 4-2 on page 68**.
3. Mount the R-H module to the work surface using four M8 screws per R-H-module mounting plate.

Installing the Second R-H Module

1. Mount the R-XHH combining bracket to the first R-H Module with four M8 x 20 screws. See **Figure 4-82**. Align the pins on the combining bracket with the mating holes in the module's slider.

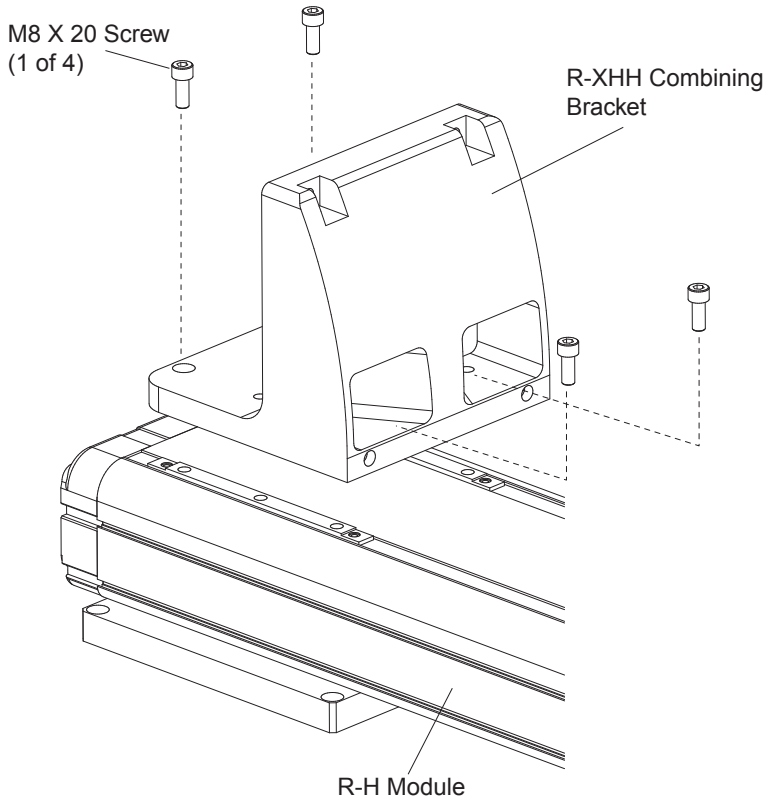


Figure 4-82. R-X(HH): Installing the R-XHH Combining Bracket

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2. Mount the other R-H module on the R-XHH combining bracket with four M8 x 20 screws. See **Figure 4-83**. Align the pins on the combining bracket with the mating holes in the module's slider.

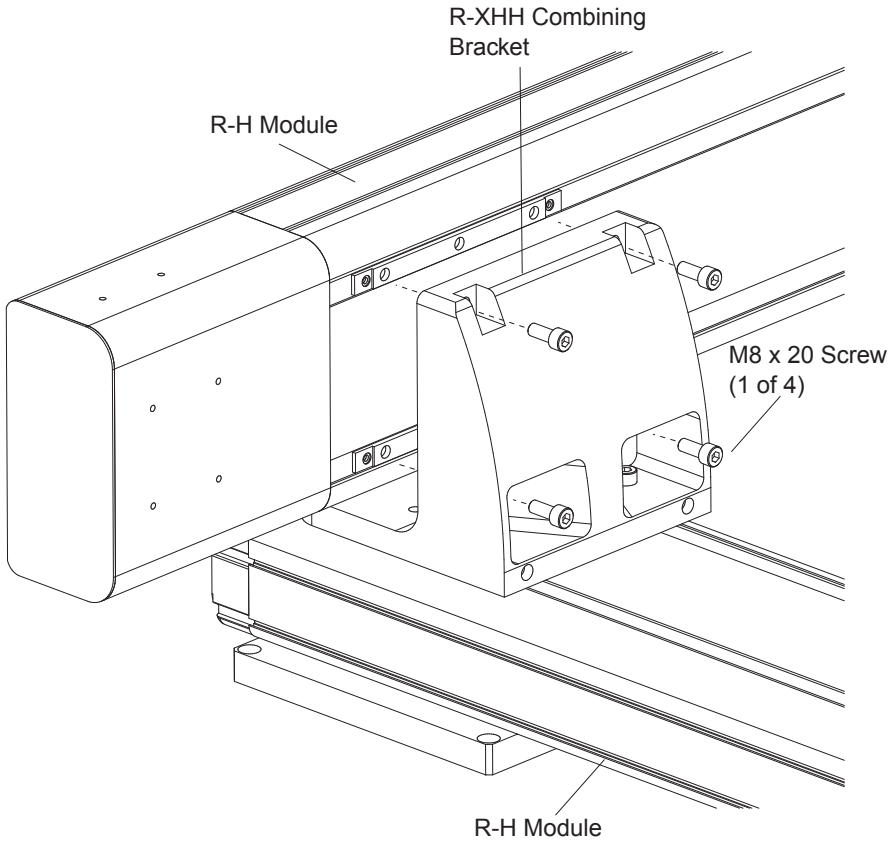


Figure 4-83. R-X(HH): Installing the Second R-H Module

Installing Adept SmartAmps

Installing SmartAmp #1 on the First R-H Module

1. Remove the cable cover from a SmartAmp mounting bracket by removing four M3 screws.
2. Install the mounting bracket onto the first R-H module at the motor cover using four M4 x 10 flathead screws; see **Figure 4-84 on page 165**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-H module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install the SmartAmp onto the mounting bracket.

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3. Install SmartAmp #1 onto the mounting bracket using four M3 x 40 screws. See **Figure 4-85**.
4. Plug the motor and encoder cables from the module into the mating receptacles in the SmartAmp. See **Figure 4-8 on page 73**. Attach the captive screws to secure the encoder connector.

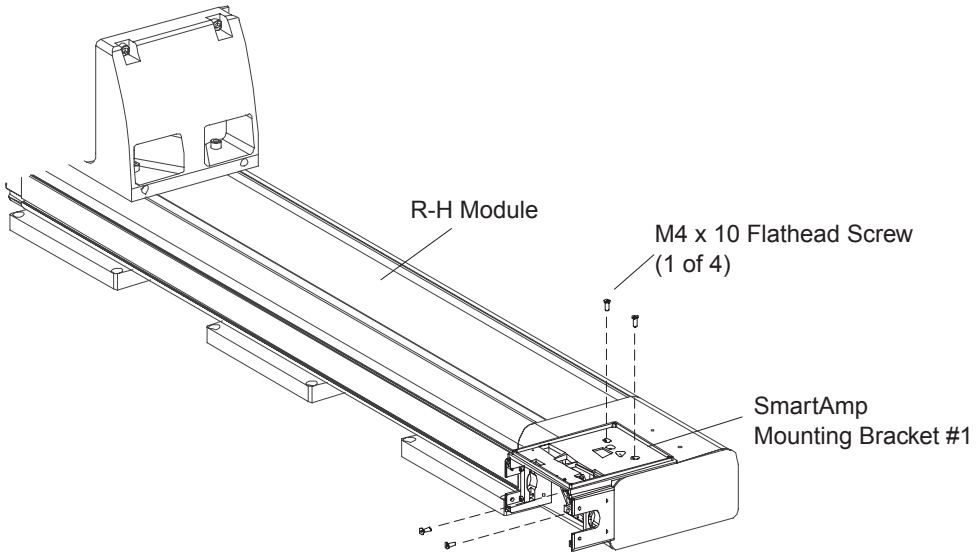


Figure 4-84. R-X(HH): Installing SmartAmp Mounting Bracket #1 on the First R-H Module

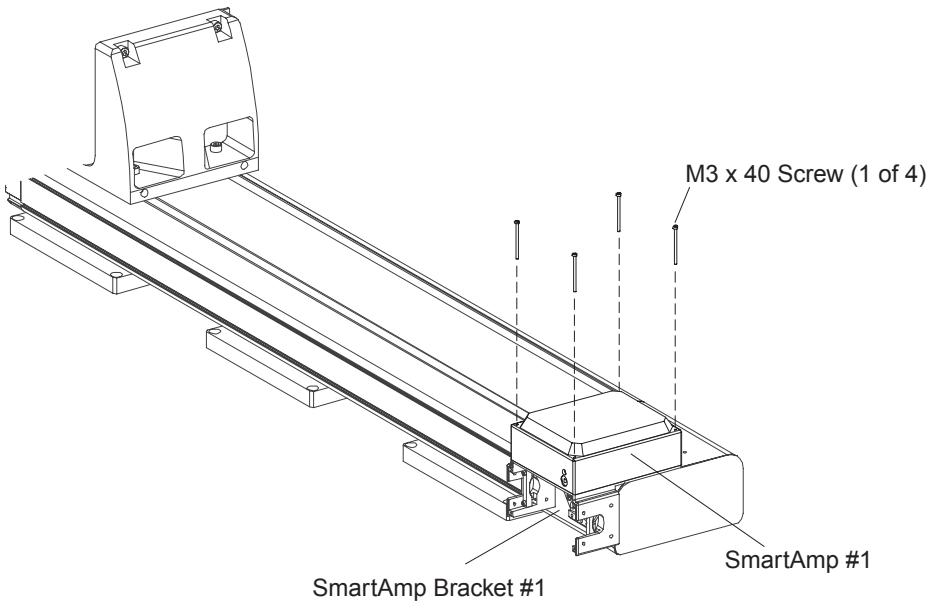


Figure 4-85. R-X(HH): Installing SmartAmp #1 on the First R-H Module

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Installing SmartAmp #2 on the Second R-H Module

1. Remove the cable cover from the other SmartAmp mounting bracket by removing four M3 screws.
2. Install a SmartAmp mounting bracket onto the second R-H module using four M4 x 10 flathead screws; see **Figure 4-86**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the second R-H module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install SmartAmp #2 onto the mounting bracket.

3. Install SmartAmp #2 onto the mounting bracket using four M3 x 40 screws. Position the SmartAmp so that the connectors extend through the mounting bracket. See **Figure 4-87 on page 167**.
4. Plug the motor and encoder cables from the module into the mating receptacles in SmartAmp #2. See **Figure 4-8 on page 73**. Attach the captive screws to secure the encoder connector.

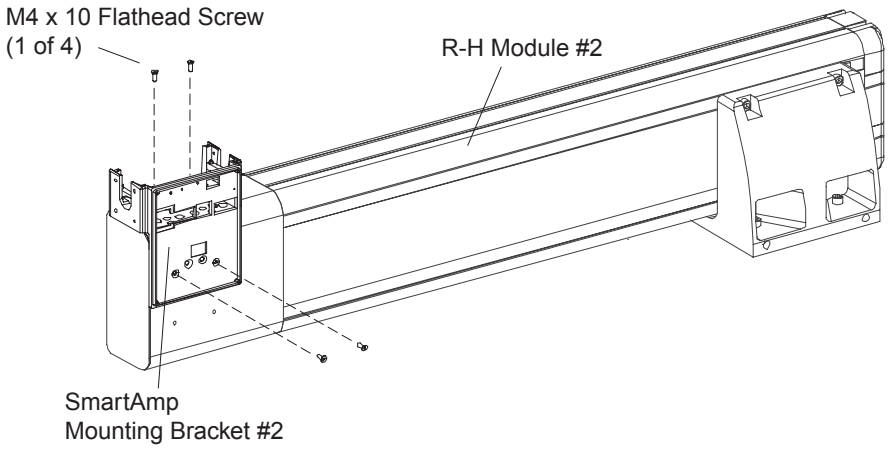


Figure 4-86. R-X(HH): Installing SmartAmp Mounting Bracket #2 on the Second R-H Module

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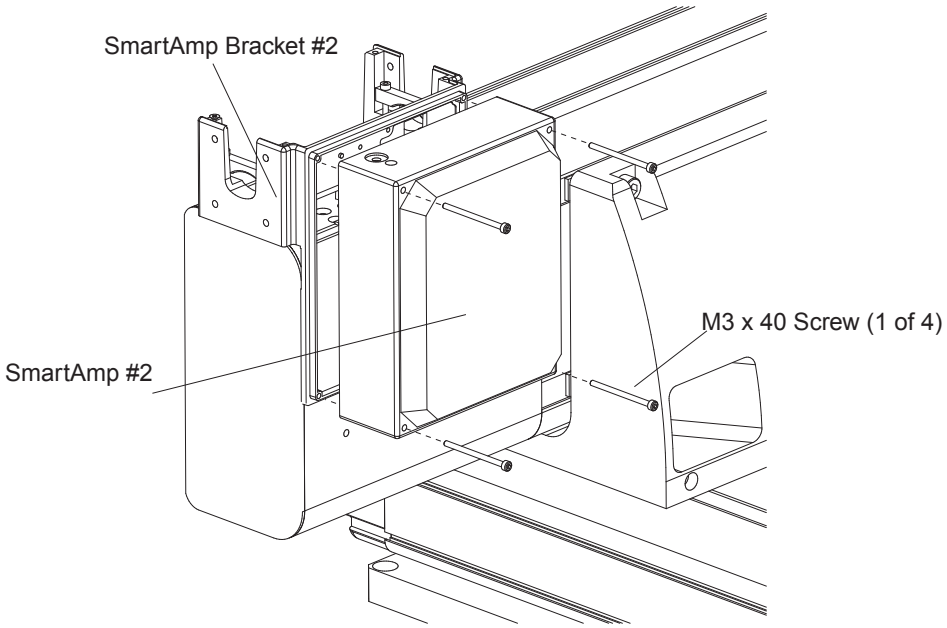


Figure 4-87. R-X(HH): Installing SmartAmp #2 on the Second R-H Module

Installing Cable Tube Assembly Between Amp #1 and Amp #2

The procedure to install cables consists of these steps:

- route cables through the cable tube
- install cable tube fittings on cable tube
- install assembled cable tube on SmartAmp mounting brackets and plug in all cables

The lengths of the cables and cable tube depend on which modules you have ordered.

Routing Cables Through Cable Tube

1. Locate three cables in the cable kit.
   - AC power cable
   - 24VDC cable
   - IEEE 1394 cable

   See **Figure 4-72 on page 148**.
2. Group the three cables together, plus any additional user cables or air lines, and slide them through the cable tube.
3. Gently pull the cables through the tube until they are evenly spaced at each end. Try to make sure the cables do not get twisted or tangled as you pull them through the tube.

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Installing Cable Tube Fittings on Cable Tube

NOTE: For both cable tube fittings, make sure the arrows on the fitting clamp are pointing toward the end of the tube.

1. Locate one of the elbow cable tube fittings.

   NOTE: The 24V cable has two additional connectors for the optional RIO system. There is a socket (latched) connector at one end of the cable and a pin connector at the other end. Install the elbow cable tube fitting with the 24V pin connector on SmartAmp #1; install the other elbow fitting onto SmartAmp #2. See **Figure 4-72 on page 148**.

2. Install the fitting by pushing it onto the end of the cable tube until the fitting has fully snapped into place inside the fitting. See **Figure 4-72 on page 148**.
3. Locate the other elbow cable tube fitting.
4. Install the fitting by pushing it onto the opposite end of the cable tube until the fitting has fully snapped into place inside the fitting.

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #1

1. Remove the cable clamp from inside the mounting bracket by removing the two M3 screws. See **Figure 4-15 on page 82** for reference.

   NOTE: **Figure 4-15** shows a straight cable tube fitting instead of the elbow cable tube fitting used on the R-X(HH). However, the illustration of the cable clamp is correct.

2. Position the cable tube assembly next to the first R-H module with the pin connector end of the 24V cable near SmartAmp #1.
3. Install the cable fitting on the outside of the mounting bracket. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See **Figure 4-73 on page 150**.
4. In SmartAmp #1, connect these cables:

   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable

   There are two identical mating connectors for each cable in the SmartAmp, you can use either one. See **Figure 4-14 on page 81**.

5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #2

1. Remove the cable clamp from inside mounting bracket #2 by removing the two M3 screws.
2. Fold the cable tube over so the elbow fitting is positioned next to mounting bracket #2. See **Figure 4-88 on page 169**.

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3. Install the elbow fitting on the outside of the mounting bracket. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See **Figure 4-88**.
4. In SmartAmp #2, connect these cables (see **Figure 4-14 on page 81**):
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

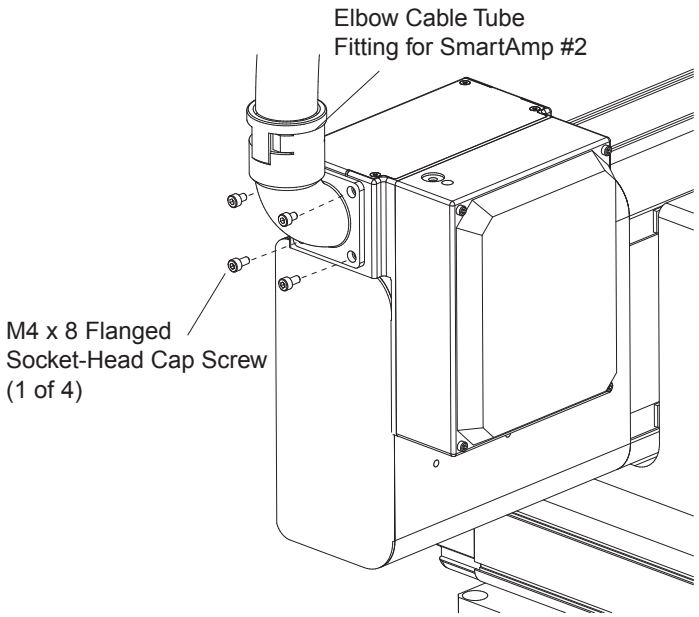


Figure 4-88. R-X(HH): Installing Cable Tube Fitting on SmartAmp Mounting Bracket #2

Connecting Cables from Controller to SmartAmp #1

See **"Connecting Cables from Controller to SmartAmp #1" on page 51** for instructions.

Completing the Installation

Perform these steps to complete the installation.

- After you connect all the cables inside the SmartAmp, attach the cable cover to the SmartAmp bracket using four M3 screws.
- Check the mechanical motion of each axis. (Modules with brakes must be checked when the power is turned on.)

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4.11 R-X(HM) Installation Procedure

Overview

This section describes the process of installing a two-axis R-X(HM) Adept SmartModules system. This configuration consists of one R-H and one R-M module joined together with an R-XHM combining bracket. Each R-H and R-M module has a SmartAmp and a SmartAmp mounting bracket. A cable tube assembly contains the cabling to interconnect the SmartAmps. See **Figure 4-89** for an overview of the system components.

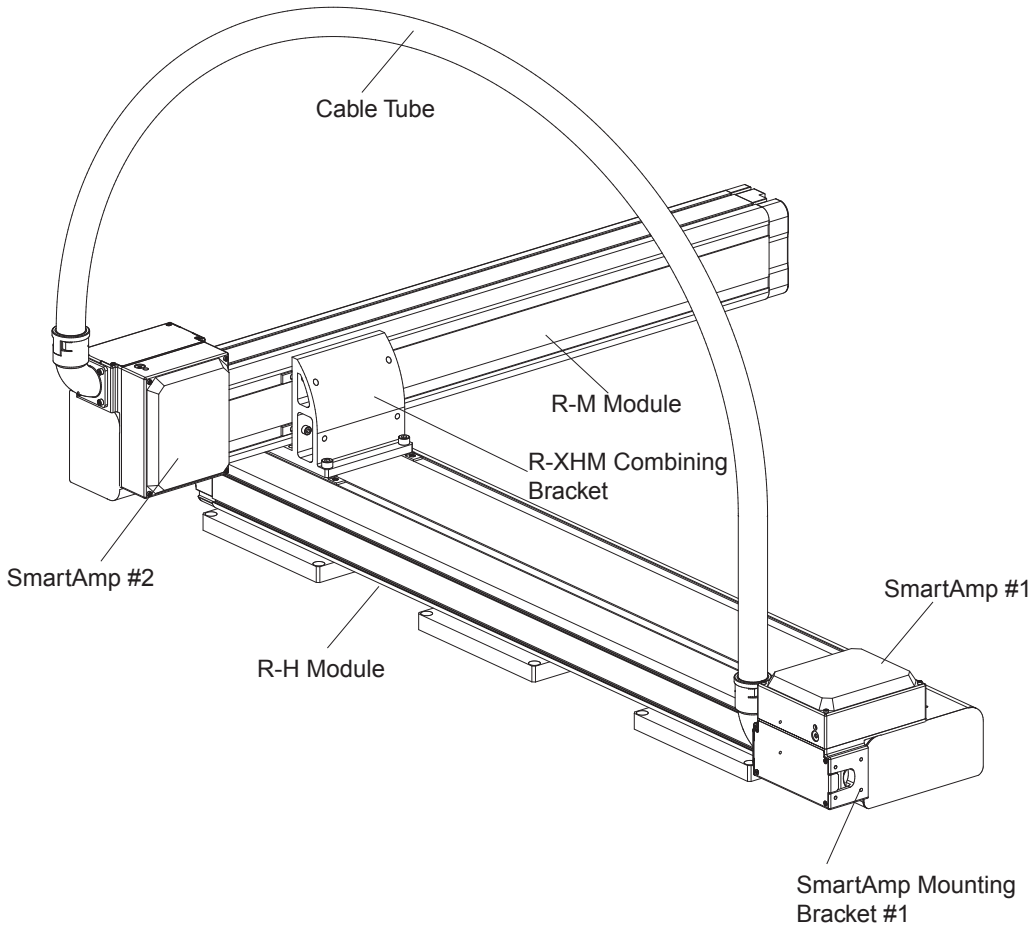


Figure 4-89. R-X(HM): System Component Overview

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Table 4-10. R-X(HM) Parts List

Description	Part Number	Qty
R-H module	9040x-1xxxx	1
R-M module	9040x-2xxxx	1
SmartAmp	30410-10000	2
SmartAmp mounting bracket	30410-20000	2
Combining bracket, R-XHM	90400-05009	1
Mounting plate, RH	90400-01100	2/3[a]
Cable tube fitting, elbow	40410-40090	2
Cable tube, flyover	40410-320xx	1
Cable kit, amp to amp AC power cable 24V DC cable IEEE 1394 cable	90410-100xx 10410-006xx 10410-007xx 10410-005xx	1
Cable kit, controller AC power cable 24V DC cable IEEE 1394 cable Ferrite core	90410-200xx 10410-009xx 10410-010xx 10410-105xx 27200-00117	1
Hardware kit	90405-00200	1
Optional Items		
Remote I/O (RIO) kit	90410-20050	1[b]

[a] Quantity will vary depending on module length.
[b] Quantity will vary according to order.

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Installing the R-H Module

NOTE: 300 to 600 mm R-H modules use two mounting plates; 800 mm and longer modules use three plates.

1. Prepare the work surface by drilling and tapping eight or twelve M8 holes (depending on module length) for the R-H-module mounting plates. See "**Chapter 10** - Technical Specifications" for dimensions of the R-H module and the plates.
2. Install R-H-module mounting plates (two or three, depending on module length) to the under side of the R-H module using four M8 x 20 screws provided for each plate. See **Figure 4-2 on page 68**.
3. Mount the R-H module to the work surface using four M8 screws per R-H-module mounting plate.

Installing the R-M Module

1. Mount the R-XHM combining bracket to the R-H module with four M8 x 20 screws. See **Figure 4-90**. Align the pins on the bracket with the mating holes in the module's slider.

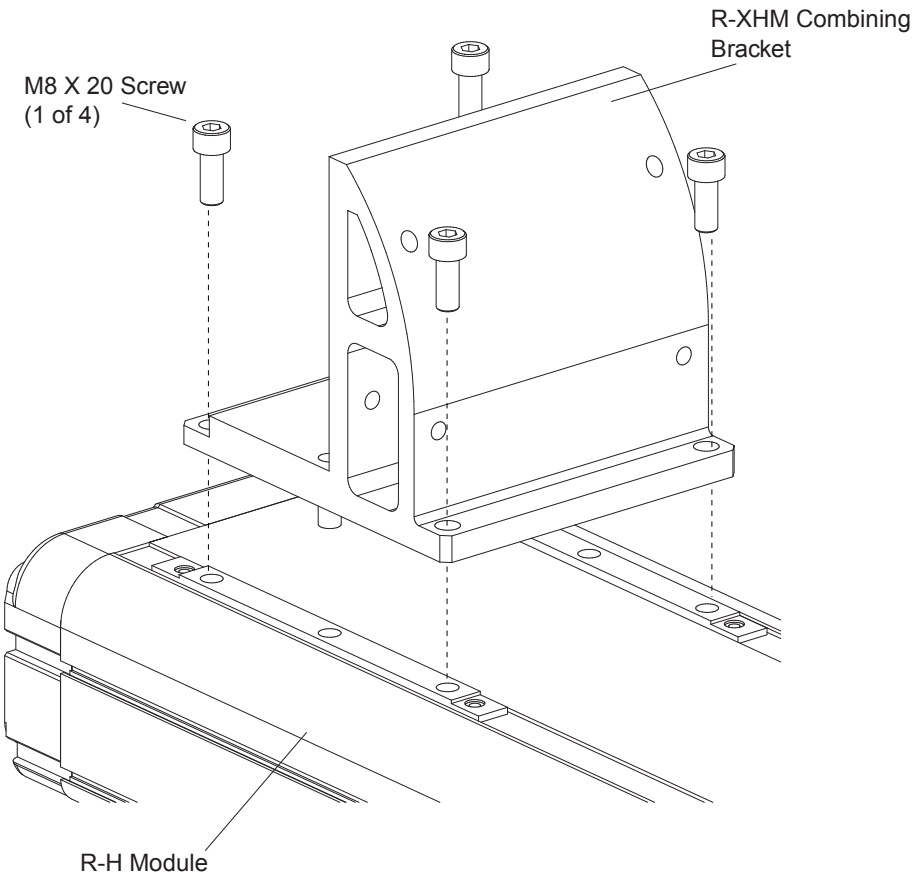


Figure 4-90. R-X(HM): Installing the R-XHM Combining Bracket

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2. Mount the R-M module on the R-XHM combining bracket with four M6 x 20 screws. See **Figure 4-91**. Position the R-M module so the alignment holes on its slider line up with the corresponding alignment pins on the R-XHM bracket.

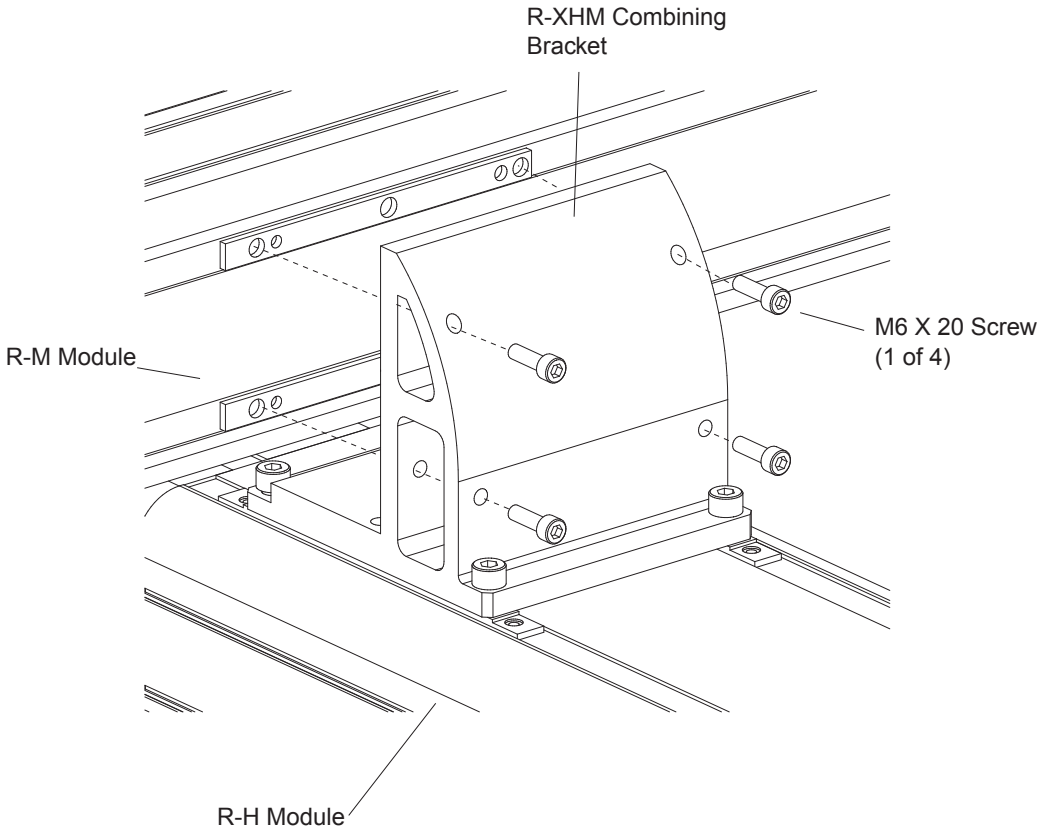


Figure 4-91. R-X(HM): Installing the R-M Module

Installing Adept SmartAmps

Installing SmartAmp #1 on the R-H Module

1. Remove the cable cover from a SmartAmp mounting bracket by removing four M3 screws.
2. Install the mounting bracket onto the R-H module at the motor cover using four M4 x 10 flathead screws; see **Figure 4-92 on page 174**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-H module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install the SmartAmp onto the mounting bracket.

3. Install SmartAmp #1 onto the mounting bracket using four M3 x 40 screws. See **Figure 4-93**.

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4. Plug the motor and encoder cables from the module into the mating receptacles in the SmartAmp. See **Figure 4-8 on page 73**. Attach the captive screws to secure the encoder connector.

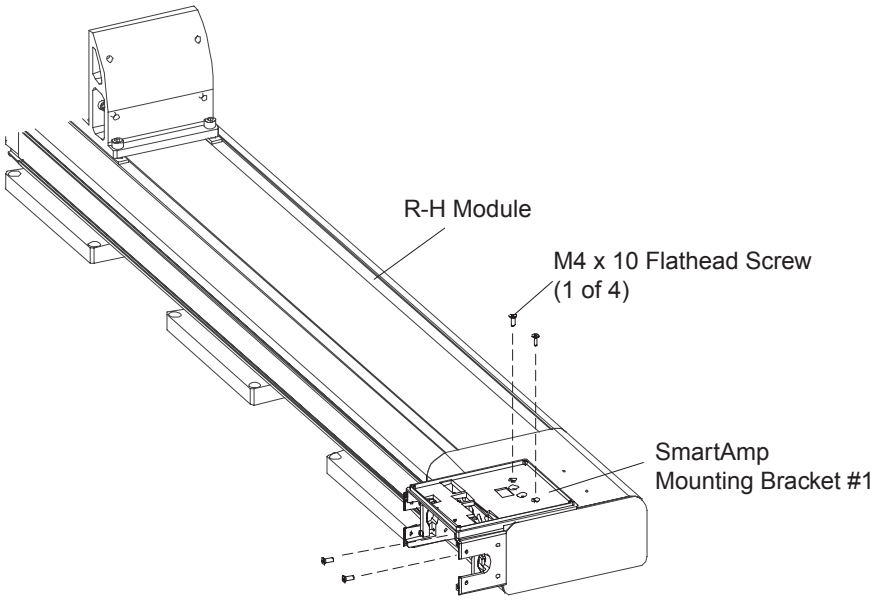


Figure 4-92. R-X(HM): Installing SmartAmp Mounting Bracket #1 on the R-H Module

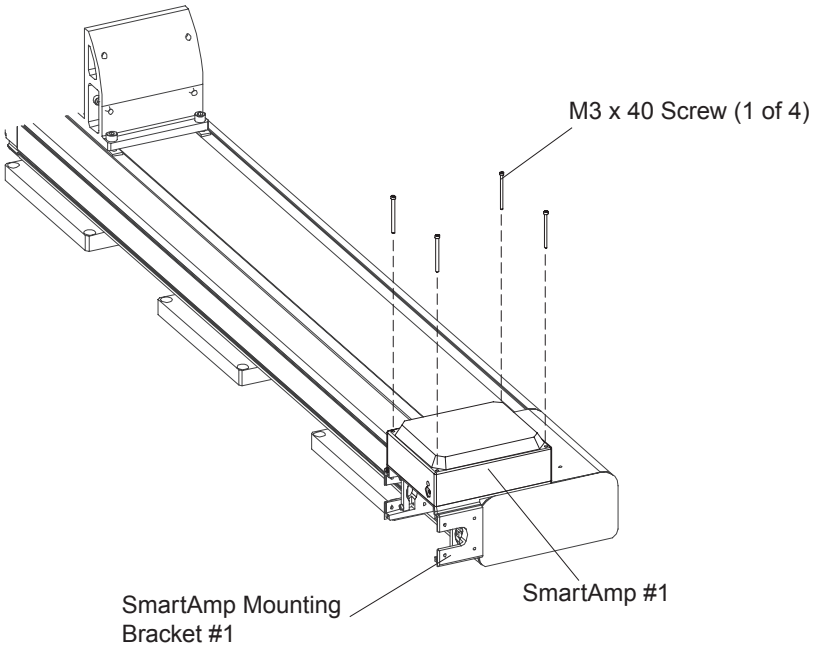


Figure 4-93. R-X(HM): Installing SmartAmp #1 on the R-H Module

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Installing SmartAmp #2 on the R-M Module

1. Remove the cable cover from the other SmartAmp mounting bracket by removing four M3 screws.
2. Install a SmartAmp mounting bracket onto the R-M module using four M4 x 10 flathead screws; see **Figure 4-94**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-M module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install SmartAmp #2 onto the mounting bracket.

3. Install SmartAmp #2 onto the mounting bracket using four M3 x 40 screws. Position the SmartAmp so that the connectors extend through the mounting bracket. See **Figure 4-95 on page 176**.
4. Plug the motor and encoder cables from the module into the mating receptacles in SmartAmp #2. See **Figure 4-8 on page 73**. Attach the captive screws to secure the encoder connector.

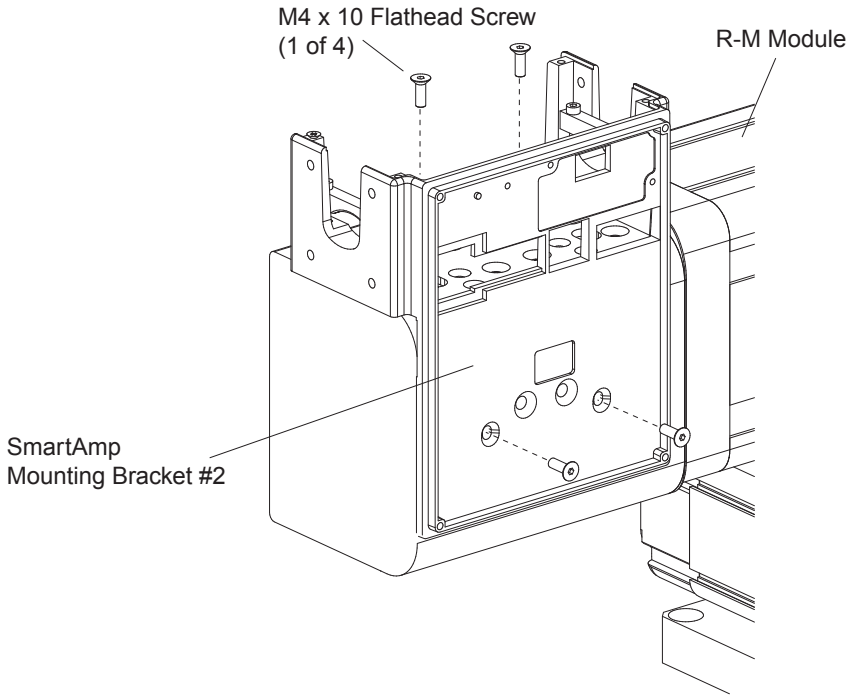


Figure 4-94. R-X(HM): Installing SmartAmp Mounting Bracket #2 on the R-M Module

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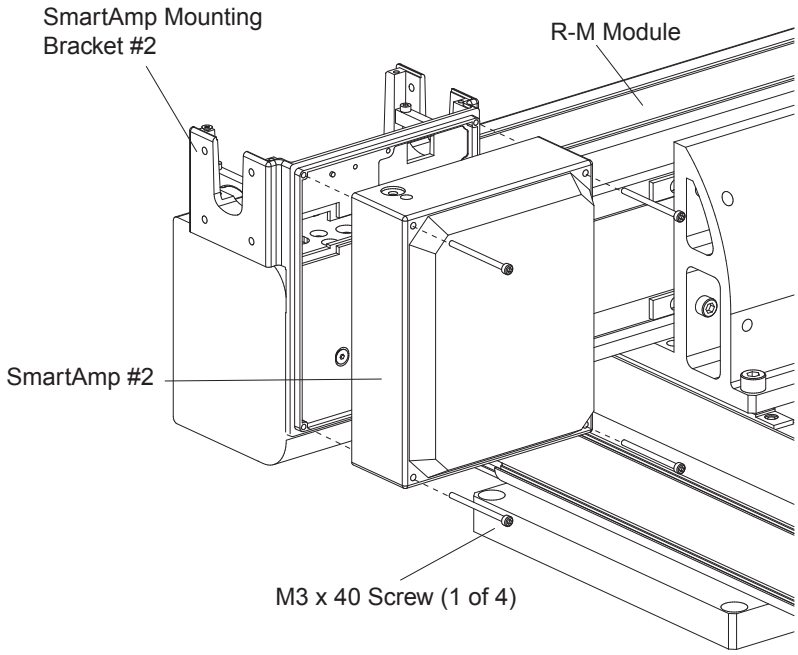


Figure 4-95. R-X(HM): Installing SmartAmp #2 on the R-M Module

Installing Cable Tube Assembly Between Amp #1 and Amp #2

The procedure to install cables consists of these steps:

- route cables through the cable tube
- install cable tube fittings on cable tube
- install assembled cable tube on SmartAmp mounting brackets and plug in all cables

The lengths of the cables and cable tube depend on which modules you have ordered.

