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# Adept MotionBlox-10 Servo Kit

## Installation Guide



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# Adept MotionBlox-10 Servo Kit

## Installation Guide



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# 1 Introduction

## 1.1 Product Description

### Adept Servo Kit

Adept Servo Kits offer a convenient and economical way to add one or more incremental axes to an existing system. The kits are plug-compatible with Adept's SmartServo distributed-servo network. The SmartServo network utilizes the IEEE-1394 protocol to provide real-time communications with an individual axis.

### Servo Kit Components

The Servo Kit consists of an Adept MotionBlox-10 (MB-10), a matched AC servo motor with absolute encoder, an amplifier mounting bracket, and related documentation. Complementary components, such as power and interface cables, remote I/O kit, and cable accessories, are available as options.

#### Adept MB-10

The Adept MB-10 is a distributed-servo amplifier that can be mounted close to the motor, thereby eliminating the need for panel space typically required for servo amplifiers. This also simplifies installation and reduces the cables required to interface with the mechanism. As an option, motor and encoder extension harnesses made from high-flex robotic cable can be ordered.

The MB-10 features an on-board RISC microprocessor that executes the advanced servo loop. Adept's IEEE-1394-based SmartServo network recognizes the MB-10 as a network node. The MB-10 is compatible with single-phase nominal AC voltage input of 200-240 V, 50 or 60 Hz.

#### Servo Motors

The servo motors for the Servo Kit are compact, CE compliant, low noise, high speed, and high power. The motors feature an absolute encoder that eliminates the need for homing. Encoder resolution is 65,536 counts per revolution. Additionally, the motors are totally enclosed and self-cooled by natural convection when mounted in an appropriate ambient environment. The MB-10 includes an internal regenerative dump resistor designed to handle approximately 20 Watts under nominal conditions. (For systems configured for regenerative power applications (such as vertical axes), contact Adept Customer Service for more information (see **Section 1.4 on page 8**).)

The servo motors are available in four sizes: 100 W, 200 W, 400 W, and 750 W. The primary advantage of the larger motors is the additional torque created. (The MB-10 amplifier is not able to drive the 750 W motor to its maximum capability.) All the motors are available with or without brakes.



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## 1.2 Required System Components

### Power Distribution Unit

The Power Distribution Unit (PDU3) is a safety device that switches AC power to the MB-10 when High Power is enabled. The PDU3 also supplies DC power for the MB-10 circuits.

#### Use with Other Adept Robots

If you are using an Adept Servo Kit with another Adept robot (such as an Adept Cobra, Viper, or Quatro), you will need the following additional items:

- PDU3 Expansion Kit - P/N 90430-30001
- XSYS Y-Cable - P/N 00411-000
- Kit for Multi-Mixed Robot Systems - P/N 06600-000

**NOTE:** Make sure that you install the Terminator plug on the open XSLV connector on the last PDU3 in your system.

## 1.3 Optional System Components

### IO Blox Device

Adept offers a remote Input/Output option with the Adept Servo Kit. The IO Blox offers eight inputs and eight outputs, all optically isolated. You can daisy-chain up to four IO Blox devices per robot or MB-10 amp. See the ***Adept IO Blox User's Guide*** for information.

## 1.4 Available Support Resources

### 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 and hardware.

Additionally, you can access the following information sources on Adept's corporate web site:

- For Contact information: http://www.adept.com/main/contact/index. html
- For Product Support information: http://www.adept.com/main/services/index.asp
- For general information about Adept Technology, Inc.: http://www.adept.com



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## Related Manuals

This guide covers the installation of the Servo Kit. There are additional manuals that cover programming, system configuration, and adding optional components. The following manuals (available on the Adept Document Library on CD-ROM) provide additional information related to the Servo Kit.

**Table 1-1. Related Manuals**

| Manual Title | Description |
|---|---|
| *Adept SmartController User's Guide* | Describes the installation and operation of the Adept SmartController, and the sDIO product. |
| *Adept Python Linear Modules User's Guide* | Describes how to assemble and install Adept Python Linear Modules. |
| *Adept SmartMotion Developer Guide* | Describes the SPEC utility used to modify servo tuning and calibration parameters. |
| *Adept IO Blox User's Guide* | Describes the IO Blox product. |

## Adept Document Library

In addition to Adept's Document Library on CD-ROM, you can find product documentation on the Adept web site in the Document Library area. The Document Library search engine allows you to locate information on a specific topic. Additionally, the Document Menu provides a list of available product documentation.

To access Adept's Document Library, type the following URL into your browser:

http://www.adept.com/Main/KE/DATA/adept_search.htm

or, select the Adept Document Library link from the Services area of the Adept web site.



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# 2 Servo Kit Installation

## 2.1 Mounting the MB-10 T-Bracket

The MB-10 fits securely onto the mounting T-bracket provided with your Adept Servo Kit. Use the M4 x 10 flathead screws to securely attach the mounting bracket to the desired mounting surface. See **Figure 2-1**.

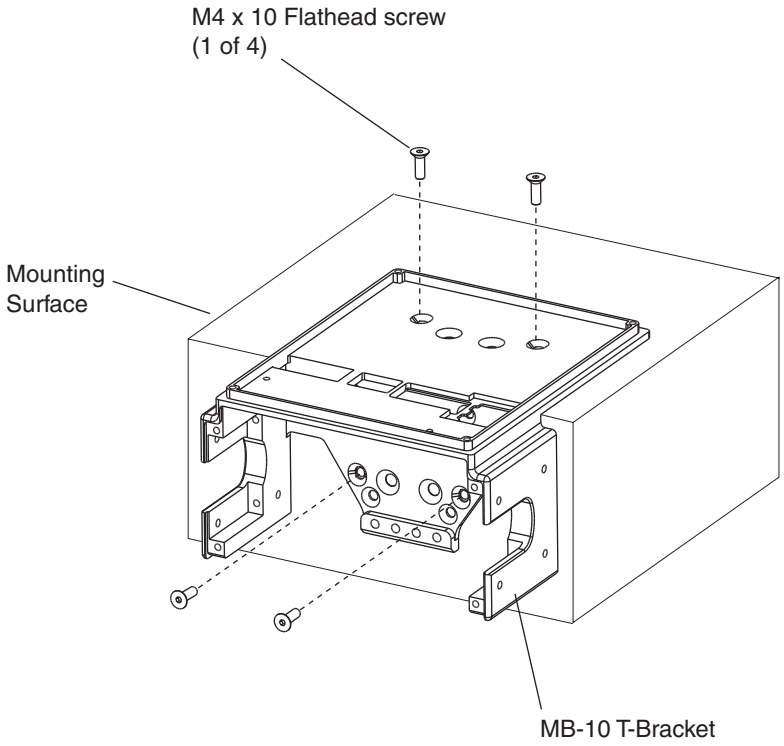



**Figure 2-1. The MB-10 Mounting T-Bracket**



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## 2.2 MB-10 T-Bracket Dimension Drawings

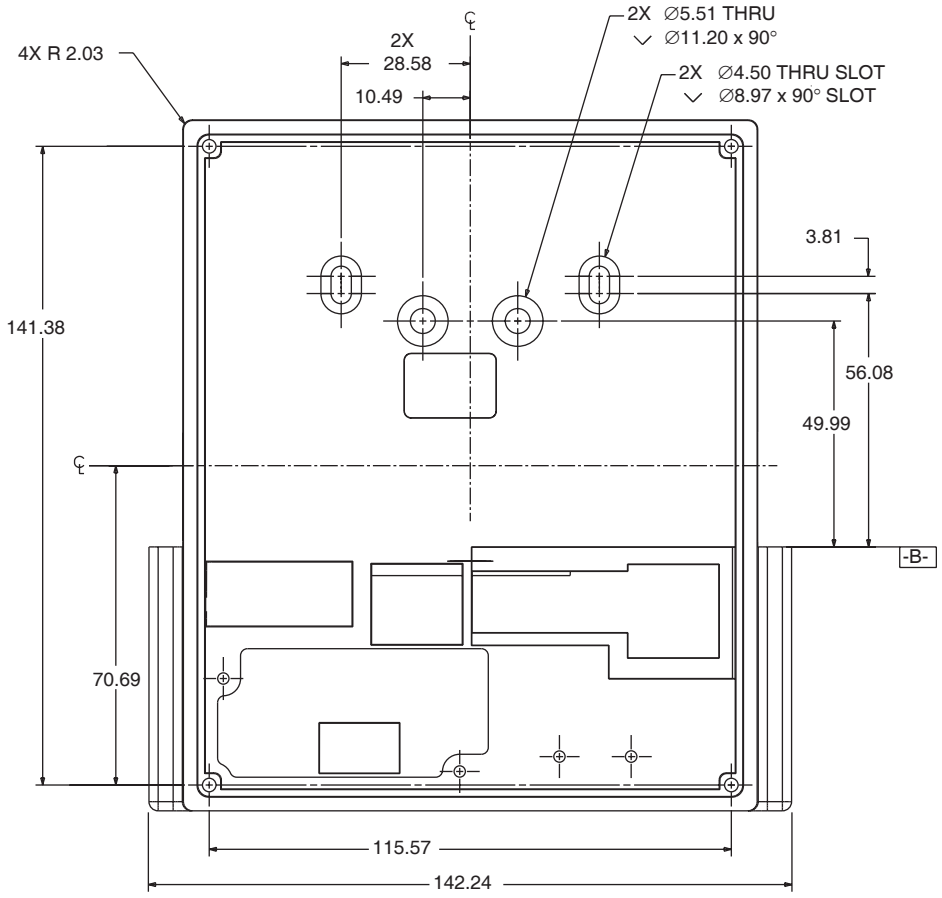



**Figure 2-2. Top View of MB-10 T-Bracket**

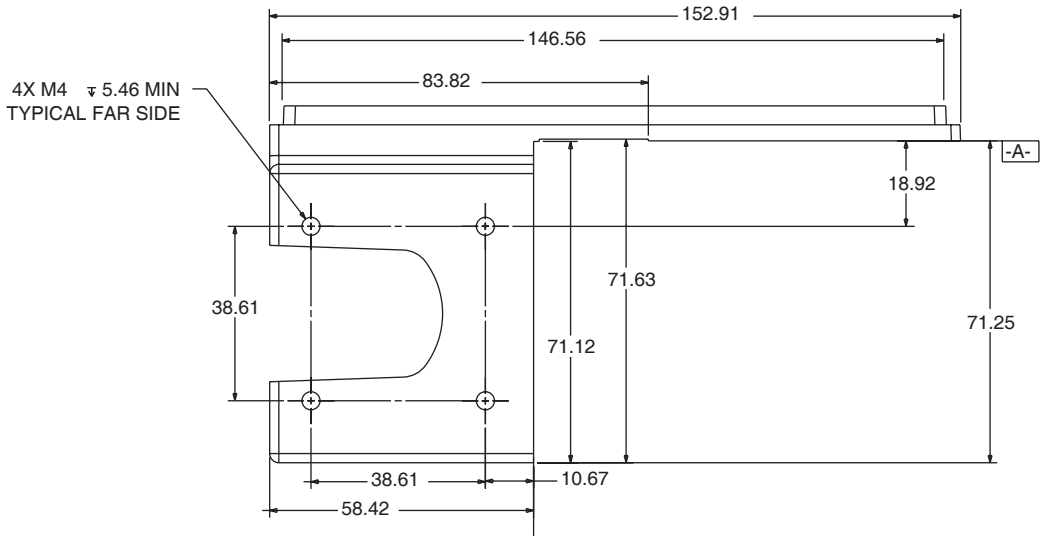



**Figure 2-3. Side View of MB-10 T-Bracket**



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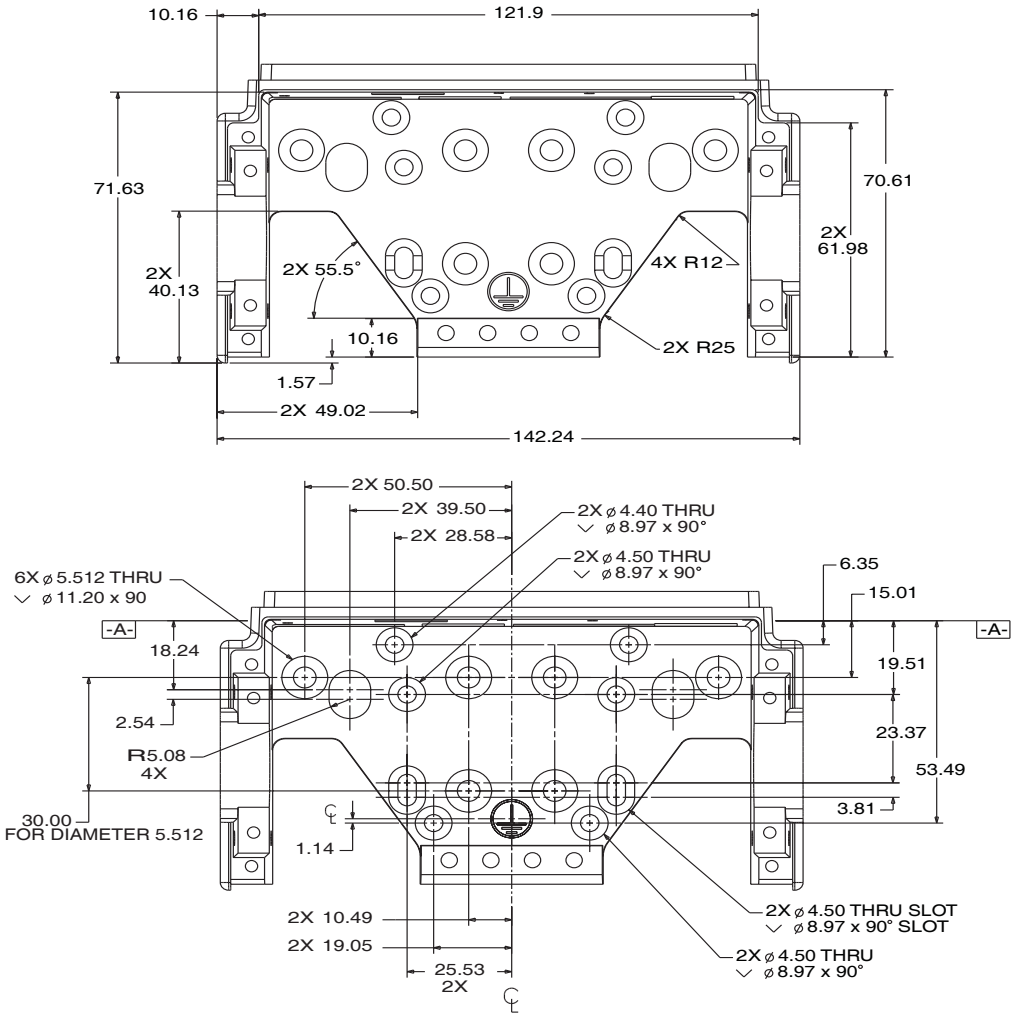



**Figure 2-4. Back View of MB-10 T-Bracket**



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## 2.3 Mounting the MB-10

To mount the MB-10 onto the T-bracket, use the four M3 x 40 screws. See **Figure 2-5**.

