

Hornet 565 Robot

Quick Setup Guide



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Chapter 1: Hornet 565 Quick Setup Guide

1.1 Introduction

Process Overview

This Quick Setup Guide steps you through the installation and start-up of your Hornet 565 robot. The major steps are:

- **Preparation:** workcell layout and safety
- **Hardware Installation:** mounting the robot and connecting system cables
- **System Start-Up:** system configuration and turning on the robot

It is assumed that a robot frame has been designed and built. Refer to the Hornet 565 Robot User's Guide for information on requirements for the frame.

NOTE: This guide does not apply to robot systems that include a SmartController EX motion controller. Refer to the *Hornet 565 Robot User's Guide* for those systems.

During the installation and start-up process, refer also to your Hornet 565 robot user's guide, shipped with each system, and available on the support disk.

Resources on the Support Disk

- This guide
- The Hornet 565 Robot User's Guide

Resources on Omron Web Sites

On the Omron Industrial Automation web site:

ia.omron.com

- The ePLC Connect 3 Software User's Guide
- EtherNet/IP Connection Guide (P649-E1-01)
This covers ePLC for the Omron NJ controller with Omron Adept Robots.
- EtherNet/IP Connection Guide (P650-E1-01)
This covers ePLCIO for the Omron NJ controller with Omron Adept robots.

On the Omron Adept web site:

adept.com

- Legacy systems communication structure pdfs
- Legacy systems code examples

1.2 Safety



WARNING: It is strictly prohibited to install or operate our robots without adequate safeguards according to applicable local and national standards. See the following figure for a simple workcell layout.

You must read the *Robot Safety Guide* and the Robot Installation and Operation chapters in the robot user's guide for information on safe operation of your robot system.

Refer to Installing User-Supplied Safety Equipment in the System Installation chapter of the robot user's guide, which provides details on connecting a user-designed E-Stop system through the XUSR connector to the robot.

1.3 Workcell Layout

The following figure shows a simple workcell layout with a user-supplied safety barrier and E-Stops provided by the optional Front Panel and optional T20 pendant.

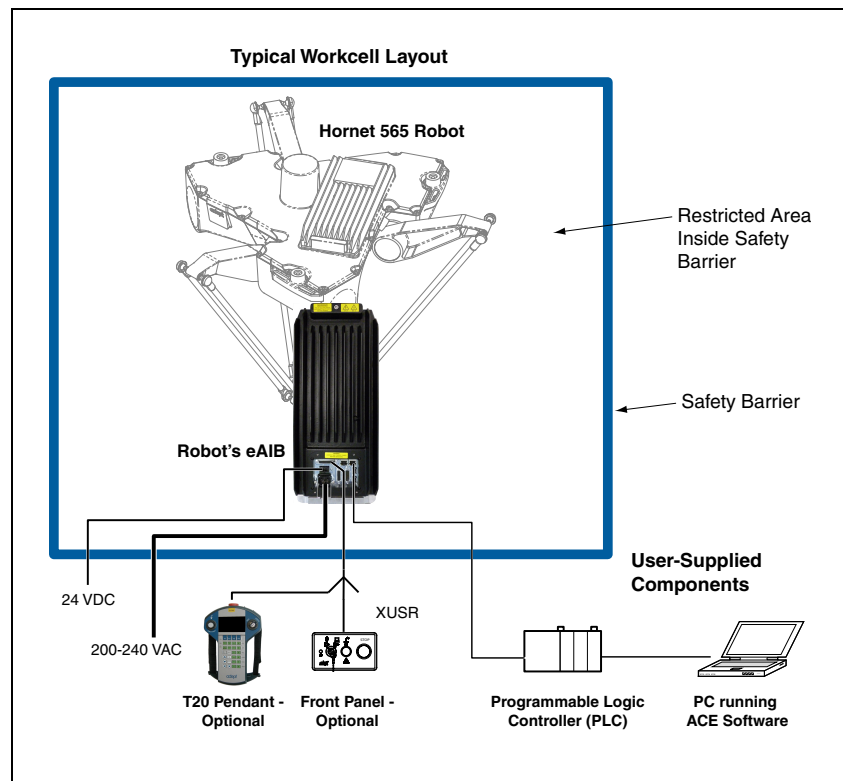


Figure 1-1. Simple Workcell Layout

1.4 Installing the Robot

Frame

The Hornet 565 robot is mounted in a user-supplied frame, so that it hangs over the work-space. A sample frame design is given, with dimensions, in the user's guide. See the following figure.