Routing Cables Through Cable Tube

1. Locate three cables in the cable kit.
   - AC power cable
   - 24VDC cable
   - IEEE 1394 cable

   See **Figure 4-72 on page 148**.
2. Group the three cables together, plus any additional user cables or air lines, and slide them through the cable tube.
3. Gently pull the cables through the tube until they are evenly spaced at each end. Try to make sure the cables do not get twisted or tangled as you pull them through the tube.

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Installing Cable Tube Fittings on Cable Tube

NOTE: For both cable tube fittings, make sure the arrows on the fitting clamp are pointing toward the end of the tube.

1. Locate one of the elbow cable tube fittings.

   NOTE: The 24V cable has two additional connectors for the optional RIO system. There is a socket (latched) connector at one end of the cable and a pin connector at the other end. Install the elbow cable tube fitting with the 24V pin connector on SmartAmp #1; install the other elbow fitting onto SmartAmp #2. See **Figure 4-72 on page 148**.

2. Install the fitting by pushing it onto the end of the cable tube until the fitting has fully snapped into place inside the fitting. See **Figure 4-72 on page 148**.
3. Locate the other elbow cable tube fitting.
4. Install the fitting by pushing it onto the opposite end of the cable tube until the fitting has fully snapped into place inside the fitting.

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #1

1. Remove the cable clamp from inside the mounting bracket by removing the two M3 screws. See **Figure 4-15 on page 82**.

   NOTE: **Figure 4-15** shows a straight cable tube fitting instead of the elbow cable tube fitting used on the R-X(HM). However, the illustration of the cable clamp is correct.

2. Position the cable tube assembly next to the R-H module with the pin end of the 24V cable near SmartAmp #1.
3. Install the cable fitting on the outside of the mounting bracket. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See **Figure 4-73 on page 150**.
4. In SmartAmp #1, connect these cables:
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable

   There are two identical mating connectors for each cable in the SmartAmp, you can use either one. See **Figure 4-14 on page 81**.
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #2

1. Remove the cable clamp from inside mounting bracket #2 by removing the two M3 screws.
2. Fold the cable tube over so the elbow fitting is positioned next to mounting bracket #2.

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3. Install the elbow fitting on the outside of the mounting bracket. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See **Figure 4-96**.
4. In SmartAmp #2, connect these cables (see **Figure 4-14 on page 81**):
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

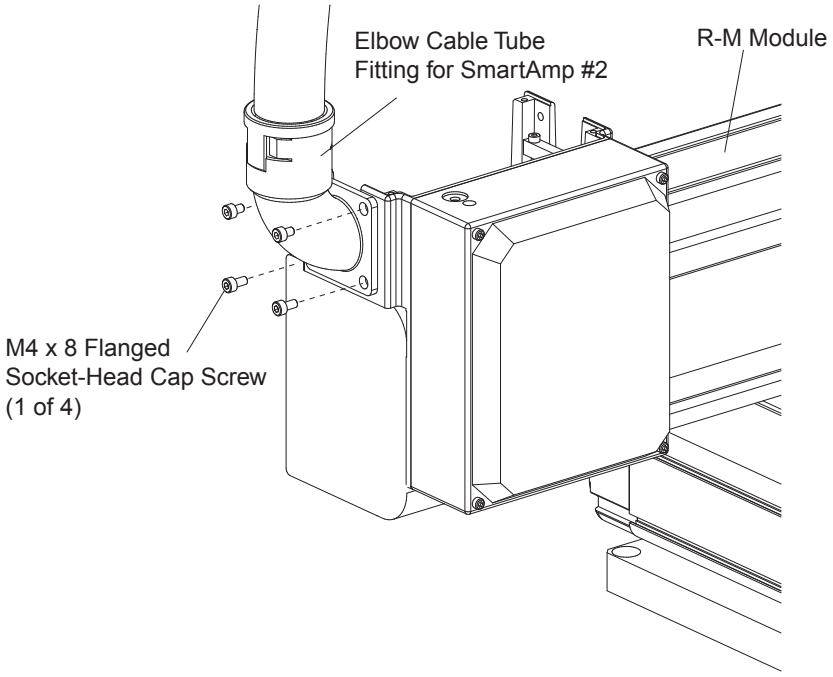


Figure 4-96. R-X(HM): Installing Cable Tube Fitting on SmartAmp Mounting Bracket #2

Connecting Cables from Controller to SmartAmp #1

See **"Connecting Cables from Controller to SmartAmp #1" on page 51** for instructions.

Completing the Installation

Perform these steps to complete the installation.

- After you connect all the cables inside the SmartAmp, attach the cable cover to the SmartAmp bracket using four M3 screws.
- Check the mechanical motion of each axis. (Modules with brakes must be checked when the power is turned on.)

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Installing Three-Axis R-Series Configurations 5

5.1 Introduction

This chapter details how to assemble the three-axis R-Series Adept SmartModules systems.

> **NOTE:** Certain systems (such as the R-P(HHMz) and R-Pq(HHMz)) offer an extended X-axis option. In the standard configuration, the motor is in-line with the module. In the extended X-axis configuration, the motor is on the side of the module. Also, a Gantry Support Module (to support one end of the module) is available for certain systems (including the R-Pq(HHMz) and R-P(HHMz) systems). If your system includes an extended X-axis option or a Gantry Support Module, see "**Chapter 7** - Installing Optional R-Series Equipment" for information on how to install the X-axis module.

Precautions

Observe the following precautions when configuring modules in multi-axis combinations:

1. Some systems include alignment pins on the combining bracket. The chamfered pin of the combining bracket and the pin hole on the main unit are high-precision mating surfaces and you may experience some resistance in positioning the pin in the hole. Carefully press the bracket and main unit together firmly, using care to avoid damaging the hole in the process.
2. When assembling cables, avoid applying unreasonable force to cables.

   NOTE: Combinations other than those illustrated are possible.

3. Before applying power, check for correct cable connections.



WARNING: Improper connection may result in damage to the controller or module motor.

Mounting Screw Torque Specifications

When mounting screws used to install modules, mounting plates, and other components, apply the amount of torque specified in **Table 3-1 on page 43** and **Table 3-2 on page 44**.

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5.2 R-P(HHMz) Installation Procedure

Overview

This section describes the process of installing a three-axis R-P(HHMz) Adept SmartModules system. This configuration consists of two R-H modules joined together with a R-GHH combining bracket, and an R-Mz module attached with a R-DHM combining bracket. Each module (R-H, R-H, and R-Mz) has a SmartAmp and SmartAmp mounting bracket. Two cable tube assemblies contain the cabling to interconnect the SmartAmps. See **Figure 5-1** for an overview of the system components.

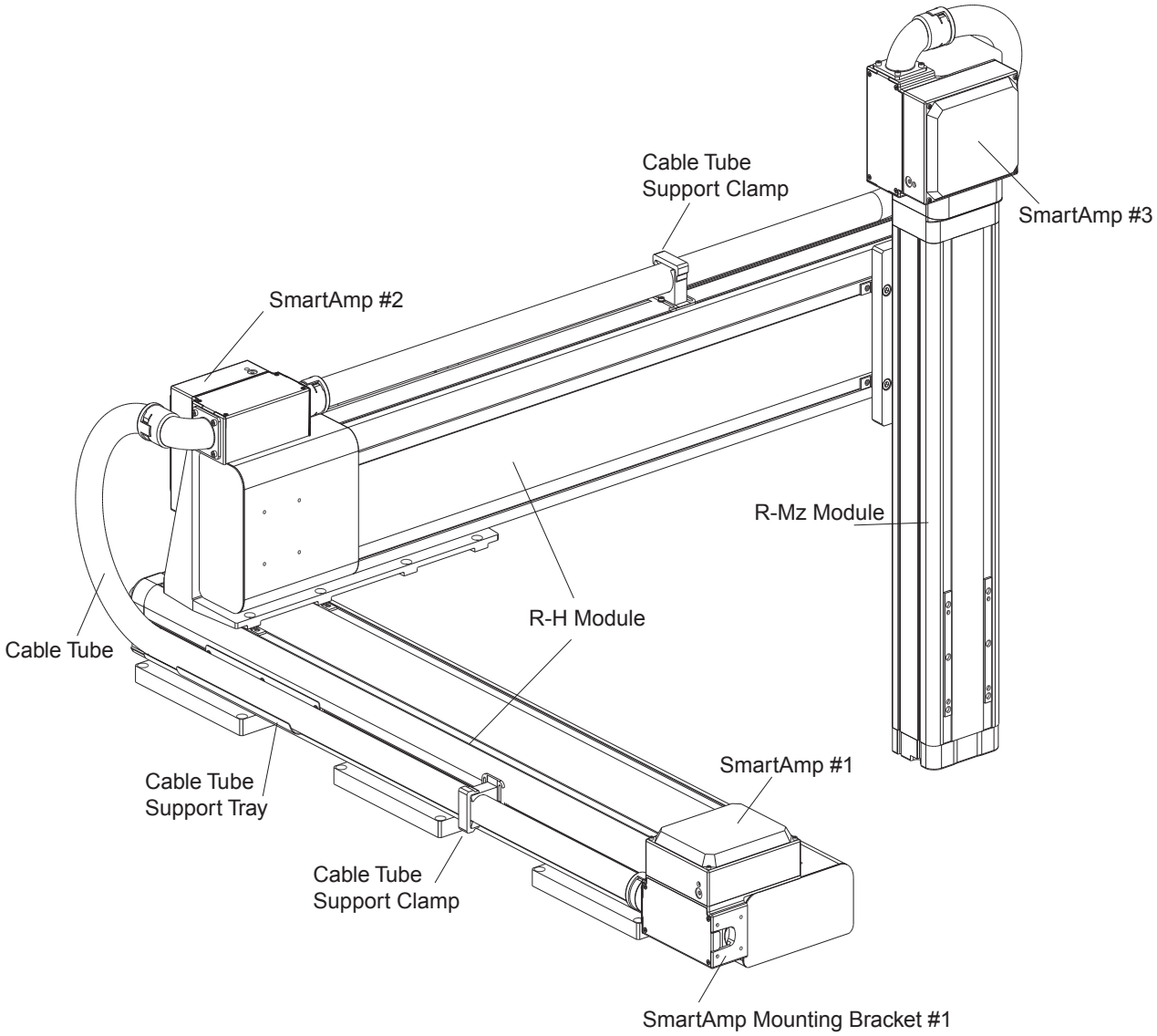


Figure 5-1. R-P(HHMz): System Component Overview

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Table 5-1. R-P(HHMz) Parts List

Description	Part Number	Qty
R-H module	9040x-1xxxx	2
R-Mz module	90405-2xxxx	1
SmartAmp	30410-10000	3
SmartAmp mounting bracket	30410-20000	3
Combining bracket, R-GHH	40405-05000	1
Combining plate, R-DHM	90400-05004	1
Mounting plate, RH	90400-01100	2/3[a]
Cable tube fitting, elbow	40410-40090	2[a]
Cable tube fitting, straight	40410-40000	2[a]
Cable tube, hi-flex	40410-310xx	2
Cable tube clamp	30410-42000	2[a]
Cable tube support tray	30410-60000	1[a]
Cable kit, amp to amp AC power cable 24V DC cable IEEE 1394 cable	90410-100xx 10410-006xx 10410-007xx 10410-005xx	2
Cable kit, controller AC power cable 24V DC cable IEEE 1394 cable Ferrite core	90410-200xx 10410-009xx 10410-010xx 10410-105xx 27200-00117	1
Hardware kit	90405-00200	1
Optional Items		
Gantry support module	90405-50xxx	1
Gantry support bracket, RH	40405-04200	1
Remote I/O (RIO) kit	90410-20050	1[b]

[a] Quantity will vary depending on module length.
[b] Quantity will vary according to order.

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Installing the First R-H Module

NOTE: 300 to 600 mm R-H modules use two mounting plates; 800 mm and longer modules use three plates.

1. Prepare the work surface by drilling and tapping eight or twelve M8 holes (depending on module length) for the R-H-module mounting plates. See **Figure 5-2**. See "**Chapter 10** - Technical Specifications " for dimensions of the R-H module and the plates.
2. Install R-H-module mounting plates (two or three, depending on module length) to the under side of the R-H module using four M8 x 20 screws provided for each plate. See **Figure 5-2**.
3. Mount the R-H module to the work surface using four M8 screws per mounting plate.

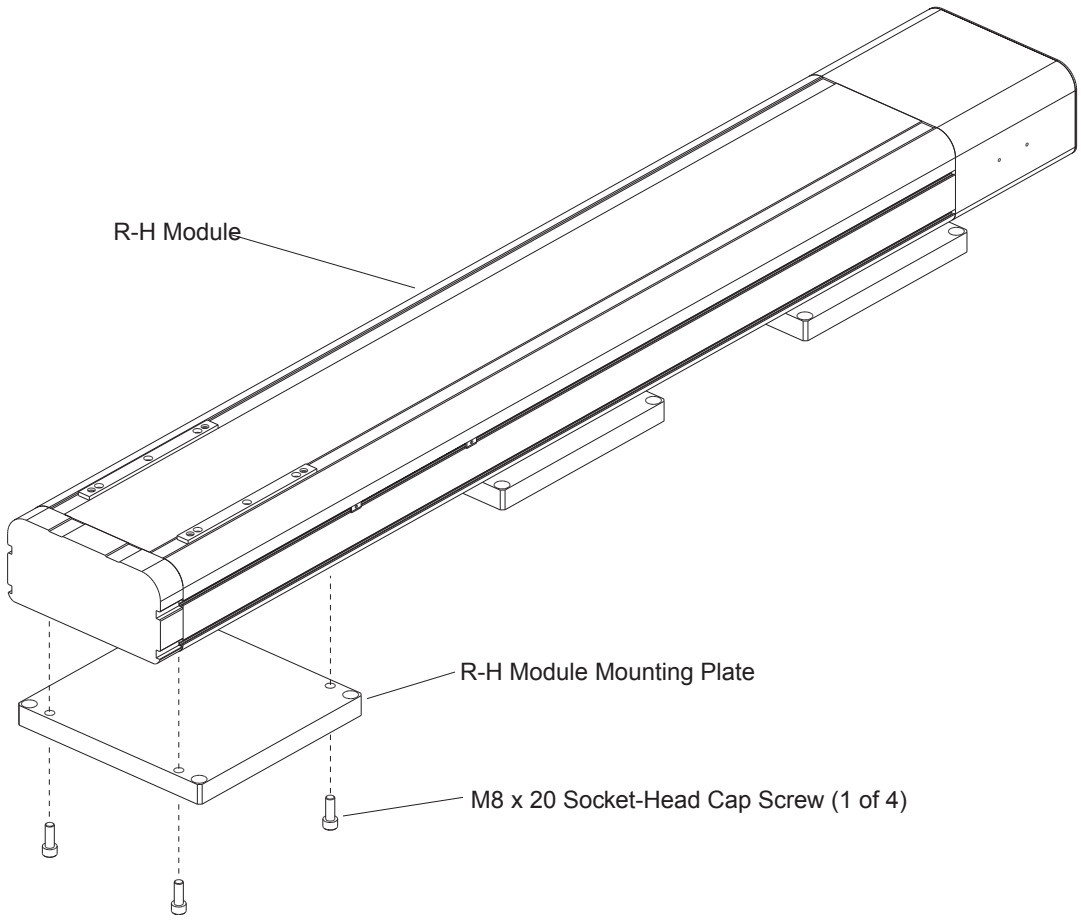


Figure 5-2. R-P(HHMz): Installing the First R-H Module

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Installing Alignment Pins on R-GHH Combining Bracket

1. Locate the R-GHH combining bracket, two 8mm round pins, and two 8mm diamond pins.
2. Install a round pin and a diamond pin in the bottom face of the R-GHH combining bracket. See **Figure 5-3**. Note the orientation of the diamond pin in the drawing. Use Loctite 609 sealant or equivalent to secure the pin in place.

   NOTE: The pin locations shown in **Figure 5-3** and **Figure 5-4** are for a "right-hand" configuration. For a "left-hand" configuration, see "**Appendix A** - Configuration Options ".

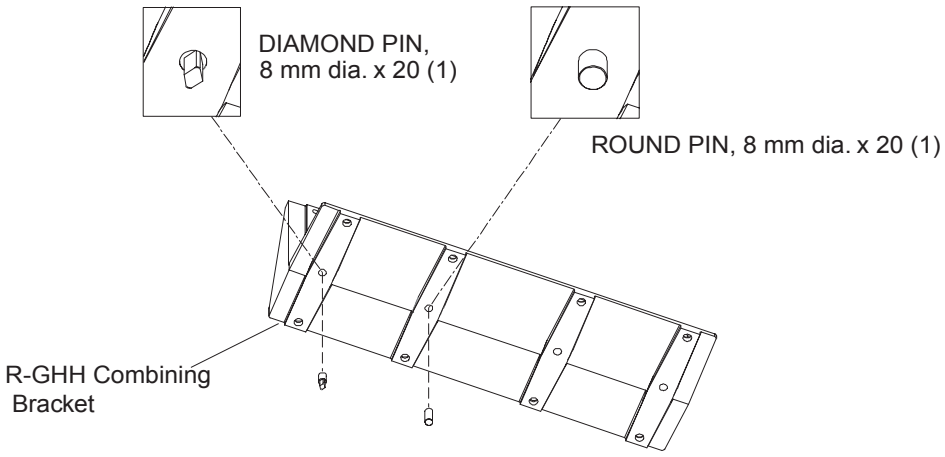


Figure 5-3. R-P(HHMz): Installing Alignment Pins on the R-GHH Combining Bracket (1)

3. Install a round pin and a diamond pin in the side face of the R-GHH combining bracket. See **Figure 5-4 on page 184**. Note the orientation of the diamond pin in the drawing. Use Loctite 609 sealant or equivalent to secure the pin in place.

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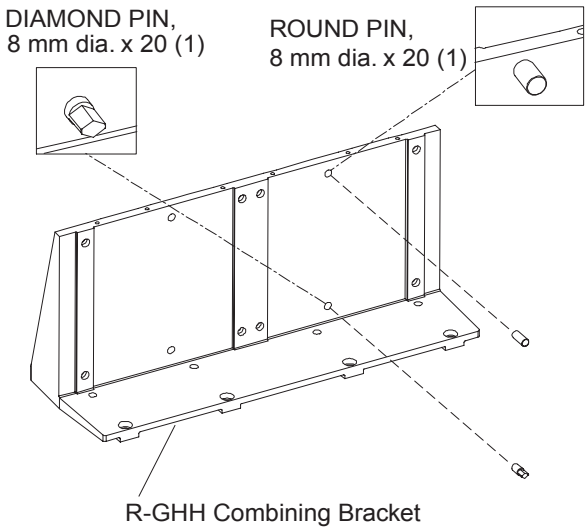


Figure 5-4. R-P(HHMz): Installing Alignment Pins on the R-GHH Combining Bracket (2)

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Installing the Second R-H Module

1. Mount the R-GHH combining bracket to the first R-H-module's slider with four M8 x 20 screws. Position the bracket as shown in **Figure 5-5**. Carefully insert the pins into pin holes to avoid damaging the pin holes.
2. Mount the second R-H module on the R-GHH combining bracket with four M8 x 14 screws. Align the pins on the bracket with the mating holes in the module.

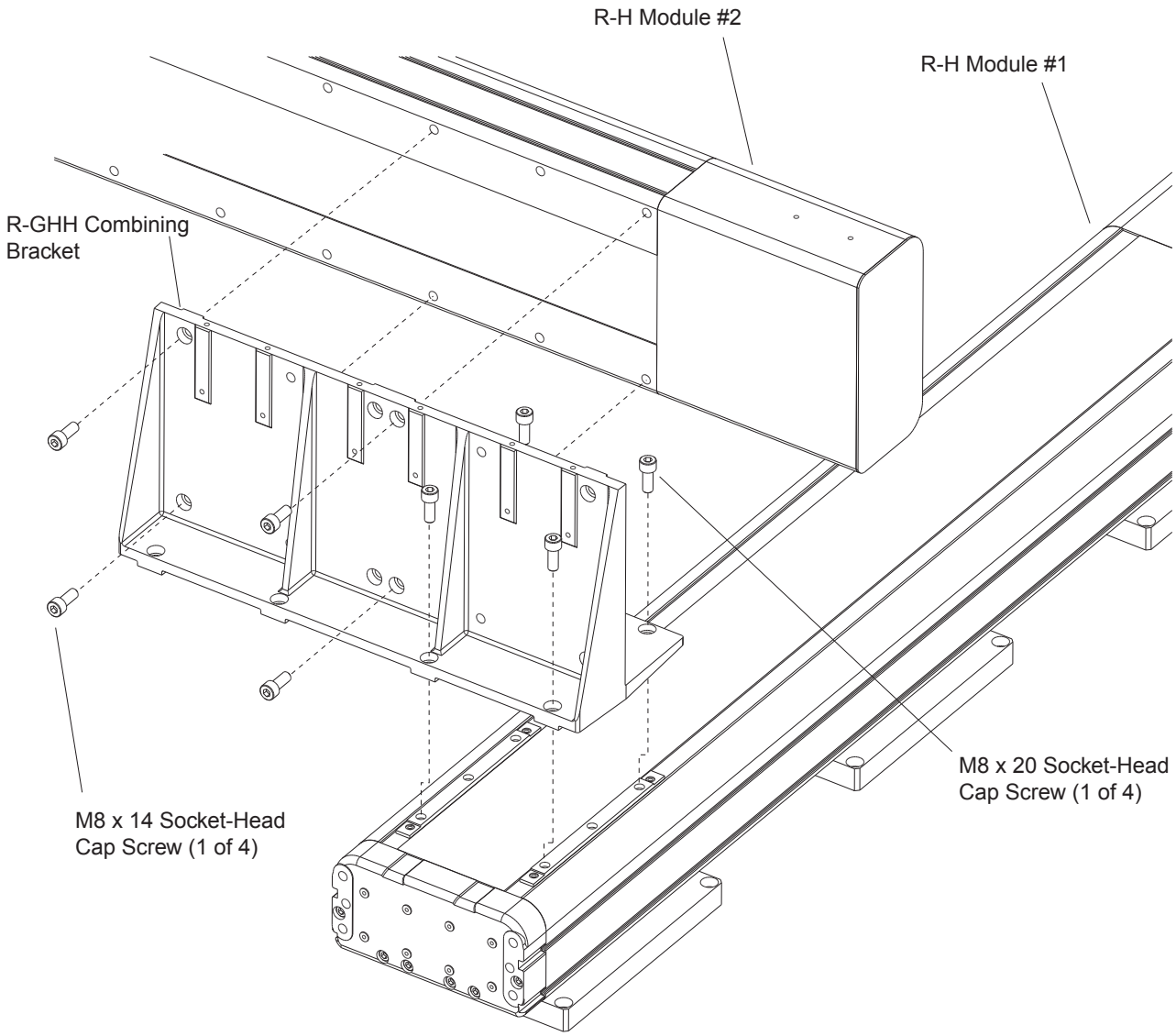


Figure 5-5. R-P(HHMz): Installing the Second R-H Module

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Installing the R-Mz Module

1. Mount the R-DHM combining bracket to the R-Mz module with four M6 x 20 screws. Position the bracket as shown in **Figure 5-6**. Align the pins on the combining bracket with the mating holes in the module.

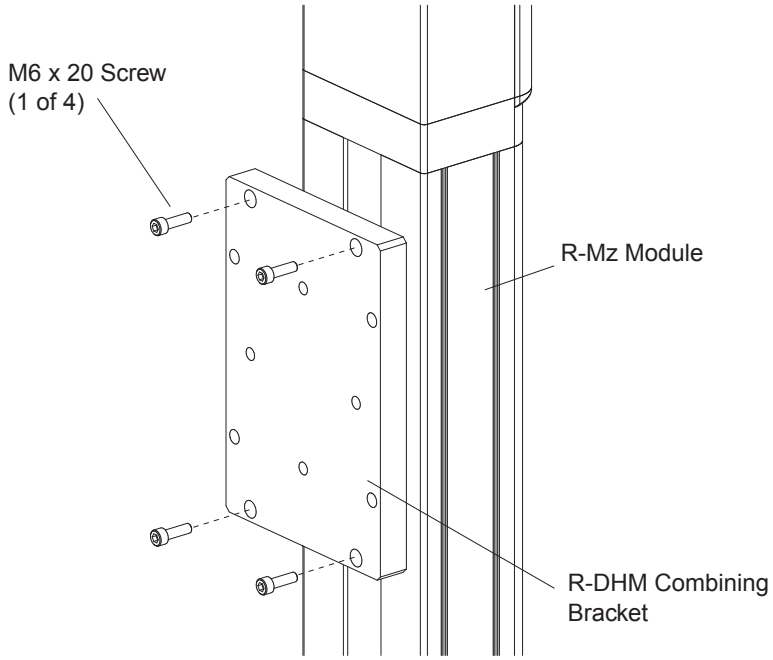


Figure 5-6. R-P(HHMz): Installing the R-DHM Combining Bracket

2. Using the R-DHM combining bracket, mount the R-Mz module to the second R-H module's slider with four M8 x 20 screws. See **Figure 5-7**. Align the pins on the combining bracket with the mating holes in the module's slider.

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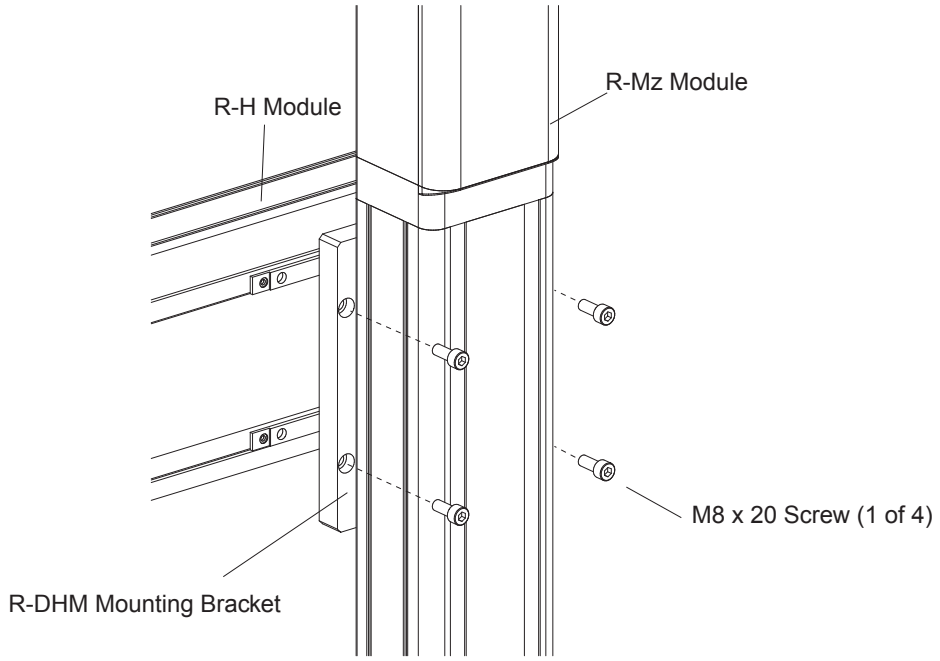


Figure 5-7. R-P(HHMz): Installing the R-Mz Module

Installing Adept SmartAmps

Installing SmartAmp #1 on First R-H Module

1. Remove the cable cover from a SmartAmp mounting bracket by removing four M3 screws.
2. Install the mounting bracket onto the first R-H module at the motor cover using four M4 x 10 flathead screws; see **Figure 5-8 on page 188**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-H module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install the SmartAmp onto the mounting bracket.

3. Install SmartAmp #1 onto the mounting bracket using four M3 x 40 screws. See **Figure 5-9 on page 189**.
4. Plug the motor and encoder cables from the module into the mating receptacles in the SmartAmp. See **Figure 5-10 on page 189**. Attach the captive screws to secure the encoder connector.

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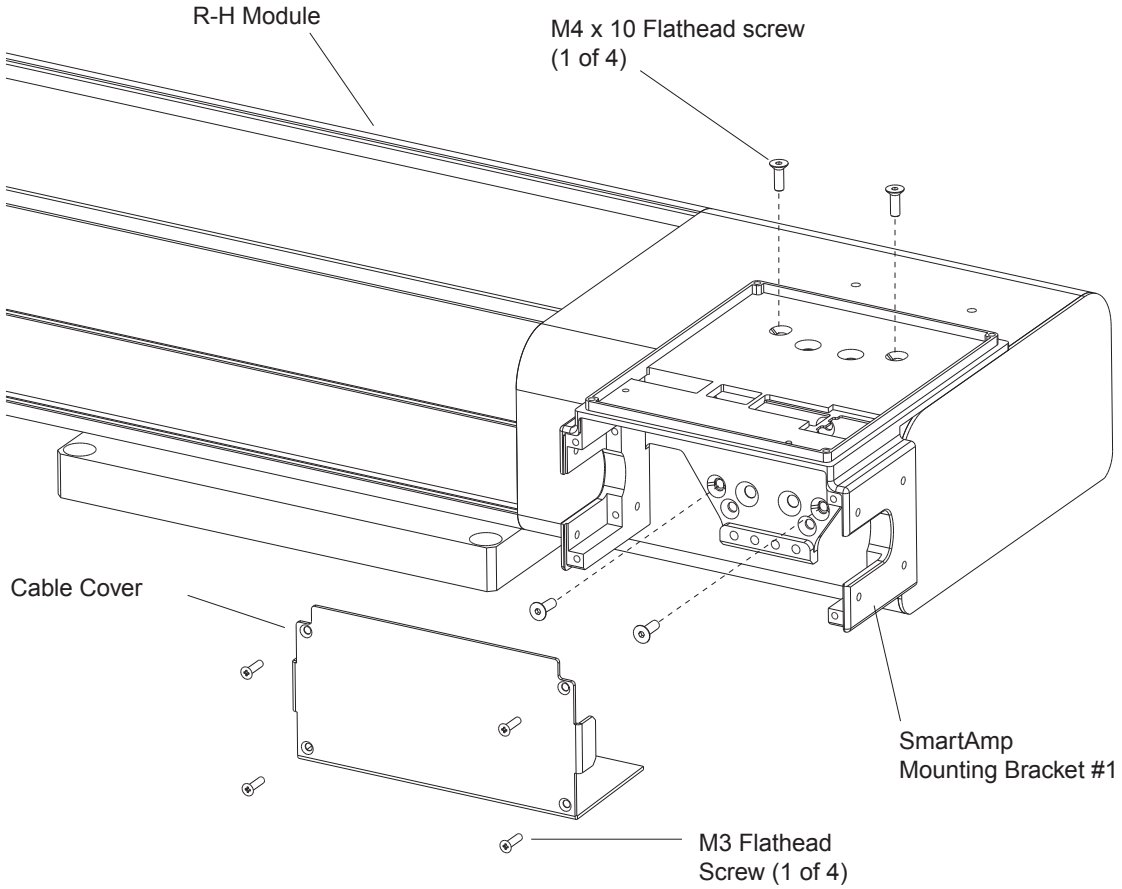


Figure 5-8. R-P(HHMz): Installing SmartAmp Mounting Bracket #1 on the First R-H Module

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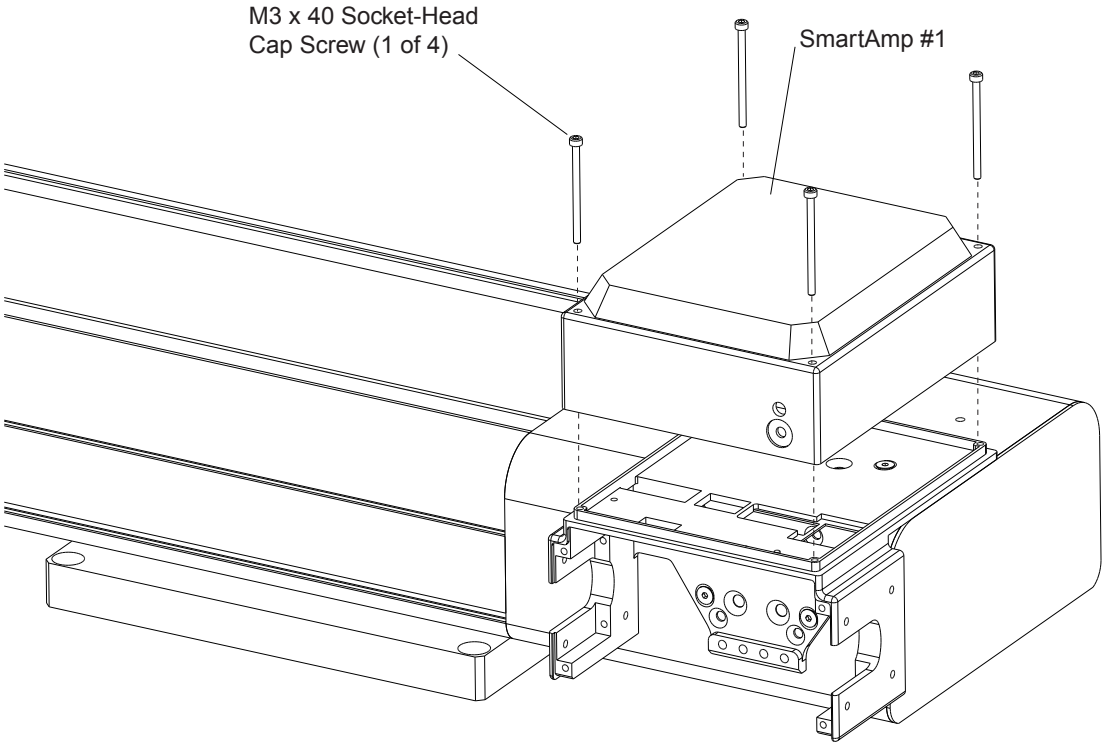


Figure 5-9. R-P(HHMz): Installing SmartAmp #1 on the First R-H Module

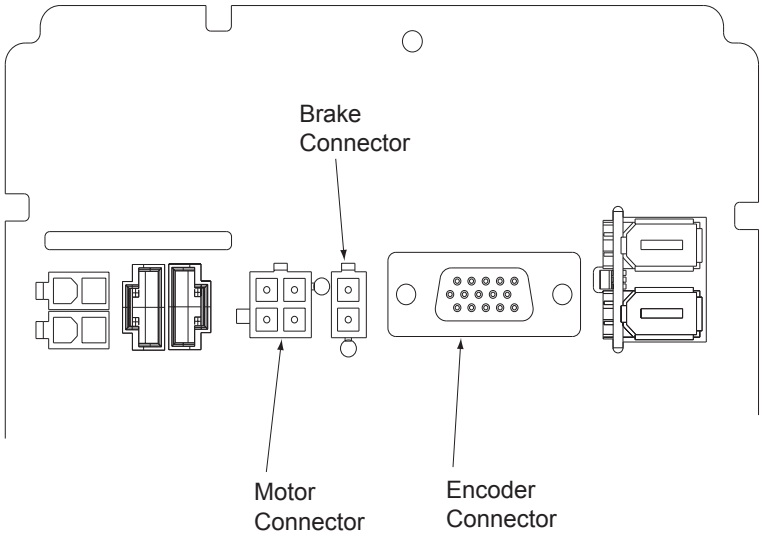


Figure 5-10. R-P(HHMz): Connecting Motor and Encoder Cables to SmartAmp

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Installing SmartAmp #2 on Second R-H Module

1. Remove the front cover from the SmartAmp mounting bracket by removing four M3 screws.
2. Install SmartAmp mounting bracket #2 onto the R-GHH bracket using four M4 x 10 flathead screws; see **Figure 5-11**. Route the motor and encoder cables from the module through the opening in the SmartAmp mounting bracket.
3. Install SmartAmp #2 onto the SmartAmp mounting bracket using four M3 x 40 screws. Position the SmartAmp so that the connectors extend through the SmartAmp mounting bracket. See **Figure 5-12 on page 191**.
4. Plug the motor and encoder cables from the module into the mating receptacles in SmartAmp #2. See **Figure 5-10 on page 189**. Attach the captive screws to secure the encoder connector.