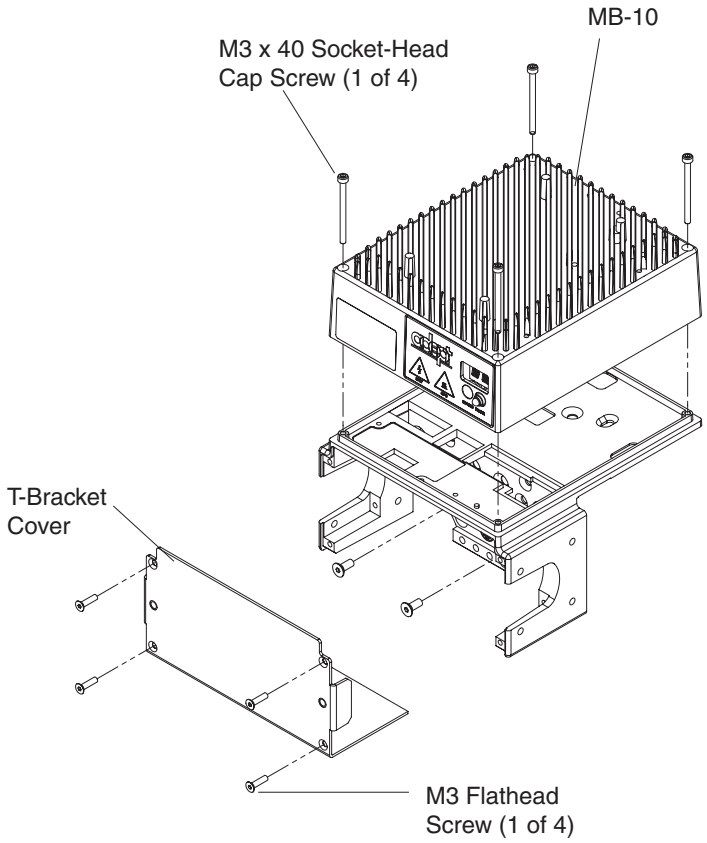



**Figure 2-5. Installing MB-10 onto the T-Bracket**

## 2.4 Mounting the Motor

The servo motors included with the Servo Kit are designed for easy mounting. Refer to the dimension drawings in **Chapter 3** to determine positions for mounting motors to the appropriate flange or adapter plate.



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## 2.5 Connecting the Motor to the MB-10

The following procedure details the sequence of steps that must be completed to connect the servo motor to the MB-10. Make sure that the system power is turned off before attaching any cables.

### Motor Cable Leads

Motors have cable leads with the following plugs: an encoder plug, a motor plug, and a brake plug for those motors with brakes. See the "Adept MB-10 Amps" chapter in the *Adept Python Linear Modules User's Guide* for plug specifications.

### Attaching the Encoder and Battery Cables

Attach the encoder cable from the servo motor to the encoder connector on the MB-10 (see **Figure 2-6**). Tighten the captive screws to secure the encoder connector.

In addition to an encoder cable, each motor is shipped with a battery and a battery harness. Use the velcro strap provided on the back of the battery to attach the battery to the motor.

**NOTE:** The battery harness must be directly connected to the motor in order for the battery to power the encoder.

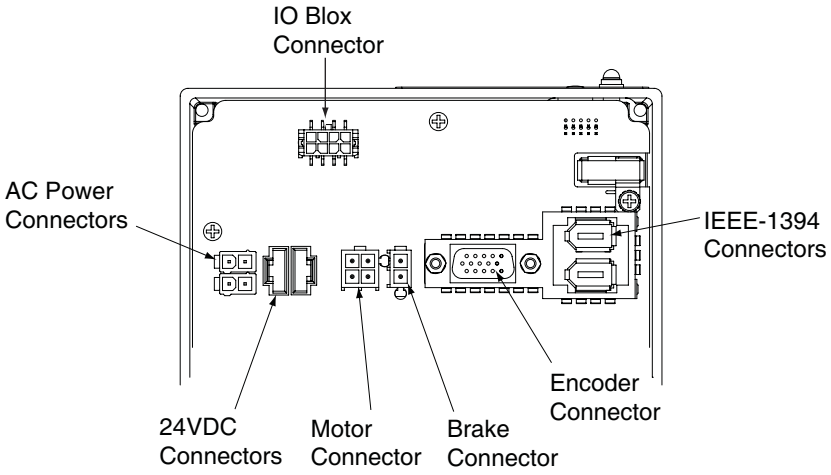



**Figure 2-6. MB-10 Connections**

**NOTE:** Some applications may require that the MB-10 be mounted remotely from the motor. For these applications the user should purchase Adept's optional high-flex extension cables. We recommended that the extension cables not exceed four meters (13.1 feet) in length. See **"Amp-to-Motor Cable Kits" on page 32** for information.



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### Attaching the Brake Cable

The servo motors (100 W, 200 W, 400 W, and 750 W) are offered with or without brakes. If you are working with a servo motor without a brake cable, skip this step.

If you have a servo motor equipped with a brake, the motor will have three cable leads. Motors without brakes have two cable leads. Attach the brake cable (labeled with a "B") to the brake connector on the MB-10. See **Figure 2-6 on page 15**.

### Attaching the Motor Cable

Attach the motor cable (the cable with the white, red, green, and blue wires) to the motor connector on the MB-10. See **Figure 2-6 on page 15**.

## 2.6 Connecting Power to the MB-10

**NOTE:** See **Figure 2-10 on page 20** for a system cable diagram.

The MB-10 amp receives 24 VDC and switched AC power from a Power Distribution Unit 3 (PDU3). See the "Power Distribution Unit 3" chapter in the ***Adept Python Linear Modules User's Guide*** for information.

### Attaching the 24 VDC Power Cable

Attach the 24 VDC power cable to one of the 24 VDC connectors on the MB-10.This cable provides 24 VDC power to the MB-10. There are two 24 VDC connectors on the MB-10; either may be used. See **Figure 2-6 on page 15**. Attach the connector with the black and red wires. The two-pin User connector can be used to provide 24 VDC power to an optional remote I/O device (IO Blox). See the ***Adept IO Blox User's Guide*** for information.



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## Attaching the AC Power Cable

Attach the AC power cable to the AC- power connector on the MB-10. This cable provides AC voltage (High Power) to the MB-10 from the PDU3. Also, separately attach its green ground lug, indicated by the black arrow in **Figure 2-7**.

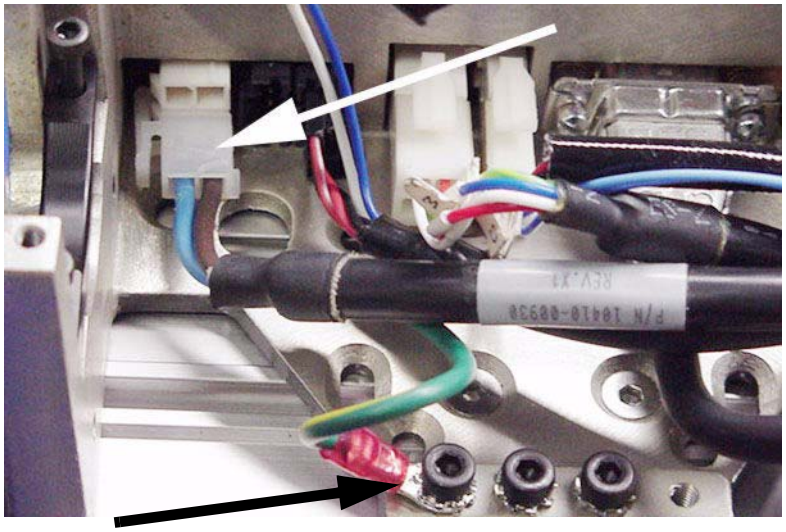


**Figure 2-7. Attaching the AC Power and Ground Cables**

## Attaching the IEEE 1394 Cable

Attach the IEEE 1394 cable to the right-most connector in the MB-10. There are two of these connectors, either one can be used. See **Figure 2-6 on page 15**.

## Attaching the Interface Cable to the IO Blox Device (optional)

This step only applies if you have purchased the optional remote IO device (IO Blox).

The Adept IO Blox device is designed for adding digital Input and Output capability to Adept products. The IO Blox offers eight inputs and eight outputs, all optically isolated, and you can combine up to four devices on each MB-10 amp.

The IO Blox uses clamp-style terminal strips for installing customer wiring. The device can be installed on a robot or MB-10 amp, or in a panel-mount environment on a DIN Rail. The product is offered with several cable options for different installation locations. Refer to the ***Adept IO Blox User's Guide*** for installation instructions.



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### Installing the MB-10 T-Bracket Cover

Secure the strain relief clamps on both sides of the MB-10 T-bracket. Then install the cover on the MB-10 T-bracket. See **Figure 2-8**. This completes the process of attaching the MB-10 cables.




**Figure 2-8. T-Bracket Cover on the MB-10**

## 2.7 Power Distribution Unit

The PDU3 is a power distribution and safety device that provides switched AC power to the MB-10(s) for E-Stop functionality. The PDU3 also supplies DC power to the MB-10 circuits for basic operation.

The PDU3 performs the following functions with regard to the Servo Kit:

1. Supplies switched AC power to the MB-10.
2. Provides AC power filtering and surge protection.
3. Supplies 24 VDC power to the MB-10 and optional IO Blox.
4. Provides CAT-3 E-Stop functionality.

**NOTE:** See the ***Adept Python Linear Modules User's Guide*** for more information on the PDU3.

See the system cable diagram in **Section 2.8 on page 20** for details on connecting the PDU3.



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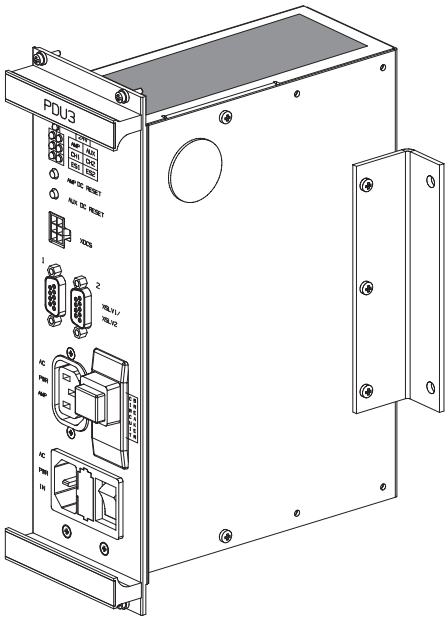



**Figure 2-9. Adept PDU3**



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## 2.8 Adept Servo Kit Cable Diagram

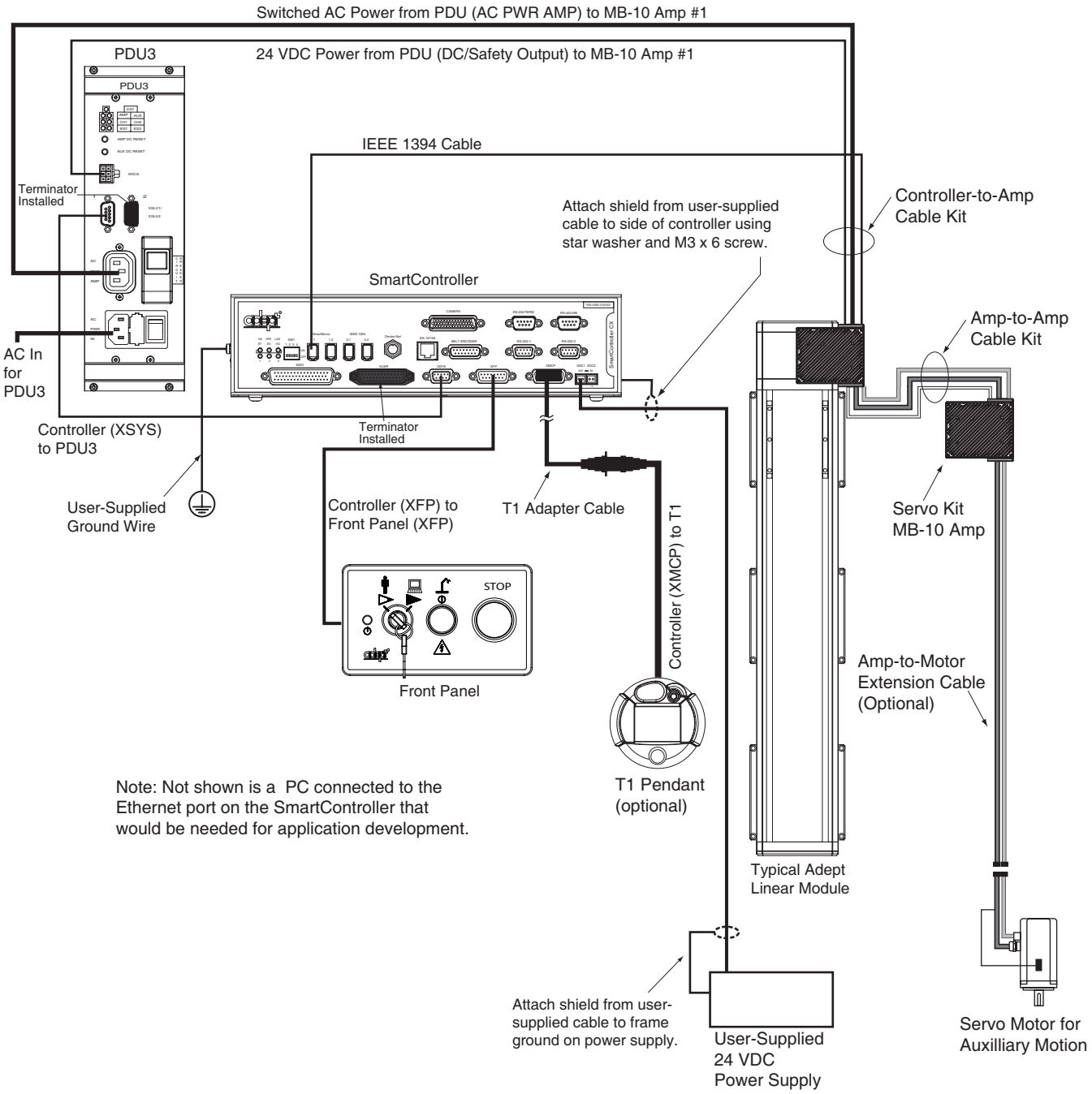



**Figure 2-10. Cable Diagram for SmartController-Based System**

See **"Amp-to-Motor Cable Kits" on page 32** for information about the available amp-to-motor extension cable kits.