Ensure that the robot is oriented such that the Status Display panel faces away from the conveyor, if your system has a conveyor. This will give you the best view of the Status Display panel, and provide the best cross-belt movement of the robot's platform.

Mounting the Robot

1. Position the robot under the mounting frame.

The pallet will not fit in most frames, so the robot will need to be unstrapped from the pallet and moved manually.

2. Put nylon slings through the six lifting slots. See the following figure.

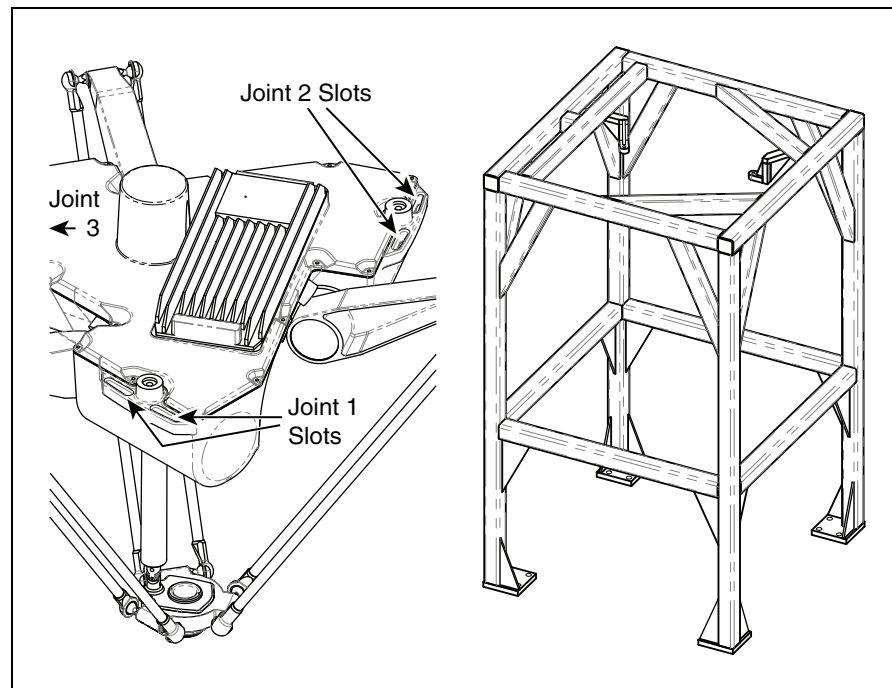


Figure 1-2. Four of Six Lifting Slots, Sample Frame (not to scale)

3. Take up the slack in the slings.
4. Lift the robot up to the mounting pads on the frame.
5. Mount the robot with three M12 x 1.75 screws. Mounting screws are user-supplied; the length is determined by your frame design.

The screws should be stainless or zinc-plated steel.

Lock washers are not needed, as the robot base has spring-lock Heli-Coil® inserts.

6. Use an external-tooth star washer, under one of the mounting screw heads, to ground the robot base to the frame.

If the frame is painted where the star washer makes contact with it, use a ring terminal under the star washer, and connect the other end of the wire from the terminal to a suitable grounding surface on the frame.

If the frame is not painted where the M12 screw makes contact with it, you do not need to use a ring terminal - just put an external-tooth star washer under the mounting screw head.