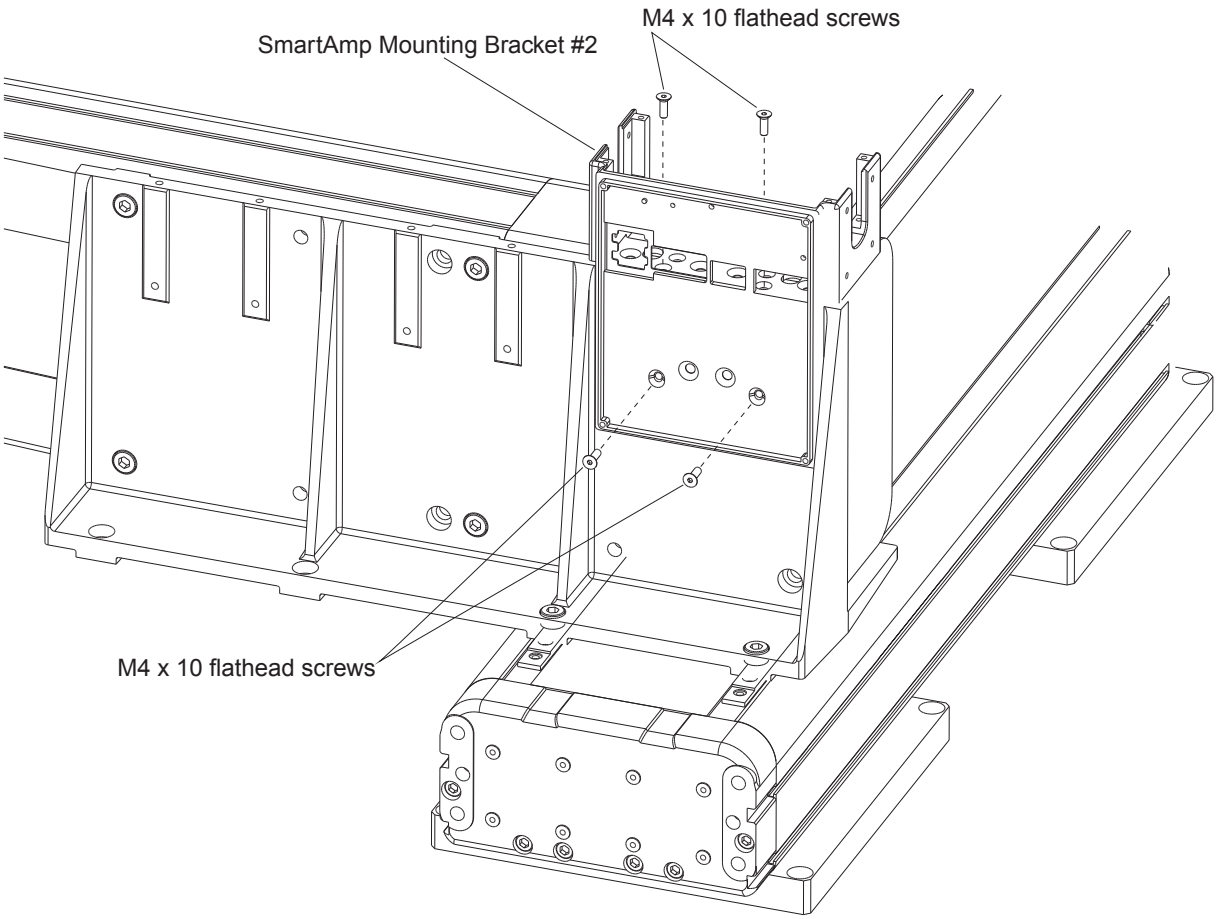


Figure 5-11. R-P(HHMz): Installing SmartAmp Mounting Bracket #2 on the Second R-H Module

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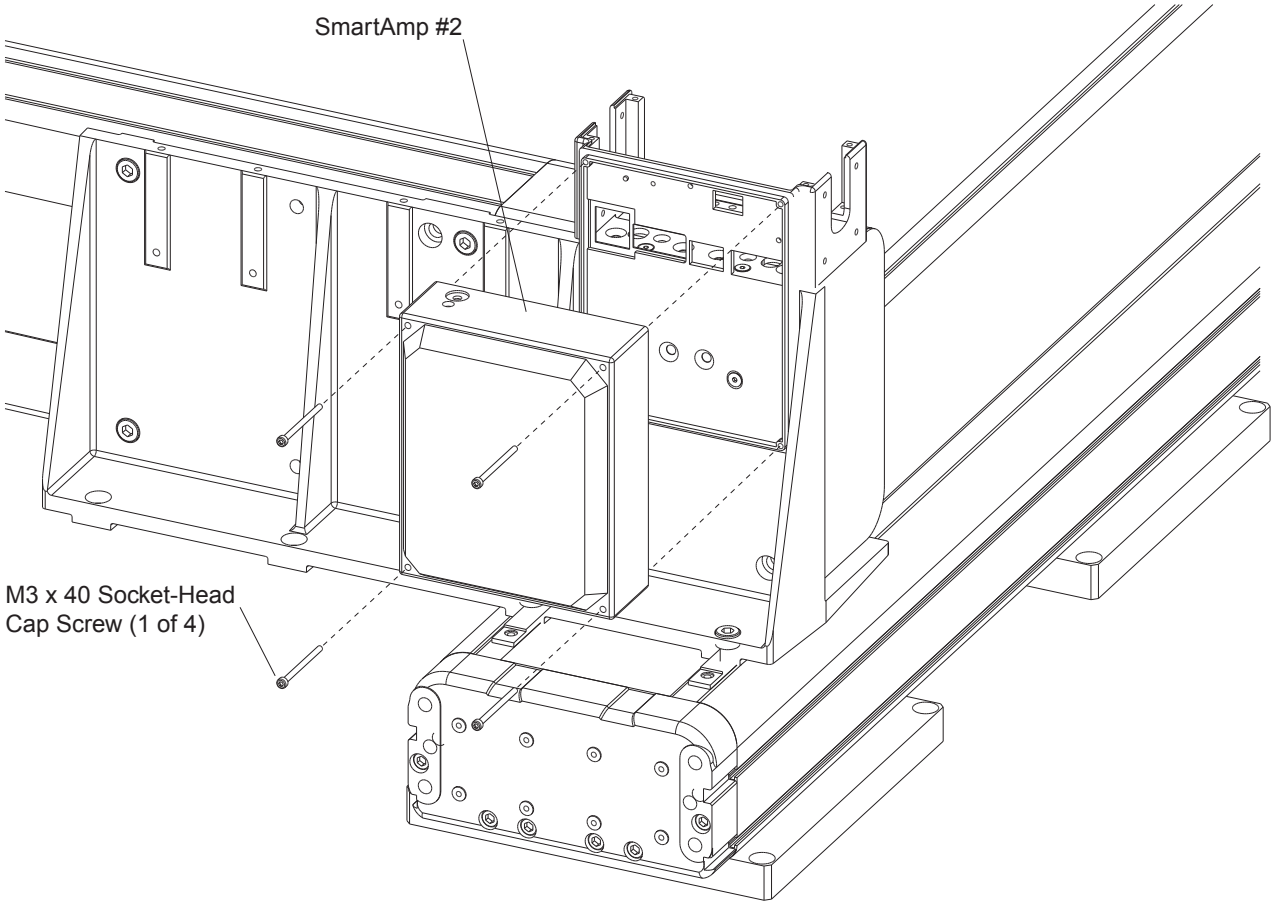


Figure 5-12. R-P(HHMz): Installing SmartAmp #2 on the Second R-H Module

Installing SmartAmp #3 on the R-Mz Module

1. Remove the cable cover from the SmartAmp mounting bracket by removing four M3 screws.
2. Install a SmartAmp mounting bracket onto the R-Mz module using four M4 x 10 flathead screws; see **Figure 5-13 on page 192**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-Mz module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install SmartAmp #3 onto the mounting bracket.

3. Install SmartAmp #3 onto the mounting bracket using four M3 x 40 screws. Position the SmartAmp so that the connectors extend through the mounting bracket. See **Figure 5-14 on page 192**.
4. Plug the motor and encoder cables from the module into the mating receptacles in SmartAmp #3. See **Figure 5-10 on page 189**. Attach the captive screws to secure the encoder connector.

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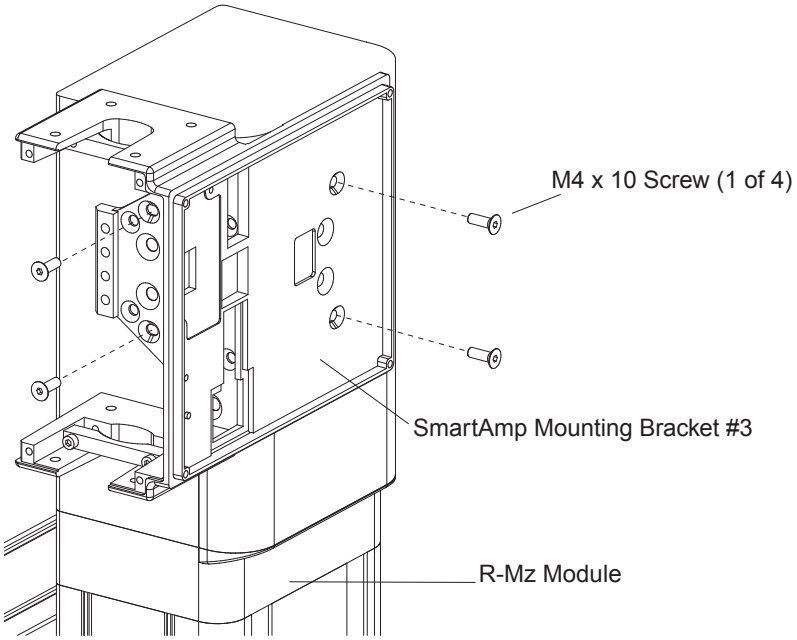


Figure 5-13. R-P(HHMz): Installing SmartAmp Mounting Bracket #3 on the R-Mz Module

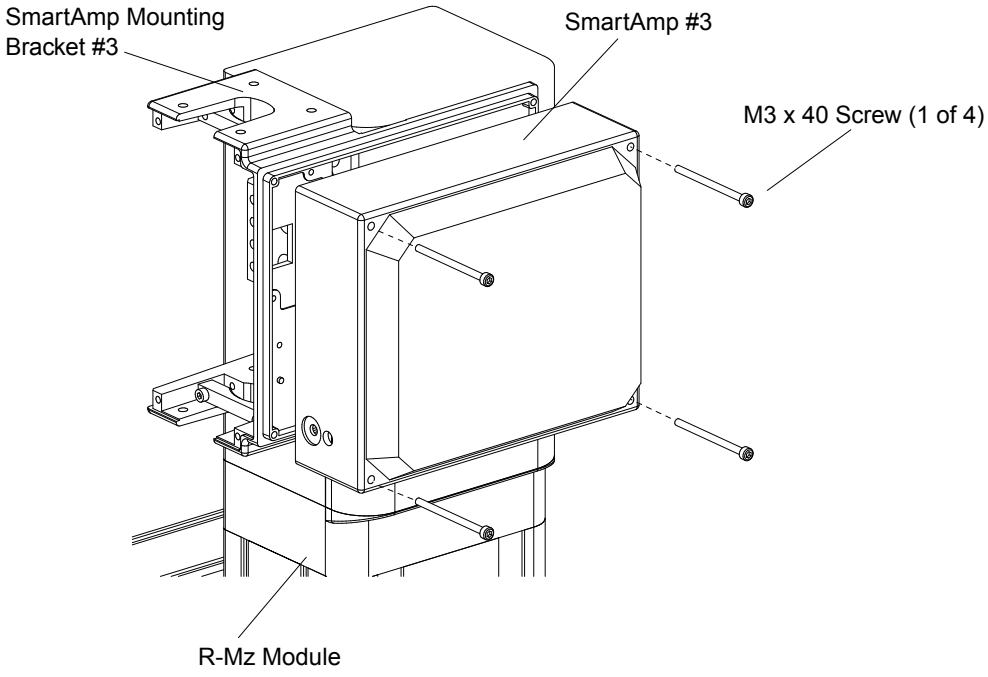


Figure 5-14. R-P(HHMz): Installing SmartAmp #3 on the R-Mz Module

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Installing the Cable Tube Support Clamps on R-H Modules

Mount a cable tube support clamp on each of the R-H modules: one clamp mounts on the side of the first R-H module; the other clamp mounts on the top of the second R-H module. See **Figure 5-15** for an illustration of the two properly mounted cable tube support clamps. For each R-H module, perform the following steps.

1. Slide two T-slot nuts into the upper side channel in the R-H module; see **Figure 5-16 on page 194**. Position the nuts for installing the cable tube support clamp.
2. Install the cable tube support clamp using two M4 x 8 screws. Leave the M4 screws loose for repositioning later after the cable tube has been installed.
3. Repeat the above steps for the other cable tube support clamp.

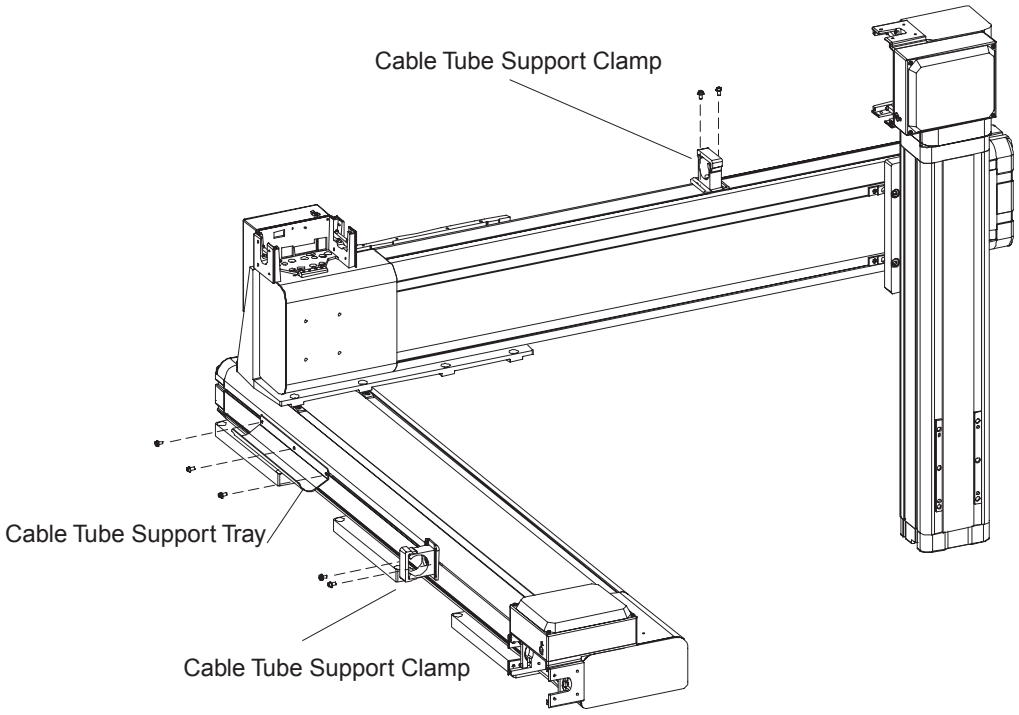


Figure 5-15. R-P(HHMz): Cable Tube Support Clamps

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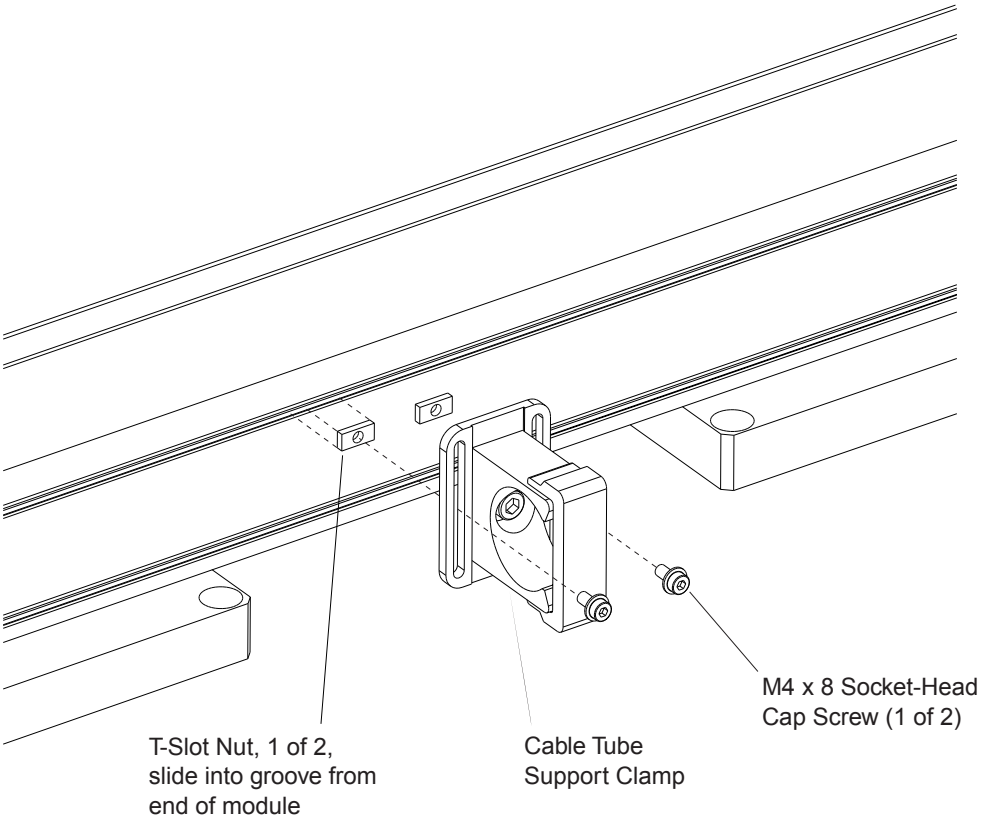


Figure 5-16. R-P(HHMz): Installing the Cable Tube Support Clamps

Installing the Cable Tube Support Tray

Install the cable tube support tray on the first R-H module only.

1. Slide three T-slot nuts into the upper side channel in the first R-H module; see **Figure 5-17 on page 195**. Position the nuts for installing the cable tube support tray.
2. Install the cable tube support tray using three M4 x 6 screws.

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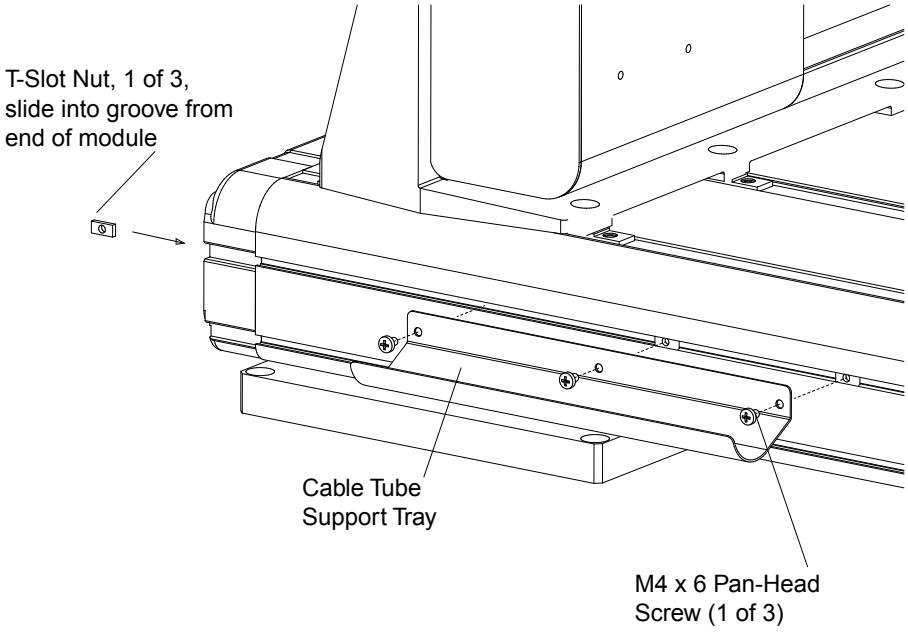


Figure 5-17. R-P(HHMz): Installing the Cable Tube Support Tray

Installing Cable Tube Assemblies Between the SmartAmps

Create one cable tube assembly to connect SmartAmp #1 to SmartAmp #2; create another cable tube assembly to connect SmartAmp #2 to SmartAmp #3.

The procedure to install cables consists of these steps:

- route cables through the cable tube
- install cable tube fittings on cable tube
- install assembled cable tube on SmartAmp mounting brackets and plug in all cables

The lengths of the cables and cable tube depend on which modules you have ordered.

Routing Cables Through Cable Tube

Perform the steps below for each of the two cable tube assemblies.

1. Locate three cables in the cable kit.
   - AC power cable
   - 24VDC cable
   - IEEE 1394 cable

   See **Figure 5-18 on page 196**.
2. Group the three cables together, plus any additional user cables or air lines, and slide them through the cable tube.

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3. Gently pull the cables through the tube until they are evenly spaced at each end. Try to make sure the cables do not get twisted or tangled as you pull them through the tube.
4. Repeat the above steps for the other cable tube assembly.

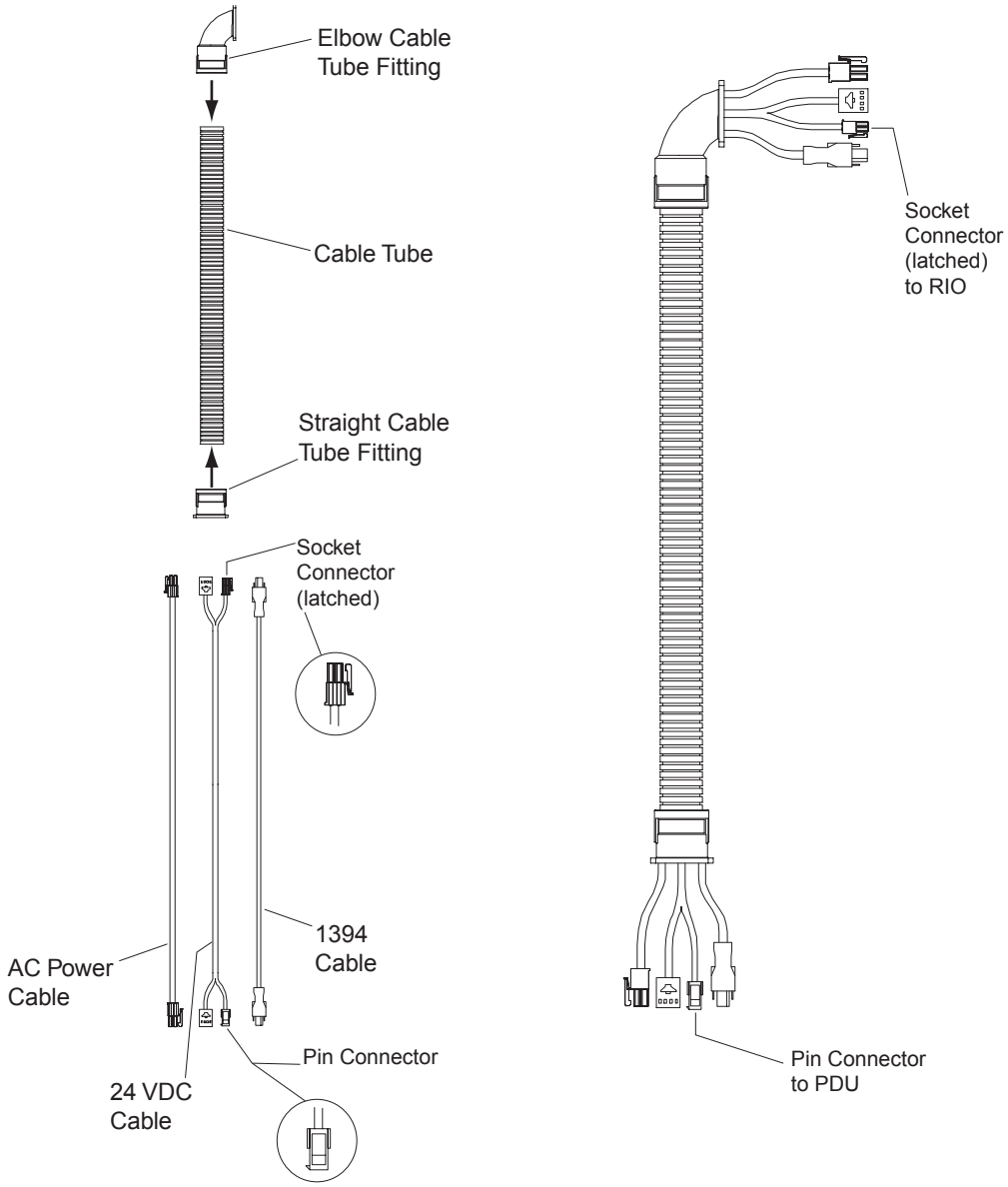


Figure 5-18. R-P(HHMz): Cable Tube Assembly (One Straight/One Elbow Fitting)

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Installing Cable Tube Fittings on Cable Tube

NOTE: For all cable tube fittings, make sure the arrows on the fitting clamp are pointing toward the end of the tube.

Perform the steps below for each of the two cable tube assemblies.

1. Locate a straight cable tube fitting.

   NOTE: The 24V cable has two additional connectors for the optional RIO system. There is a socket (latched) connector at one end of the cable and a pin connector at the other end. For both cable tube assemblies, install the straight cable tube fitting on the end near the 24V pin connector; install the elbow fitting on the other end. Each cable tube assembly should have a straight cable tube fitting on one end (near the 24V pin connector), and an elbow fitting (near the 24V socket connector) on the other end. See **Figure 5-18 on page 196**.

2. Install the fitting by pushing it onto the end of the cable tube until the fitting has fully snapped into place inside the fitting. See **Figure 5-18 on page 196**.
3. Locate an elbow cable tube fitting.
4. Install the fitting by pushing it onto the opposite end of the cable tube until the fitting has fully snapped into place inside the fitting.
5. Repeat the above steps for the other cable tube assembly.

Installing the First Cable Tube Assembly

Install the first cable tube assembly between SmartAmp #1 and SmartAmp #2.

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #1 Perform the steps below to attach the first cable tube assembly to SmartAmp mounting bracket #1 and connect cables to SmartAmp #1.

1. Remove the cable clamp from inside the mounting bracket by removing the two M3 screws. See **Figure 5-19 on page 198**.
2. Position the straight fitting of the cable tube assembly near SmartAmp #1.
3. Install the straight fitting on the outside of the mounting bracket. Make sure the fitting clamp is accessible. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See **Figure 5-20 on page 198**.
4. In SmartAmp #1, connect these cables:
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable

   There are two identical mating connectors for each cable in the SmartAmp, you can use either one. See **Figure 5-21 on page 199**.
5. Slide the cable clamp into the channel inside the mounting bracket.

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6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

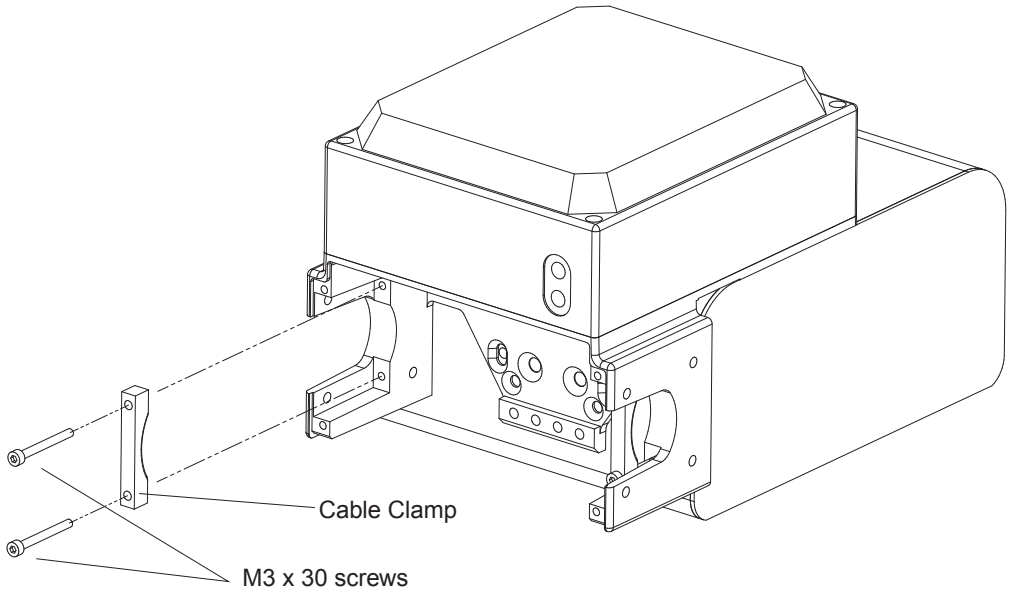


Figure 5-19. R-P(HHMz): Removing the Cable Clamp

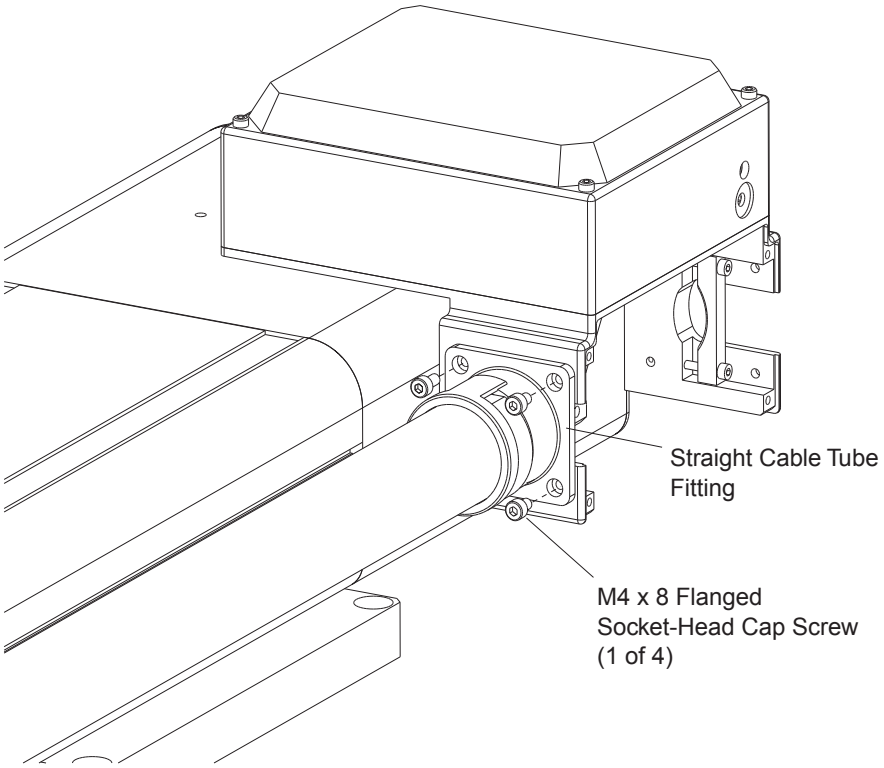


Figure 5-20. R-P(HHMz): Installing Cable Tube Fitting on SmartAmp Mounting Bracket #1

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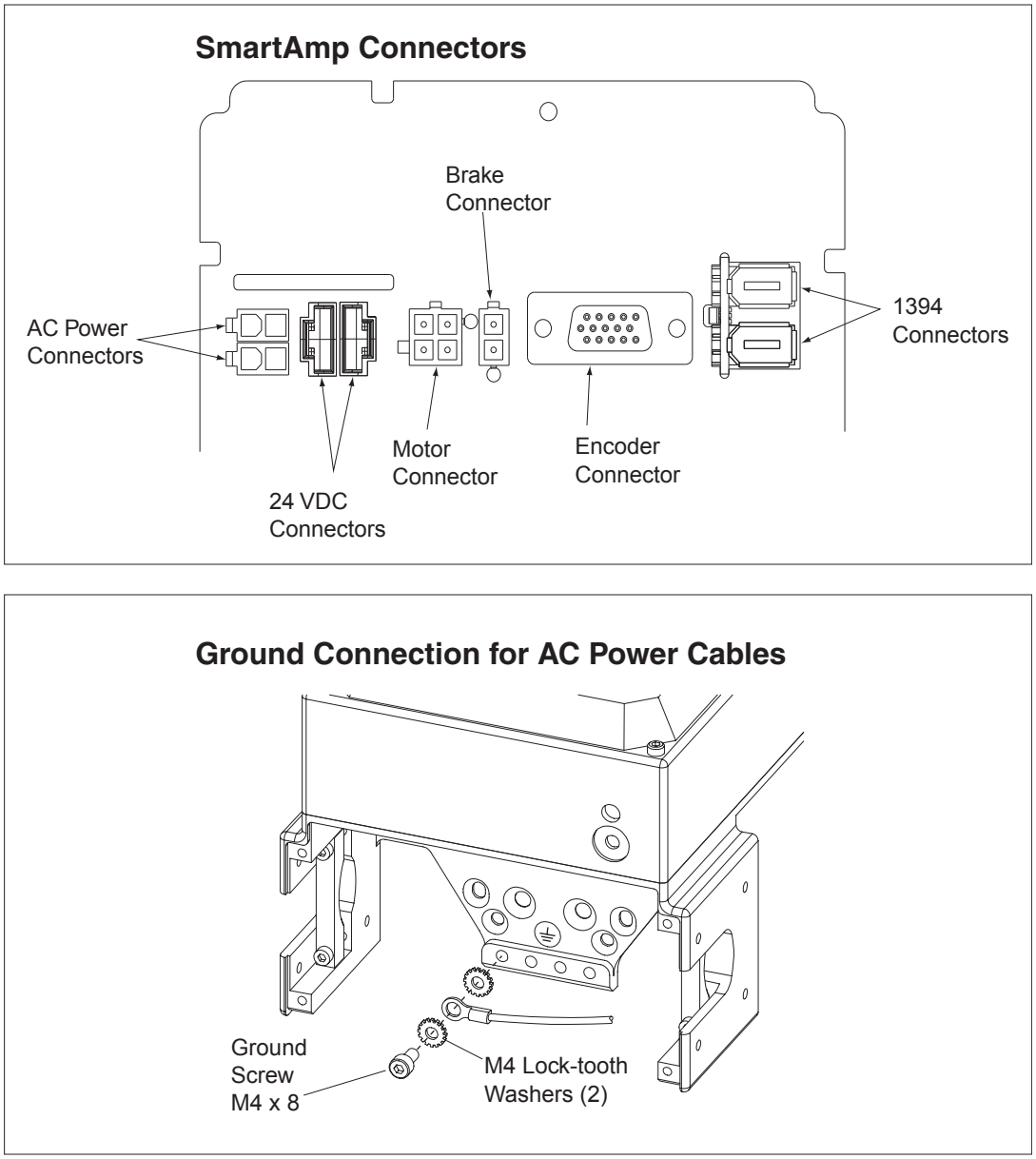


Figure 5-21. R-P(HHMz): Connecting Cables to SmartAmp

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #2 Perform the steps below to attach the first cable tube assembly to SmartAmp mounting bracket #2 and connect cables to SmartAmp #2.

1. Remove the cable clamp from inside mounting bracket #2 by removing the two M3 screws.
2. Rest the cable tube in the support tray. Fold the cable tube up 180 degrees so the elbow fitting is positioned next to mounting bracket #2.
3. Install the elbow fitting on the outside of mounting bracket #2. See **Figure 5-22 on page 200**. Use four M4 x 8 screws to secure the fitting to the mounting bracket.