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# System Requirements and Specifications 3

## 3.1 System Requirements

### Power Requirements for SmartController System

1. DC to SmartController: 24 VDC, 120 W, 5 A
2. AC to PDU3: 200 to 240 VAC, single phase, 8 A

See the *Adept SmartController User's Guide* for complete information on power requirements for the SmartController.



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# 3.2 System Specifications

## Servo Motor Specifications

This section provides technical specifications for the following motors: 100 W motors, 200 W motors, 400 W motors, and 750 W motors. The same performance specifications apply to the motors with brakes, except where noted.

**Table 3-1. Servo Kit Motor Specification**

| Adept Part Number | 100 W 05083-100 (no brake) 05083-101 (with brake) | 200 W 05083-200 (no brake) 05083-201 (with brake) | 400 W 05083-400 (no brake) 05083-401 (with brake) | 750 W 05083-750 (no brake) 05083-751 (with brake) | Units |
|---|---|---|---|---|---|
| **Rated Power**[a] | 100 | 200 | 400 | 750[b] | W |
| **Rated Torque** | 0.318 | 0.637 | 1.27 | 2.39 | N-m |
| **Peak Torque** | 0.96 | 1.91 | 3.82 | 5.55 | N-m |
| **Continuous Current** | 0.91 | 2.1 | 2.8 | 4.4 | Amp rms |
| **Max Current** | 2.8 | 6.5 | 8.5 | 13.4 | Amp rms |
| **Rated Speed** | 3000 | 3000 | 3000 | 3000 | rpm |
| **Max Speed** | 5000 | 5000 | 5000 | 5000 | rpm |
| **Torque Constant** | 0.408 | 0.355 | 0.533 | 0.590 | N*m/Amp rms |
| **Encoder Resolution** | 65,536 | 65,536 | 65,536 | 65,536 | counts/rev |
| **Moment of Inertia no brake** | 0.0364 | 0.106 | 0.173 | 0.671 | $kg*m^2 \times 10^{-4}$ |
| **Moment of Inertia with brake** | 0.0449 | 0.164 | 0.231 | 0.811 | $kg*m^2 \times 10^{-4}$ |
| **Weight, no brake** | 0.5 | 1.1 | 1.7 | 3.5 | kg |
| **Weight, with brake** | 0.8 | 1.6 | 2.2 | 4.3 | kg |
| **Radial Load Rating** | 78 | 245 | 245 | 392 | N |
| **Thrust Load Rating** | 54 | 74 | 74 | 147 | N |
| **Shaft Diameter** | 8 | 14 | 14 | 16 | mm |
| **Mounting Flange** | 40 | 60 | 60 | 80 | mm |
| **Length, no brake** | 94.5 | 96.5 | 124.5 | 145.0 | mm |
| **Length, with brake** | 135.0 | 136.0 | 164.0 | 189.5 | mm |
| **Operating Temp** | 0 to 40 | 0 to 40 | 0 to 40 | 0 to 40 | deg C |
| **Winding Class** | B | B | B | B | |
| **Max Winding Temp** | 130 | 130 | 130 | 130 | deg C |
| **Resistance** | 7.0 | 1.3 | 1.2 | 0.45 | Ohms/phase (@ 120 deg C) |

[a] Rated power may be duty-cycle limited by the motor or amplifier. Variables that affect rated power include ambient temperature, motor mount configuration, load inertia, cycle dynamics, and gravity effects.

[b] The MB-10 amplifier is not able to drive the 750 W motor to its maximum capability.



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## Determining Maximum Number of Devices per PDU3

The table below (from the *Adept Python Linear Modules User's Guide*) shows the PDU3 maximum DC power output capability.

**Table 3-2. PDU3 Specifications**

| **Amplifier DC Output** | |
|---|---|
| Output Voltage | 24 VDC +/- 10% |
| Output Current | 3 A maximum[a] |
| **AUX DC Output** | |
| Output Voltage | 24 VDC +10% -15% |
| Output Current | 3 A maximum[a] |

[a] Note: maximum combined amplifier DC output current and Aux/IO Blox output current may not exceed 4 A.

The table below (from the *Adept Python Linear Modules User's Guide*) shows the DC input power requirements for each MB-10 amplifier.

**Table 3-3. Adept MB-10 Specifications**

| **Input Power Requirements** | |
|---|---|
| DC input current | 1 A max. |
| - MB-10 and motor only<br>- MB-10, motor and brake<br>- additional per IO Blox | 400 mA, nominal at 24 V<br>675 mA, nominal at 24 V<br>25 mA, nominal at 24 V |

### Calculation Example

For the PDU3's 4.0 A maximum DC output, the example below shows how you can calculate how much each axis is drawing and how much would be left over on the User line.

For a four-axis system comprised of two standard Python modules (one with brake), two Servo Kits, a third-party "user" brake that draws 0.37 amps, and two I/O Blox devices:

**Table 3-4. Calculation Example**

| | | | |
|---|---|---|---|
| Axis 1 | Python with one I/O Blox | 400 mA + 25 mA | = 425 mA |
| Axis 2 | Python with brake | 675 mA | = 675 mA |
| Axis 3 | Servo Kit & user brake | 400 mA + 370 mA | = 770 mA |
| Axis 4 | Servo Kit & I/O Blox | 400 mA + 25 mA | = 425 mA |
| Total demand on PDU3 amplifier DC output line | | | = 2.295 A |



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This is less than three amps, so this configuration is acceptable. In addition, 4.0 - 2.295 = 1.7 amps is available for the User on the Aux DC output line.

## Motor Dimensions

The drawings in this section show the dimensions of the 100 W, 200 W, 400 W, and 750 W motors (with and without brake).

### 100 W Motor Dimensions (without brake)

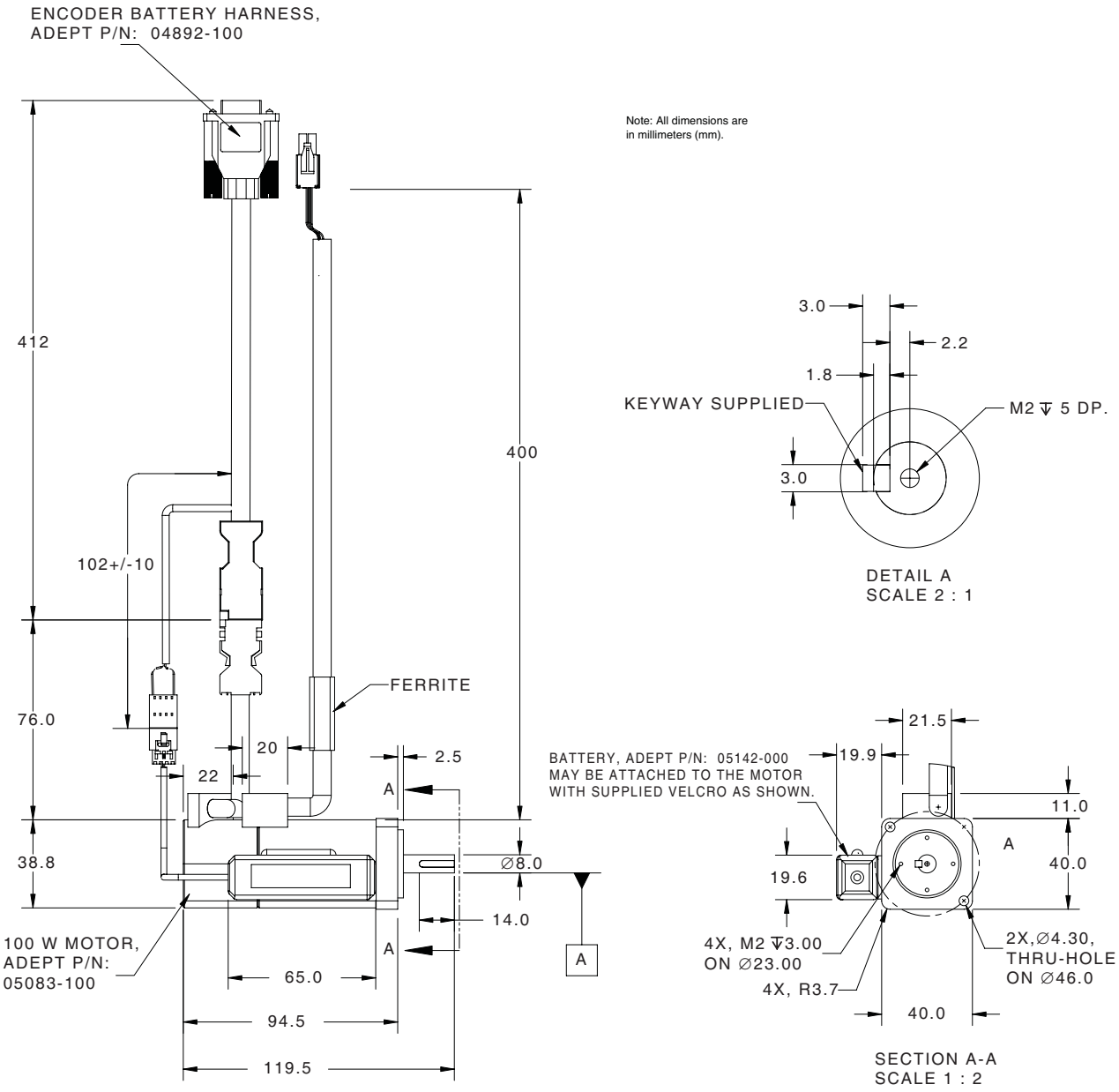



**Figure 3-1. 100 W Motor Dimension Drawing**



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## 100 W Motor Dimensions (with brake)

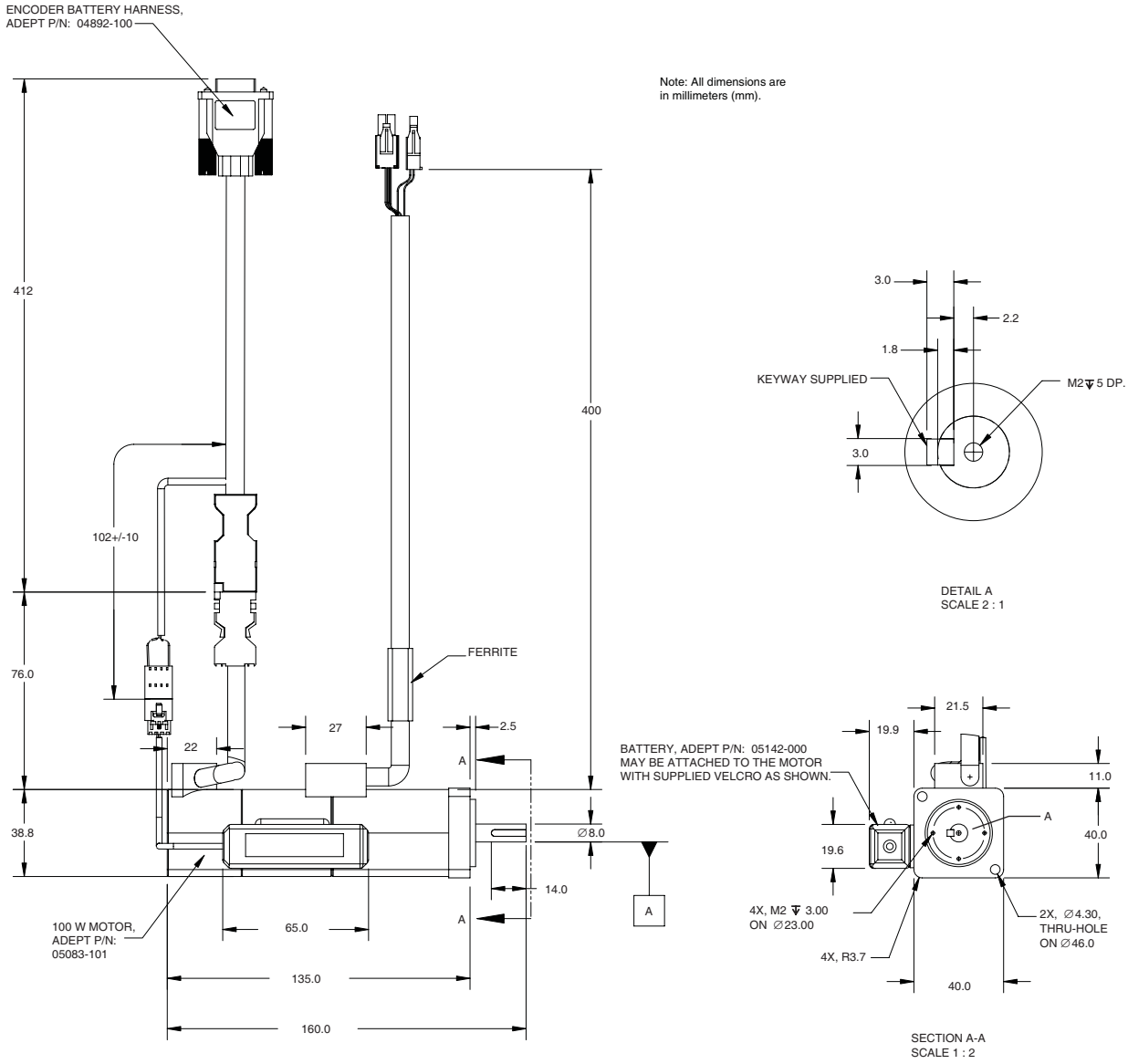



**Figure 3-2. 100 W Motor (with brake) Dimension Drawing**



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## 200 W Motor Dimensions (without brake)