7. Tighten all mounting screws to 61 N-m (45 ft-lbf).

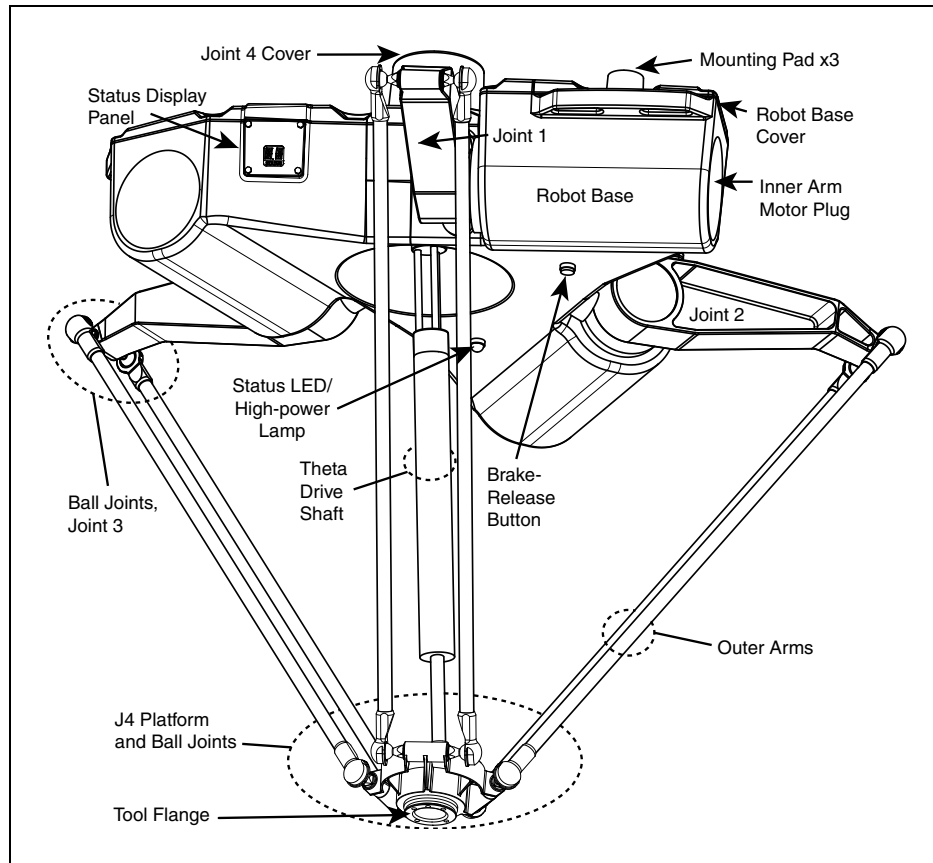


Figure 1-3. Labeled Drawing of Hornet Components, J4 Platform, Springs not Shown

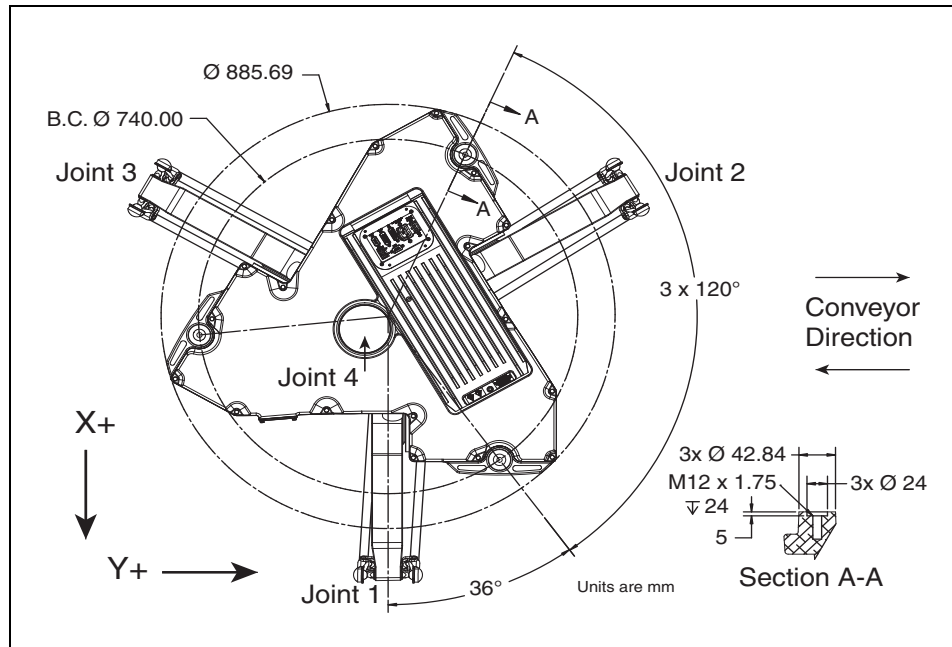


Figure 1-4. Hornet 565 Robot Base Mounting Pattern

Attaching the Outer Arms and Platform

The Hornet 565 robot is available with either a rotating platform (J4) or a fixed platform. The fixed platform model does not use a J4 motor or a theta drive shaft.