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4. In SmartAmp #2, connect these cables (see **Figure 5-21 on page 199**):
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

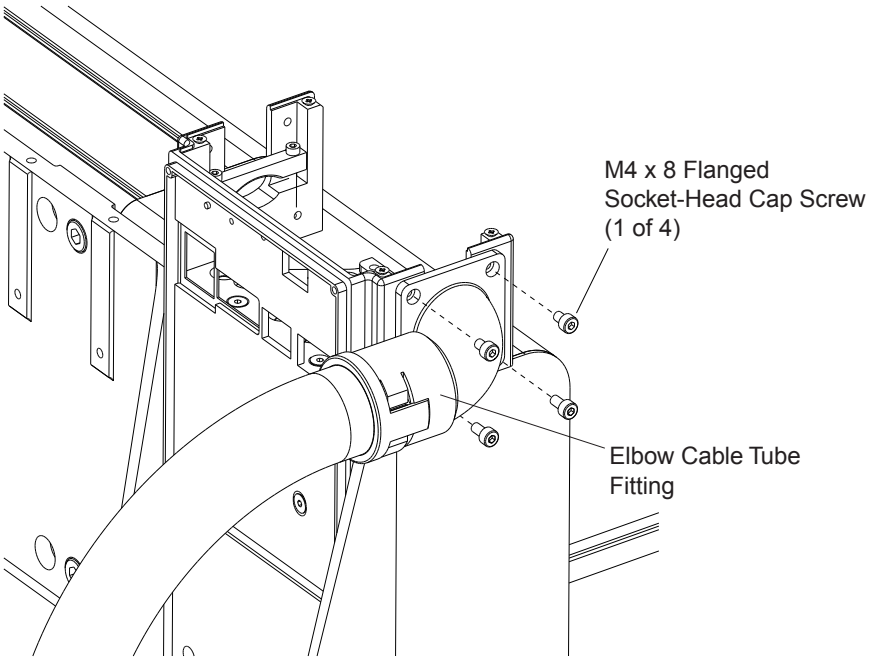


Figure 5-22. R-P(HHMz): Installing Cable Tube Fitting on SmartAmp Mounting Bracket #2

7. Slide the cable tube support clamp to the desired position and snap the tube into place. The clamp should be positioned just past the point where the cable tube bends when the second R-H module is closest to SmartAmp #1. Tighten the screws on the clamp to secure it.
8. Slide the cable tube support tray into place near the end of the module so that the tube is supported at the end of travel. Tighten the screws on the tray to secure it.

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Installing the Second Cable Tube Assembly

Install the second cable tube assembly between SmartAmp #2 and SmartAmp #3.

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #2 Perform the steps below to attach the second cable tube assembly to SmartAmp mounting bracket #2 and connect cables to SmartAmp #2.

1. Remove the cable clamp from inside mounting bracket #2 by removing the two M3 screws. See **Figure 5-19 on page 198** for an illustration of the cable clamp (note that this illustration is oriented differently from the correct mounting position for mounting bracket #2).
2. Position the straight fitting of the cable tube assembly near SmartAmp #2, opposite from the elbow cable tube fitting already connected to SmartAmp #2.
3. Install the straight cable tube fitting on the outside of the mounting bracket. Make sure the fitting clamp is accessible. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See **Figure 5-20 on page 198** for an illustration of how to connect a straight cable tube fitting. Note that this illustration is rotated from the correct orientation of the fitting and does not show the elbow fitting previously connected to SmartAmp #2.
4. In SmartAmp #2, connect these cables from the second cable tube assembly:
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable

   See **Figure 5-21 on page 199**.
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #3 Perform the steps below to attach the second cable tube assembly to SmartAmp mounting bracket #3 and connect cables to SmartAmp #3.

1. Remove the cable clamp from inside mounting bracket #3 by removing the two M3 screws.
2. Fold the cable tube up 180 degrees so the elbow fitting is positioned next to mounting bracket #3.
3. Install the elbow fitting on the outside of mounting bracket #3. See **Figure 5-23 on page 202**. Use four M4 x 8 screws to secure the fitting to the mounting bracket.
4. In SmartAmp #3, connect these cables (see **Figure 5-21 on page 199**):
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable
5. Slide the cable clamp into the channel inside the mounting bracket.

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6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

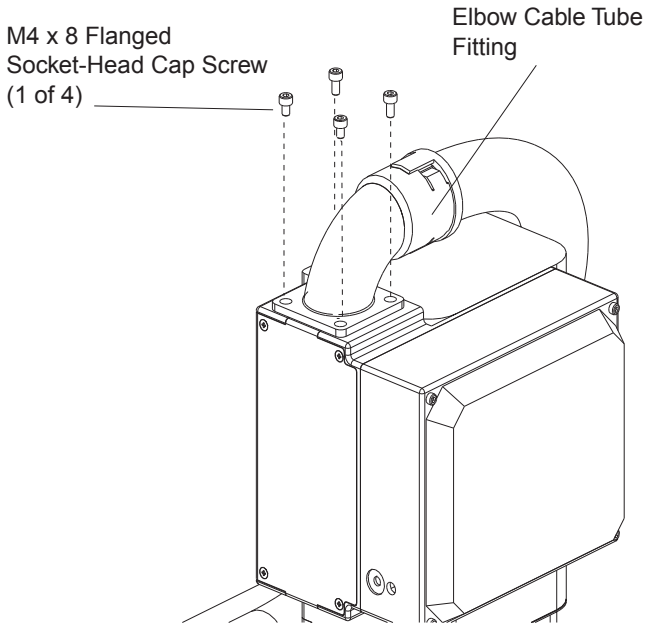


Figure 5-23. R-P(HHMz): Installing Cable Tube Fitting on SmartAmp Mounting Bracket #3

7. Slide the cable tube support clamp to the desired position and snap the tube into place. Tighten the screws on the clamp to secure it.

Connecting Cables from Controller to SmartAmp #1

See **"Connecting Cables from Controller to SmartAmp #1" on page 51** for instructions.

Completing the Installation

Perform these steps to complete the installation.

- After you connect all the cables inside the SmartAmp, attach the cable cover to the SmartAmp bracket using four M3 screws.
- Check the mechanical motion of each axis. (Modules with brakes must be checked when the power is turned on.)

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5.3 R-Pq(HHMz) Installation Procedure

Overview

This section describes the process of installing a three-axis R-Pq(HHMz) Adept SmartModules system. This configuration consists of two R-H modules joined together with a R-GHH combining bracket, and an R-Mz module attached with an R-XHM bracket. Each module (R-H, R-H, and R-Mz) has a SmartAmp and SmartAmp mounting bracket. Two cable tube assemblies contain the cabling to interconnect the SmartAmps. See **Figure 5-24** for an overview of the system components.

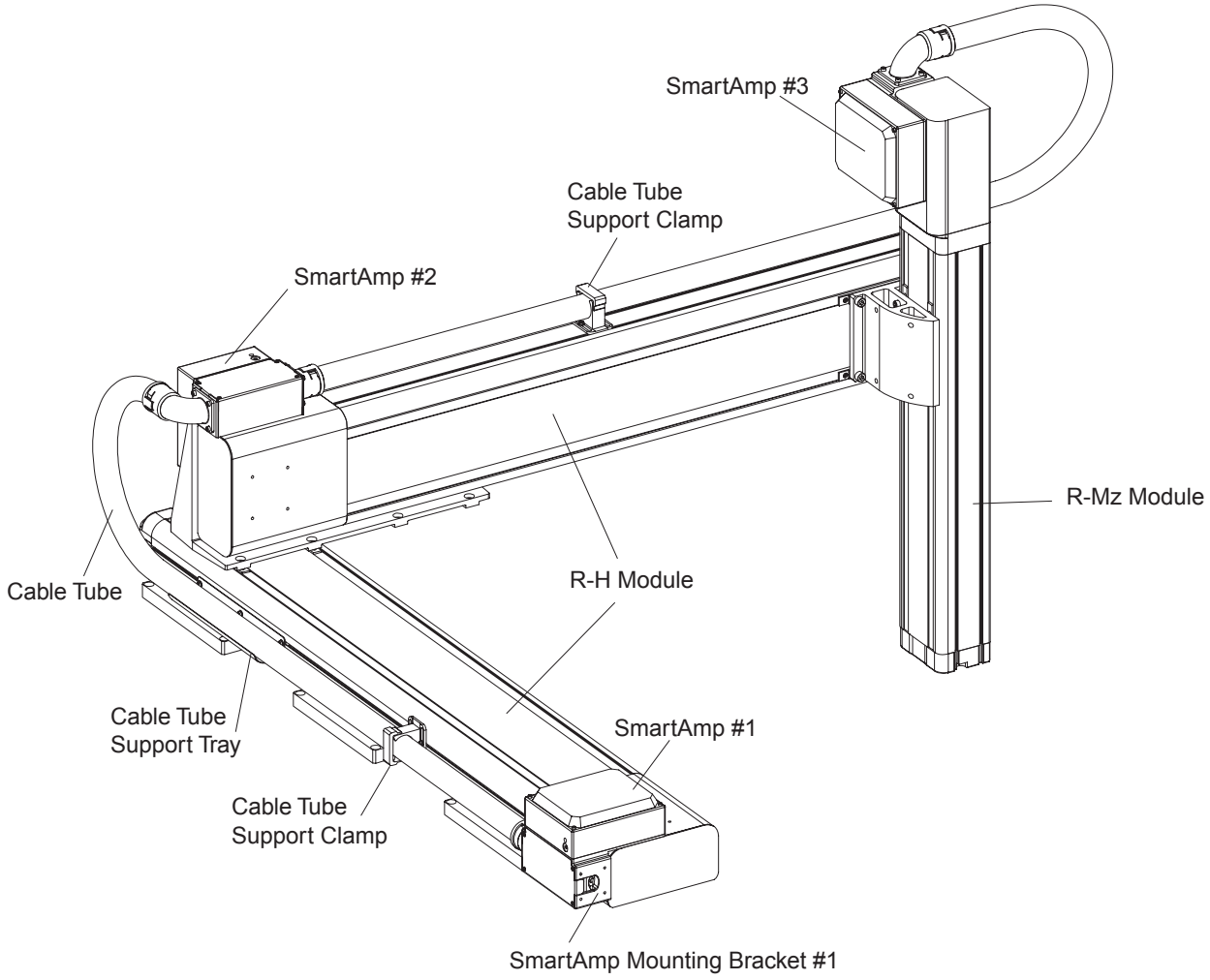


Figure 5-24. R-Pq(HHMz): System Component Overview

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Table 5-2. R-Pq(HHMz) Parts List

Description	Part Number	Qty
R-H module	9040x-1xxxx	2
R-Mz module	90405-2xxxx	1
SmartAmp	30410-10000	3
SmartAmp mounting bracket	30410-20000	3
Combining bracket, R-GHH	40405-05000	1
Combining plate, R-XHM	90400-05009	1
Mounting plate, RH	90400-01100	2/3[a]
Cable tube fitting, elbow	40410-40090	2[a]
Cable tube fitting, straight	40410-40000	2[a]
Cable tube, hi-flex	40410-310xx	2
Cable tube clamp	30410-42000	2[a]
Cable tube support tray	30410-60000	1[a]
Cable kit, amp to amp AC power cable 24V DC cable IEEE 1394 cable	90410-100xx 10410-006xx 10410-007xx 10410-005xx	2
Cable kit, controller AC power cable 24V DC cable IEEE 1394 cable Ferrite core	90410-200xx 10410-009xx 10410-010xx 10410-105xx 27200-00117	1
Hardware kit	90405-00200	1
Optional Items		
Gantry support module	90405-50xxx	1
Gantry support bracket, RH	40405-04200	1
Remote I/O (RIO) kit	90410-20050	1[b]

[a] Quantity will vary depending on module length.
[b] Quantity will vary according to order.

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Installing the First R-H Module

NOTE: 300 to 600 mm R-H modules use two mounting plates; 800 mm and longer modules use three plates.

1. Prepare the work surface by drilling and tapping eight or twelve M8 holes (depending on module length) for the R-H-module mounting plates. See "**Chapter 10** - Technical Specifications " for dimensions of the R-H module and the plates.
2. Install R-H-module mounting plates (two or three, depending on module length) to the under side of the R-H module using four M8 x 20 screws provided for each plate. See **Figure 5-2 on page 182**.
3. Mount the R-H module to the work surface using four M8 screws per mounting plate.

Installing Alignment Pins on R-GHH Combining Bracket

1. Locate the R-GHH combining bracket, two 8mm round pins, and two 8mm diamond pins.
2. Install a round pin and a diamond pin in the bottom face of the R-GHH combining bracket. See **Figure 5-3 on page 183**. Note the orientation of the diamond pin in the drawing. Use Loctite 609 sealant or equivalent to secure the pin in place.

   NOTE: The pin locations shown in **Figure 5-3** and **Figure 5-4** are for a "right-hand" configuration. For a "left-hand" configuration, see "**Appendix A** - Configuration Options ".
3. Install a round pin and a diamond pin in the side face of the R-GHH combining bracket. See **Figure 5-4 on page 184**. Note the orientation of the diamond pin in the drawing. Use Loctite 609 sealant or equivalent to secure the pin in place.

Installing the Second R-H Module

1. Mount the R-GHH combining bracket to the first R-H-module's slider with four M8 x 20 screws. Position the bracket as shown in **Figure 5-5 on page 185**. Carefully insert the pins into pin holes to avoid damaging the pin holes.
2. Mount the second R-H module on the R-GHH combining bracket with four M8 x 14 screws. Align the pins on the bracket with the mating holes in the module. See **Figure 5-5 on page 185**.

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Installing the R-Mz Module

1. Mount the R-XHM combining bracket to the second R-H module with four M8 x 20 screws. Position the bracket as shown in **Figure 5-25**. Align the pins on the combining bracket with the mating holes in the module's slider.

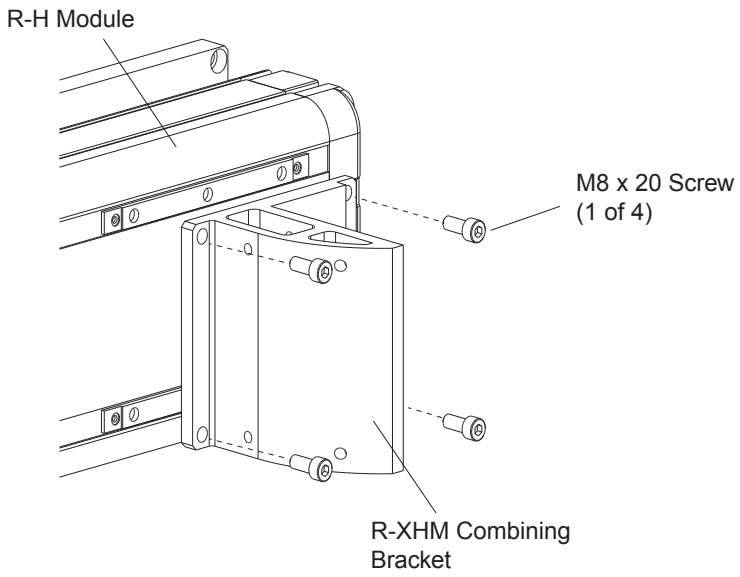


Figure 5-25. R-Pq(HHMz): Installing the R-XHM Combining Bracket

2. Using the R-XHM combining bracket, mount the R-Mz module on the R-H module's slider with four M6 x 20 screws. See **Figure 5-26**. Align the pins on the combining bracket with the mating holes in the module's slider.

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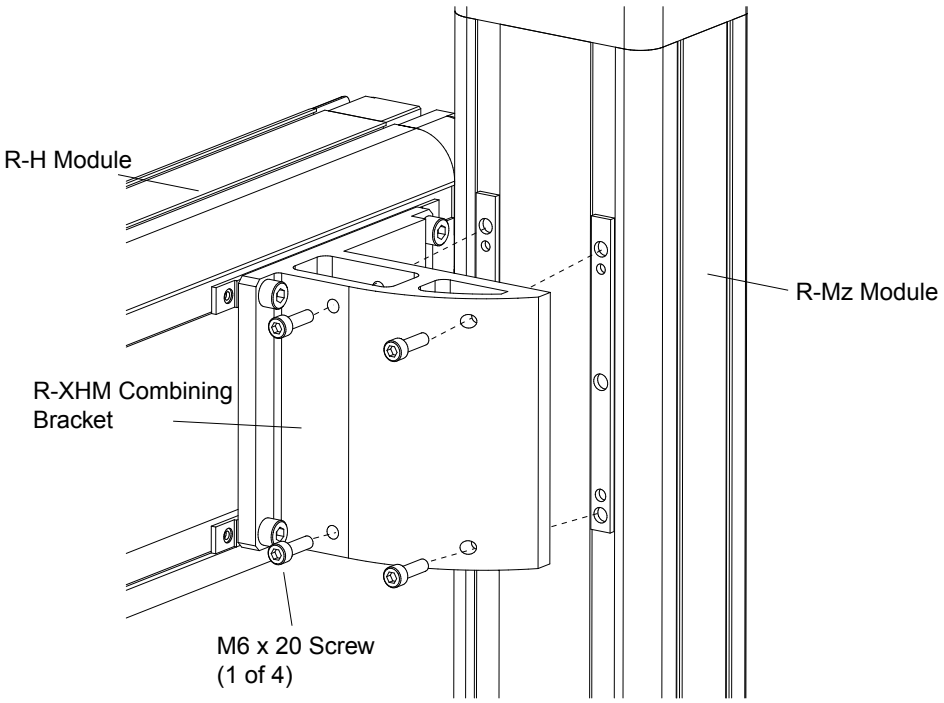


Figure 5-26. R-Pq(HHMz): Installing the R-Mz Module

Installing Adept SmartAmps

Installing SmartAmp #1 on First R-H Module

1. Remove the cable cover from a SmartAmp mounting bracket by removing four M3 screws.
2. Install the mounting bracket onto the first R-H module at the motor cover using four M4 x 10 flathead screws; see **Figure 5-8 on page 188**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-H module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install the SmartAmp onto the mounting bracket.
3. Install SmartAmp #1 onto the mounting bracket using four M3 x 40 screws. See **Figure 5-9 on page 189**.
4. Plug the motor and encoder cables from the module into the mating receptacles in the SmartAmp. See **Figure 5-10 on page 189**. Attach the captive screws to secure the encoder connector.

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Installing SmartAmp #2 on the Second R-H Module

1. Remove the front cover from the SmartAmp mounting bracket by removing four M3 screws.
2. Install SmartAmp mounting bracket #2 onto the R-GHH bracket using four M4 x 10 flathead screws; see **Figure 5-11 on page 190**. Route the motor and encoder cables from the module through the opening in the SmartAmp mounting bracket.
3. Install SmartAmp #2 onto the SmartAmp mounting bracket using four M3 x 40 screws. Position the SmartAmp so that the connectors extend through the SmartAmp mounting bracket. See **Figure 5-12 on page 191**.
4. Plug the motor and encoder cables from the module into the mating receptacles in SmartAmp #2. See **Figure 5-10 on page 189**. Attach the captive screws to secure the encoder connector.

Installing SmartAmp #3 on the R-Mz Module

1. Remove the cable cover from the SmartAmp mounting bracket by removing four M3 screws.
2. Install a SmartAmp mounting bracket onto the R-Mz module using four M4 x 10 flathead screws; see **Figure 5-27 on page 209**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-Mz module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install SmartAmp #3 onto the mounting bracket.

3. Install SmartAmp #3 onto the mounting bracket using four M3 x 40 screws. Position the SmartAmp so that the connectors extend through the mounting bracket. See **Figure 5-28 on page 210**.
4. Plug the motor and encoder cables from the module into the mating receptacles in SmartAmp #3. See **Figure 5-10 on page 189**. Attach the captive screws to secure the encoder connector.

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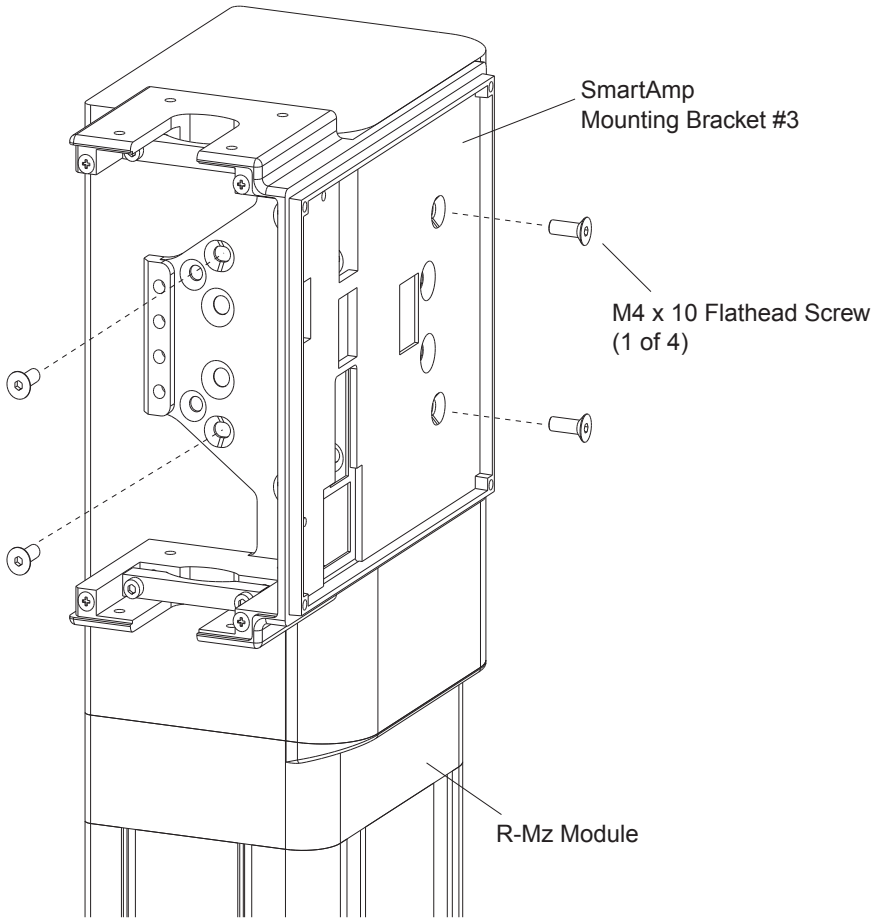


Figure 5-27. R-Pq(HHMz): Installing SmartAmp Mounting Bracket #3 on the R-Mz Module

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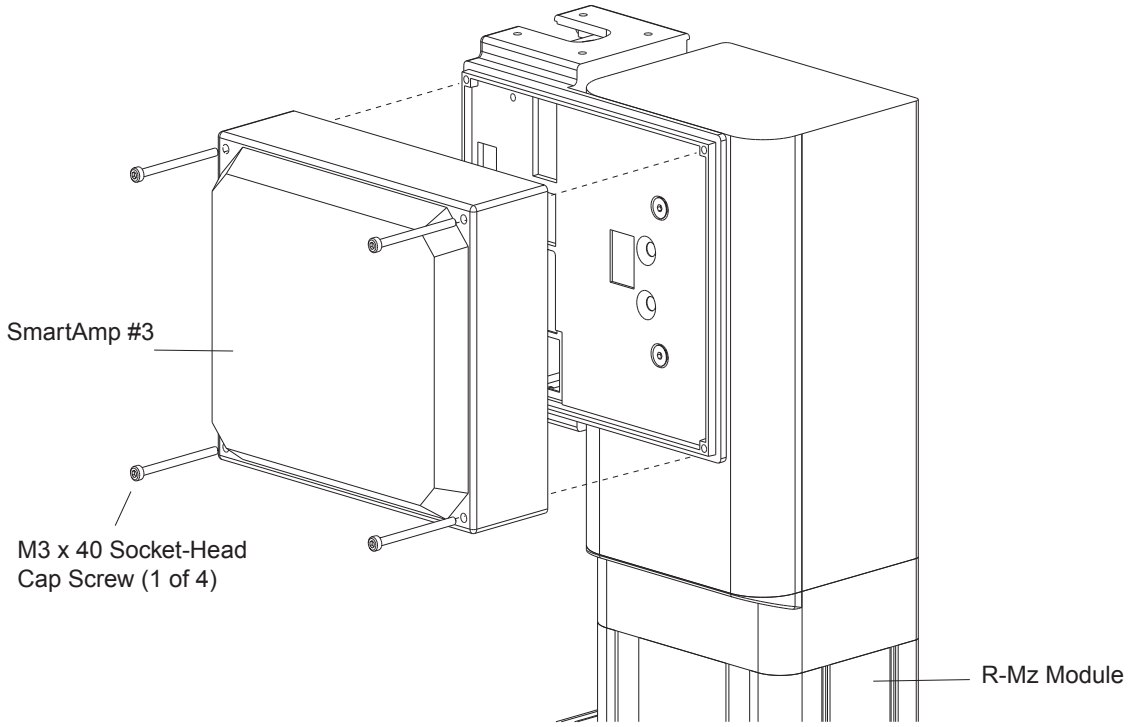


Figure 5-28. R-Pq(HHMz): Installing SmartAmp #3 on the R-Mz Module

Installing the Cable Tube Support Clamps on R-H Modules

Mount a cable tube support clamp on each of the R-H modules: one clamp mounts on the side of the first R-H module; the other clamp mounts on the top of the second R-H module. See **Figure 5-29 on page 211** for an illustration of the two properly mounted cable tube support clamps. For each R-H module, perform the following steps.

1. Slide two T-slot nuts into the upper side channel in the R-H module; see **Figure 5-16 on page 194**. Position the nuts for installing the cable tube support clamp.
2. Install the cable tube support clamp using two M4 x 8 screws. Leave the M4 screws loose for repositioning later after the cable tube has been installed.
3. Repeat the above steps for the other cable tube support clamp.

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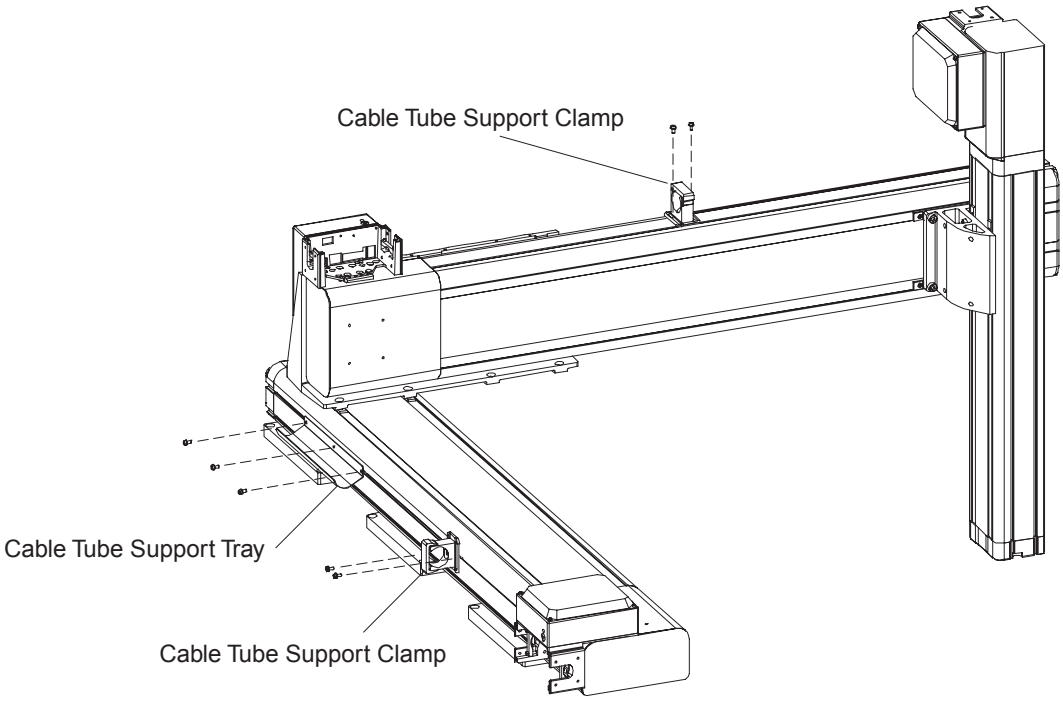


Figure 5-29. R-Pq(HHMz): Cable Tube Support Clamps and Cable Tube Support Tray

Installing the Cable Tube Support Tray

Install the cable tube support tray on the first R-H module only.

1. Slide three T-slot nuts into the upper side channel in the first R-H module; see **Figure 5-17 on page 195**. Position the nuts for installing the cable tube support tray.
2. Install the cable tube support tray using three M4 x 6 screws.

Installing Cable Tube Assemblies Between the SmartAmps

Create one cable tube assembly to connect SmartAmp #1 to SmartAmp #2; create another cable tube assembly to connect SmartAmp #2 to SmartAmp #3.

The procedure to install cables consists of these steps:

- route cables through the cable tube
- install cable tube fittings on cable tube
- install assembled cable tube on SmartAmp mounting brackets and plug in all cables

The lengths of the cables and cable tube depend on which modules you have ordered.

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Routing Cables Through Cable Tube

Perform the steps below for each of the two cable tube assemblies.

1. Locate three cables in the cable kit.
   - AC power cable
   - 24VDC cable
   - IEEE 1394 cable

   See **Figure 5-18 on page 196**.
2. Group the three cables together, plus any additional user cables or air lines, and slide them through the cable tube.
3. Gently pull the cables through the tube until they are evenly spaced at each end. Try to make sure the cables do not get twisted or tangled as you pull them through the tube.
4. Repeat the above steps for the other cable tube assembly.

Installing Cable Tube Fittings on Cable Tube

NOTE: For all cable tube fittings, make sure the arrows on the fitting clamp are pointing toward the end of the tube.

Perform the steps below for each of the two cable tube assemblies.

1. Locate a straight cable tube fitting.

   NOTE: The 24V cable has two additional connectors for the optional RIO system. There is a socket (latched) connector at one end of the cable and a pin connector at the other end. For both cable tube assemblies, install the straight cable tube fitting on the end near the 24V pin connector; install the elbow fitting on the other end. Each cable tube assembly should have a straight cable tube fitting on one end (near the 24V pin connector), and an elbow fitting (near the 24V socket connector) on the other end. See **Figure 5-18 on page 196**.
2. Install the fitting by pushing it onto the end of the cable tube until the fitting has fully snapped into place inside the fitting. See **Figure 5-18 on page 196**.
3. Locate an elbow cable tube fitting.
4. Install the fitting by pushing it onto the opposite end of the cable tube until the fitting has fully snapped into place inside the fitting.
5. Repeat the above steps for the other cable assembly.

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Installing the First Cable Tube Assembly

Install the first cable tube assembly between SmartAmp #1 and SmartAmp #2.

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #1 Perform the steps below to attach the first cable tube assembly to SmartAmp mounting bracket #1 and connect cables to SmartAmp #1.

1. Remove the cable clamp from inside the mounting bracket by removing the two M3 screws. See **Figure 5-19 on page 198**.
2. Position the straight fitting of the cable tube assembly near SmartAmp #1.
3. Install the straight fitting on the outside of the mounting bracket. Make sure the fitting clamp is accessible. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See **Figure 5-20 on page 198**.
4. In SmartAmp #1, connect these cables:
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable

   There are two identical mating connectors for each cable in the SmartAmp, you can use either one. See **Figure 5-21 on page 199**.
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #2 Perform the steps below to attach the first cable tube assembly to SmartAmp mounting bracket #2 and connect cables to SmartAmp #2.

1. Remove the cable clamp from inside mounting bracket #2 by removing the two M3 screws.
2. Rest the cable tube in the support tray. Fold the cable tube up 180 degrees so the elbow fitting is positioned next to mounting bracket #2.
3. Install the elbow fitting on the outside of mounting bracket #2. See **Figure 5-22 on page 200**. Use four M4 x 8 screws to secure the fitting to the mounting bracket.
4. In SmartAmp #2, connect these cables (see **Figure 5-21 on page 199**):
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

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7. Slide the cable tube support clamp to the desired position and snap the tube into place. The clamp should be positioned just past the point where the cable tube bends when the second R-H module is closest to SmartAmp #1. Tighten the screws on the clamp to secure it.
8. Slide the cable tube support tray into place near the end of the module so that the tube is supported at the end of travel. Tighten the screws on the tray to secure it.

Installing the Second Cable Tube Assembly

Install the second cable tube assembly between SmartAmp #2 and SmartAmp #3.

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #2 Perform the steps below to attach the second cable tube assembly to SmartAmp mounting bracket #2 and connect cables to SmartAmp #2.

1. Remove the cable clamp from inside mounting bracket #2 by removing the two M3 screws. See **Figure 5-19 on page 198** for an illustration of the cable clamp (note that this illustration is oriented differently from the correct mounting position onto mounting bracket #2).
2. Position the straight fitting of the cable tube assembly near SmartAmp #2, opposite from the elbow cable tube fitting already connected to SmartAmp #2.
3. Install the straight cable tube fitting on the outside of the mounting bracket. Make sure the fitting clamp is accessible. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See **Figure 5-20 on page 198** for an illustration of how to connect a straight cable tube fitting. Note that this illustration is rotated from the correct orientation of the fitting and does not show the elbow fitting previously connected to SmartAmp #2.
4. In SmartAmp #2, connect these cables from the second cable tube assembly:
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable

   See **Figure 5-21 on page 199**.
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #3 Perform the steps below to attach the second cable tube assembly to SmartAmp mounting bracket #3 and connect cables to SmartAmp #3.

1. Remove the cable clamp from inside mounting bracket #3 by removing the two M3 screws.
2. Fold the cable tube up 180 degrees so the elbow fitting is positioned next to mounting bracket #3.
3. Install the elbow fitting on the outside of mounting bracket #3. See **Figure 5-30 on page 215**. Use four M4 x 8 screws to secure the fitting to the mounting bracket.

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4. In SmartAmp #3, connect these cables (see **Figure 5-21 on page 199**):
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

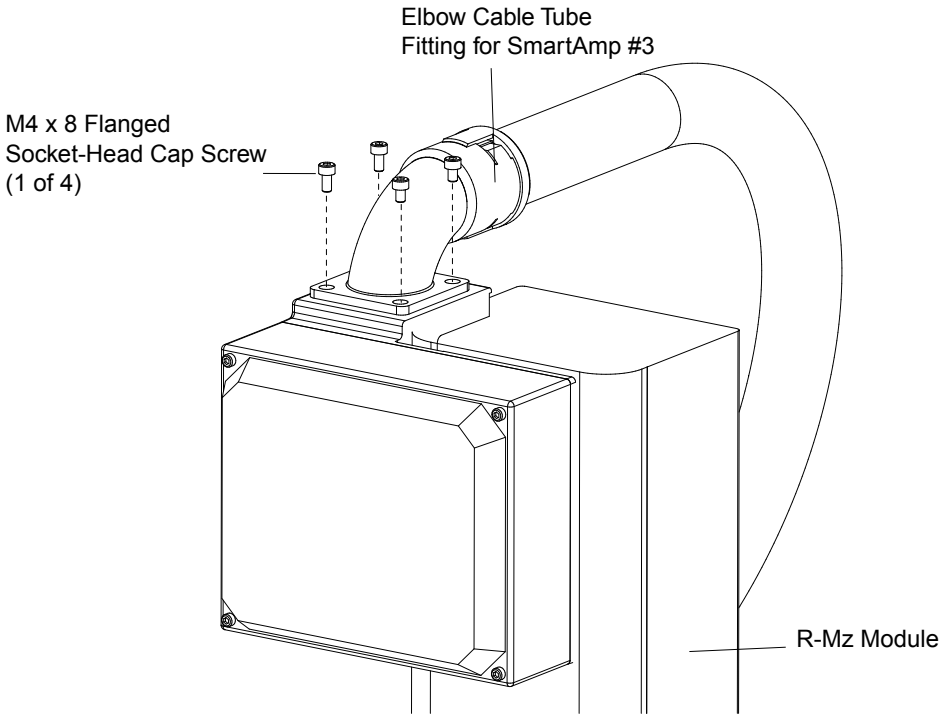


Figure 5-30. R-Pq(HHMz): Installing Cable Tube Fitting on SmartAmp Mounting Bracket #3

7. Slide the cable tube support clamp to the desired position and snap the tube into place. Tighten the screws on the clamp to secure it.

Connecting Cables from Controller to SmartAmp #1

See **"Connecting Cables from Controller to SmartAmp #1" on page 51** for instructions.

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Completing the Installation

Perform these steps to complete the installation.

- After you connect all the cables inside the SmartAmp, attach the cable cover to the SmartAmp bracket using four M3 screws.
- Check the mechanical motion of each axis. (Modules with brakes must be checked when the power is turned on.)

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5.4 R-P(HMSz) Installation Procedure

Overview

This section describes the process of installing a three-axis R-P(HMSz) Adept SmartModules system. This configuration consists of an R-H and R-M module joined together with a R-GHM combining bracket, and an R-Sz module attached with a R-DMS combining bracket. Each module (R-H, R-M, and R-Sz) has a SmartAmp and SmartAmp mounting bracket. Two cable tube assemblies contain the cabling to interconnect the SmartAmps. See **Figure 5-31** for an overview of the system components.