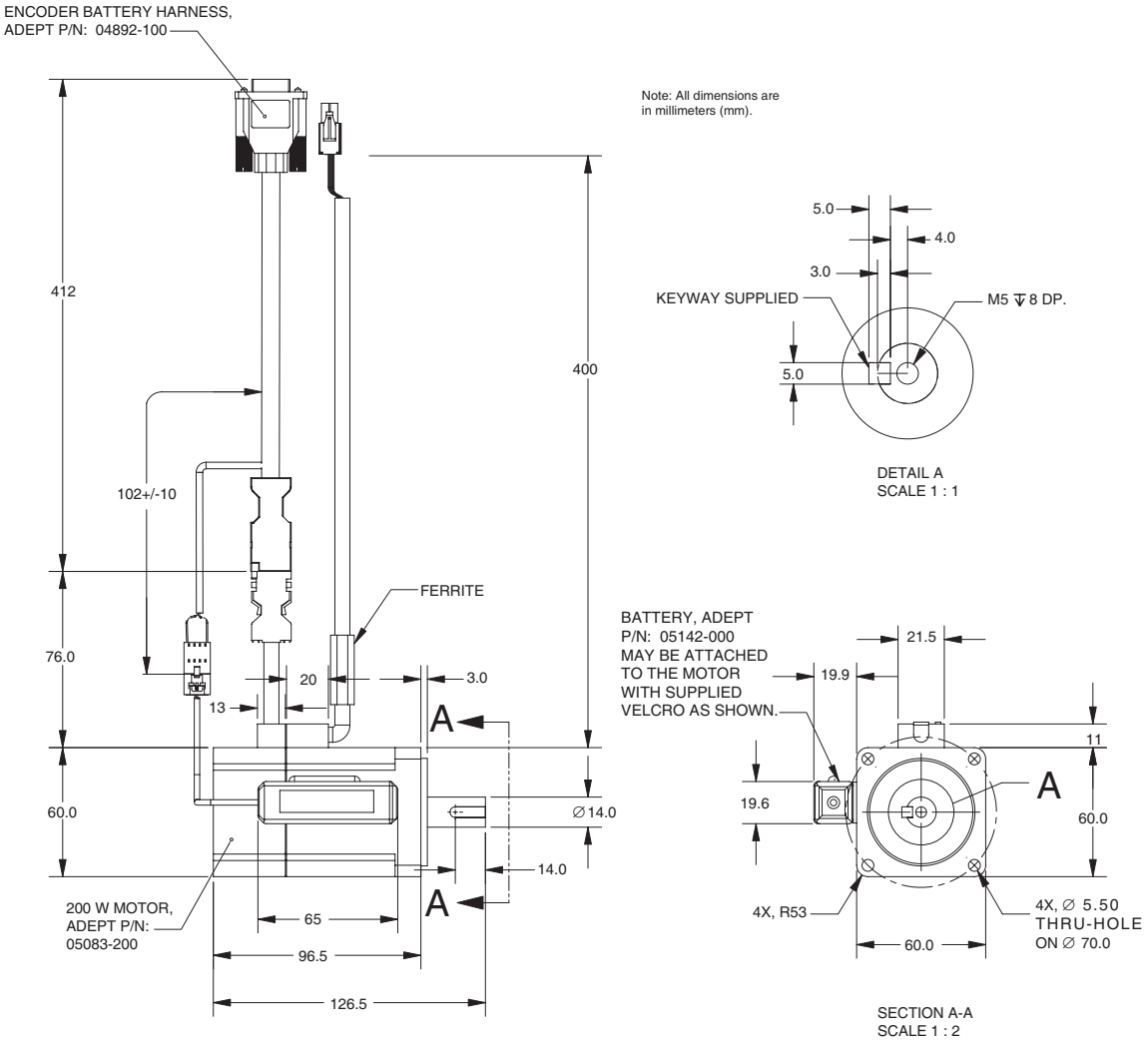



**Figure 3-3. 200 W Motor Dimension Drawing**



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## 200 W Motor Dimensions (with brake)

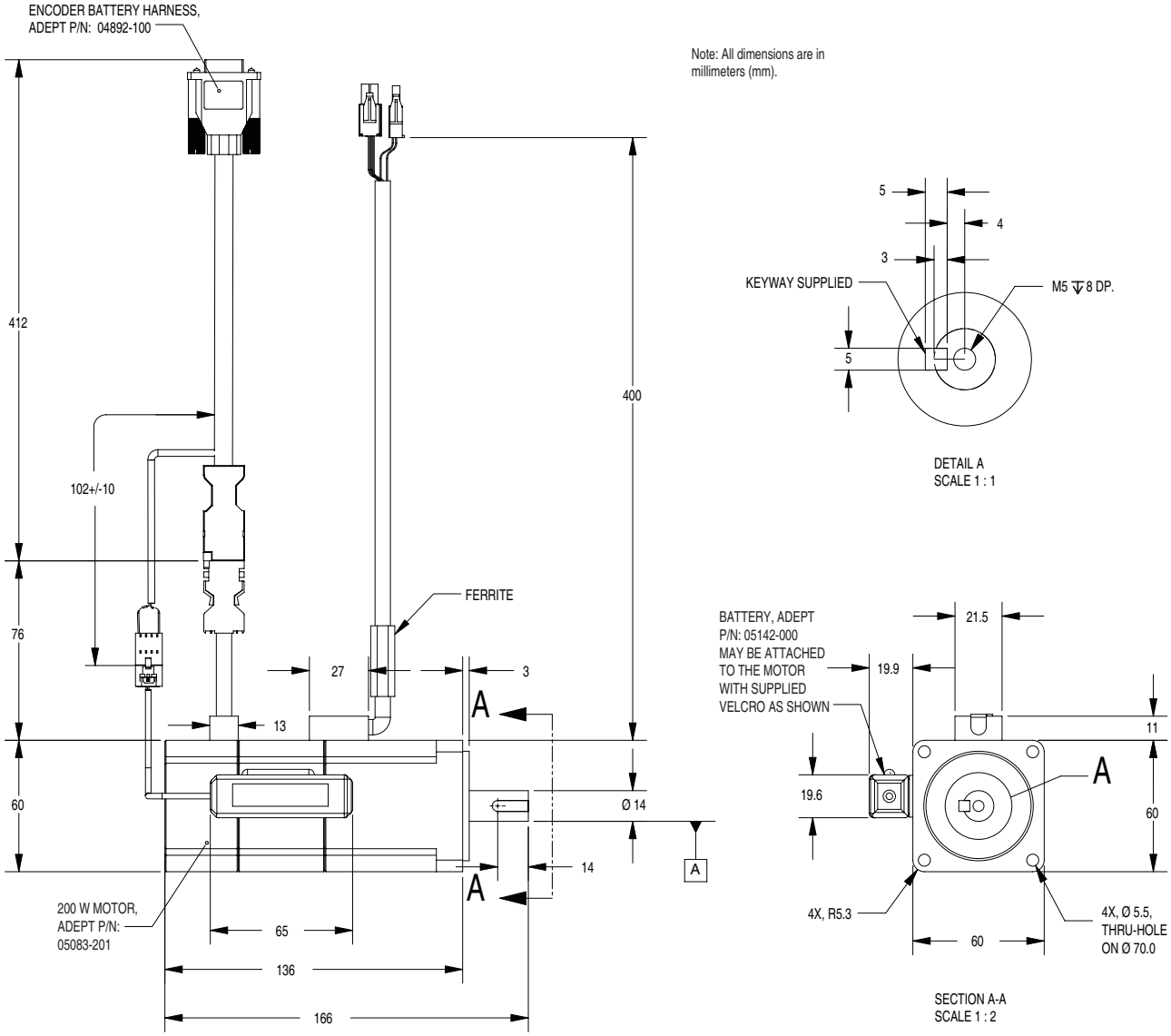



**Figure 3-4. 200 W Motor (with brake) Dimension Drawing**



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## 400 W Motor Dimensions (without brake)

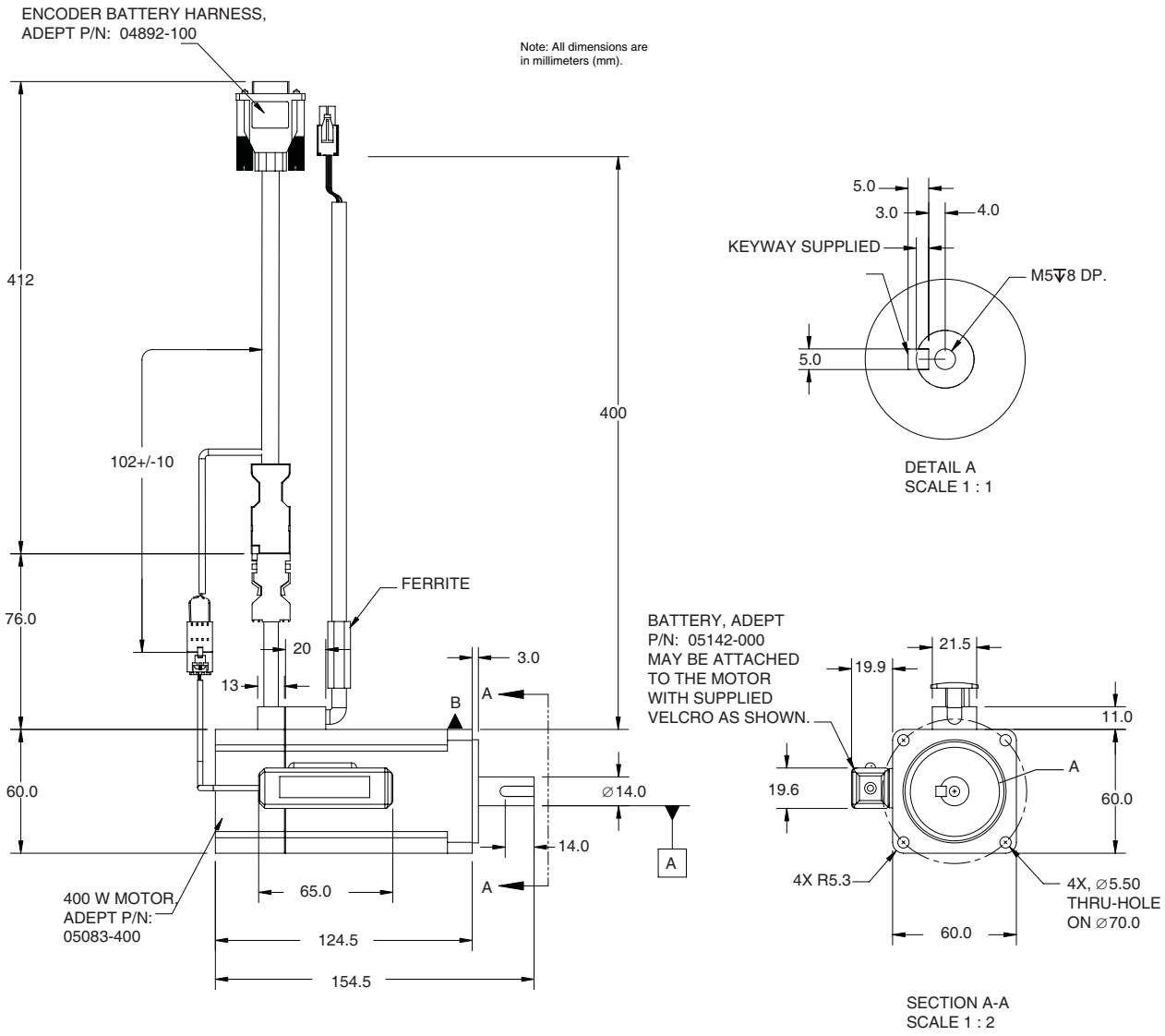



**Figure 3-5. 400 W Motor Dimension Drawing**



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## 400 W Motor Dimensions (with brake)

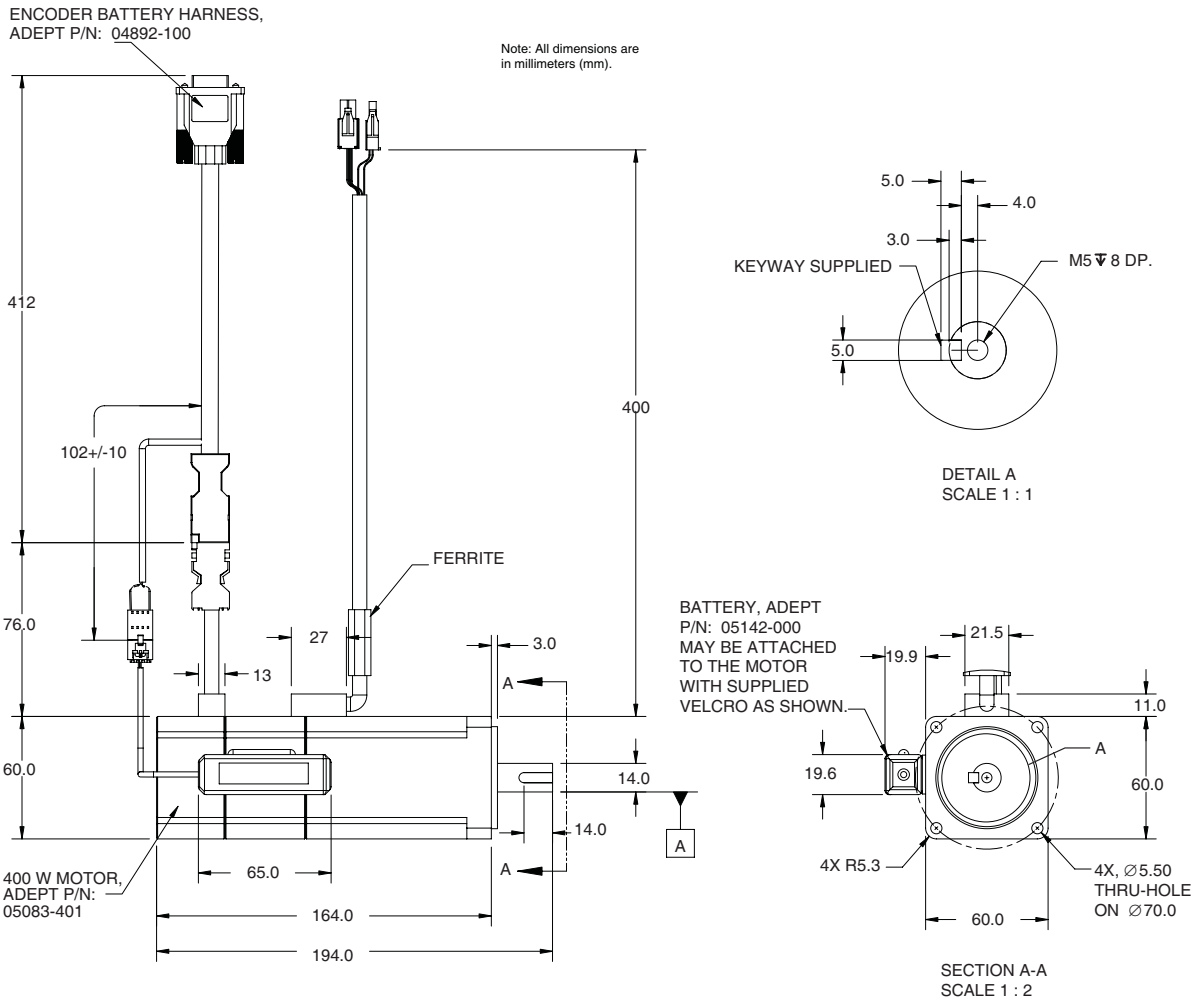



**Figure 3-6. 400 W Motor (with brake) Dimension Drawing**



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## 750 W Motor Dimensions (without brake)