The Hornet 565 robot platform gets attached to the inner arms by the outer arms.

NOTE: Except for attaching the outer arms and, for the J4 platform, the theta drive shaft, the platform is shipped fully assembled.

One pair of outer arms attaches between each inner arm and the platform. No tools are needed.

For the J4 platform only: Both the theta drive shaft attachment on the J4 motor and the platform are offset by about 2 in. from the centers of the robot base and tool flange. The platform should be attached so that its shaft aligns between the Joint 1 and Joint 3 ball studs on the robot base. Joint 1 should connect to motor 1, which is immediately to the right of the Status Display panel on the robot base. See the preceding figure.

- Each outer arm has a ball joint socket at each end.
- The inner arms and the platform have corresponding pairs of ball studs.
- The procedure for attaching the outer arms is the same for both platforms.

1. Attach one pair of outer arms to each inner arm.

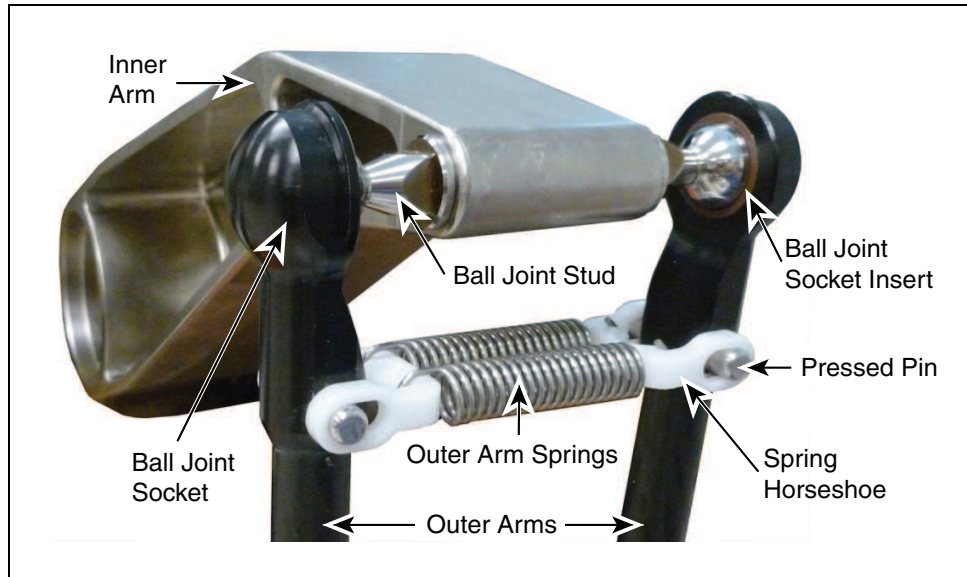


Figure 1-5. Ball Joint Assembly, Inner Arm

- a. Pivot the two arms away from each other lengthwise. This requires the least stretching of the spring to attach the ball joints.
- b. Slip one ball joint socket over the corresponding ball stud.
- c. Swing the bottom end of the outer arm pair sideways as you slip the other ball joint socket over the corresponding ball stud.



CAUTION: Do not overstretch the outer arm springs. Separate the sockets only enough to fit them over the ball studs.