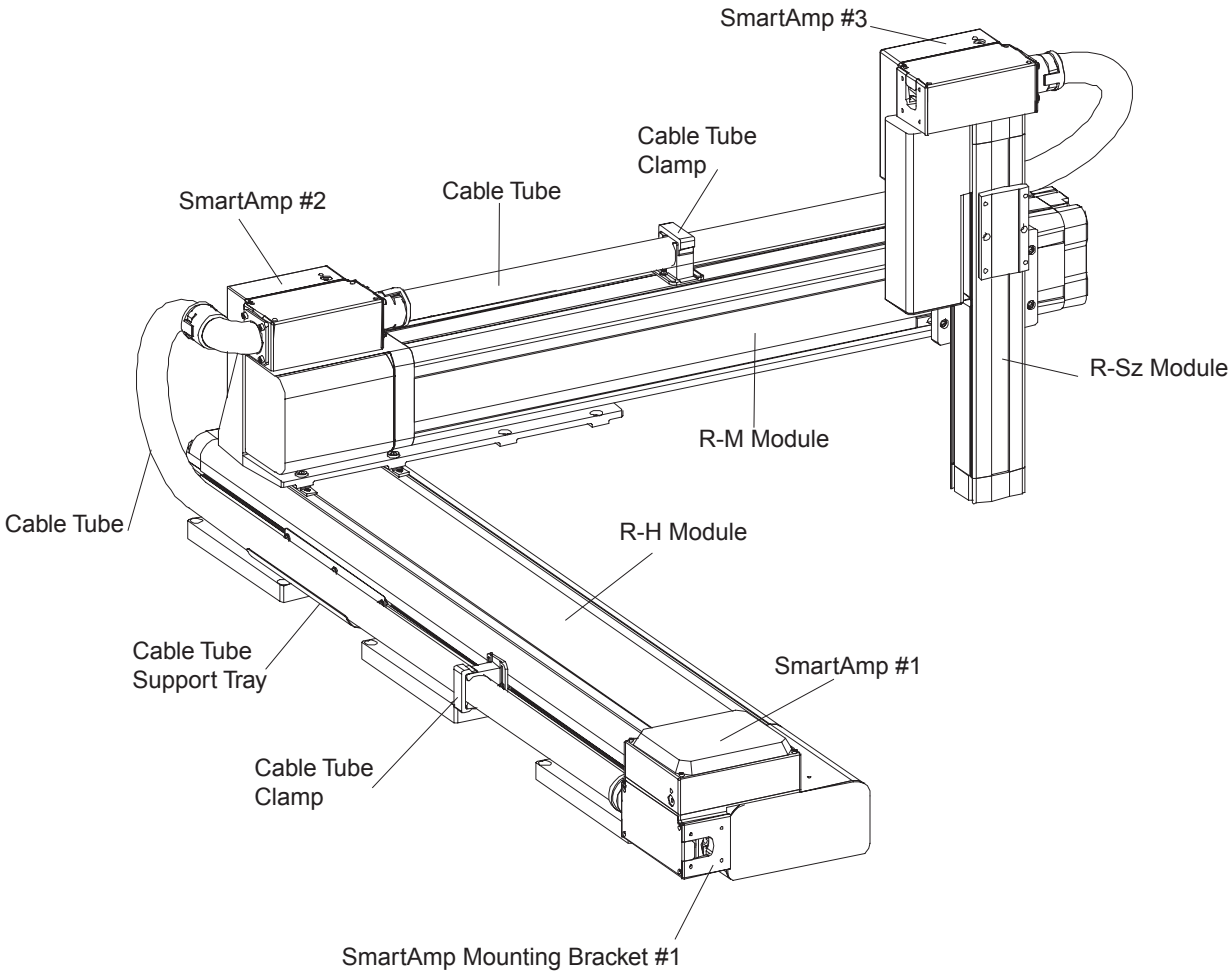


Figure 5-31. R-P(HMSz): System Component Overview

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Table 5-3. R-P(HMSz) Parts List

Description	Part Number	Qty
R-H module	9040x-1xxxx	1
R-M module	9040x-2xxxx	1
R-Sz module	9040x-4xxxx	1
SmartAmp	30410-10000	3
SmartAmp mounting bracket	30410-20000	3
Combining bracket, R-GHM	40405-05002	1
Combining plate, R-DMS	90400-05006	1
Mounting plate, RH	90400-01100	2/3[a]
Cable tube fitting, elbow	40410-40090	1[a]
Cable tube fitting, straight	40410-40000	3[a]
Cable tube, hi-flex	40410-310xx	2
Cable tube clamp	30410-42000	2[a]
Cable tube support tray	30410-60000	1[a]
Cable kit, amp to amp AC power cable 24V DC cable IEEE 1394 cable	90410-100xx 10410-006xx 10410-007xx 10410-005xx	2
Cable kit, controller AC power cable 24V DC cable IEEE 1394 cable Ferrite core	90410-200xx 10410-009xx 10410-010xx 10410-105xx 27200-00117	1
Hardware kit	90405-00200	1
Optional Items		
Gantry support module	90405-50xxx	1
Gantry support bracket, RM	40405-04100	1
Remote I/O (RIO) kit	90410-20050	1[b]

[a] Quantity will vary depending on module length.
[b] Quantity will vary according to order.

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Installing the R-H Module

NOTE: 300 to 600 mm R-H modules use two mounting plates; 800 mm and longer modules use three plates.

1. Prepare the work surface by drilling and tapping eight or twelve M8 holes (depending on module length) for the R-H-module mounting plates. See "**Chapter 10** - Technical Specifications " for dimensions of the R-H module and the plates.
2. Install R-H-module mounting plates (two or three, depending on module length) to the under side of the R-H module using four M8 x 20 screws provided for each plate. See **Figure 5-2 on page 182**.
3. Mount the R-H module to the work surface using four M8 screws per mounting plate.

Installing Alignment Pins on R-GHM Bracket

1. Locate the R-GHM combining bracket, two 8mm round pins, and two 8mm diamond pins.
2. Install a round pin and a diamond pin in the bottom face of the R-GHM combining bracket. See **Figure 5-32**. Note the orientation of the diamond pin in the drawing. Use Loctite 609 sealant or equivalent to secure the pin in place.

   NOTE: The pin locations shown in **Figure 5-32** and **Figure 5-33** are for a "right-hand" configuration. For a "left-hand" configuration, see "**Appendix A** - Configuration Options ".

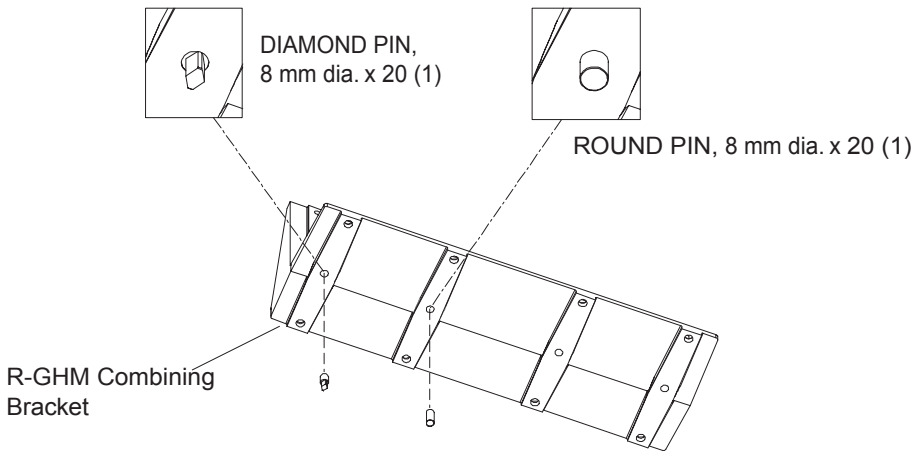


Figure 5-32. R-P(HMSz): Installing Alignment Pins on the R-GHM Combining Bracket (1)

3. Install a round pin and a diamond pin in the vertical face of the R-GHM combining bracket. See **Figure 5-33 on page 220**. Note the orientation of the diamond pin in the drawing. Use Loctite 609 sealant or equivalent to secure the pin in place.

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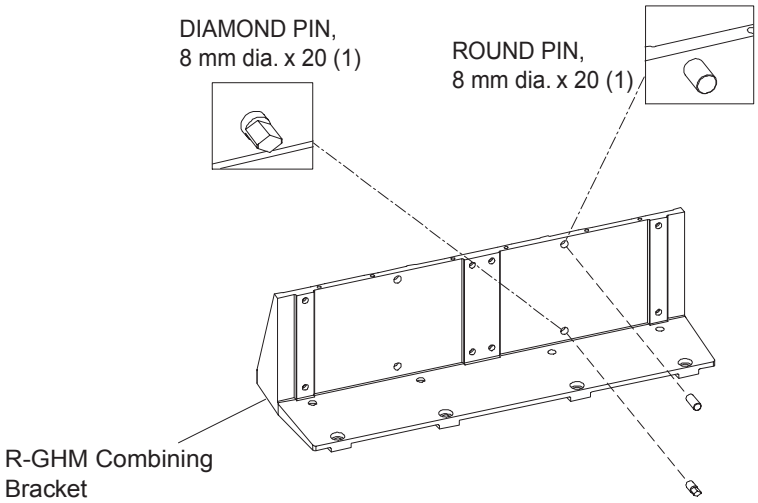


Figure 5-33. R-P(HMSz): Installing Alignment Pins on the R-GHM Combining Bracket (2)

Installing the R-M Module

1. Mount the R-GHM combining bracket to the R-H-module slider with four M8 x 20 screws. Position the bracket as shown in **Figure 5-34 on page 221**. Carefully insert the pins into pin holes to avoid damaging the pin holes.
2. Mount the R-M module on the R-GHM combining bracket with four M6 x 16 screws. Align the pins on the bracket with the mating holes in the module.

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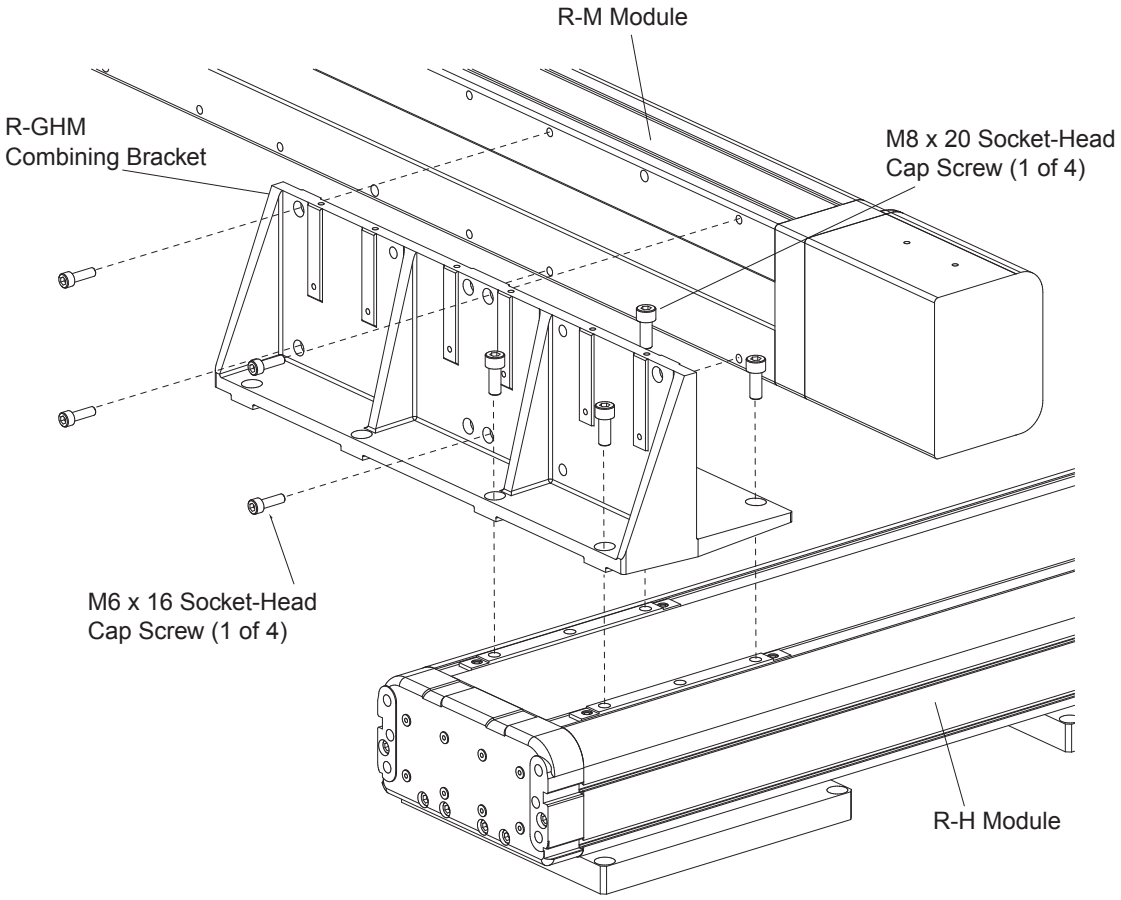


Figure 5-34. R-P(HMSz): Installing the R-GHM Combining Bracket and the R-M Module

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Installing Alignment Pins on the R-DMS Bracket

1. Locate the R-DMS combining bracket, two 8mm round pins, and two 8mm diamond pins.
2. Install a round pin and a diamond pin on each side of the R-DMS combining bracket. See **Figure 5-35**. Note the hole configuration shown in the drawing to identify where to install the pins. Also, note the orientation of the diamond pins in the drawing. Use Loctite 609 sealant or equivalent to secure the pins in place.

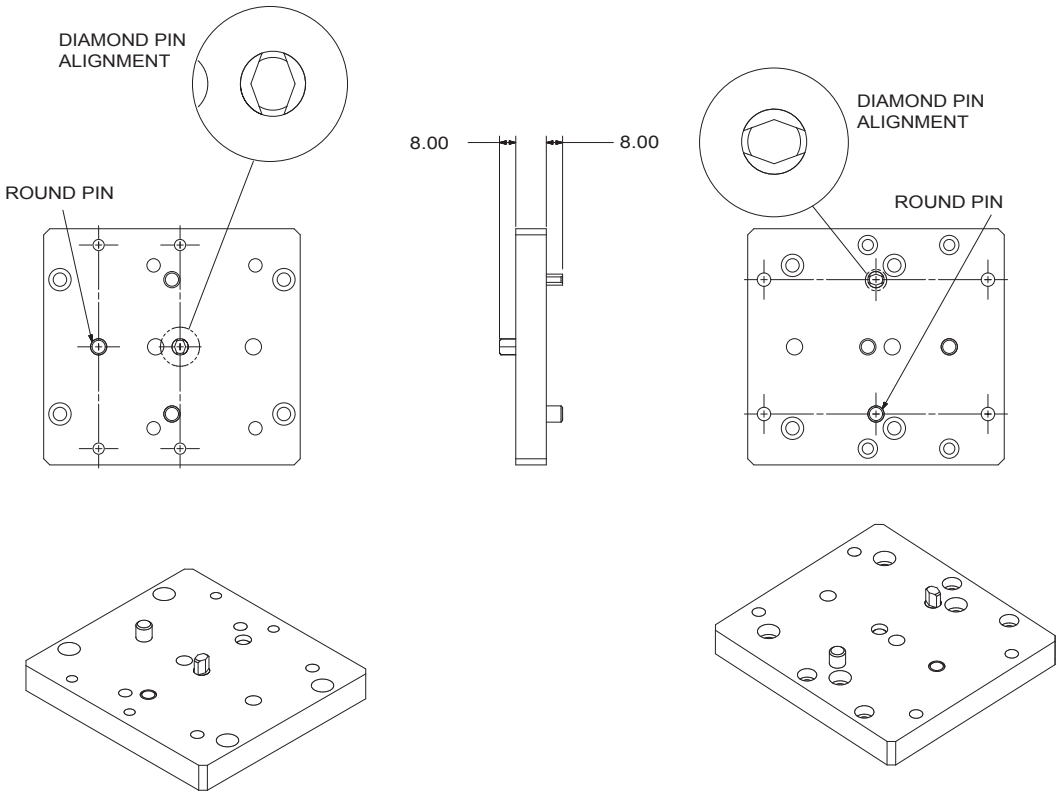


Figure 5-35. R-P(HMSz): Installing Alignment Pins on the R-DMS Combining Bracket

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Installing the R-Sz Module

1. Mount the R-DMS combining bracket to the R-Sz module with four M5 x 16 screws. Position the bracket as shown in **Figure 5-36**. Align the pins on the bracket with the mating holes in the module.

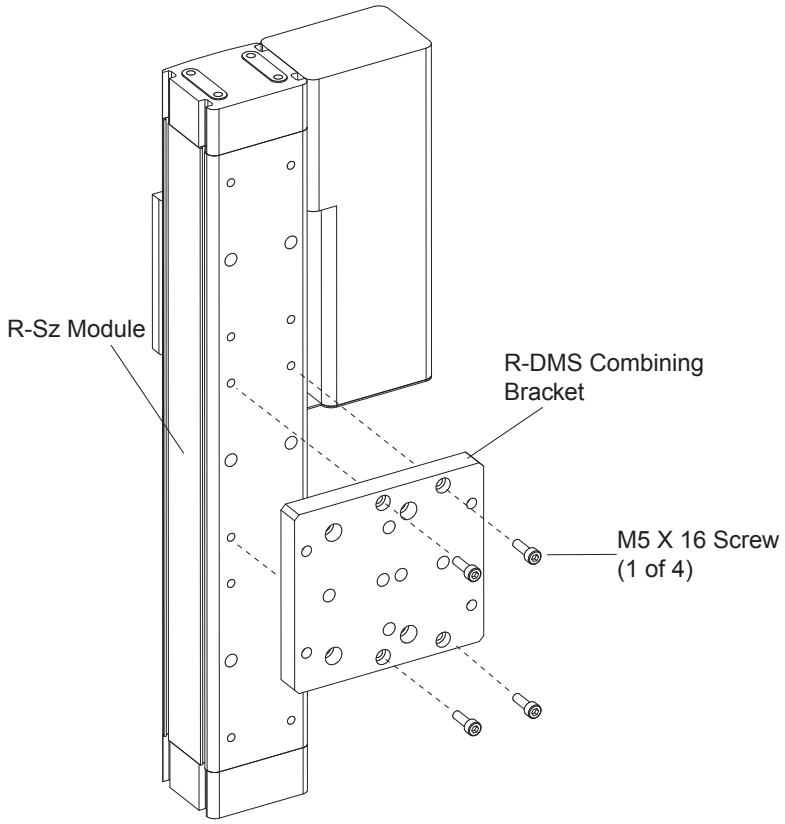


Figure 5-36. R-P(HMSz): Installing the R-DMS Combining Bracket

2. Using the R-DMS combining bracket, mount the R-Sz module to the R-M module with four M6 x 16 screws. See **Figure 5-37 on page 224**.

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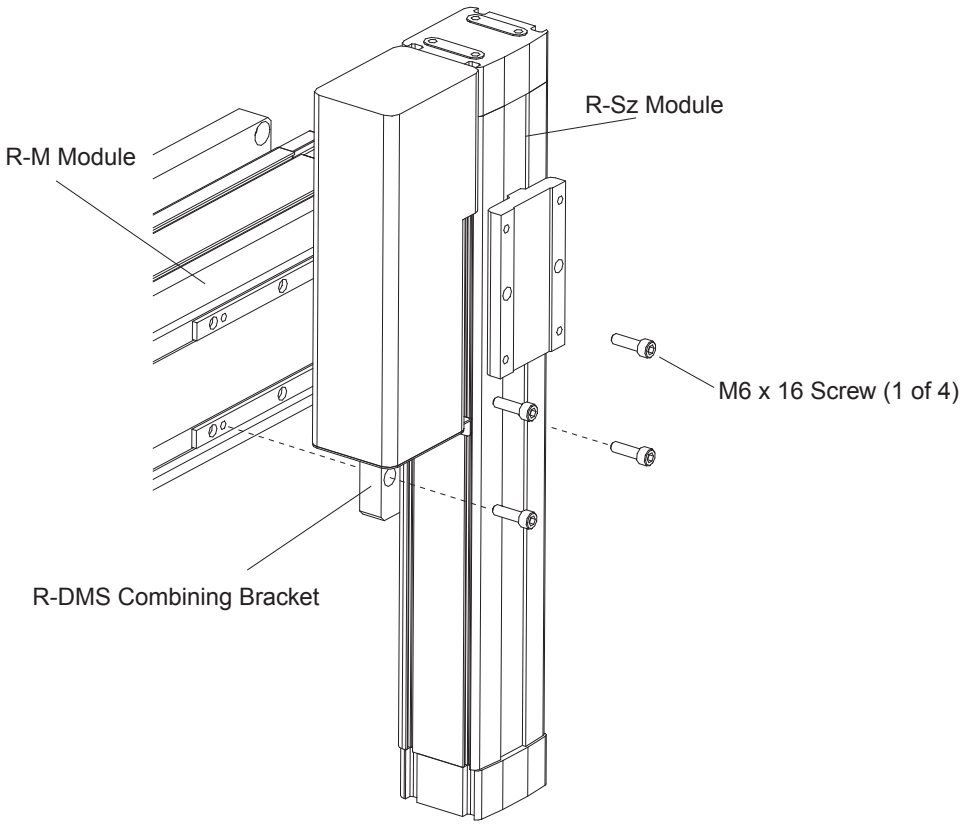


Figure 5-37. R-P(HMSz): Installing the R-Sz Module

Installing Adept SmartAmps

Installing SmartAmp #1 on R-H Module

1. Remove the cable cover from a SmartAmp mounting bracket by removing four M3 screws.
2. Install the mounting bracket onto the R-H module at the motor cover using four M4 x 10 flathead screws; see **Figure 5-8 on page 188**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-H module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install the SmartAmp onto the mounting bracket.
3. Install SmartAmp #1 onto the mounting bracket using four M3 x 40 screws. See **Figure 5-9 on page 189**.
4. Plug the motor and encoder cables from the module into the mating receptacles in the SmartAmp. See **Figure 5-10 on page 189**. Attach the captive screws to secure the encoder connector.

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Installing SmartAmp #2 on R-GHM Combining Bracket

1. Remove the cable cover from the SmartAmp mounting bracket by removing four M3 screws.
2. Install a mounting bracket onto the R-GHM combining bracket in position #2 using four M4 x 10 flathead screws; see **Figure 5-38**. Route the motor and encoder cables from the module through the opening in the mounting bracket.
3. Install a SmartAmp onto the mounting bracket in position #2 using four M3 x 40 screws. Position the SmartAmp so that the connectors extend through the mounting bracket. See **Figure 5-39 on page 226**.
4. Plug the motor and encoder cables from the module into the mating receptacles in SmartAmp #2. See **Figure 5-10 on page 189**. Attach the captive screws to secure the encoder connector.

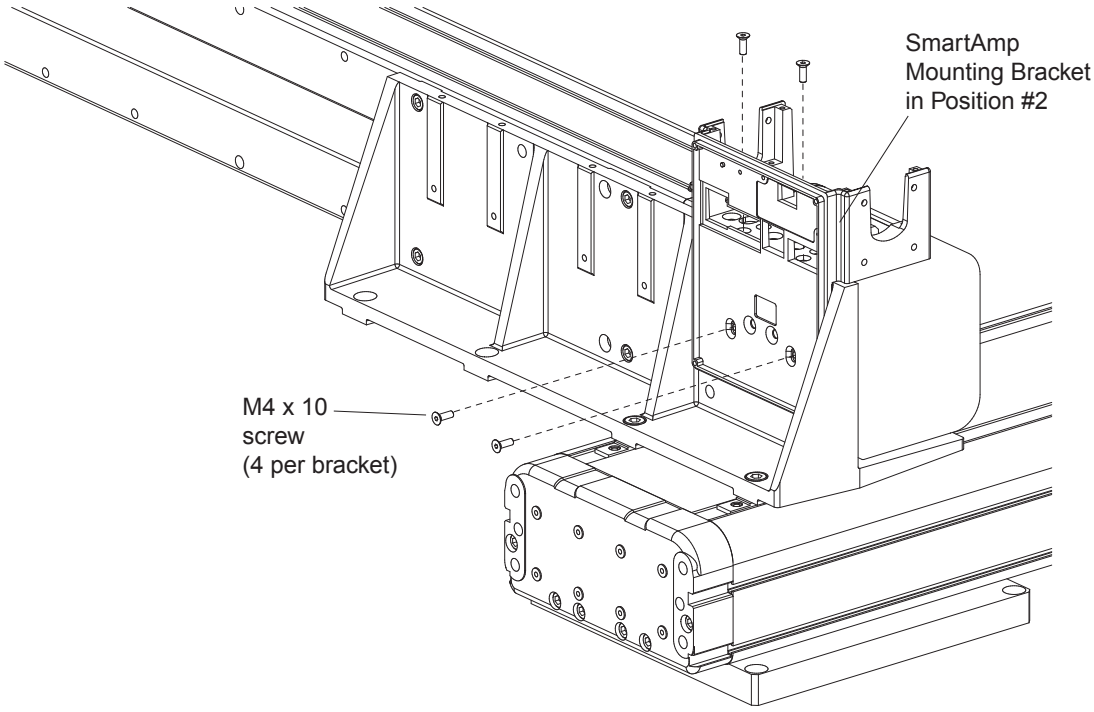


Figure 5-38. R-P(HMSz): Installing SmartAmp Mounting Bracket #2 on the R-GHM Bracket

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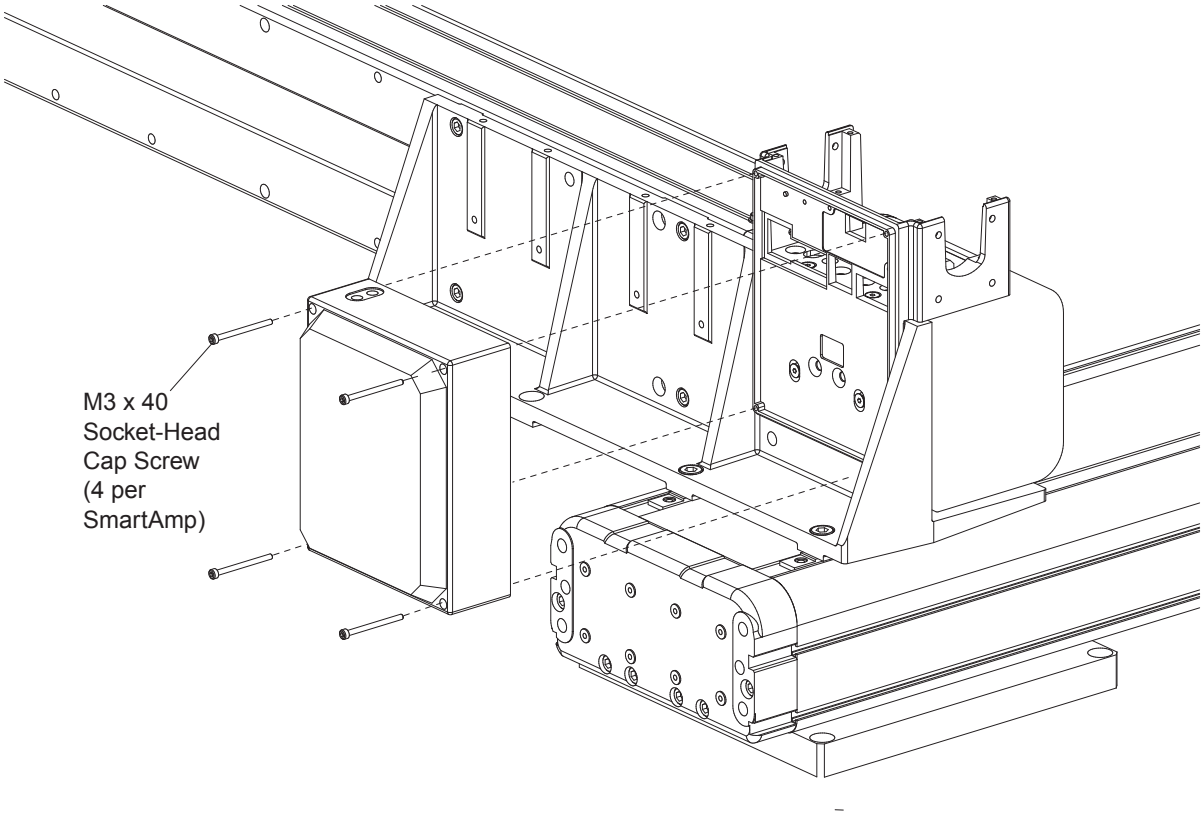


Figure 5-39. R-P(HMSz): Installing SmartAmp #2 on the R-GHM Combining Bracket

Installing SmartAmp #3 on the R-Sz Module

1. Remove the cable cover from the SmartAmp mounting bracket by removing four M3 screws.
2. Install a SmartAmp mounting bracket onto the R-Sz module using four M5 x 10 flathead screws; see **Figure 5-40 on page 227**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-Sz module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install the SmartAmp onto the mounting bracket.
3. Install SmartAmp #3 onto the mounting bracket using four M3 x 40 screws. Position the SmartAmp so that the connectors extend through the mounting bracket. See **Figure 5-41 on page 227**.
4. Plug the motor and encoder cables from the module into the mating receptacles in SmartAmp #2. See **Figure 5-10 on page 189**. Attach the captive screws to secure the encoder connector.

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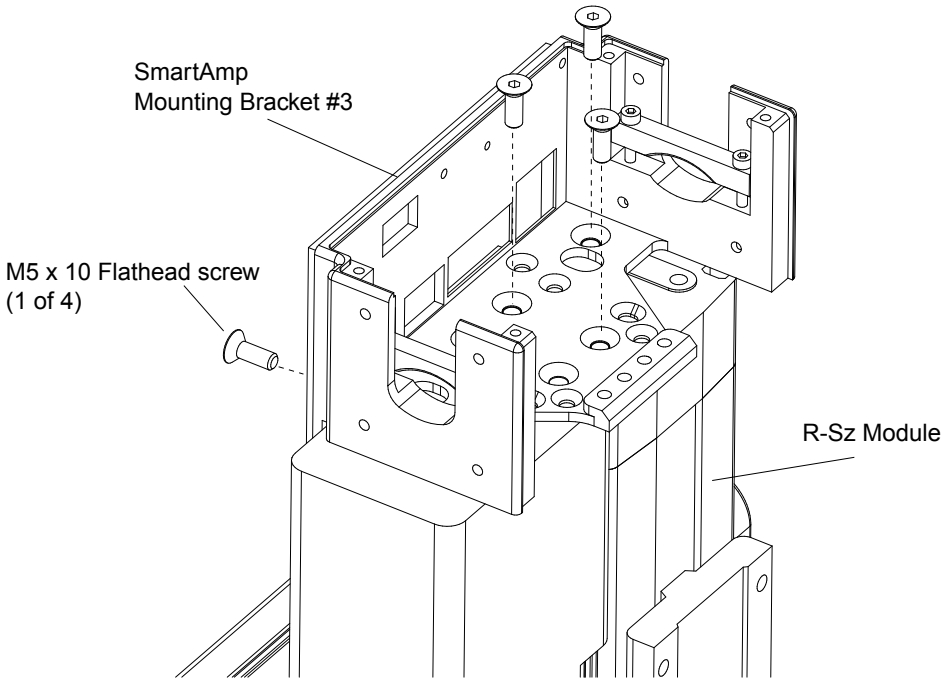


Figure 5-40. R-P(HMSz): Installing SmartAmp Mounting Bracket #3 on the R-Sz Module

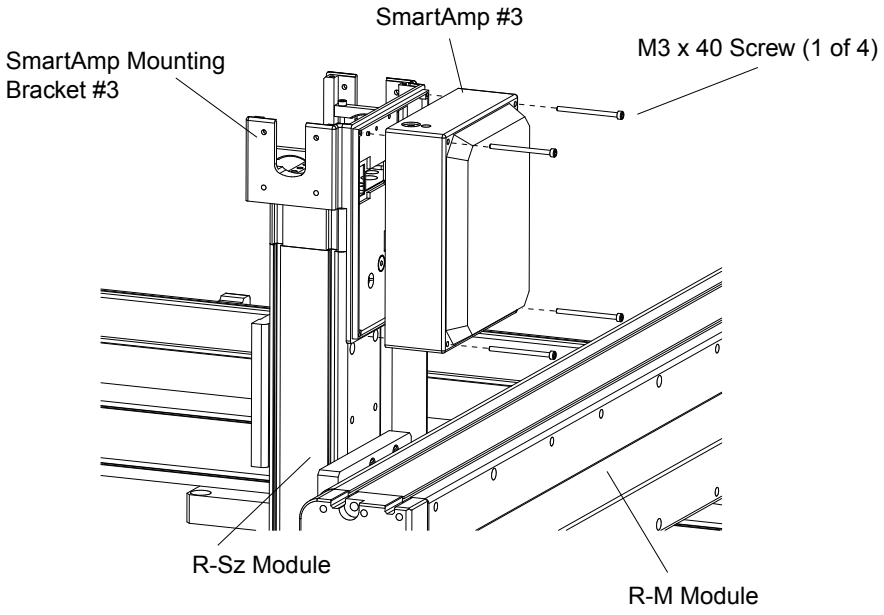


Figure 5-41. R-P(HMSz): Installing SmartAmp #3 on the R-Sz Module

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Installing the Cable Tube Support Clamps

Mount a cable tube support clamp on the R-H module and on the R-M module. See **Figure 5-42** for an illustration of the two properly mounted cable tube support clamps. Perform the following steps for the R-H module and the R-M module.

1. Slide two T-slot nuts into the upper side channel in the module; see **Figure 5-16 on page 194**. Position the nuts for installing the cable tube support clamp.
2. Install the cable tube support clamp using two M4 x 8 screws. Leave the M4 screws loose for repositioning later after the cable tube has been installed.
3. Repeat the above steps for the other cable tube support clamp.

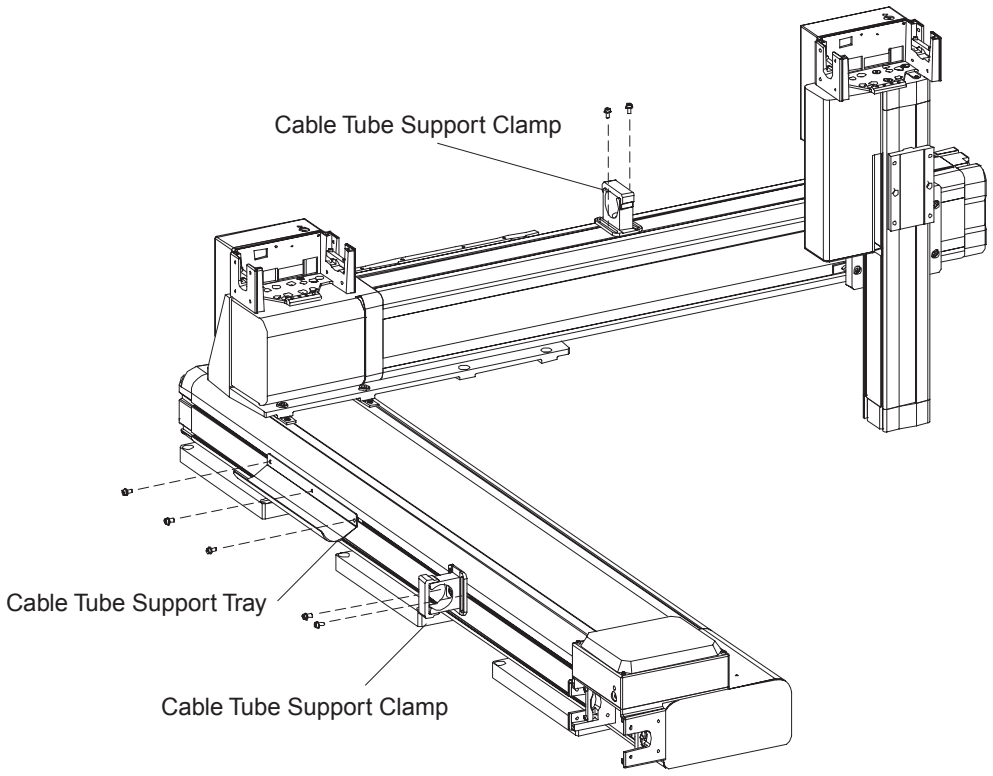


Figure 5-42. R-P(HMSz): Cable Tube Support Clamps and Cable Tube Support Tray

Installing the Cable Tube Support Tray

Install the cable tube support tray on the R-H module only.

1. Slide three T-slot nuts into the upper side channel in the first R-H module; see **Figure 5-17 on page 195**. Position the nuts for installing the cable tube support tray.
2. Install the cable tube support tray using three M4 x 6 screws.

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Installing Cable Tube Assemblies Between the SmartAmps

Create one cable tube assembly to connect SmartAmp #1 to SmartAmp #2; create another cable tube assembly to connect SmartAmp #2 to SmartAmp #3.

The procedure to install cables consists of these steps:

- route cables through the cable tube
- install cable tube fittings on cable tube
- install assembled cable tube on SmartAmp mounting brackets and plug in all cables

The lengths of the cables and cable tube depend on which modules you have ordered.

Routing Cables Through Cable Tube

Perform the steps below for each of the two cable tube assemblies.

1. Locate three cables in the cable kit.
   - AC power cable
   - 24VDC cable
   - IEEE 1394 cable

   See **Figure 5-43 on page 230** and **Figure 5-44 on page 231**.