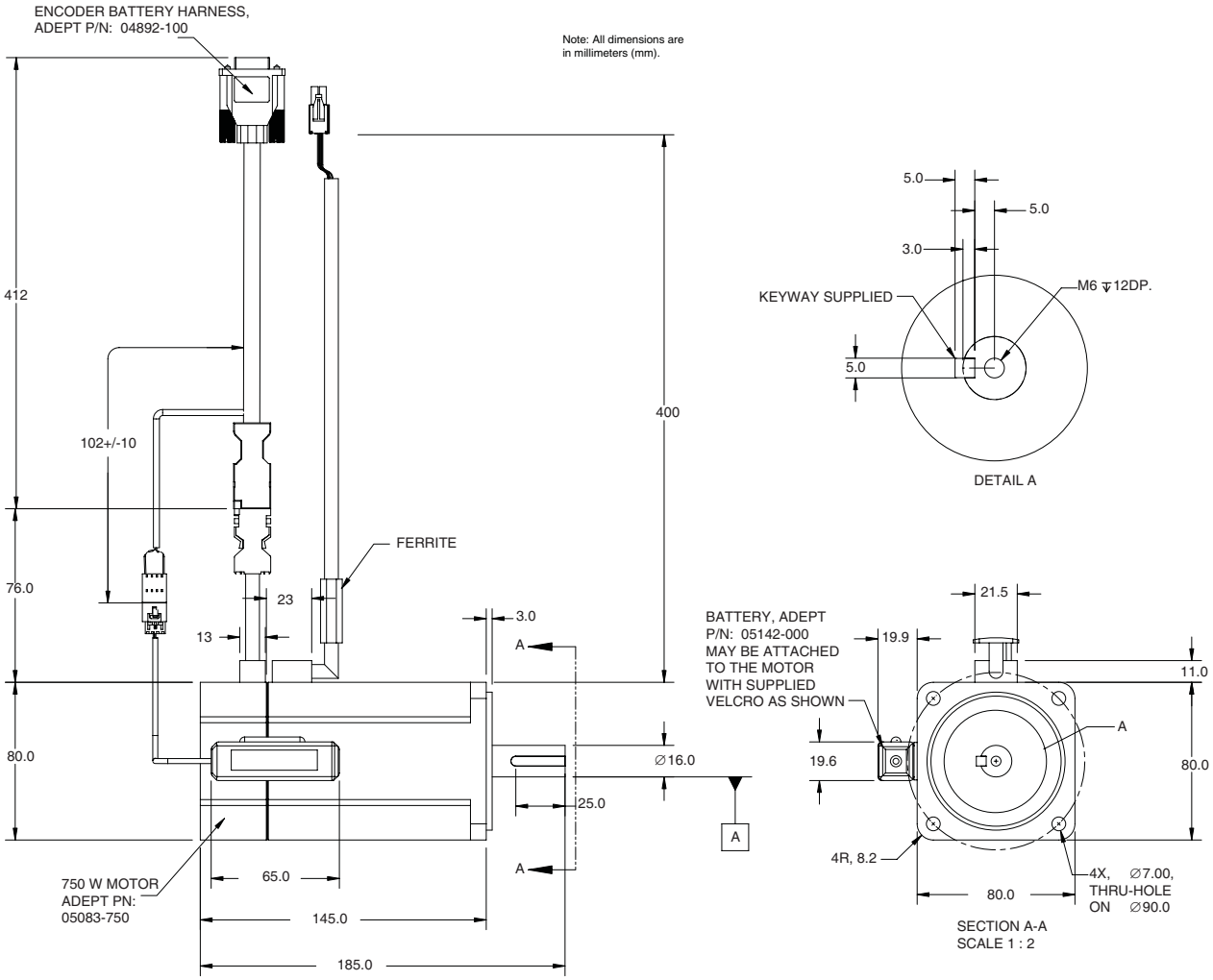



**Figure 3-7. 750 W Motor Dimension Drawing**



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## 750 W Motor Dimensions (with brake)

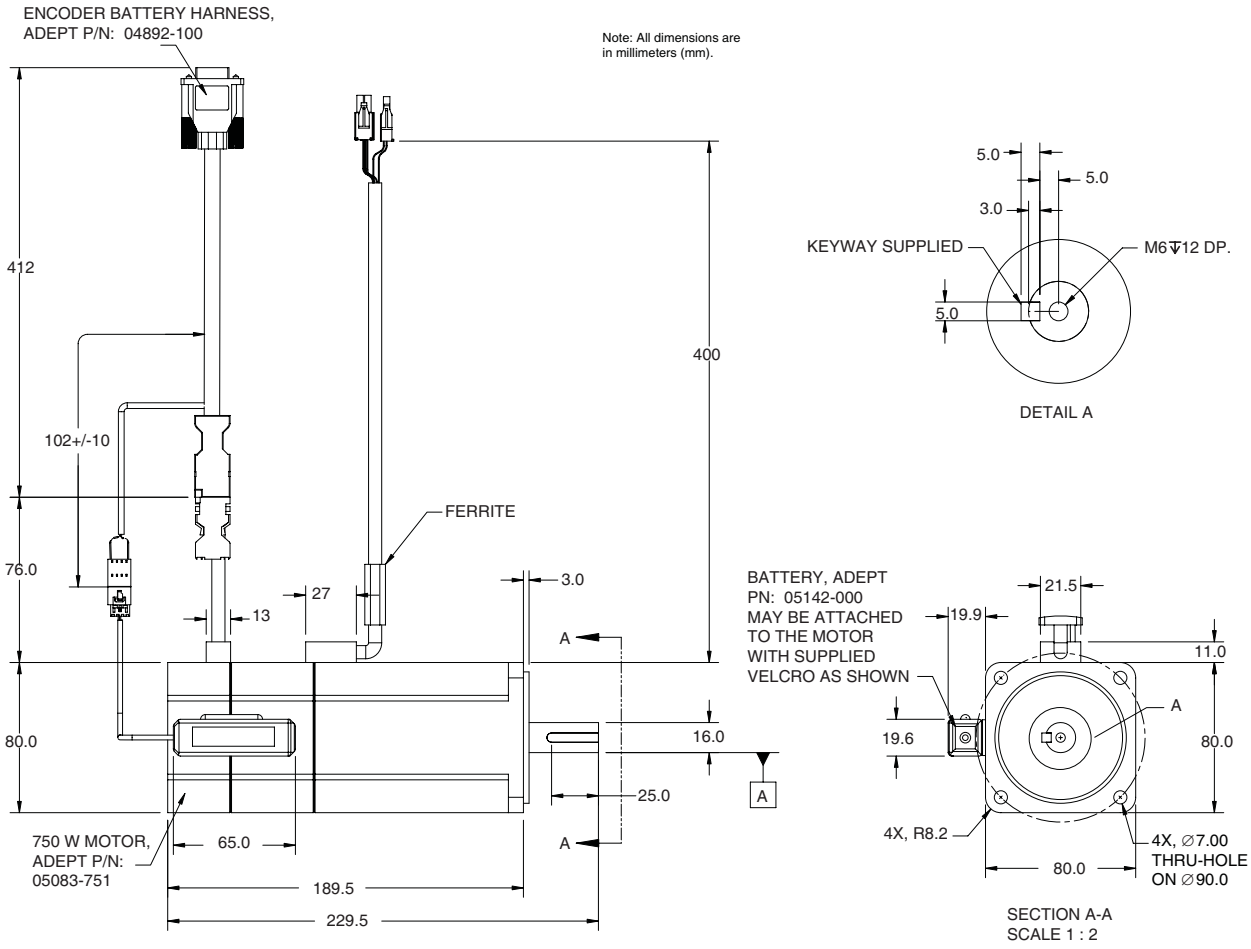



**Figure 3-8. 750 W Motor (with brake) Dimension Drawing**



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## 3.3 MB-10 Servo Kit Cable Kits

### Amp-to-Amp Cable Kits

MB-10 amps may be mounted adjacent to each other or up to 4.5 m apart. The cable kit for connecting two MB-10 amps contains three cables: an IEEE-1394 (FireWire™) cable, an AC power cable, and a 24 VDC power cable. The available cable lengths and the kit part numbers are listed below.

**Table 3-5. MB-10-to-MB-10 Amp Cable Kit Option**

| Cable Length | Kit Part Number |
|---|---|
| 0.27 M | 90410-10003 |
| 0.8 M | 90410-10008 |
| 1.1 M | 90410-10011 |
| 1.4 M | 90410-10014 |
| 1.8 M | 90410-10018 |
| 2.2 M | 90410-10022 |
| 2.6 M | 90410-10026 |
| 3.0 M | 90410-10030 |
| 4.5 M | 90410-10045 |

### Amp-to-Motor Cable Kits

The MB-10 Servo Kit motors may be mounted up to 4 m away from the MB-10 amp. The extension cable kit for connecting an MB-10 amp to a motor contains two cables: a motor cable and an encoder cable. The available cable lengths and the kit part numbers are listed below.



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**Table 3-6. MB-10-to-Sigma II Motor Cable Kit Option**

| Cable Length | Kit Part Number |
|---|---|
| 1.1 M | 90410-12011 |
| 1.4 M | 90410-12014 |
| 1.8 M | 90410-12018 |
| 2.2 M | 90410-12022 |
| 2.6 M | 90410-12026 |
| 3.0 M | 90410-12030 |
| 3.5 M | 90410-12035 |
| 4.0 M | 90410-12040 |



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# 4 Adept Servo Kit Software

## 4.1 Overview

Before the system is operational, the Servo Kit motor must be configured to operate with the V+ motion control software. The basic steps are provided below.

> **NOTE:** Before modifying your system configuration, back up your current system configuration.

1. Use the CONFIG_C program to append the appropriate device module(s) for the mechanism(s) in your system. See **Section 4.2** for details.
2. Use the DC_SETUP program to configure the axis. See **Section 4.3** for details. The steps performed are:
   - Node mapping
   - Loading the Module Joint file
   - Calibrating the axis
3. Test the axis. See **Section 4.4** for details.
4. Modify the default SPEC data file parameters. See **Section 4.5** for details.

## 4.2 Using CONFIG_C to Append Device Modules

Perform the steps below to use the CONFIG_C program to append the appropriate device module(s) for the mechanism(s) in your system. Add a device module for each robot (each robot may contain multiple Servo Kits).

1. Connect all hardware associated with the controller and robot except the mechanical hardware attached to the Servo Kit motor.



> **WARNING:** The Servo Kit motor shaft should not be attached to any mechanism during the software configuration. After the configuration is complete and functionality of the motor has been verified, the intended mechanical device can be attached to the motor shaft.

2. To start up the CONFIG_C program, type the following at the prompt:

```
LOAD D:\UTIL\CONFIG_C

EXE 1 a.config_c
```



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A screen similar to the one shown in **Figure 4-1** will be displayed.

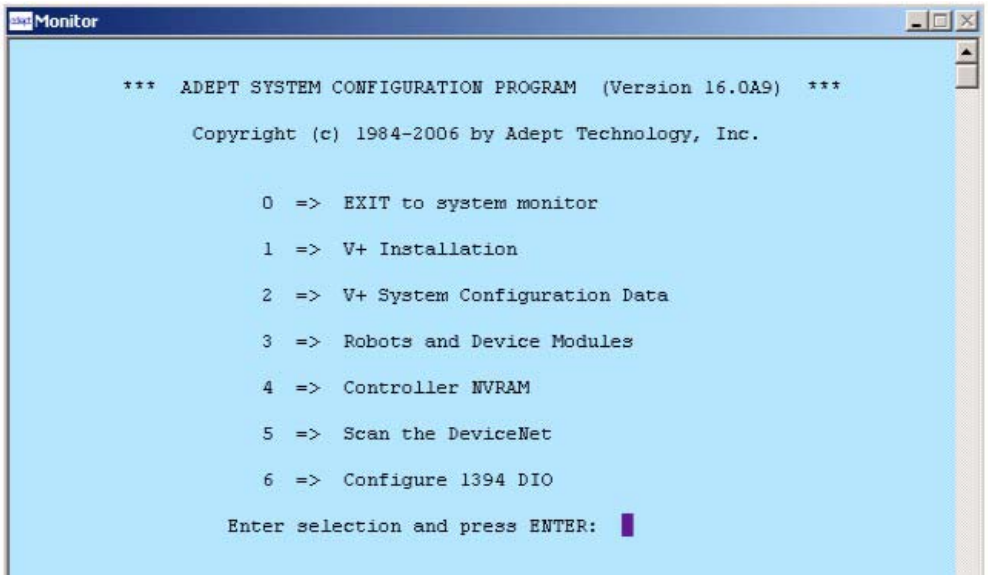



**Figure 4-1. CONFIG_C Main Menu**

3. Select option 3 "Robots and Device Modules." A screen similar to the one shown below will be displayed.

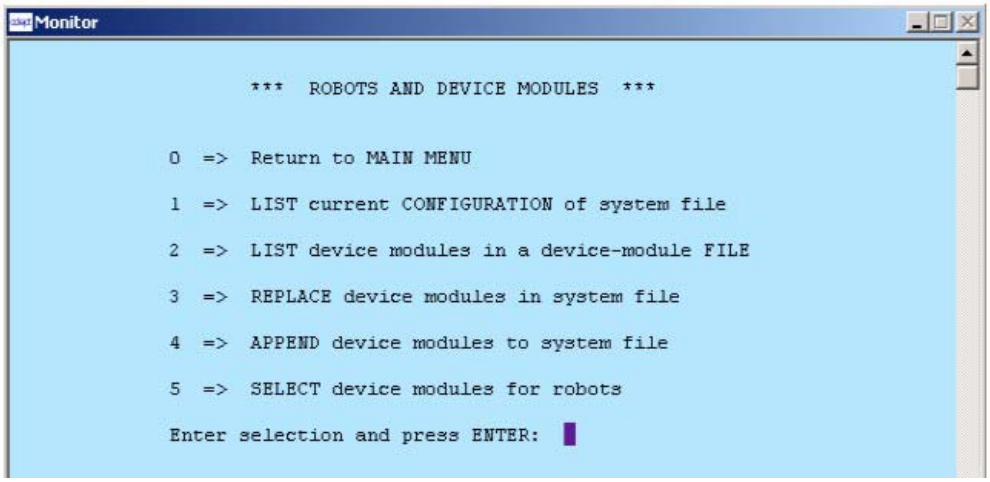



**Figure 4-2. Robots and Device Modules Menu**

4. Select option 4 "APPEND device modules to system file." A screen similar to the one shown in **Figure 4-3** will be displayed.



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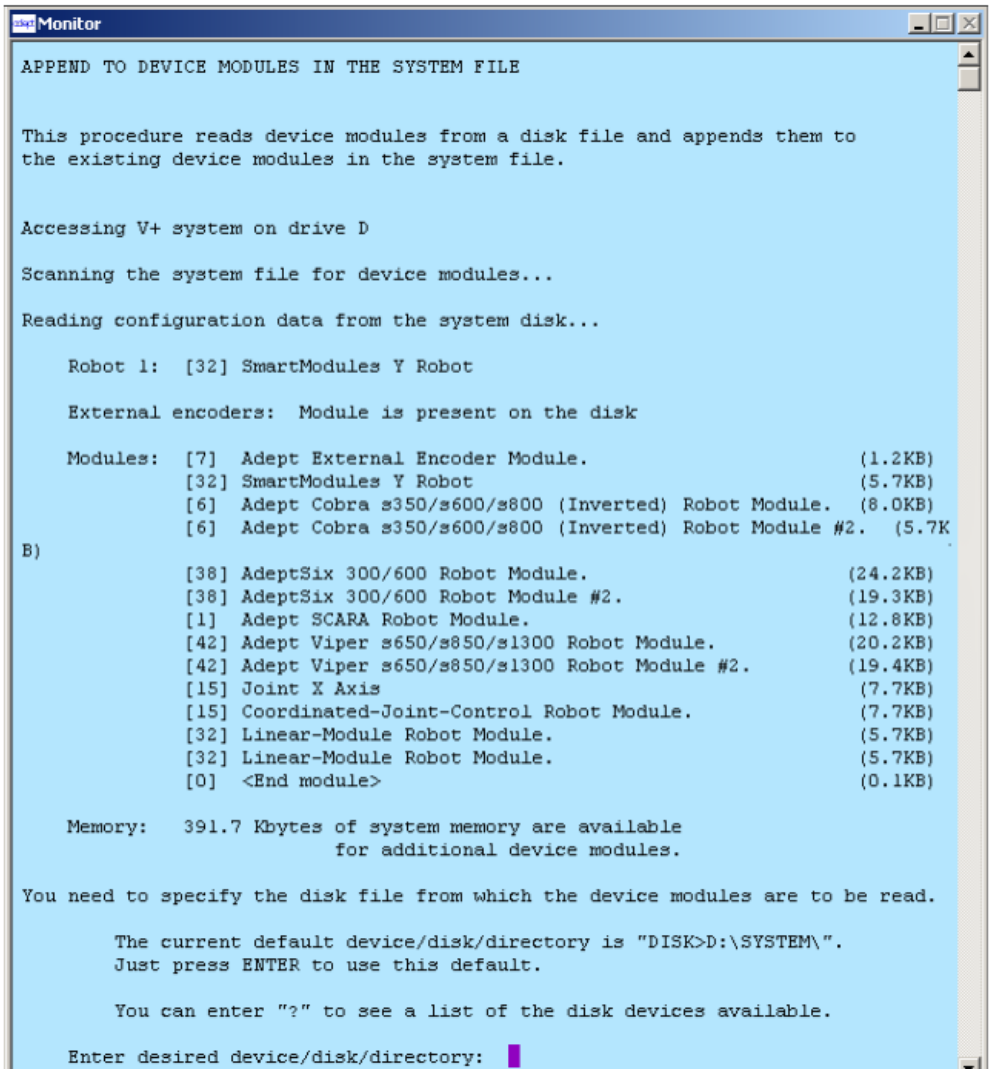



**Figure 4-3. Append to Device Modules Screen**

5. Make sure the device/disk/directory containing the device modules is selected. By default, the device modules are located in D:\SYSTEM\.

   **NOTE:** The instructions below show how to append two different device modules: the JTS Coordinated-Joint-Control Robot Module and the Linear-Module Robot Module. In general, append the JTS Coordinated-Joint-Control Robot Module for applications requiring continuous turning capabilities (such as for driving conveyor belts); append the Linear-Module Robot Module for applications requiring linear (or point-to-point) motion control.

6. When prompted to enter the device-module file name:

   - Type "JTS" (to select "JTS Coordinated-Joint-Control Robot Module") and press ENTER.

     Or



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- Type “LM” (to select “Linear-Module Robot Module”) and press ENTER.

After appending the selected device module, the program will step through the process of associating the device module to each robot that is configured for the controller.

7. When prompted to select robot 1, type “y” and press ENTER.
8. When prompted to select a device module to associate with robot 1, type the number beside the device module you appended to the system. For example, type “32” to associate the Linear-Module Robot Module with robot 1 (see **Figure 4-4** for an example).
9. If you are not configuring another robot, type “n” and press ENTER when you see the prompt asking if you want robot 2.

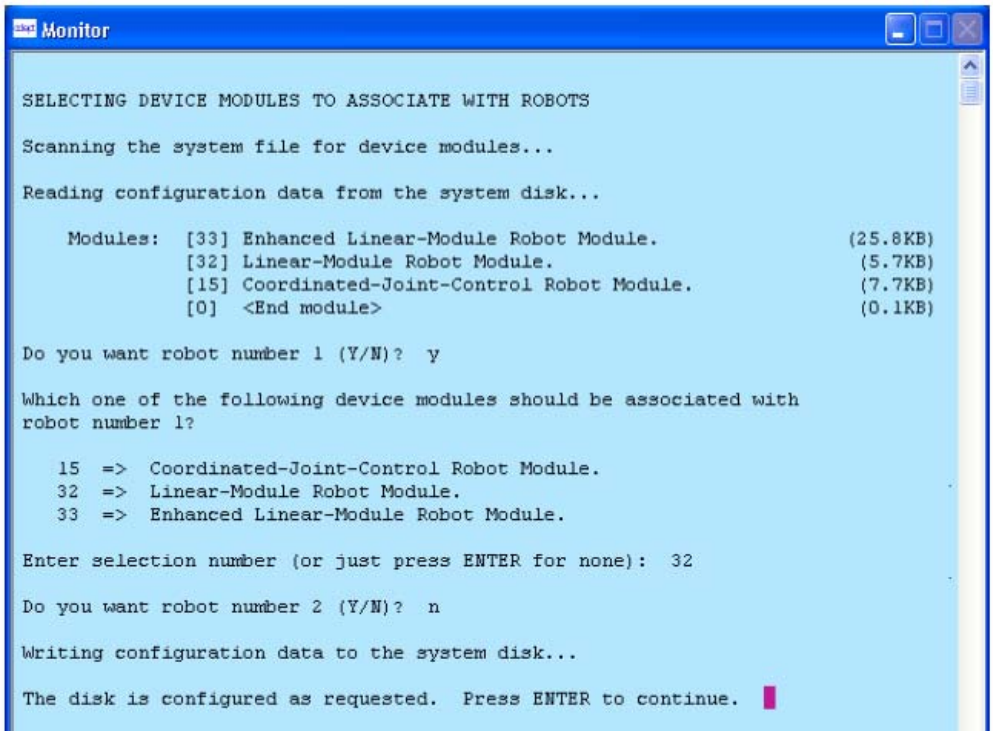



**Figure 4-4. CONFIG_C Selecting Device Modules to Associate with Robot Screen**

10. Follow the on-screen prompts to continue.
11. Reboot the controller.



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## 4.3 Using DC_SETUP to Configure the Axis

1. After the controller reboots, type the following at the prompt.

```
load d:\util\dc_setup.v2

execute 1 a.dc_setup
```

The procedures for configuring an axis with the JTS Coordinated-Joint-Control Robot Module and Linear-Module Robot Module are different. There is a separate section in this manual for each module. The points below provide an overview of the two procedures.

- In practice, use DC_SETUP only once to configure the axis for the device module you appended using CONFIG_C.
- If you appended the JTS Coordinated-Joint-Control Robot Module, refer to the instructions in **"Configuration for JTS Coordinated-Joint-Control Robot Module" on page 39**.
- If you appended the Linear-Module Robot Module, refer to the instructions in **"Configuration for LM Linear-Module Robot Module" on page 44**.

### Configuration for JTS Coordinated-Joint-Control Robot Module

The procedure below shows an example of how to configure an axis after the JTS Coordinated-Joint-Control Robot Module has been appended to and associated with your system.

After booting the controller and loading and executing DC_SETUP, a screen similar to the one shown in **Figure 4-5** will be displayed.

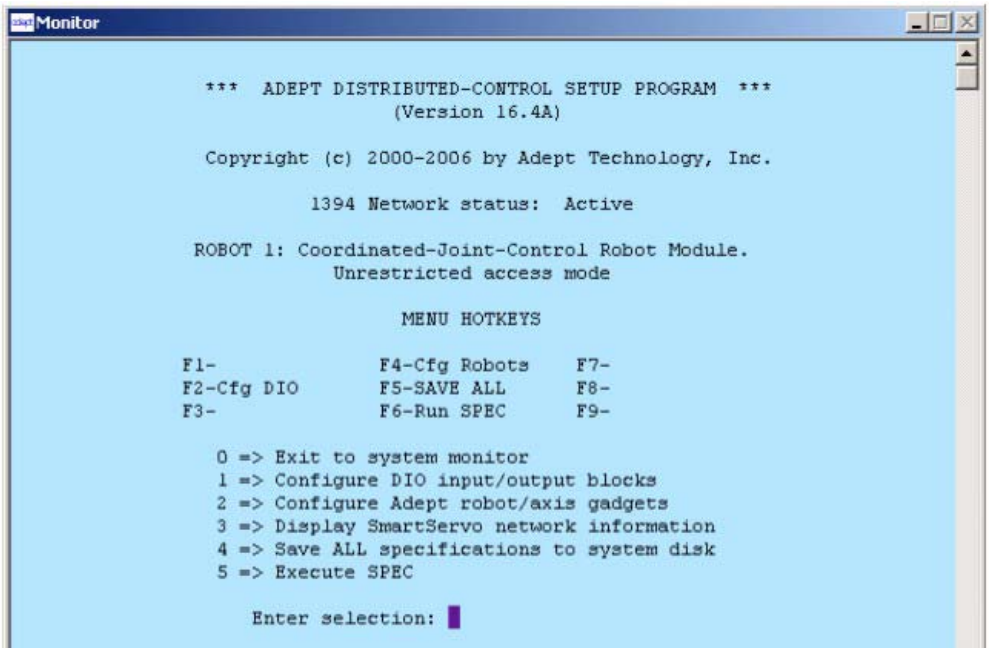



**Figure 4-5. DC_SETUP Main Menu (JTS Coordinated-Joint-Control Module)**



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2. Select option 2 “Configure Adept robot/axis gadgets” and press ENTER. A screen similar to **Figure 4-6** will be displayed.

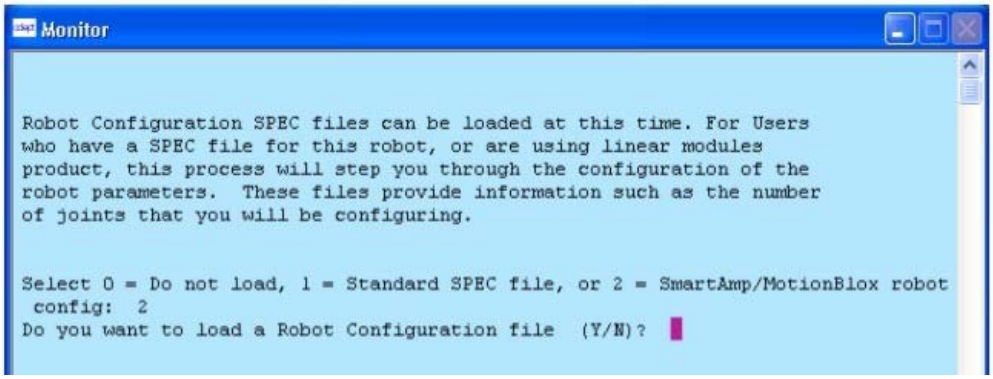



**Figure 4-6. DC_SETUP (JTS Coordinated-Joint-Control Module)**

3. Select option 2 “SmartAmp/MotionBlox robot config.” and press ENTER. Type “Y” and press ENTER to load the robot configuration file. A screen similar to the one shown in **Figure 4-7** will be displayed.