   NOTE: **Figure 5-43** shows a cable tube assembly with one straight and one elbow cable tube fitting. **Figure 5-44** shows a cable tube assembly with two straight cable tube fittings.
2. Group the three cables together, plus any additional user cables or air lines, and slide them through the cable tube.
3. Gently pull the cables through the tube until they are evenly spaced at each end. Try to make sure the cables do not get twisted or tangled as you pull them through the tube.
4. Repeat the above steps for the other cable tube assembly.

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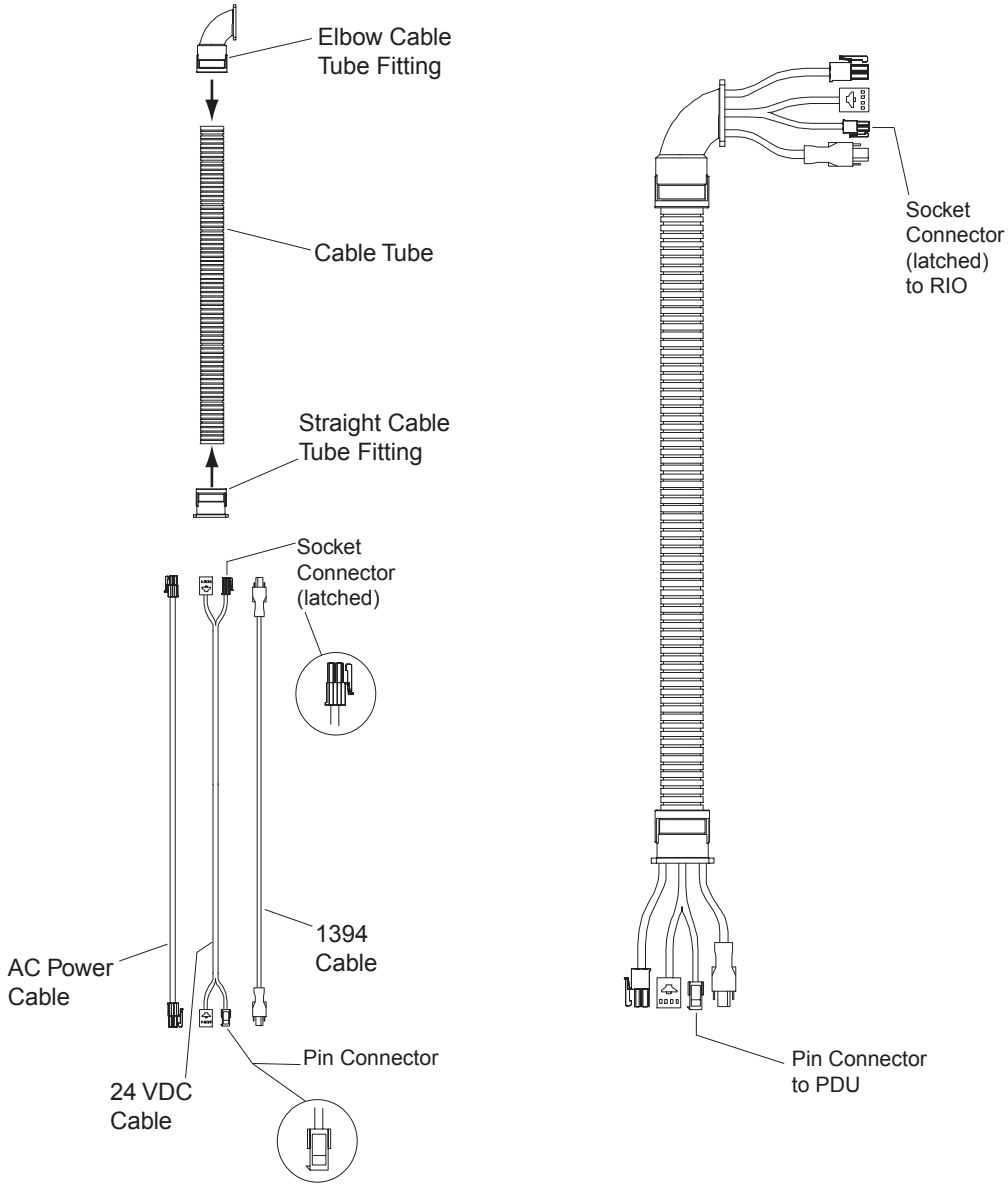


Figure 5-43. R-P(HMSz): Cable Tube Assembly (One Straight/One Elbow Fitting)

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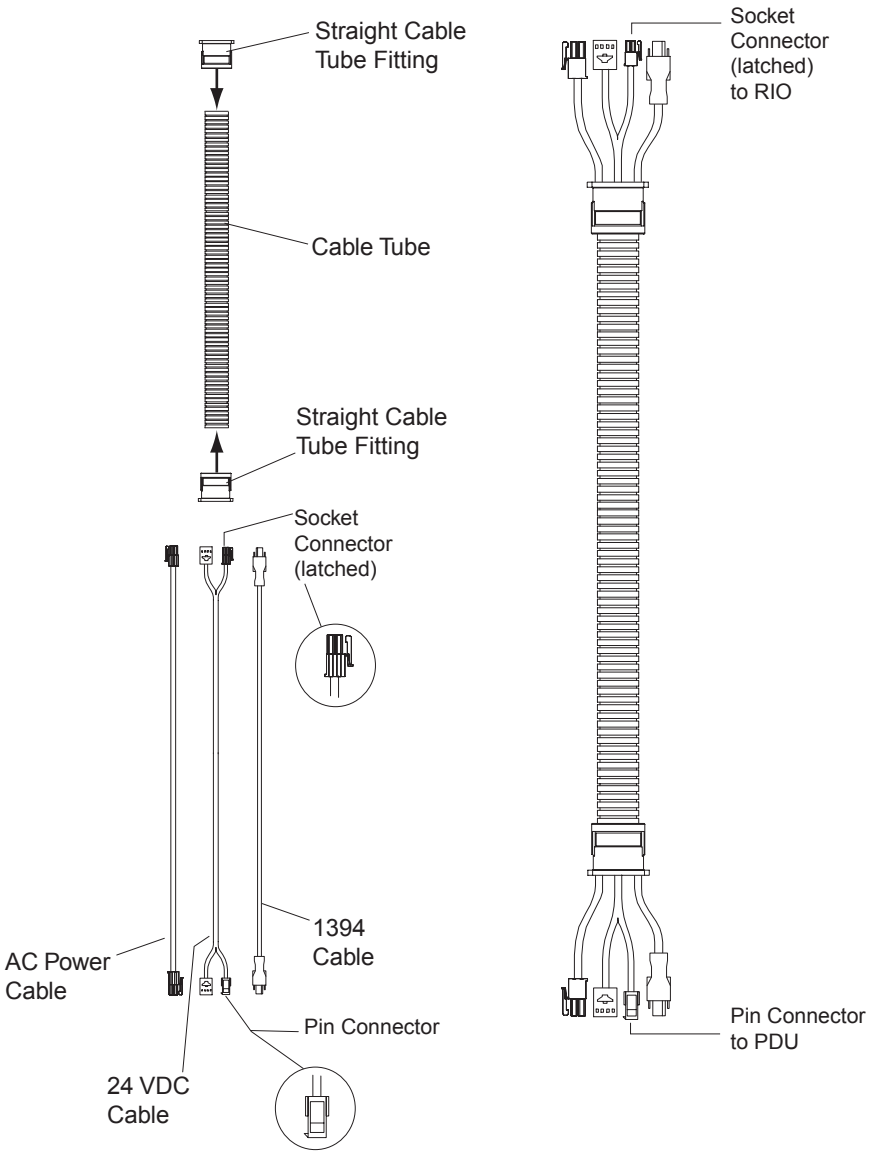


Figure 5-44. R-P(HMSz): Cable Tube Assembly (Two Straight Fittings)

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Installing Cable Tube Fittings on Cable Tubes

Create one cable tube assembly with one straight and one elbow cable tube fitting; create another cable tube assembly with two straight cable tube fittings.

> **NOTE:** For all cable tube fittings, make sure the arrows on the fitting clamp are pointing toward the end of the tube.

To create the cable tube assembly with one straight and one elbow cable tube fitting:

1. Locate a straight cable tube fitting.

   NOTE: The 24V cable has two additional connectors for the optional RIO system. There is a socket (latched) connector at one end of the cable and a pin connector at the other end. When installing this cable tube assembly, install the straight cable tube fitting on the end near the 24V pin connector; install the elbow cable tube fitting on the other end. See **Figure 5-43 on page 230**.

2. Install the fitting by pushing it onto the end of the cable tube until the fitting has fully snapped into place inside the fitting. See **Figure 5-43 on page 230**.
3. Locate the elbow cable tube fitting.
4. Install the fitting by pushing it onto the opposite end of the cable tube until the fitting has fully snapped into place inside the fitting.

To create the cable tube assembly with two straight cable tube fittings:

1. Locate a straight cable tube fitting.

   NOTE: When installing this cable tube assembly, install the straight cable tube fitting near the 24V pin connector to SmartAmp #2; install the straight cable tube fitting near the 24V socket connector to SmartAmp #3. See **Figure 5-44 on page 231**.

2. Install the fitting by pushing it onto the end of the cable tube until the fitting has fully snapped into place inside the fitting. See **Figure 5-44 on page 231**.
3. Locate the other straight cable tube fitting.
4. Install the fitting by pushing it onto the opposite end of the cable tube until the fitting has fully snapped into place inside the fitting.

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Installing the Straight/Elbow Cable Tube Assembly

Install the cable tube assembly with one straight and one elbow cable tube fitting between SmartAmp #1 and SmartAmp #2.

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #1 Perform the steps below to attach the straight/elbow cable tube assembly to SmartAmp mounting bracket #1 and connect cables to SmartAmp #1.

1. Remove the cable clamp from inside the mounting bracket by removing the two M3 screws. See **Figure 5-19 on page 198**.
2. Position the straight fitting of the cable tube assembly near SmartAmp #1.
3. Install the straight fitting on the outside of the mounting bracket. Make sure the fitting clamp is accessible. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See **Figure 5-20 on page 198**.
4. In SmartAmp #1, connect these cables:
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable

   There are two identical mating connectors for each cable in the SmartAmp, you can use either one. See **Figure 5-21 on page 199**.
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #2 Perform the steps below to attach the straight/elbow cable tube assembly to SmartAmp mounting bracket #2 and connect cables to SmartAmp #2.

1. Remove the cable clamp from inside mounting bracket #2 by removing the two M3 screws.
2. Rest the cable tube in the support tray. Fold the cable tube up 180 degrees so the elbow fitting is positioned next to mounting bracket #2.
3. Install the elbow fitting on the outside of mounting bracket #2. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See **Figure 5-22 on page 200**.
4. In SmartAmp #2, connect these cables (see **Figure 5-21 on page 199**):
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

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7. Slide the cable tube support clamp to the desired position and snap the tube into place. The clamp should be positioned just past the point where the cable tube bends when the R-M module is closest to SmartAmp #1. Tighten the screws on the clamp to secure it.
8. Slide the cable tube support tray into place near the end of the module so that the tube is supported at the end of travel. Tighten the screws on the tray to secure it.

Installing the Straight/Straight Cable Tube Assembly

Install the cable tube assembly with two straight cable tube fittings between SmartAmp #2 and SmartAmp #3.

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #2 Perform the steps below to attach the straight/straight cable tube assembly to SmartAmp mounting bracket #2 and connect cables to SmartAmp #2.

1. Remove the cable clamp from inside mounting bracket #2 by removing the two M3 screws. See **Figure 5-19 on page 198** for an illustration of the cable clamp (note that this illustration is oriented differently from the correct mounting position onto mounting bracket #2).
2. Position the cable tube assembly with the straight fitting near the 24VDC pin connector beside SmartAmp #2, opposite from the elbow cable tube fitting already connected to SmartAmp #2.
3. Install the straight cable tube fitting on the outside of the mounting bracket. Make sure the fitting clamp is accessible. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See **Figure 5-20 on page 198** for an illustration of how to connect a straight cable tube fitting. Note that this illustration is rotated from the correct orientation of the fitting and does not show the elbow fitting previously connected to SmartAmp #2.
4. In SmartAmp #2, connect these cables from the straight/straight cable tube assembly:
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable

   See **Figure 5-21 on page 199**.
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #3 Perform the steps below to attach the straight/straight cable tube assembly to SmartAmp mounting bracket #3 and connect cables to SmartAmp #3.

1. Remove the cable clamp from inside mounting bracket #3 by removing the two M3 screws.
2. Fold the cable tube up 180 degrees so the straight fitting is positioned next to mounting bracket #3.

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3. Install the straight fitting on the outside of mounting bracket #3. Make sure the fitting clamp is accessible. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See **Figure 5-45**.
4. In SmartAmp #3, connect these cables (see **Figure 5-21 on page 199**):
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

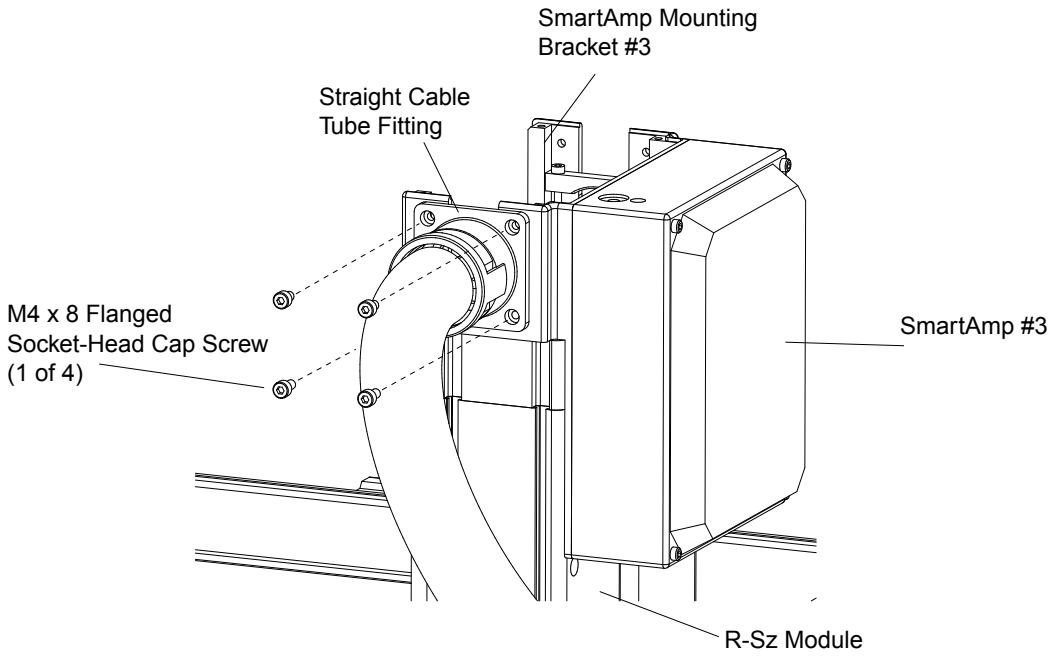


Figure 5-45. R-P(HMSz): Installing Cable Tube Fitting on SmartAmp Mounting Bracket #3

7. Slide the cable tube support clamp to the desired position and snap the tube into place. Tighten the screws on the clamp to secure it.
8. Slide the cable tube support tray into place near the end of the module so that the tube is supported at the end of travel. Tighten the screws on the tray to secure it.

Connecting Cables from Controller to SmartAmp #1

See **"Connecting Cables from Controller to SmartAmp #1" on page 51** for instructions.

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Completing the Installation

Perform these steps to complete the installation.

- After you connect all the cables inside the SmartAmp, attach the cable cover to the SmartAmp bracket using four M3 screws.
- Check the mechanical motion of each axis. (Modules with brakes must be checked when the power is turned on.)

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5.5 R-Pq(HMSz) Installation Procedure

Overview

This section describes the process of installing a three-axis R-Pq(HMSz) Adept SmartModules system. This configuration consists of an R-H and R-M module joined together with an R-GHM combining bracket, and an Sz module attached with an R-DMS combining bracket. Each module (R-H, R-M, and R-Sz) has a SmartAmp and SmartAmp mounting bracket. Two cable tube assemblies contain the cabling to interconnect the SmartAmps. See **Figure 5-46** for an overview of the system components.

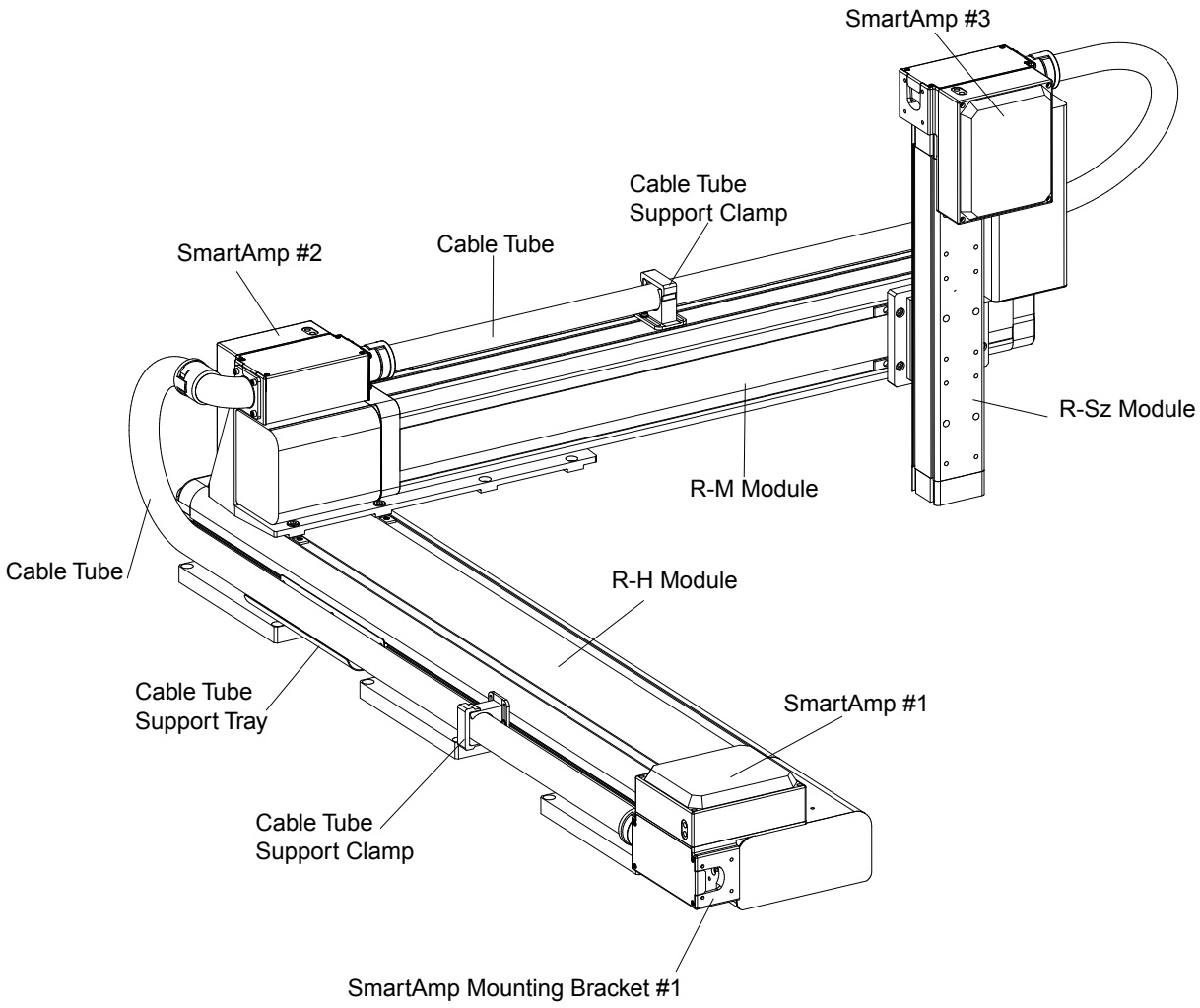


Figure 5-46. R-Pq(HMSz): System Component Overview

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Table 5-4. R-Pq(HMSz) Parts List

Description	Part Number	Qty
R-H module	9040x-1xxxx	1
R-M module	9040x-2xxxx	1
R-Sz module	9040x-4xxxx	1
SmartAmp	30410-10000	3
SmartAmp mounting bracket	30410-20000	3
Combining bracket, R-GHM	40405-05002	1
Combining bracket, R-DMS	90400-05006	1
Mounting plate, RH	90400-01100	2/3[a]
Cable tube fitting, elbow	40410-40090	1
Cable tube fitting, straight	40410-40000	3
Cable tube, hi-flex	40410-310xx	2
Cable tube clamp	30410-42000	2[a]
Cable tube support tray	30410-60000	1[a]
Cable kit, amp to amp AC power cable 24V DC cable IEEE 1394 cable	90410-100xx 10410-006xx 10410-007xx 10410-005xx	2
Cable kit, controller AC power cable 24V DC cable IEEE 1394 cable Ferrite core	90410-200xx 10410-009xx 10410-010xx 10410-105xx 27200-00117	1
Hardware kit	90405-00200	1
Optional Items		
Gantry support module	90405-50xxx	1
Gantry support bracket, RM	40405-04100	1
Remote I/O (RIO) kit	90410-20050	1[b]

[a] Quantity will vary depending on module length.
[b] Quantity will vary according to order.

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Installing the R-H Module

NOTE: 300 to 600 mm R-H modules use two mounting plates; 800 mm and longer modules use three plates.

1. Prepare the work surface by drilling and tapping eight or twelve M8 holes (depending on module length) for the R-H-module mounting plates. See "**Chapter 10** - Technical Specifications " for dimensions of the R-H module and the plates.
2. Install R-H-module mounting plates (two or three, depending on module length) to the under side of the R-H module using four M8 x 20 screws provided for each plate. See **Figure 5-2 on page 182**.
3. Mount the R-H module to the work surface using four M8 screws per mounting plate.

Installing Alignment Pins on R-GHM Combining Bracket

1. Locate the R-GHM combining bracket, two 8mm round pins, and two 8mm diamond pins.
2. Install a round pin and a diamond pin in the bottom face of the R-GHM combining bracket. See **Figure 5-32 on page 219**. Note the orientation of the diamond pin in the drawing. Use Loctite 609 sealant or equivalent to secure the pin in place.

   NOTE: The pin locations shown in **Figure 5-32** and **Figure 5-33** are for a "right-hand" configuration. For a "left-hand" configuration, see "**Appendix A** - Configuration Options ".
3. Install a round pin and a diamond pin in the vertical face of the R-GHM combining bracket. See **Figure 5-33 on page 220**. Note the orientation of the diamond pin in the drawing. Use Loctite 609 sealant or equivalent to secure the pin in place.

Installing the R-M Module

1. Mount the R-GHM combining bracket to the R-H-module's slider with four M8 x 20 screws. Position the bracket as shown in **Figure 5-34 on page 221**. Carefully insert the pins into pin holes to avoid damaging the pin holes.
2. Mount the R-M module on the R-GHM combining bracket with four M6 x 16 screws. Align the pins on the bracket with the mating holes in the module.

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Installing Alignment Pins on the R-DMS Combining Bracket

1. Locate the R-DMS combining bracket, two 8mm round pins, and two 8mm diamond pins.
2. Install a round pin and a diamond pin on each side of the R-DMS combining bracket. See **Figure 5-47**. Note the hole configuration shown in the drawing to identify where to install the pins. Also, note the orientation of the diamond pins in the drawing. Use Loctite 609 sealant or equivalent to secure the pins in place.

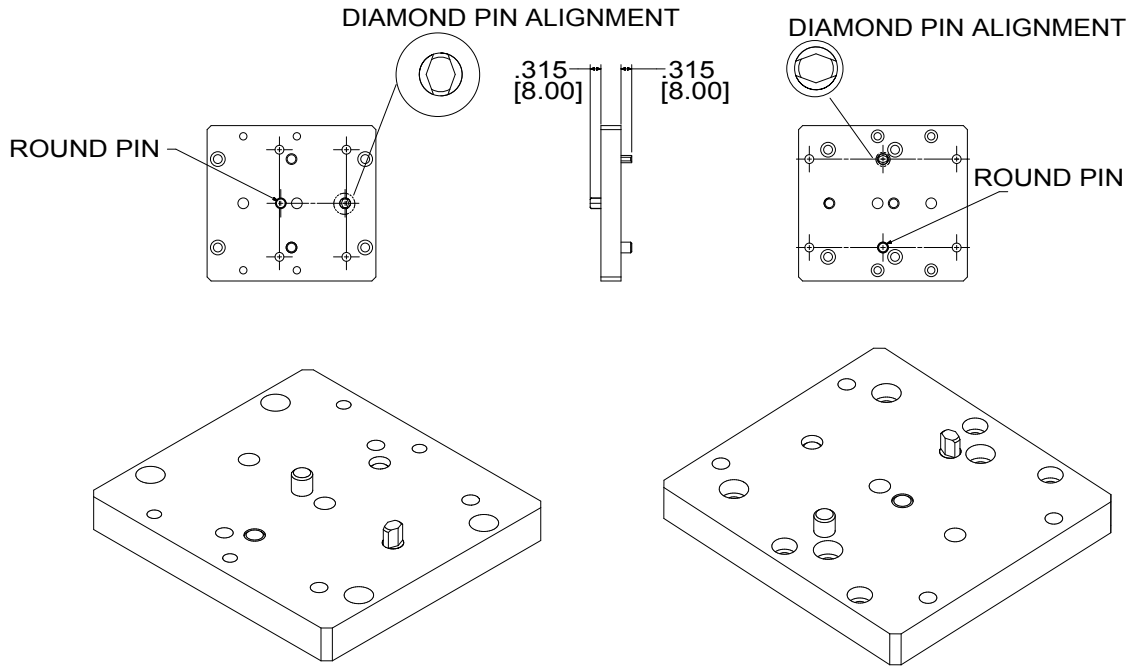


Figure 5-47. R-Pq(HMSz) Installing Alignment Pins on the R-DMS Combining Bracket

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Installing the R-Sz Module

1. Mount the R-DMS combining bracket to the R-Sz module's slider with four M6 x 16 screws. See **Figure 5-48**. Align the pins on the bracket with the mating holes in the slider.

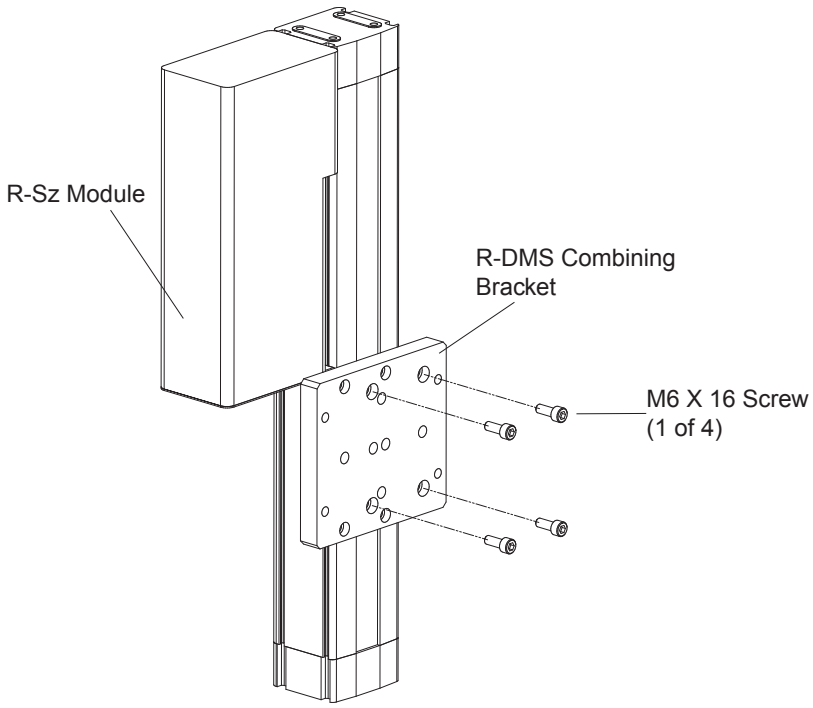


Figure 5-48. R-Pq(HMSz) Installing the R-DMS Combining Bracket

2. Using the R-DMS combining bracket, mount the R-Sz module's slider to the R-M module's slider with four M6 x 16 screws. See **Figure 5-49 on page 242**.

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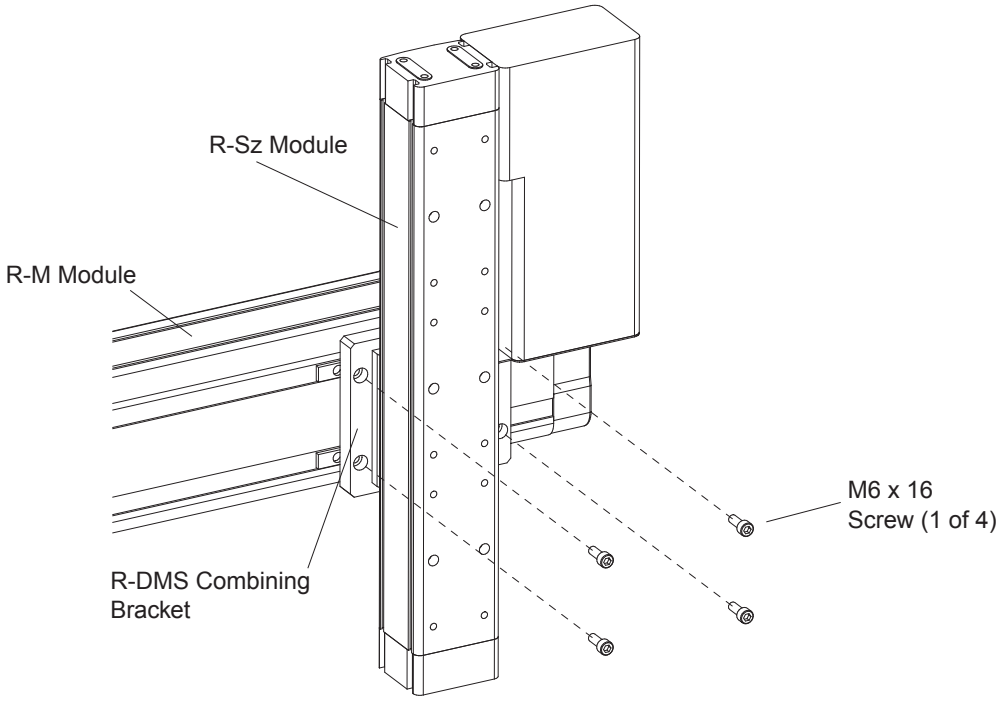


Figure 5-49. R-Pq(HMSz) Installing the R-Sz Module

Installing Adept SmartAmps

Installing SmartAmp #1 on the R-H Module

1. Remove the cable cover from a SmartAmp mounting bracket by removing four M3 screws.
2. Install the mounting bracket onto the R-H module at the motor cover using four M4 x 10 flathead screws; see **Figure 5-8 on page 188**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-H module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install the SmartAmp onto the mounting bracket.

3. Install SmartAmp #1 onto the mounting bracket using four M3 x 40 screws. See **Figure 5-9 on page 189**.
4. Plug the motor and encoder cables from the module into the mating receptacles in the SmartAmp. See **Figure 5-10 on page 189**. Attach the captive screws to secure the encoder connector.

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Installing SmartAmp #2 on the R-GHM Combining Bracket

1. Remove the cable cover from the SmartAmp mounting bracket by removing four M3 screws.
2. Install a mounting bracket onto the R-GHM combining bracket in position #2 using four M4 x 10 flathead screws; see **Figure 5-38 on page 225**. Route the motor and encoder cables from the module through the opening in the mounting bracket.
3. Install a SmartAmp onto the mounting bracket in position #2 using four M3 x 40 screws. Position the SmartAmp so that the connectors extend through the mounting bracket. See **Figure 5-39 on page 226**.
4. Plug the motor and encoder cables from the module into the mating receptacles in SmartAmp #2. See **Figure 5-10 on page 189**. Attach the captive screws to secure the encoder connector.

Installing SmartAmp #3 on the R-Sz Module

1. Remove the cable cover from the SmartAmp mounting bracket by removing four M3 screws.
2. Install a SmartAmp mounting bracket onto the R-Sz module using four M5 x 10 flathead screws; see **Figure 5-50 on page 244**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-Sz module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install the SmartAmp onto the mounting bracket.

3. Install SmartAmp #3 onto the mounting bracket using four M3 x 40 screws. Position the SmartAmp so that the connectors extend through the mounting bracket. See **Figure 5-51 on page 245**.
4. Plug the motor and encoder cables from the module into the mating receptacles in SmartAmp #2. See **Figure 5-10 on page 189**. Attach the captive screws to secure the encoder connector.

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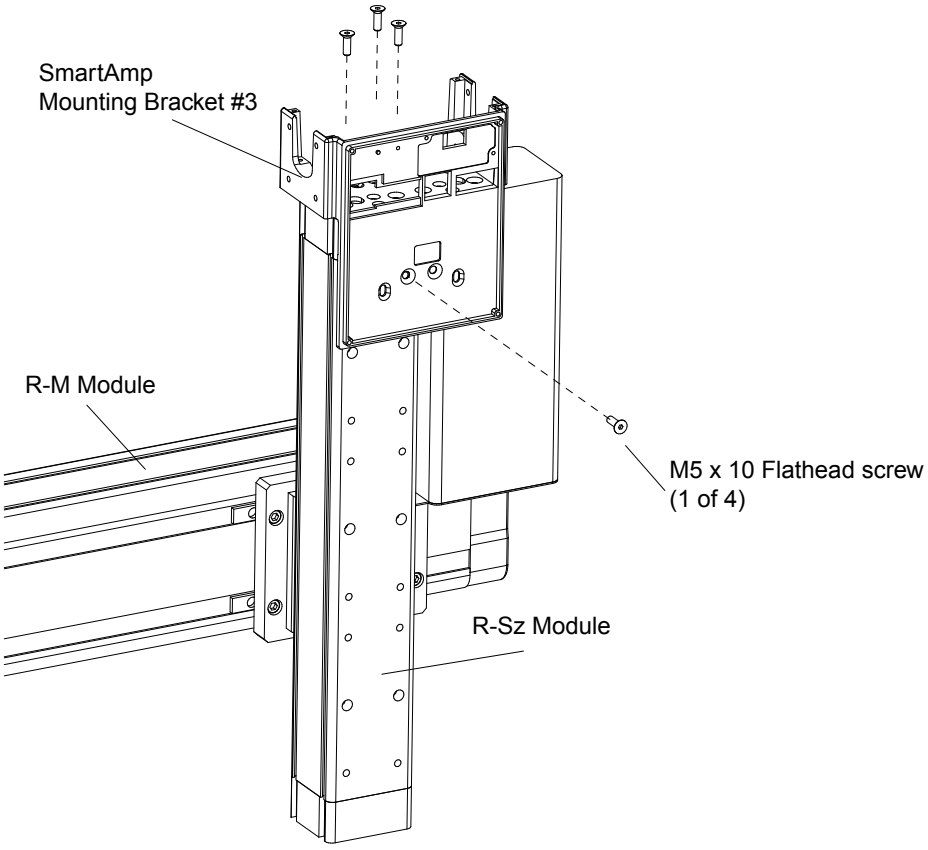


Figure 5-50. R-Pq(HMSz): Installing SmartAmp Mounting Bracket #3 on the R-Sz Module

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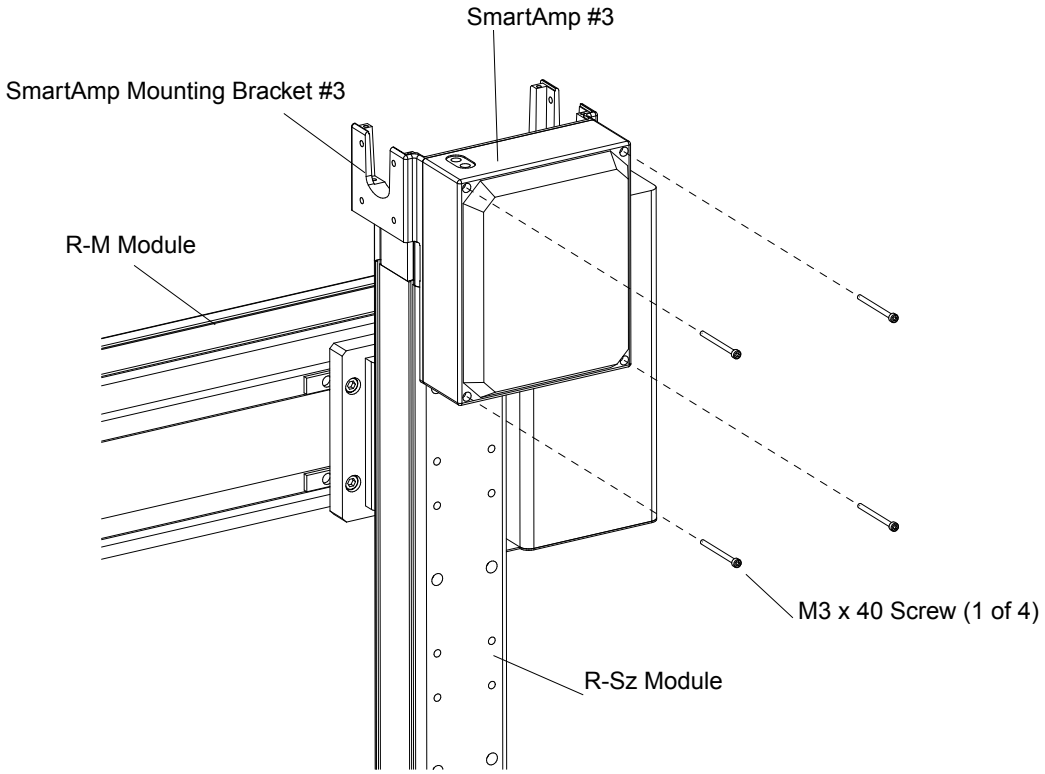


Figure 5-51. R-Pq(HMSz): Installing SmartAmp #3 on the R-Sz Module

Installing the Cable Tube Support Clamps

Mount a cable tube support clamp on the R-H module and on the R-M module. See **Figure 5-52** for an illustration of the two properly mounted cable tube support clamps. Perform the following steps for the R-H module and the R-M module.