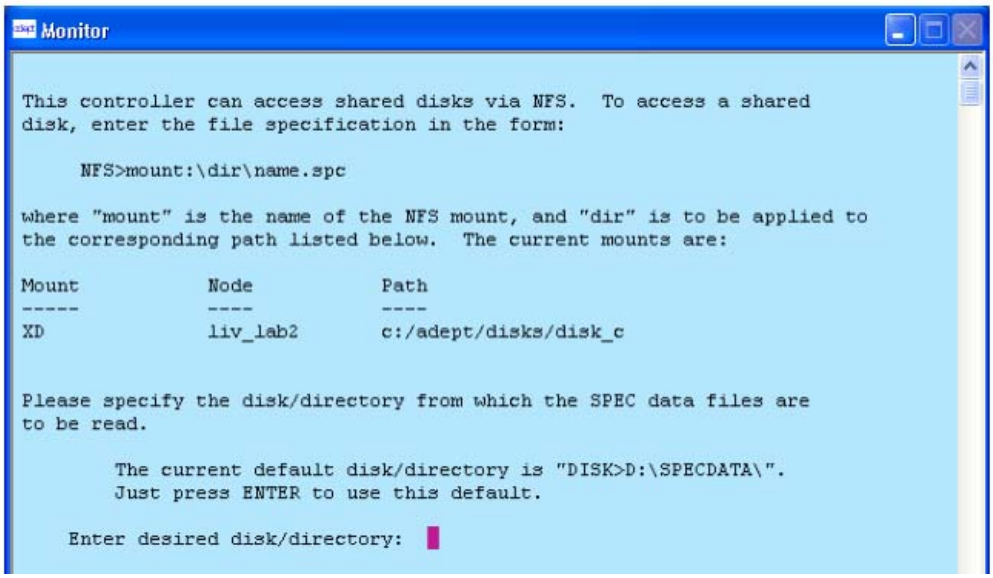



**Figure 4-7. DC_SETUP (JTS Coordinated-Joint-Control Module)**

4. Press ENTER. A screen similar to the one shown in **Figure 4-8** will be displayed.



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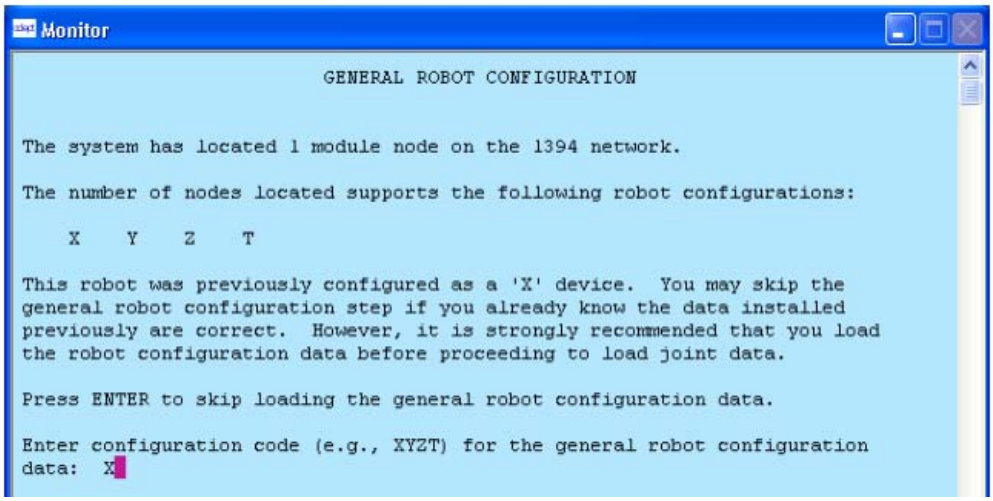



**Figure 4-8. DC_SETUP General Robot Config. (JTS Coordinated-Joint-Control Module)**

5. Type "X" (or another one of the available axes displayed on screen) and press ENTER. A screen similar to the one shown in **Figure 4-9** will be displayed.

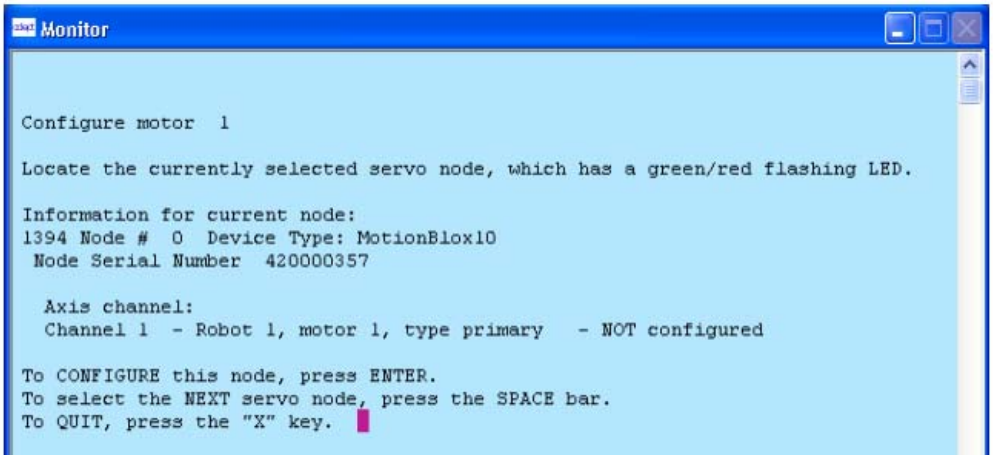



**Figure 4-9. DC_SETUP (JTS Coordinated-Joint-Control Module)**

6. Press the SPACE bar to select the SmartServo device to which the Servo Kit motor is connected.When the LED on the MB-10 amp you want to configure flashes green/red, press ENTER to select it.
7. Type "Y" to configure this channel. A screen similar to the one shown in **Figure 4-10** will be displayed.



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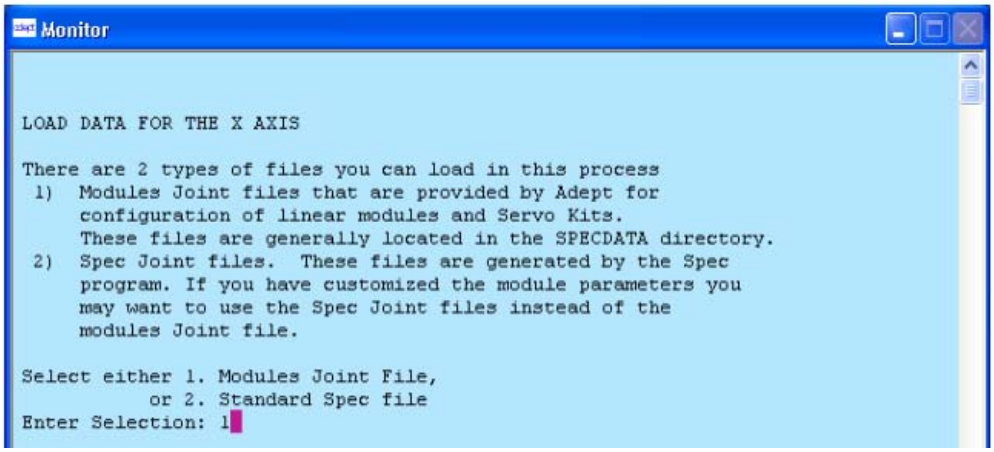



**Figure 4-10. DC_SETUP Load Data for the Axis (JTS Coordinated-Joint-Control Module)**

8. Select option 1 “Module Joint File” and press ENTER.
9. When prompted to enter the part number index for the selected axis, enter the five-digit part number of the motor you are configuring, or type “?” and press ENTER to display a list of the supported motor part numbers. If you enter “?”, a screen similar to the one shown in **Figure 4-11** will be displayed.



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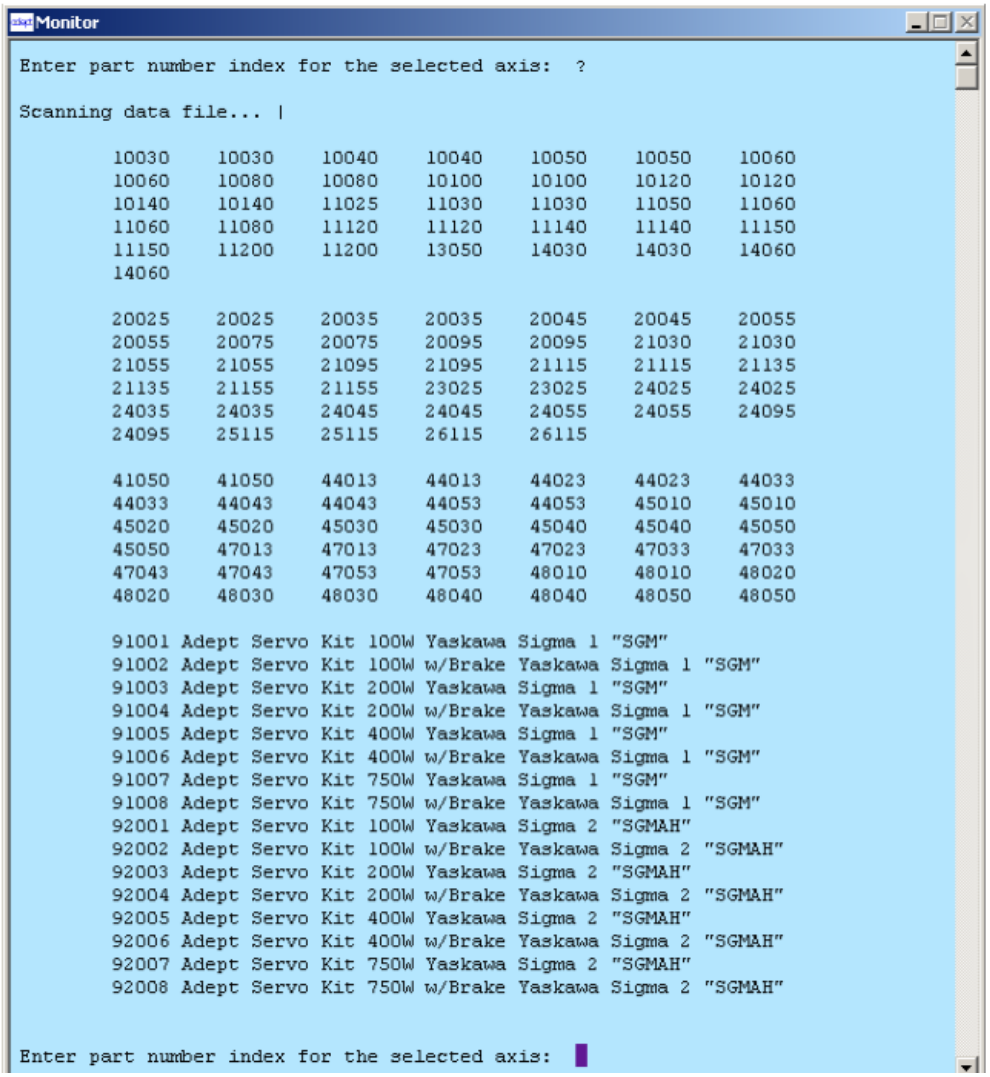



**Figure 4-11. DC_SETUP (JTS Coordinated-Joint-Control Module)**

A list of part numbers is displayed. The list includes the part numbers for the various types of Servo Kit motors, including Sigma 1 and 2 versions, 100 W, 200 W, 400 W, and 750 W models, and motors with and without brakes (for example, "92008 Adept Servo Kit 750 W w/ Brake Yaskawa Sigma 2 ""SGMAH""). The part number in the above example is "92008."

10. After you enter the part number for the motor attached to the MB-10 amp or Servo Kit and press ENTER, select option 4 *"Save ALL specifications to system disk"* from the Distributed Control Setup main menu.
11. After saving the specification data to disk, exit from the DC_SETUP program.
12. Load and execute the SM_CAL.V2 program. To start up SM_CAL, type the following at the prompt:

```
load d:\util\sm_cal.v2

execute 1 a.sm_cal
```



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13. Follow the on-screen prompts to perform the calibration.

    **NOTE:** Motor calibration will reset the absolute encoder multi-turn data to zero.

## Configuration for LM Linear-Module Robot Module

The procedure below shows an example of how to configure an axis after the LM Linear-Module Robot Module has been appended to and associated with your system.

After booting the controller and loading and executing DC_SETUP, a screen similar to the one shown below will be displayed.

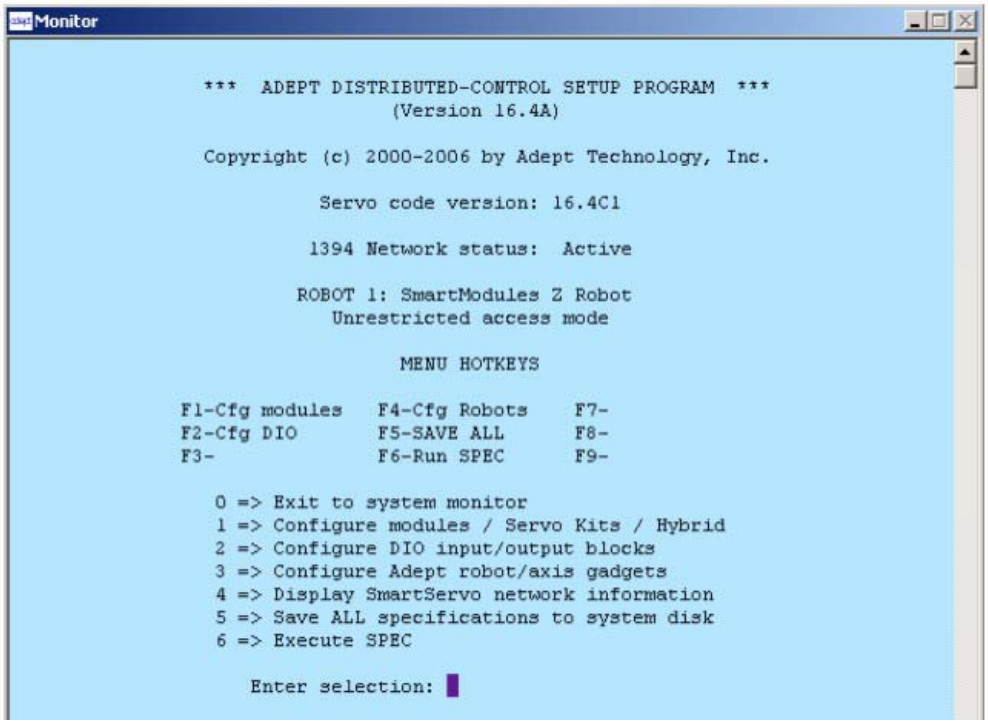



**Figure 4-12. DC_SETUP Main Menu (LM Linear-Module Robot Module)**

1. Select option 1 “Configure modules/Servo Kits/Hybrid.” A screen similar to the one shown below will be displayed.



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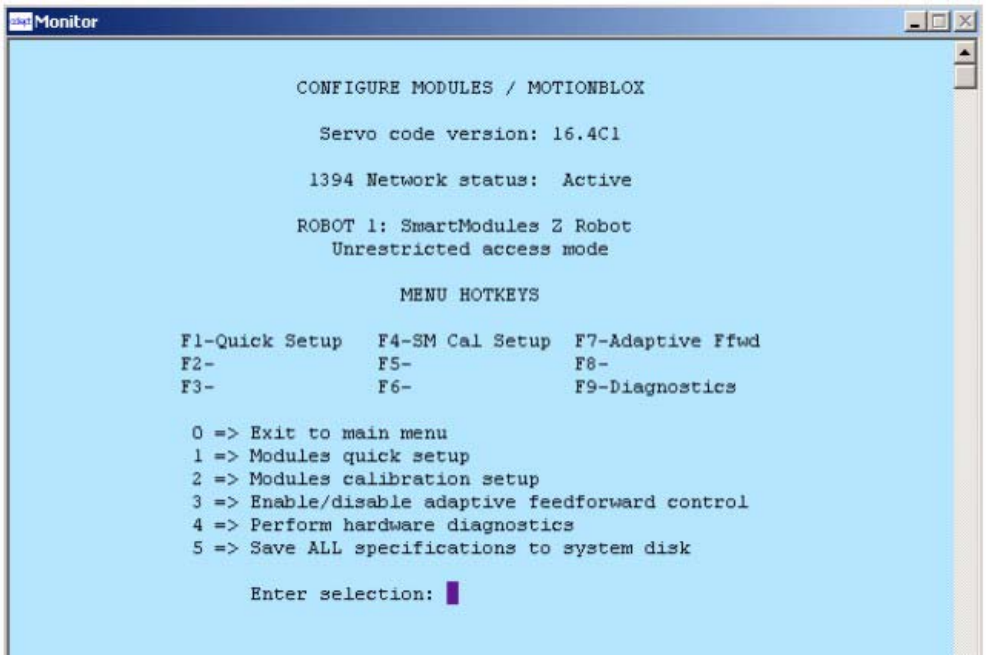



**Figure 4-13. DC_SETUP Configure Modules/MotionBlox Menu**

2. Select option 1 “Modules Quick Setup” and press ENTER. A screen similar to the one shown below will be displayed.

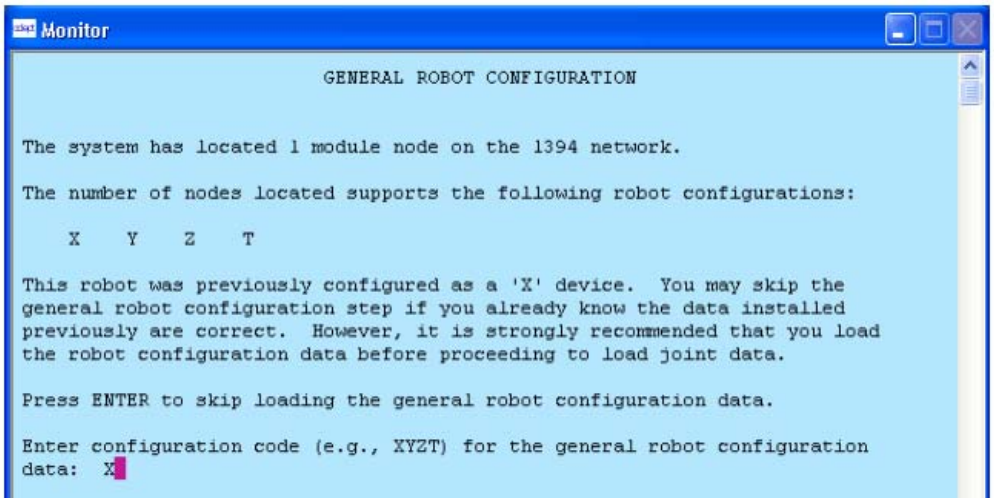



**Figure 4-14. DC_SETUP General Robot Config. (LM Linear-Module Robot Module)**

3. Type “X” (or another one of the available axes displayed on screen) and press ENTER. A screen similar to the one shown in **Figure 4-15** will be displayed.



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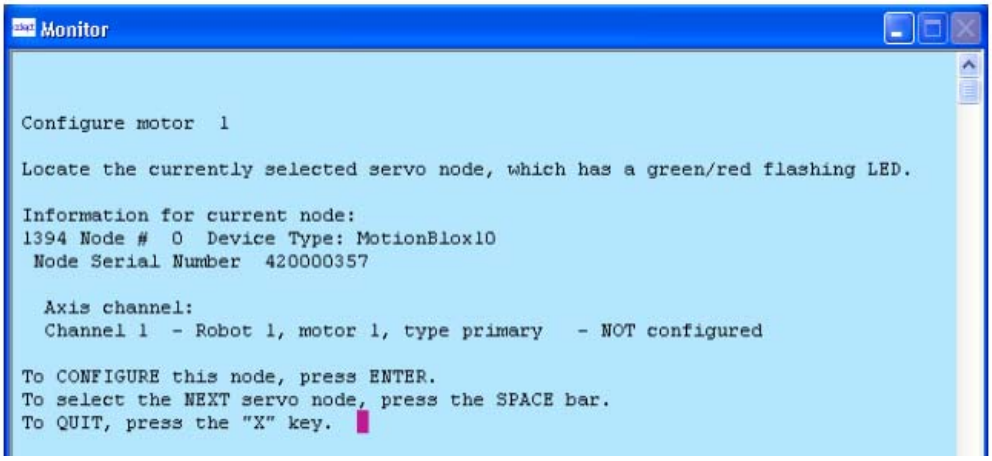



**Figure 4-15. DC_SETUP (LM Linear-Module Robot Module)**

4. Press the SPACE bar to select the SmartServo device to which the Servo Kit motor is connected.When the LED on the MB-10 amp you want to configure flashes green/red, press ENTER to select it.
5. Type "Y" to configure this channel. A screen similar to the one shown in **Figure 4-16** will be displayed.

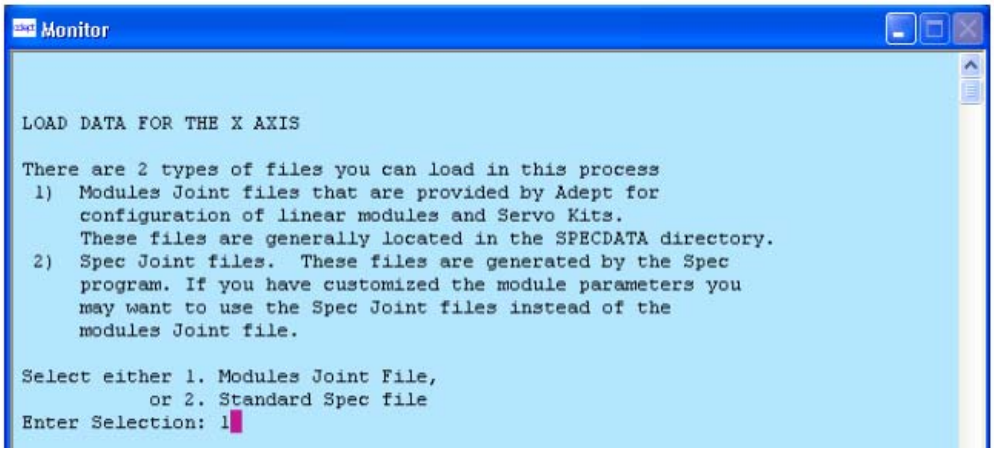



**Figure 4-16. DC_SETUP Load Data for the Axis (LM Linear-Module Robot Module)**

6. Select option 1 "Module Joint File" and press ENTER.
7. When prompted to enter the part number index for the selected axis, enter the five-digit part number of the motor you are configuring, or type "?" and press ENTER to display a list of the supported motor part numbers. If you enter "?", a screen similar to the one shown in **Figure 4-17** will be displayed.



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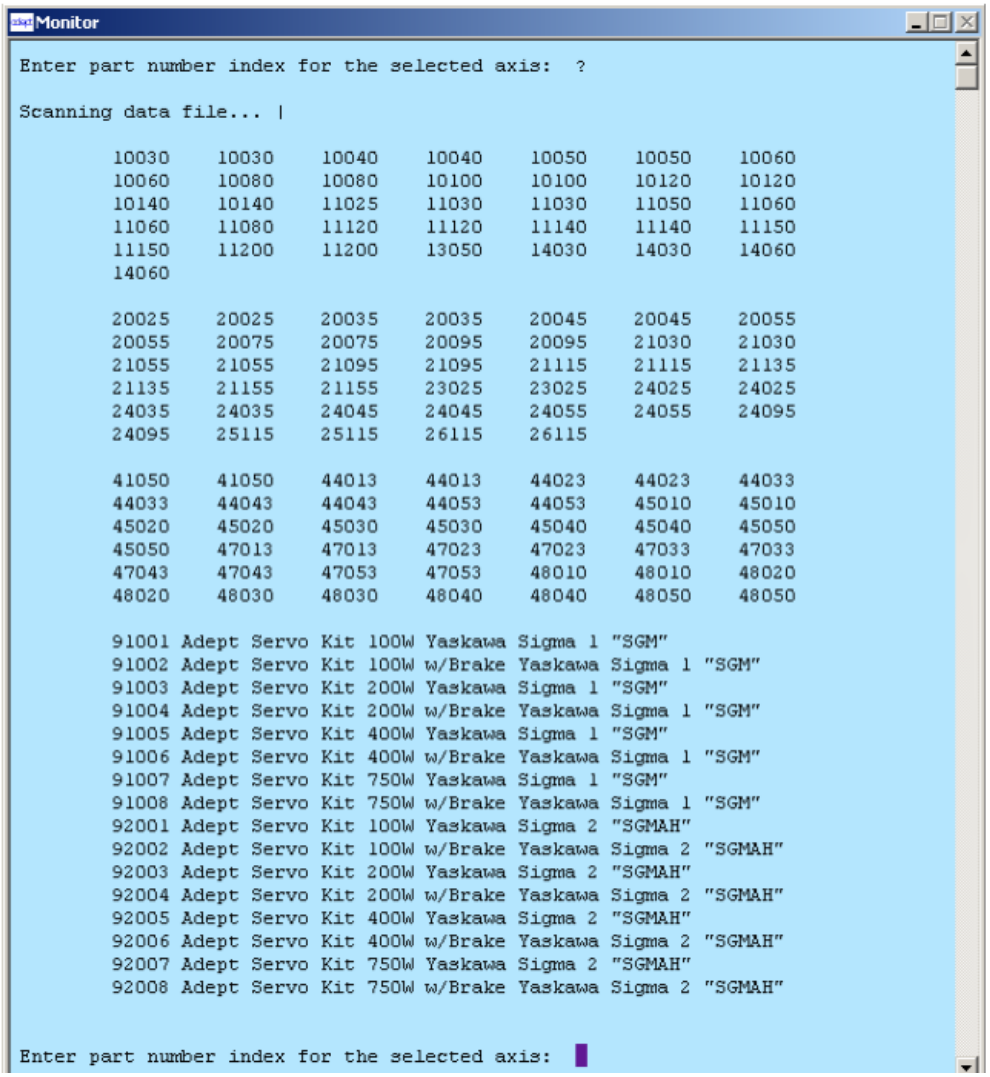



**Figure 4-17. DC_SETUP (LM Linear-Module Robot Module)**

A list of part numbers is displayed. The list includes the part numbers for the various types of Servo Kit motors, including Sigma 1 and 2 versions, 100 W, 200 W, 400 W, and 750 W models, and motors with and without brakes (for example, “92008 Adept Servo Kit 750 W w/ Brake Yaskawa Sigma 2 ““SGMAH””). The part number in the above example is “92008.”

After you enter the part number for the motor attached to the MB-10 amp or Servo Kit and press ENTER, a screen similar to the one shown in **Figure 4-18** will be displayed.



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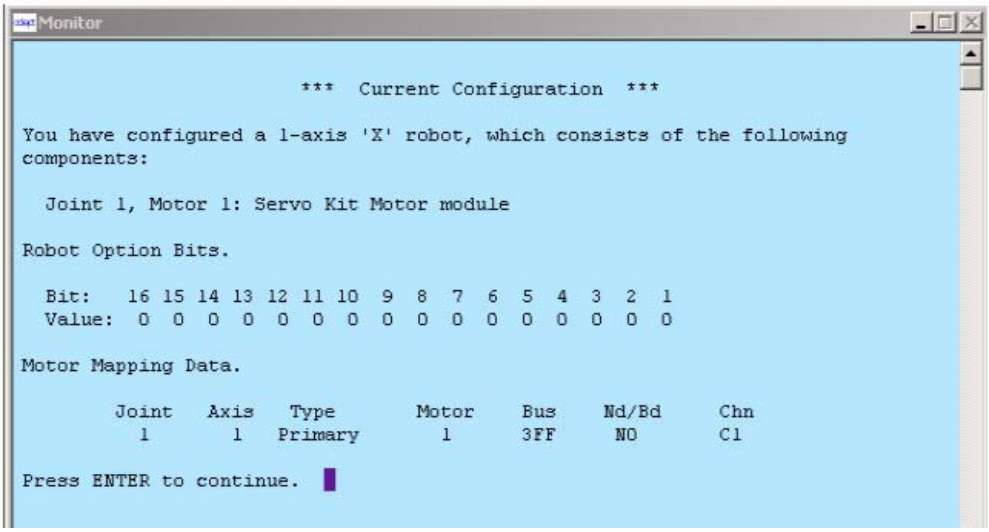



**Figure 4-18. DC_SETUP Current Configuration Screen**

8. Press ENTER to continue on to the calibration step.
9. Follow the on-screen prompts to select each joint to calibrate the axes that calibrate to a hard stop. The absolute encoder position on these axes must be reset. This is accomplished by driving the axes to a hard stop, then resetting the absolute encoder to zero.

   **NOTE:** Motor calibration will reset the absolute encoder multi-turn data to zero.

10. After you have calibrated the axis, you will be prompted to save the specification data to system disk. You must save the specification data and reboot the controller before the new configuration will be in effect.

## 4.4 Testing the Axis

The Servo Kit motor should now be operational. This can be verified by moving the axis using the optional pendant or writing a brief test program to exercise the motor.



**WARNING:** The Servo Kit motor shaft should not be attached to any mechanism during testing. After the configuration is complete and functionality of the motor has been verified, the intended mechanical device can be attached to the motor shaft.

**NOTE:** For continuous-turn applications, V+ requires a roll-over value. The default roll-over value is 360 degrees, which can be changed using the Motion Parameter menu in spec.v2.



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For continuous-turn applications, refer to the Adept website for information on the SPIN program command.

Below is a SPIN example program:

```
.PROGRAM rb.spin()

   SELECT ROBOT = 1           ;JTS Robot number

   ATTACH ()

   SPEED 100 ALWAYS           ;Define motion parameters
   ACCEL 100, 100
   COARSE ALWAYS

   temp.speed[1] = 300        ;Set spin speed to 300 RPM

   SPIN temp.speed[1]         ;Spin motor
.END
```

Below is an example program showing how to exercise the motor.

```
.PROGRAM test()
   DETACH ()
   SELECT ROBOT = 1           ;user selects the targeted robot
   ATTACH ()

   SPEED 10 ALWAYS
   ACCEL 100, 100
   FINE ALWAYS

   TIMER (1) = 0

   FOR ii = 1 TO 10
          MOVE #PPOINT(10)    ;user selects the low motion limit
          BREAK
          MOVE #PPOINT(100)   ;user selects the high motion limit
          BREAK
   END

   TYPE "Total cycle time: ", TIMER(1), " seconds."
```



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## 4.5 Modifying the Default Parameters to Optimize Performance

The SPEC data files contain default parameters, which allow functionality of the Servo Kit to be tested. Servo Kit is capable of high-performance operation. However, the default parameters are set conservatively for safety considerations. It will be necessary to adjust these parameters for specific applications. These parameters can be adjusted using the SPEC utility. For details on using that program, and descriptions of all the data items, refer to the ***Adept SmartMotion Developer Guide***.



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