1. Slide two T-slot nuts into the upper side channel in the module; see **Figure 5-16 on page 194**. Position the nuts for installing the cable tube support clamp.
2. Install the cable tube support clamp using two M4 x 8 screws. Leave the M4 screws loose for repositioning later after the cable tube has been installed.
3. Repeat the above steps for the other cable tube support clamp.

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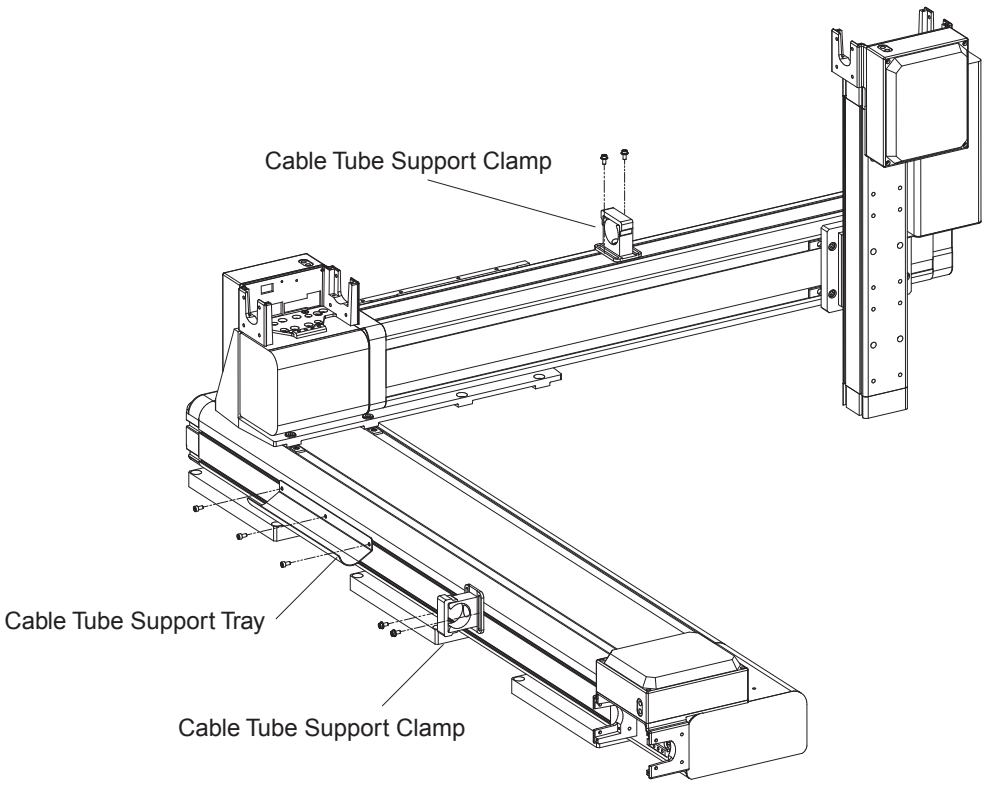


Figure 5-52. R-Pq(HMSz): Cable Tube Support Clamps and Cable Tube Support Tray

Installing the Cable Tube Support Tray

Install the cable tube support tray on the R-H module only.

1. Slide three T-slot nuts into the upper side channel in the R-H module; see **Figure 5-17 on page 195**. Position the nuts for installing the cable tube support tray.
2. Install the cable tube support tray using three M4 x 6 screws.

Installing Cable Tube Assemblies Between the SmartAmps

Create one cable tube assembly to connect SmartAmp #1 to SmartAmp #2; create another cable tube assembly to connect SmartAmp #2 to SmartAmp #3.

The procedure to install cables consists of these steps:

- route cables through the cable tube
- install cable tube fittings on cable tube
- install assembled cable tube on SmartAmp mounting brackets and plug in all cables

The lengths of the cables and cable tube depend on which modules you have ordered.

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Routing Cables Through Cable Tube

Perform the steps below for each of the two cable tube assemblies.

1. Locate three cables in the cable kit.
   - AC power cable
   - 24VDC cable
   - IEEE 1394 cable

   See **Figure 5-43 on page 230** and **Figure 5-44 on page 231**.

   NOTE: **Figure 5-43** shows a cable tube assembly with one straight and one elbow cable tube fitting. **Figure 5-44** shows a cable tube assembly with two straight cable tube fittings.

2. Group the three cables together, plus any additional user cables or air lines, and slide them through the cable tube.
3. Gently pull the cables through the tube until they are evenly spaced at each end. Try to make sure the cables do not get twisted or tangled as you pull them through the tube.
4. Repeat the above steps for the other cable tube assembly.

Installing Cable Tube Fittings on Cable Tubes

Create one cable tube assembly with one straight and one elbow cable tube fitting; create another cable tube assembly with two straight cable tube fittings.

NOTE: For all cable tube fittings, make sure the arrows on the fitting clamp are pointing toward the end of the tube.

To create the cable tube assembly with one straight and one elbow cable tube fitting:

1. Locate a straight cable tube fitting.

   NOTE: The 24V cable has two additional connectors for the optional RIO system. There is a socket (latched) connector at one end of the cable and a pin connector at the other end. When installing this cable tube assembly, install the straight cable tube fitting on the end near the 24V pin connector; install the elbow cable tube fitting on the other end. See **Figure 5-43 on page 230**.

2. Install the fitting by pushing it onto the end of the cable tube until the fitting has fully snapped into place inside the fitting. See **Figure 5-43 on page 230**.
3. Locate the elbow cable tube fitting.
4. Install the fitting by pushing it onto the opposite end of the cable tube until the fitting has fully snapped into place inside the fitting.

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To create the cable tube assembly with two straight cable tube fittings:

1. Locate a straight cable tube fitting.

   NOTE: When installing this cable tube assembly, install the straight cable tube fitting near the 24V pin connector to SmartAmp #2; install the straight cable tube fitting near the 24V socket connector to SmartAmp #3. See **Figure 5-44 on page 231**.

2. Install the fitting by pushing it onto the end of the cable tube until the fitting has fully snapped into place inside the fitting. See **Figure 5-44 on page 231**.
3. Locate the other straight cable tube fitting.
4. Install the fitting by pushing it onto the opposite end of the cable tube until the fitting has fully snapped into place inside the fitting.

Installing the Straight/Elbow Cable Tube Assembly

Install the cable tube assembly with one straight and one elbow cable tube fitting between SmartAmp #1 and SmartAmp #2.

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #1 Perform the steps below to attach the straight/elbow cable tube assembly to SmartAmp mounting bracket #1 and connect cables to SmartAmp #1.

1. Remove the cable clamp from inside the mounting bracket by removing the two M3 screws. See **Figure 5-19 on page 198**.
2. Position the straight fitting of the cable tube assembly near SmartAmp #1.
3. Install the straight fitting on the outside of the mounting bracket. Make sure the fitting clamp is accessible. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See **Figure 5-20 on page 198**.
4. In SmartAmp #1, connect these cables:

   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable

   There are two identical mating connectors for each cable in the SmartAmp, you can use either one. See **Figure 5-21 on page 199**.

5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

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Installing Cable Tube Fitting on SmartAmp Mounting Bracket #2 Perform the steps below to attach the straight/elbow cable tube assembly to SmartAmp mounting bracket #2 and connect cables to SmartAmp #2.

1. Remove the cable clamp from inside mounting bracket #2 by removing the two M3 screws.
2. Rest the cable tube in the support tray. Fold the cable tube up 180 degrees so the elbow fitting is positioned next to mounting bracket #2.
3. Install the elbow fitting on the outside of mounting bracket #2. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See **Figure 5-22 on page 200**.
4. In SmartAmp #2, connect these cables (see **Figure 5-21 on page 199**):
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.
7. Slide the cable tube support clamp to the desired position and snap the tube into place. The clamp should be positioned just past the point where the cable tube bends when the R-M module is closest to SmartAmp #1. Tighten the screws on the clamp to secure it.
8. Slide the cable tube support tray into place near the end of the module so that the tube is supported at the end of travel. Tighten the screws on the tray to secure it.

Installing the Straight/Straight Cable Tube Assembly

Install the cable tube assembly with two straight cable tube fittings between SmartAmp #2 and SmartAmp #3.

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #2 Perform the steps below to attach the straight/straight cable tube assembly to SmartAmp mounting bracket #2 and connect cables to SmartAmp #2.

1. Remove the cable clamp from inside mounting bracket #2 by removing the two M3 screws. See **Figure 5-19 on page 198** for an illustration of the cable clamp (note that this illustration is oriented differently from the correct mounting position onto mounting bracket #2).
2. Position the cable tube assembly with the straight fitting near the 24VDC pin connector beside SmartAmp #2, opposite from the elbow cable tube fitting already connected to SmartAmp #2.
3. Install the straight cable tube fitting on the outside of the mounting bracket. Make sure the fitting clamp is accessible. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See **Figure 5-20 on page 198** for an illustration of how to connect a straight cable tube fitting. Note that this illustration is rotated from the correct orientation of the fitting and does not show the elbow fitting previously connected to SmartAmp #2.

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4. In SmartAmp #2, connect these cables from the straight/straight cable tube assembly:
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable

   See **Figure 5-21 on page 199**.
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #3 Perform the steps below to attach the straight/straight cable tube assembly to SmartAmp mounting bracket #3 and connect cables to SmartAmp #3.

1. Remove the cable clamp from inside mounting bracket #3 by removing the two M3 screws.
2. Fold the cable tube up 180 degrees so the straight fitting is positioned next to mounting bracket #3.
3. Install the straight fitting on the outside of mounting bracket #3. Make sure the fitting clamp is accessible. Use four M4 x 8 screws to secure the fitting to the mounting bracket. See **Figure 5-53 on page 251**.
4. In SmartAmp #3, connect these cables (see **Figure 5-21 on page 199**):
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

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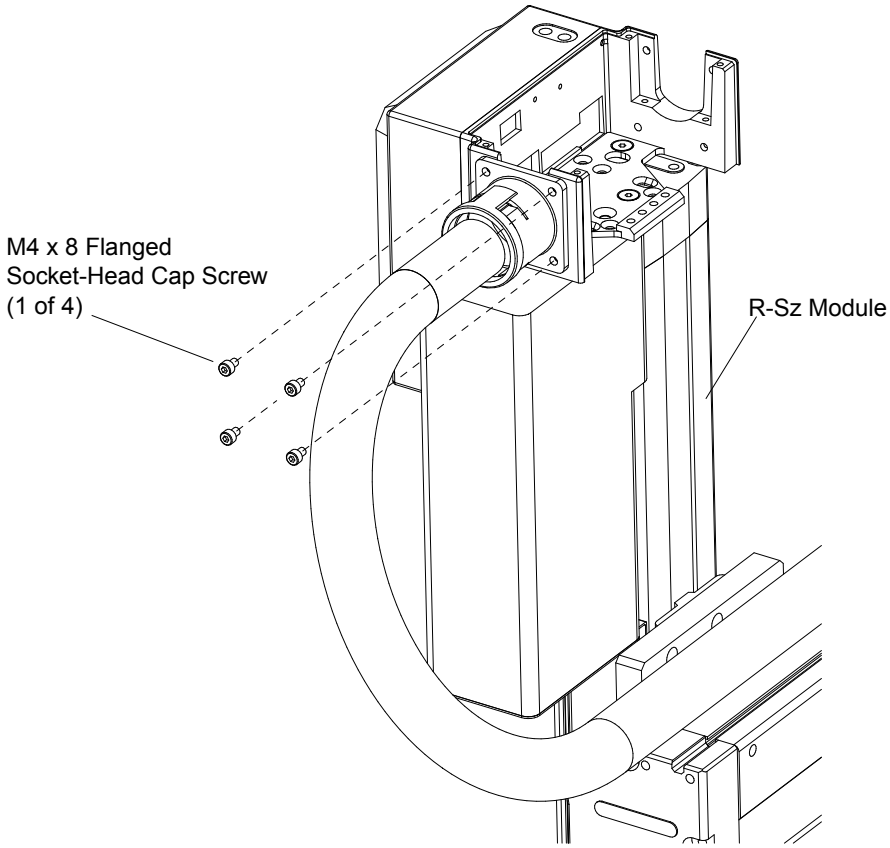


Figure 5-53. R-Pq(HMSz): Installing Cable Tube Fitting on SmartAmp Mounting Bracket #3

7. Slide the cable tube support clamp to the desired position and snap the tube into place. Tighten the screws on the clamp to secure it.

Connecting Cables from Controller to SmartAmp #1

See **"Connecting Cables from Controller to SmartAmp #1" on page 51** for instructions.

Completing the Installation

Perform these steps to complete the installation.

- After you connect all the cables inside the SmartAmp, attach the cable cover to the SmartAmp bracket using four M3 screws.
- Check the mechanical motion of each axis. (Modules with brakes must be checked when the power is turned on.)

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Installing Adept Cartesian Configurations 6

6.1 Introduction

This chapter describes how to assemble an Adept SmartModules four-axis Cartesian system, R-G(HMZT), and install the required cables.

> **NOTE:** The Cartesian system offer an extended X-axis option. In the standard configuration, the motor is in-line with the module. In the extended X-axis configuration, the motor is on the side of the module. Also, a Gantry Support Module (to support one end of the module) is available for the Cartesian system. If your system includes an extended X-axis option or a Gantry Support Module, see "**Chapter 7** - Installing Optional R-Series Equipment " for information on how to install the X-axis module.

See "**Chapter 10** - Technical Specifications " for information on dimensions of the modules, brackets, and work envelope.

Precautions

Observe the following precautions when configuring modules in multi-axis combinations:

1. Some systems include alignment pins on the combining bracket. The chamfered pin of the combining bracket and the pin hole on the main unit are high-precision mating surfaces and you may experience some resistance in positioning the pin in the hole. Carefully press the bracket and main unit together firmly, using care to avoid damaging the hole in the process.
2. When assembling cables, avoid applying unreasonable force to cables.

   NOTE: Combinations other than those illustrated are possible.

3. Before applying power, check for correct cable connections.



WARNING: Improper connection may result in damage to the controller or module motor.

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Mounting Screw Torque Specifications

When mounting screws used to install modules, mounting plates, and other components, apply the amount of torque specified in Table 3-1 on page 43 and Table 3-2 on page 44.

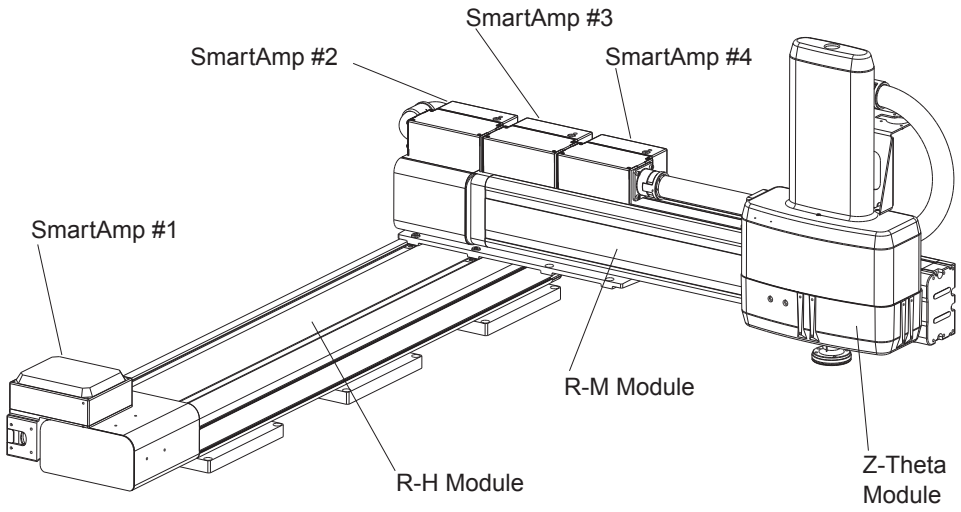


Figure 6-1. R-G(HMZT): System Component Overview

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Table 6-1. R-G(HMZT) Parts List

Description	Part Number	Qty
R-H module	9040x-1xxxx	1
R-M module	9040x-2xxxx	1
Z-Theta cable harness	30410-700xx	1
Z-Theta calibration fixture	30450-60500	1
Z-Theta module assy	30451-51000	1
Z-Theta mounting bracket	40451-10000	1
Z-Theta user flange kit	90554-20020	1
SmartAmp	30410-10000	4
SmartAmp cable tube mounting bracket	30410-20000	4
Combining bracket, R-GHM	40405-05002	1
Mounting plate, RH	90400-01100	2/3[a]
Cable tube fitting, elbow	40410-40090	1
Cable tube fitting, straight	40410-40000	1
Cable tube, hi-flex	40410-310xx	1
Cable tube clamp	30410-42000	2[a]
Cable tube support tray	30410-60000	1[a]
Cable kit, amp to amp AC power cable 24V DC cable IEEE 1394 cable	90410-100xx 10410-006xx 10410-007xx 10410-005xx	3
Cable kit, controller AC power cable 24V DC cable IEEE 1394 cable Ferrite core	90410-200xx 10410-009xx 10410-010xx 10410-105xx 27200-00117	1
Hardware kit	90405-00200	1
Optional Items		
Gantry support module	90405-50xxx	1
Gantry support bracket, RM	40405-04100	1
Remote I/O (RIO) kit	90410-20050	1[b]

[a] Quantity will vary depending on module length.
[b] Quantity will vary according to order.

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6.2 Installing the R-H Module

NOTE: 300 to 600 mm R-H modules use two mounting plates; 800 mm and longer modules use three plates.

1. Prepare the work surface by drilling and tapping eight or twelve M8 holes (depending on module length) for the R-H-module mounting plates. See "**Chapter 10** - Technical Specifications " for dimensions of the R-H module and the plates.
2. Install R-H-module mounting plates to the under side of the R-H module using four M8 x 20 screws provided for each plate. See **Figure 6-2**.
3. Mount the R-H module to the work surface using M8 x 20 screws.

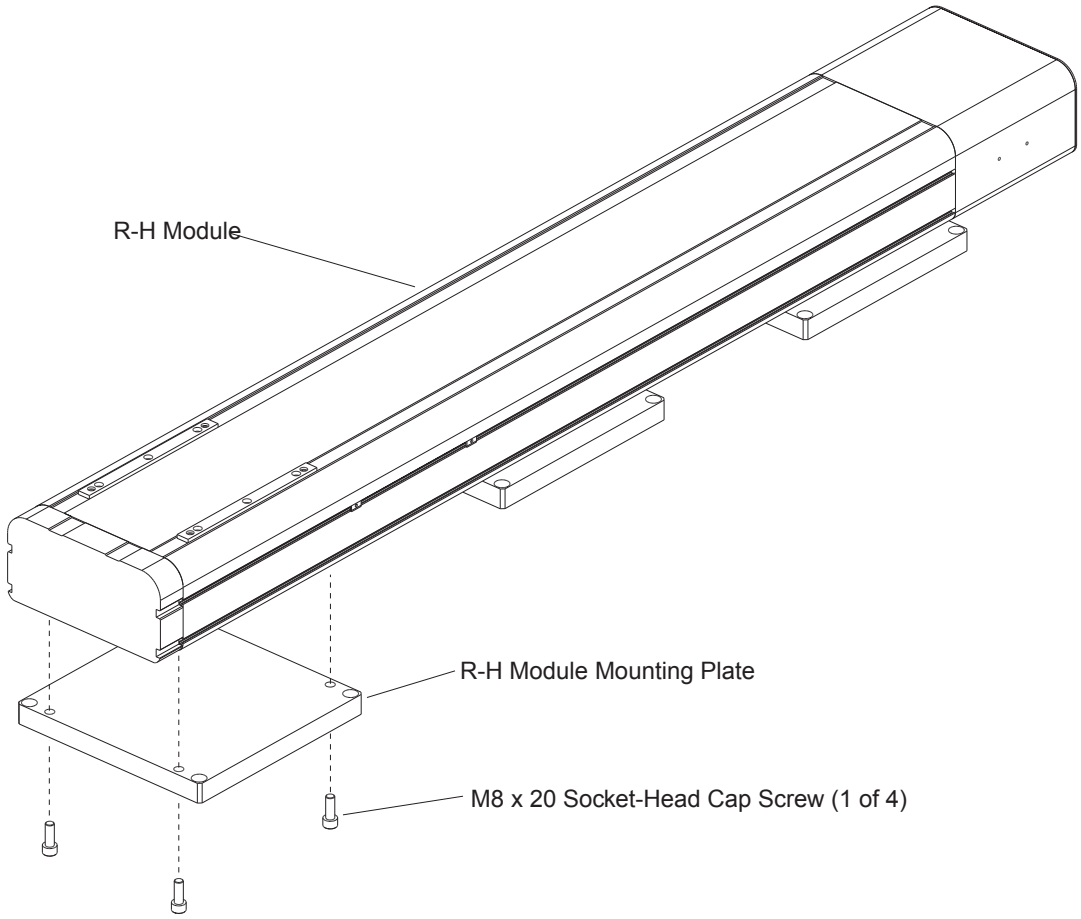


Figure 6-2. R-G(HMZT): Installing the R-H Module

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6.3 Installing Alignment Pins on R-GHM Combining Bracket

1. Locate the R-GHM combining bracket, two 8mm round pins, and two 8mm diamond pins.
2. Install a round pin and a diamond pin in the bottom face of the R-GHM combining bracket. See **Figure 6-3**. Note the orientation of the diamond pin in the drawing. Use Loctite 609 sealant or equivalent to secure the pin in place.

   NOTE: The pin locations shown in **Figure 6-3** and **Figure 6-4** are for a "right-hand" configuration. For a "left-hand" configuration, see "**Appendix A** - Configuration Options ".

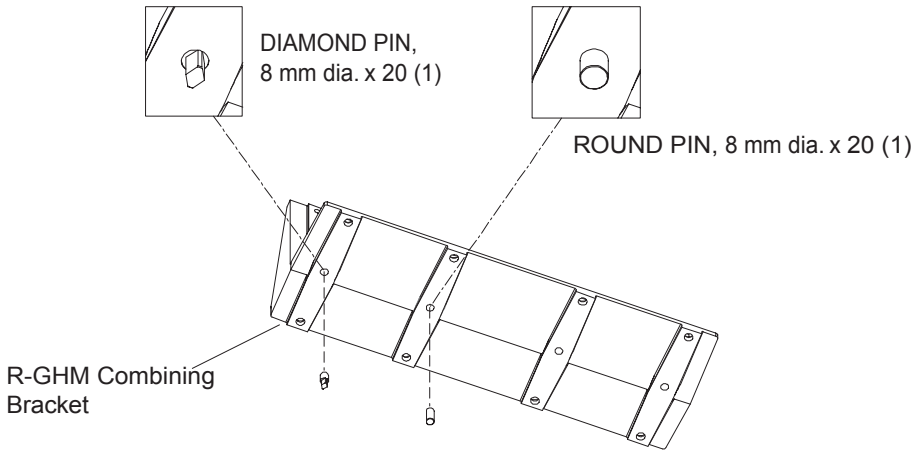


Figure 6-3. R-G(HMZT): Installing Alignment Pins on the R-GHM Combining Bracket (1)

3. Install a round pin and a diamond pin in the vertical face of the R-GHM combining bracket. See **Figure 6-4**. Note the orientation of the diamond pin in the drawing. Use Loctite 609 sealant or equivalent to secure the pin in place.

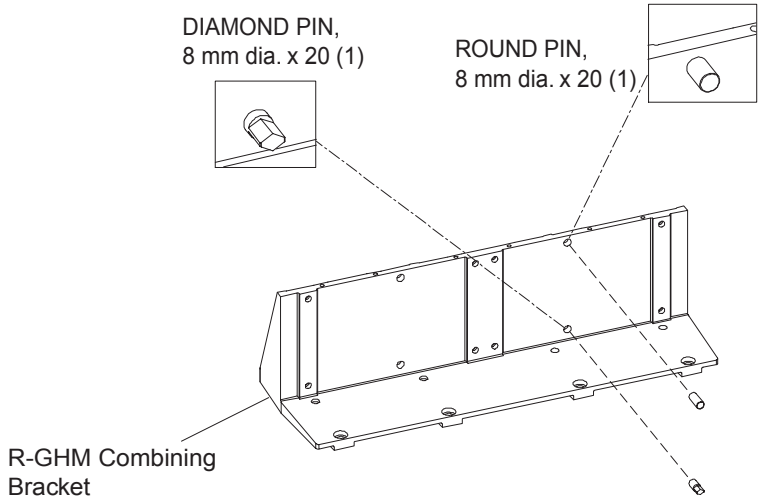


Figure 6-4. R-G(HMZT): Installing Alignment Pins on the R-GHM Combining Bracket (2)

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6.4 Installing the R-M Module

1. Mount the R-GHM combining bracket to the R-H-module slider with four M8 x 20 screws. Position the bracket as shown in **Figure 6-5**. Carefully insert the pins into pin holes to avoid damaging the pin holes.
2. Mount the R-M module on the R-GHM combining bracket with four M6 x 16 screws. Align the pins on the bracket with the mating holes in the module.

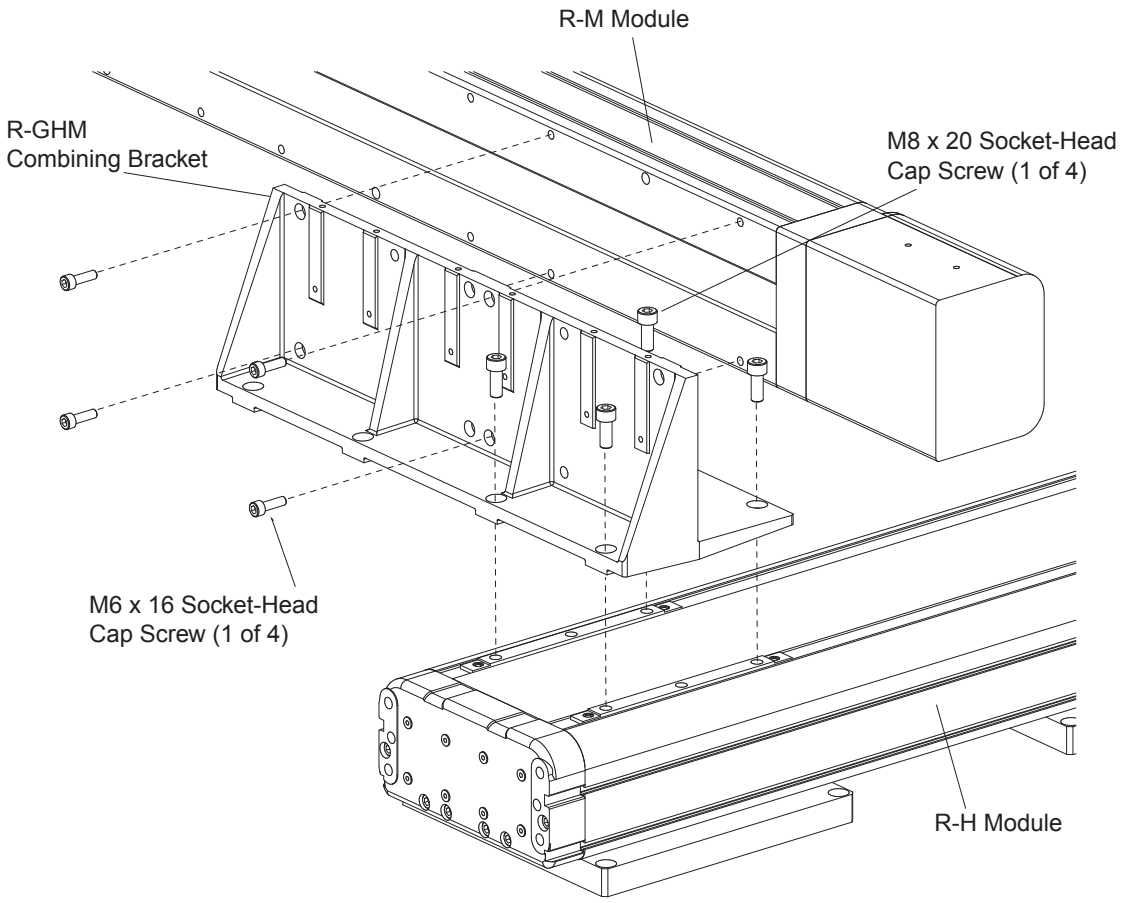


Figure 6-5. R-G(HMZT): Installing the R-M Module

6.5 Installing the Z-Theta Module

1. Remove the three M5 x 12 screws on the Z-Theta Module top cover. Lift the cover straight up off the main body.
2. Attach the Z-Theta module to the R-M-module's slider with the four captive M6 screws located in the back wall of the Z-Theta module. Align the pins on the Z-Theta module with the mating holes in the R-M-module's slider. Use an extended-length hex wrench with a ball point as shown in **Figure 6-6** and **Figure 6-7**.

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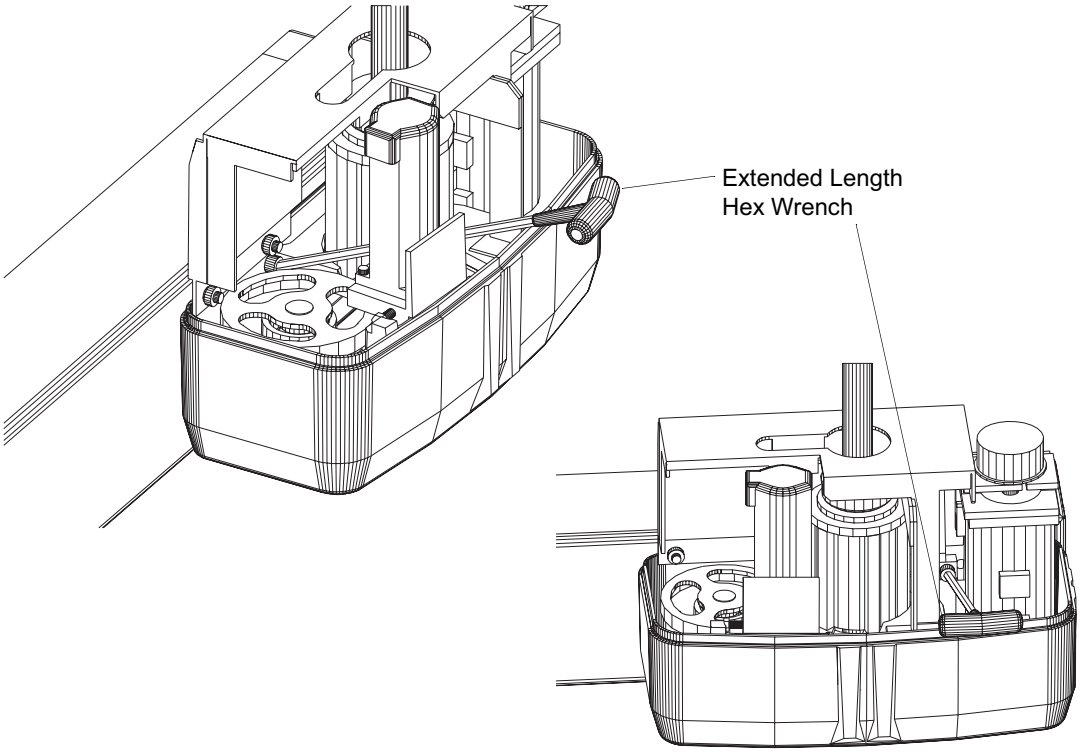


Figure 6-6. R-G(HMZT): Attaching the Z-Theta Module to the R-M Module

NOTE: The bottom two mounting screws are accessed from underneath the Z-Theta Module; see **Figure 6-7**.

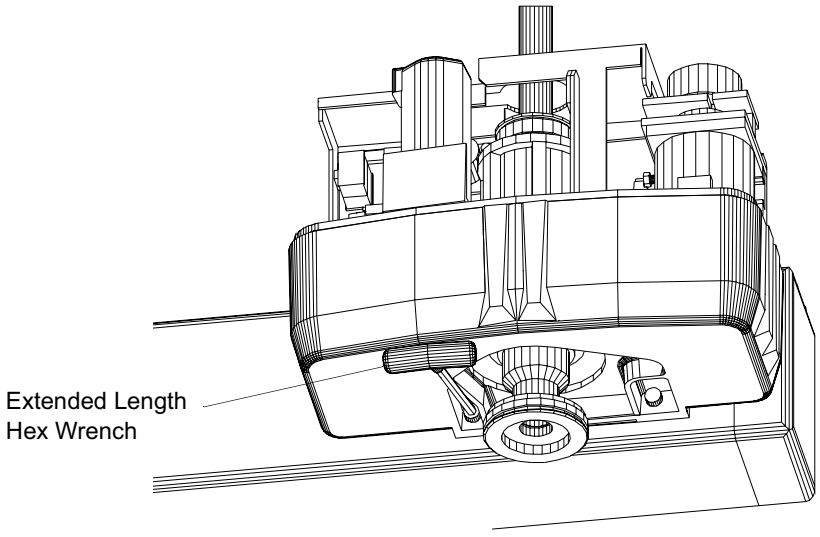


Figure 6-7. R-G(HMZT): Mounting Screws on Z-Theta Module

3. Replace the top cover of the Z-Theta unit, but do not install the screws yet.

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4. Install the Z-Theta cable tube bracket to the back side of the Z-Theta Module using the three M5 x 12 screws that were removed in step 1; see **Figure 6-8**. These screws secure the bracket and the cover.

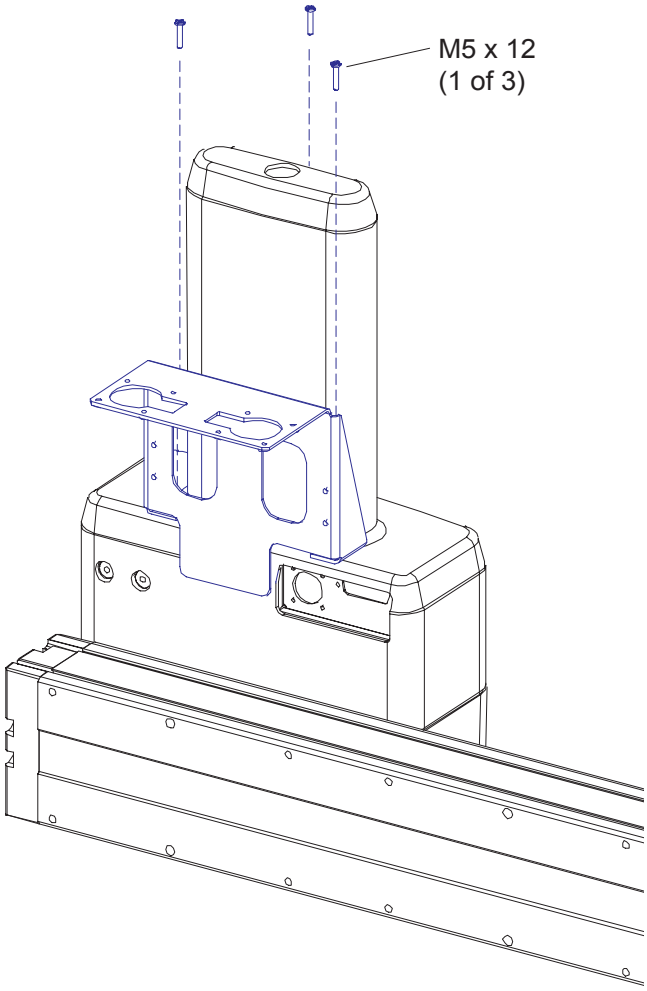


Figure 6-8. R-G(HMZT): Installing Z-Theta Cable Tube Bracket on the Z-Theta Module

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6.6 Installing Adept SmartAmps

Installing SmartAmp #1 on R-H Module

1. Remove the cable cover from a SmartAmp mounting bracket by removing four M3 screws.
2. Install the mounting bracket onto the R-H module at the motor cover using four M4 x 10 flathead screws; see **Figure 6-9**. Route the motor and encoder cables from the module through the opening in the mounting bracket.

   NOTE: If you have an optional RIO unit that will be mounted on the R-H module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install the SmartAmp onto the mounting bracket.

3. Install SmartAmp #1 onto the mounting bracket using four M3 x 40 screws. See **Figure 6-10 on page 263**.
4. Plug the motor and encoder cables from the module into the mating receptacles in the SmartAmp. See **Figure 6-11 on page 263**. Attach the captive screws to secure the encoder connector.

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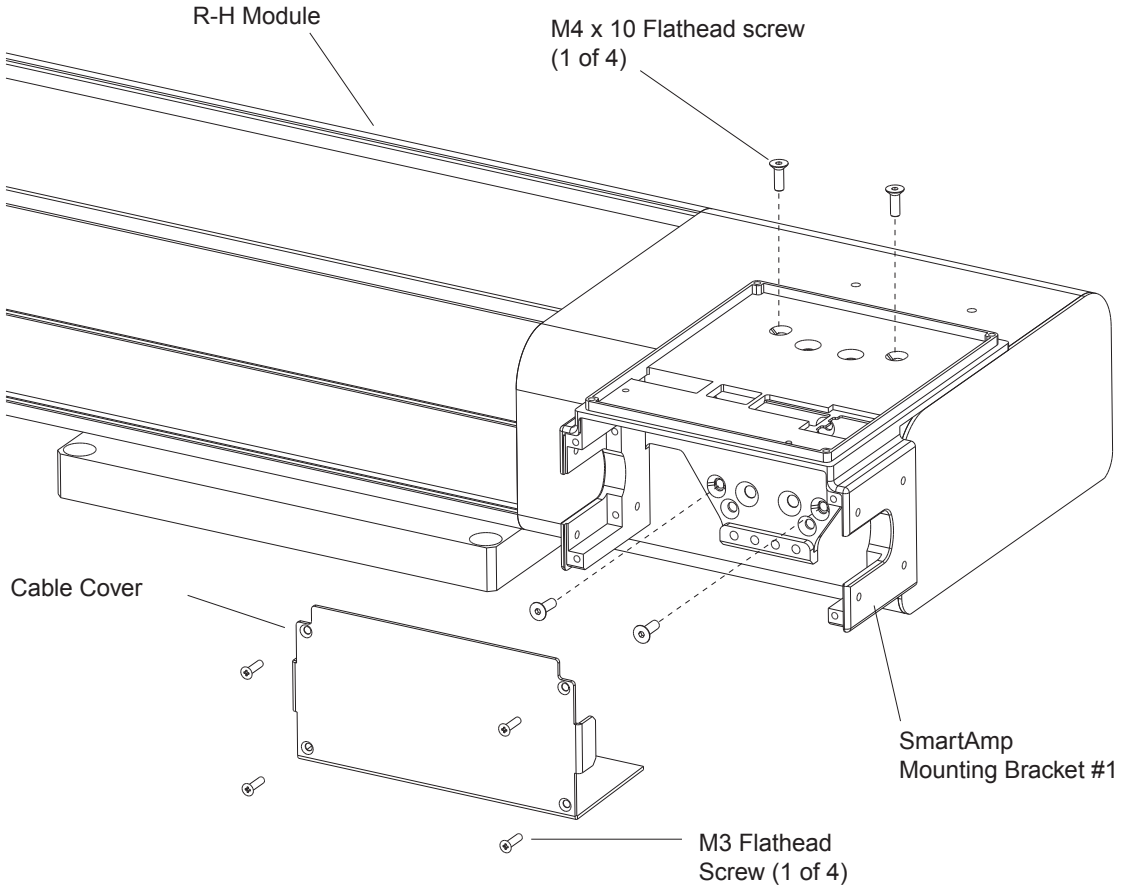


Figure 6-9. R-G(HMZT): Installing SmartAmp Mounting Bracket #1 on the R-H Module

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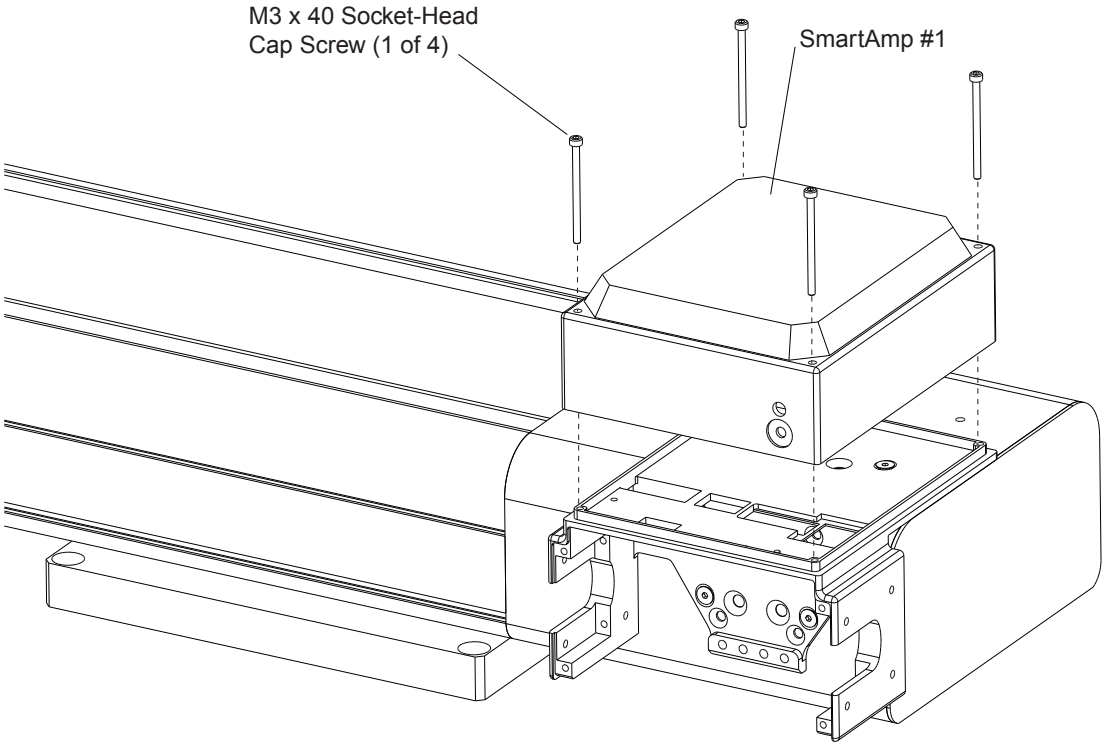


Figure 6-10. R-G(HMZT): Installing SmartAmp #1 on the R-H Module

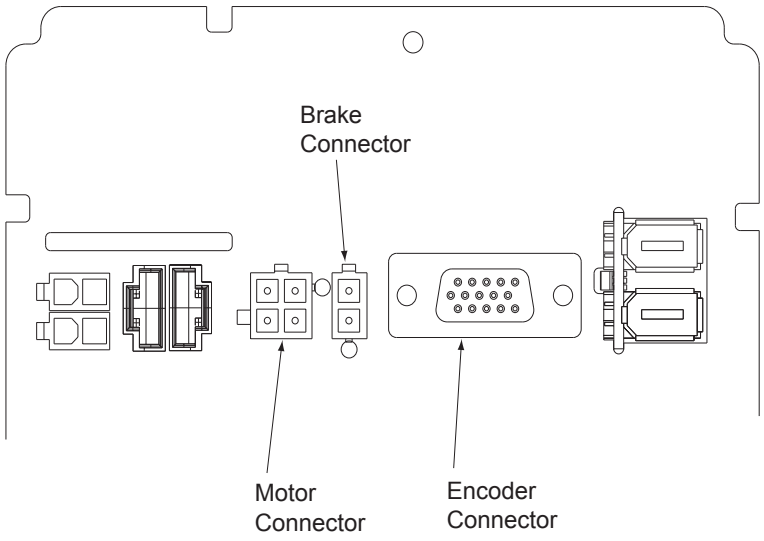


Figure 6-11. R-G(HMZT): Connecting Motor and Encoder Cables to SmartAmp

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Installing SmartAmps on R-GHM Combining Bracket

1. Remove the cable cover from three SmartAmp mounting brackets by removing four M3 screws on each one.
2. Install a SmartAmp mounting bracket onto the R-GHM combining bracket in position #2 using four M4 x 10 flathead screws; see **Figure 6-12**. Route the motor and encoder cables from the module through the opening in the mounting bracket.
3. Install a SmartAmp onto the mounting bracket in position #2 using four M3 x 40 screws. Position the SmartAmp so that the connectors extend through the mounting bracket. See **Figure 6-13 on page 265**.
4. Plug the motor and encoder cables from the module into the mating receptacles in SmartAmp #2. Attach the captive screws to secure the encoder connector.

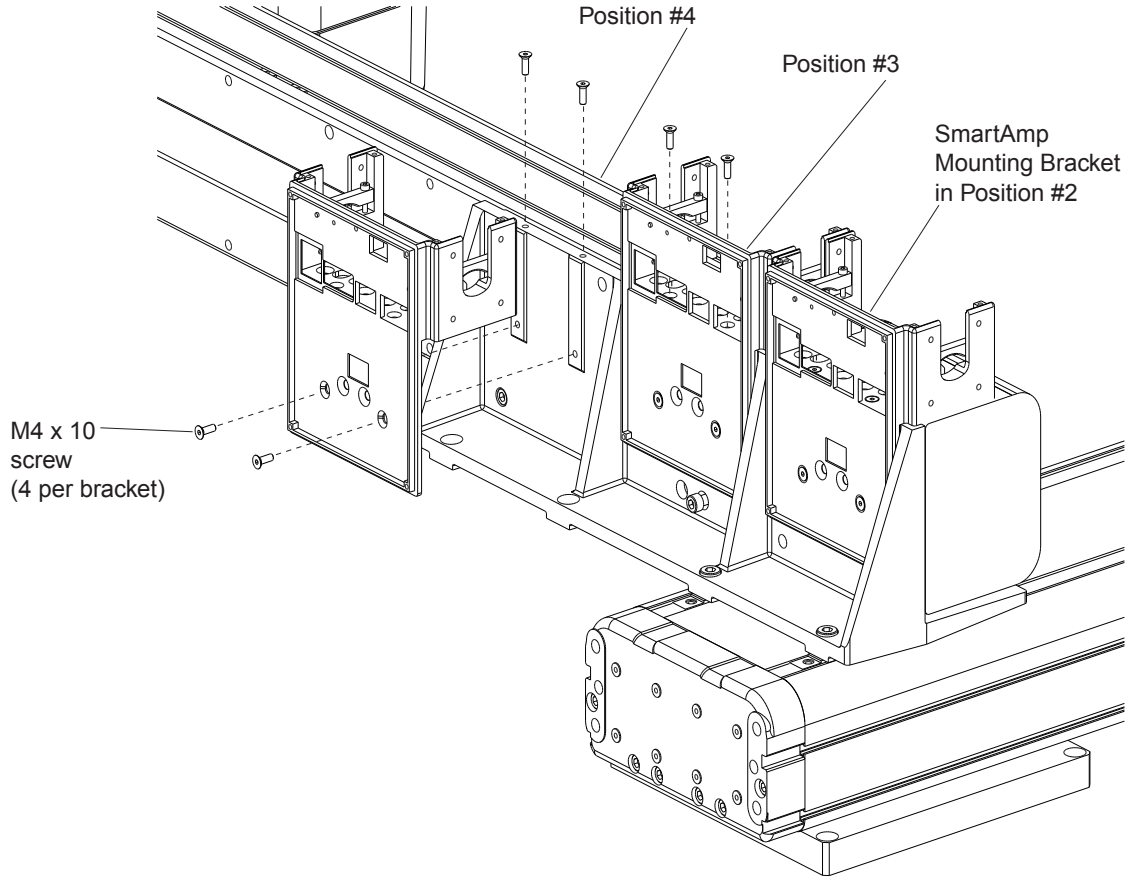


Figure 6-12. R-G(HMZT): Installing SmartAmp Mounting Bracket on the R-GHM Bracket

5. Install SmartAmp mounting brackets onto the R-GHM combining bracket in positions #3 and #4 as described above.

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NOTE: If you have an optional RIO unit that will be mounted on the Z-Theta module, refer to the ***Adept SmartModules Instruction Handbook for Controller Installation*** for information on installing the SPI board at this time. This needs to be done before you install SmartAmp #4 onto the mounting bracket.

6. Install SmartAmps onto the mounting brackets in position #3 and position #4 as described above.

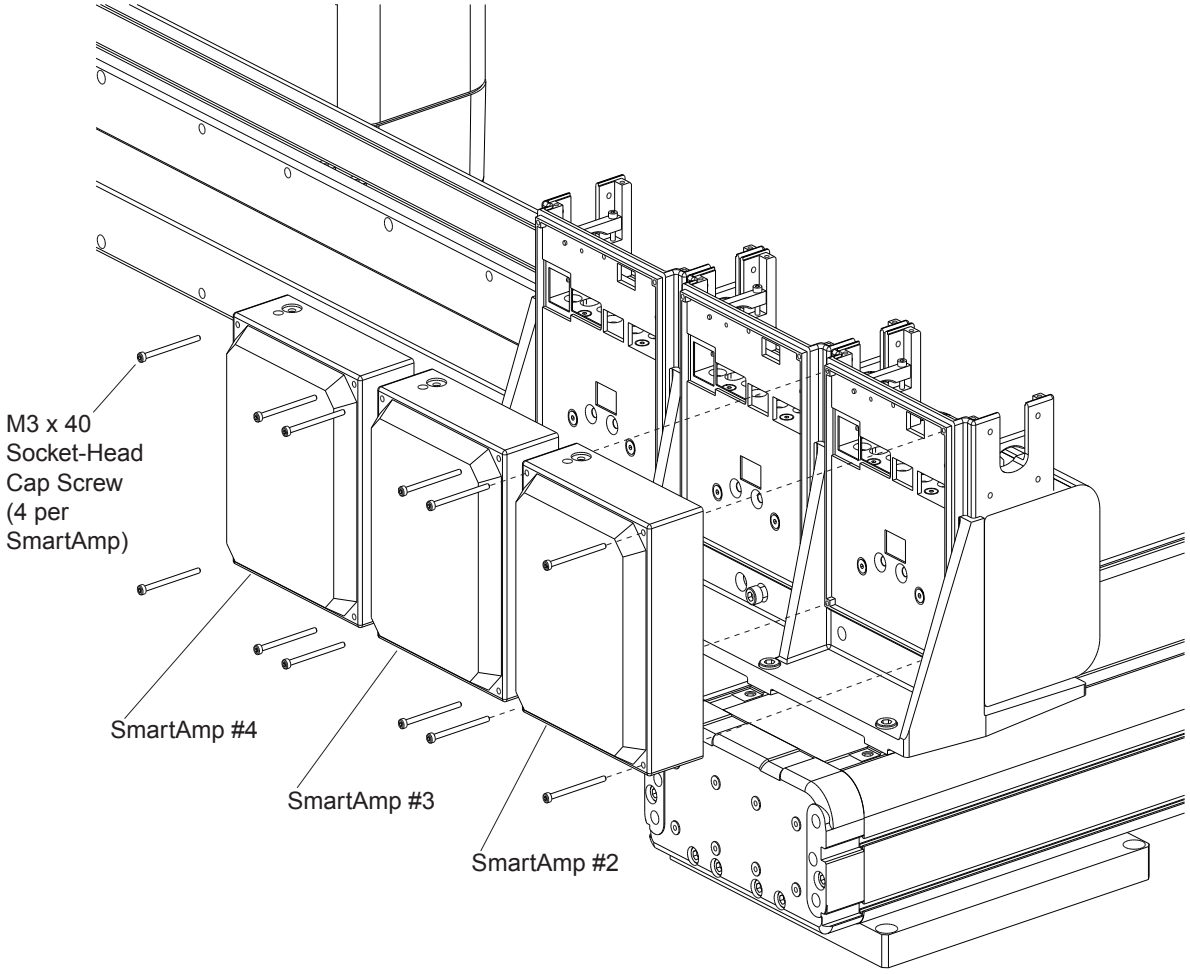


Figure 6-13. R-G(HMZT): Installing SmartAmps #2, #3, and #4 on the R-GHM Combining Bracket

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6.7 Installing Cable Tube Supports

Installing the Cable Tube Support Clamp on R-H Module

1. Slide two T-slot nuts into the upper side channel in the R-H module; see **Figure 6-14**. Position the nuts for installing the cable tube support clamp.
2. Install the cable tube support clamp using two M4 x 8 screws. Leave the M4 screws loose for repositioning later after the cable tube has been installed.

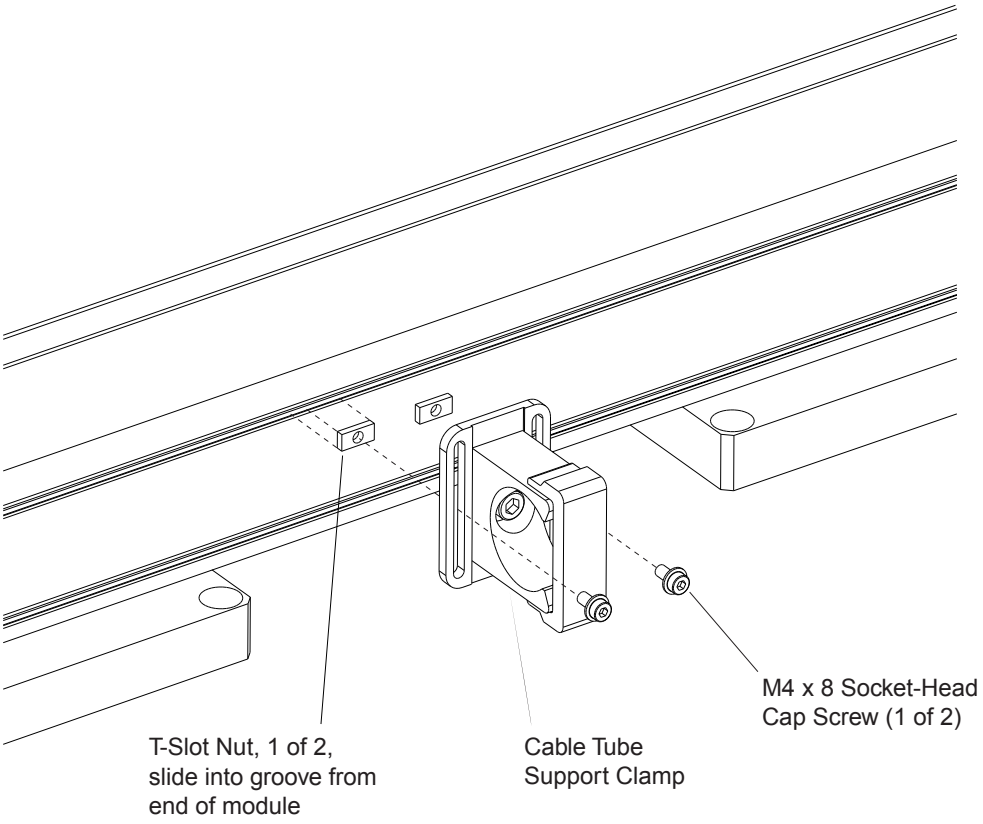


Figure 6-14. R-G(HMZT): Installing the Cable Tube Support Clamp

Installing the Cable Tube Support Tray

1. Slide three T-slot nuts into the upper side channel in the R-H module; see **Figure 6-15 on page 267**. Position the nuts for installing the cable tube support tray.
2. Install the cable tube support tray using three M4 x 6 screws.

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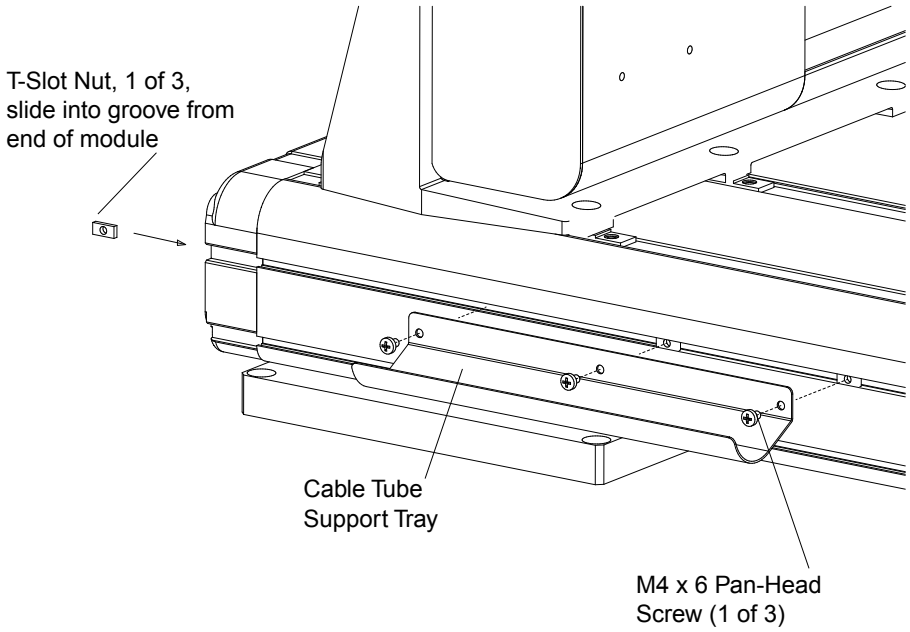


Figure 6-15. R-G(HMZT): Installing the Cable Tube Support Tray

Installing Cable Tube Support Clamp on R-M Module

1. Slide two T-slot nuts into the top channels on the R-M module. Position the nuts for installing the cable tube support clamp, approximately 6 inches from SmartAmp #4.
2. Install the cable tube support clamp using two M4 x 8 screws. Leave the M4 screws loose for repositioning later after the cable tube has been installed.

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6.8 Installing Cable Tube Assembly Between Amp #1 and Amp #2

The procedure to install cables consists of these steps:

- install cable tube fittings on cable tube
- route cables through the cable tube
- install assembled cable tube on SmartAmp mounting bracket and plug in all cables

The lengths of the cables and cable tube depend on which modules you have ordered.

Installing Cable Tube Fittings on Cable Tube

1. Locate a straight cable tube fitting.
2. Install the fitting by pushing it onto the end of the cable tube until the fitting has fully snapped into place inside the fitting. See **Figure 6-16 on page 269**.
3. Locate an elbow cable tube fitting.
4. Install the fitting by pushing it onto the opposite end of the cable tube until the fitting has fully snapped into place inside the fitting.

Routing Cables Through Cable Tube

1. Locate three cables in the cable kit.
   - AC power cable
   - 24VDC cable
   - IEEE 1394 cable

   See **Figure 6-16 on page 269**.
2. Group the three cables together, plus any additional user cables or air lines, and slide them through the cable tube, starting from the elbow end first.

   NOTE: The 24V cable has two additional connectors for the optional RIO system. There is a socket (latched) connector at one end of the cable and a pin connector at the other end. Position this cable so the socket end is at the elbow fitting and the pin end is at the straight fitting. See **Figure 6-16 on page 269**.
3. Gently pull the cables through the tube until they are evenly spaced at each end. Try to make sure the cables do not get twisted or tangled as you pull them through the tube.

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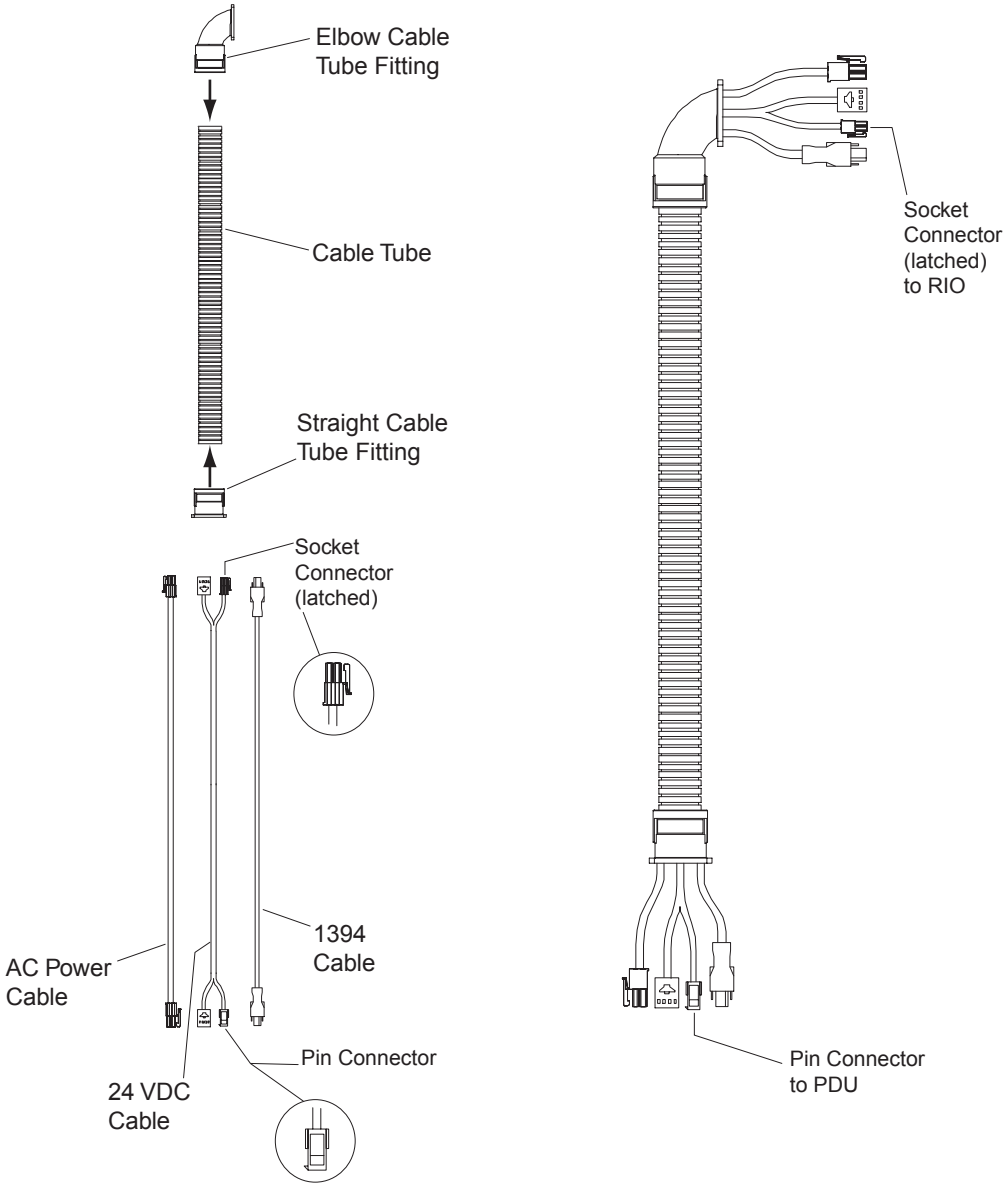


Figure 6-16. R-G(HMZT): Cable Tube Assembly (One Straight/One Elbow Fitting)

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #1

1. Remove the cable clamp from inside the mounting bracket by removing the two M3 screws. See **Figure 6-18 on page 271**.
2. Position the cable tube assembly next to the R-H module with the straight fitting near SmartAmp #1.
3. Install the straight fitting on the outside of the mounting bracket. See **Figure 6-19 on page 272**. Make sure the fitting clamp is accessible. Use four M4 x 8 screws, to secure the fitting to the mounting bracket.

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4. In SmartAmp #1, connect these cables:
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable

   There are two identical mating connectors for each cable in the SmartAmp, you can use either one. See **Figure 6-17**.

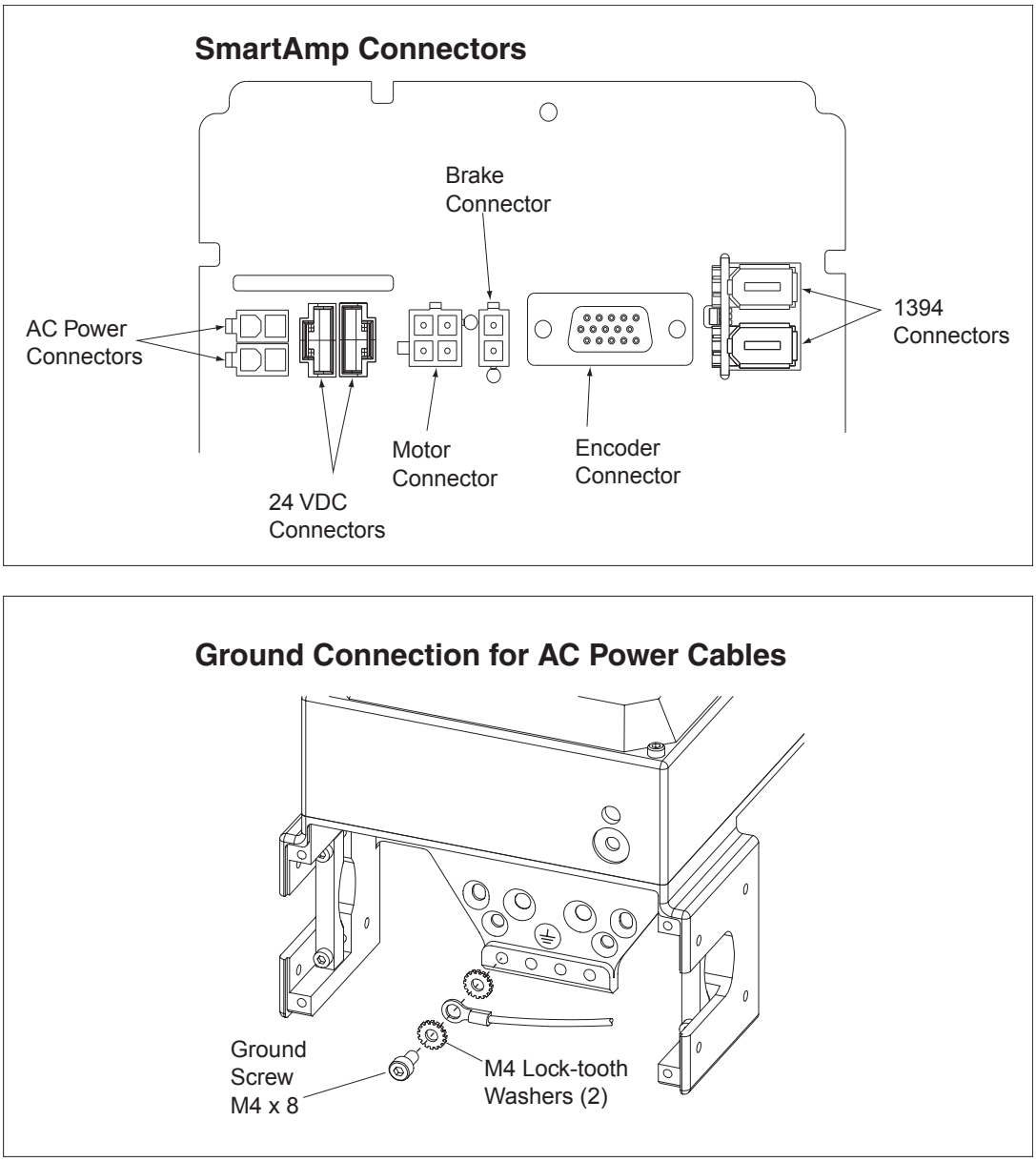


Figure 6-17. R-G(HMZT): Connecting Cables to SmartAmp

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5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

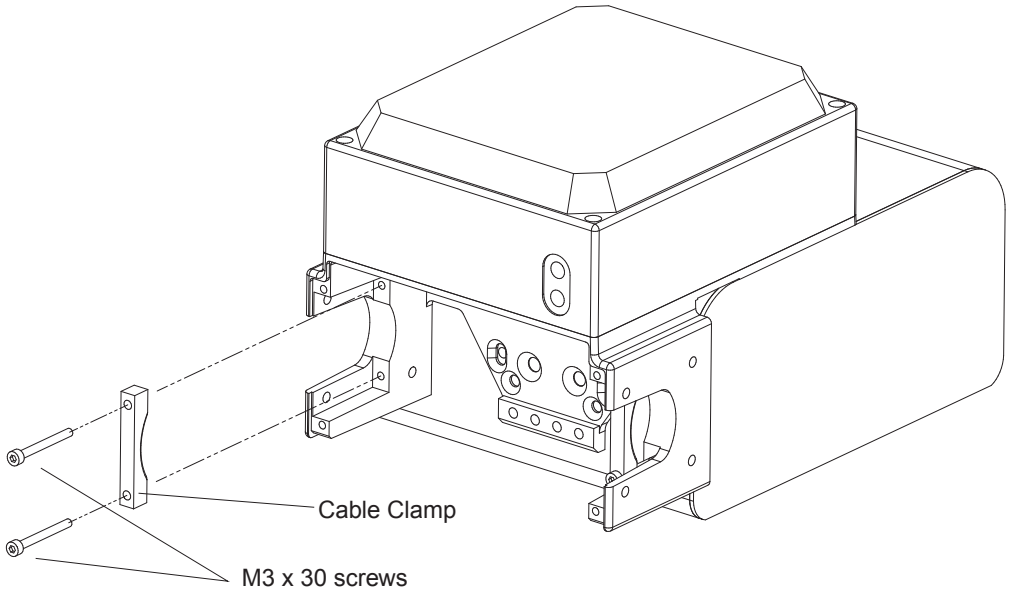


Figure 6-18. R-G(HMZT): Removing the Cable Clamp

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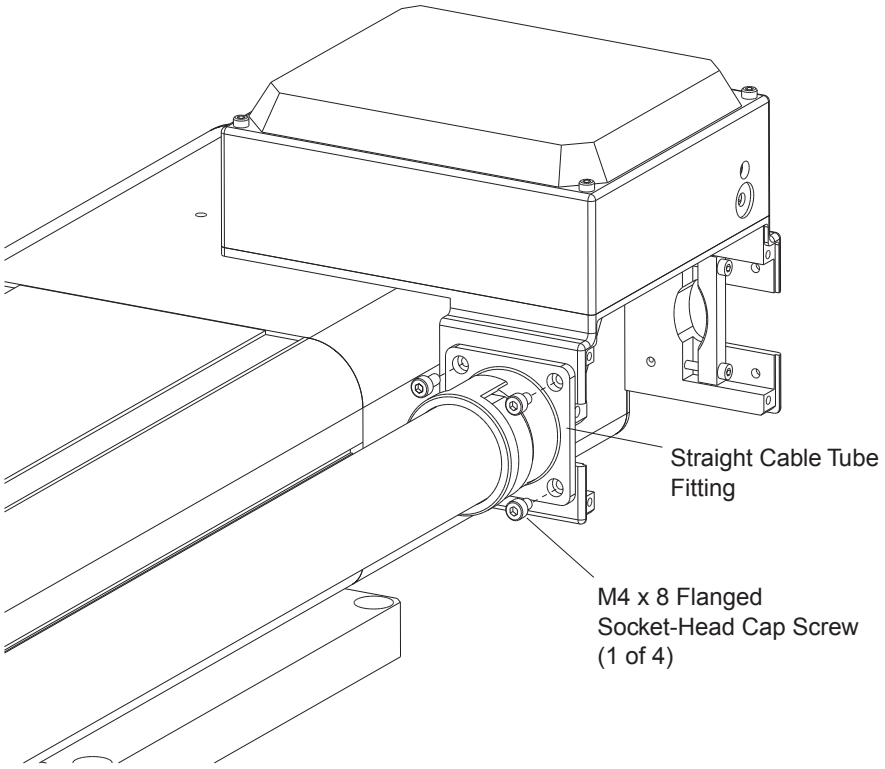


Figure 6-19. R-G(HMZT): Installing Cable Tube Fitting on SmartAmp Mounting Bracket #1

Installing Cable Tube Fitting on SmartAmp Mounting Bracket #2

1. Remove the cable clamp from inside mounting bracket #2 by removing the two M3 screws.
2. Rest the cable tube in the support tray. Fold the cable tube up 180 degrees so the elbow fitting is positioned next to mounting bracket #2.
3. Install the elbow fitting on the outside of the mounting bracket. See **Figure 6-20**. Use four M4 x 8 screws to secure the fitting to the mounting bracket.
4. In SmartAmp #2, connect these cables (see **Figure 6-17 on page 270**):
   - IEEE 1394 cable
   - AC power cable and ground ring lug
   - 24VDC cable
5. Slide the cable clamp into the channel inside the mounting bracket.
6. Install two M3 x 30 screws through the cable clamp and into the holes in the mounting bracket. Tighten the clamp until the cables are secure. Do not over-tighten nor leave the cables too loose to allow them to slide.

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