2. Attach one pair of outer arms to each of the three pairs of ball studs on the platform.

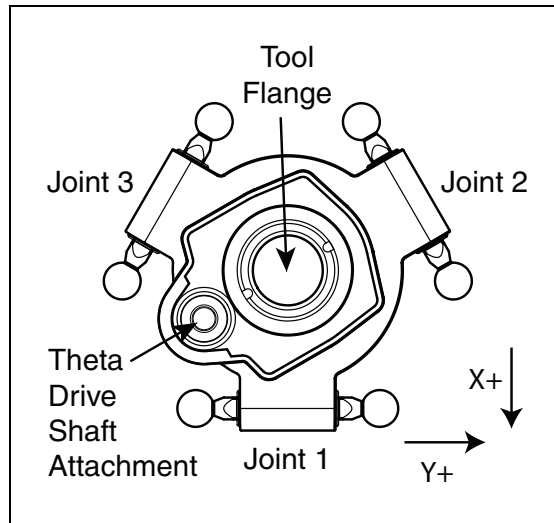


Figure 1-6. Top View of J4 Platform

- a. Swing the bottom end of the outer arm pair to the right, as far as possible.
 - b. Slip the right ball joint socket over the right ball stud. (Move the platform as needed to do this.)
 - c. Move the platform and outer arm pair to the left as you slip the left ball joint socket over the corresponding ball stud.
3. Ensure that all spring hooks are fully-seated in the grooves of the horseshoes. See the following figure.



Figure 1-7. Ball Joint Assembly, Showing Springs and Horseshoes

Attaching the Theta Drive Shaft (J4 Platform Only)

NOTE: The fixed platform does not use a theta drive shaft, so this section does not apply to robots with a fixed platform.

Each U-joint has two identical ends. When the theta drive shaft is shipped, it will have one end of a U-joint attached to each end. Attach the top end of the drive shaft to the J4 motor shaft, labeled Top, first. This requires using a 3 mm hex key, with its short end shortened to 10 - 15 mm. A normal hex key will not fit in the space available.

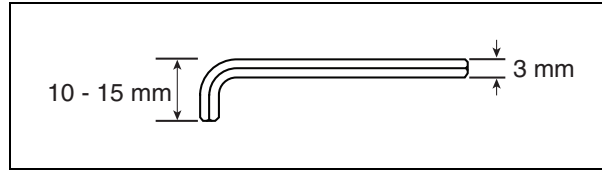


Figure 1-8. Shortened Hex Key

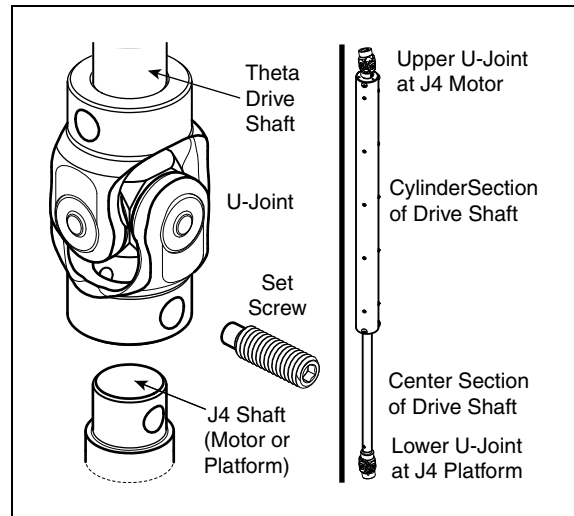


Figure 1-9. U-Joint, Set Screw, J4 Shaft | Drive Shaft

To attach the free end of the U-joint:

1. Slide the end of the U-joint over the shaft (platform or J4 motor).
The fit will be fairly tight.
The hole in the side of the U-joint needs to line up with the hole in the shaft.
2. Screw an M6 x 20 dog point set screw (included) through the shaft, going through the hole in the side of the U-joint, and into the blind hole on the opposite side of the U-joint. The U-joint is not threaded.

Use Loctite 242, and tighten to 5 N-m (3.7 ft-lbf) of torque. The head of the set-screw should be flush with the outer surface of the U-joint.

NOTE: The platform and J4 motor will need to be aligned after the ACE software has been installed, and the robot has been powered-on.

1.5 System Cable Connections

Open the Accessory box and locate the eAIB XSYSTEM cable. Connect the cables and peripherals as shown in the following figure. Parts and steps are covered in the following two tables. Refer to the System Installation chapter in your *Hornet 565 Robot User's Guide* for more detail.

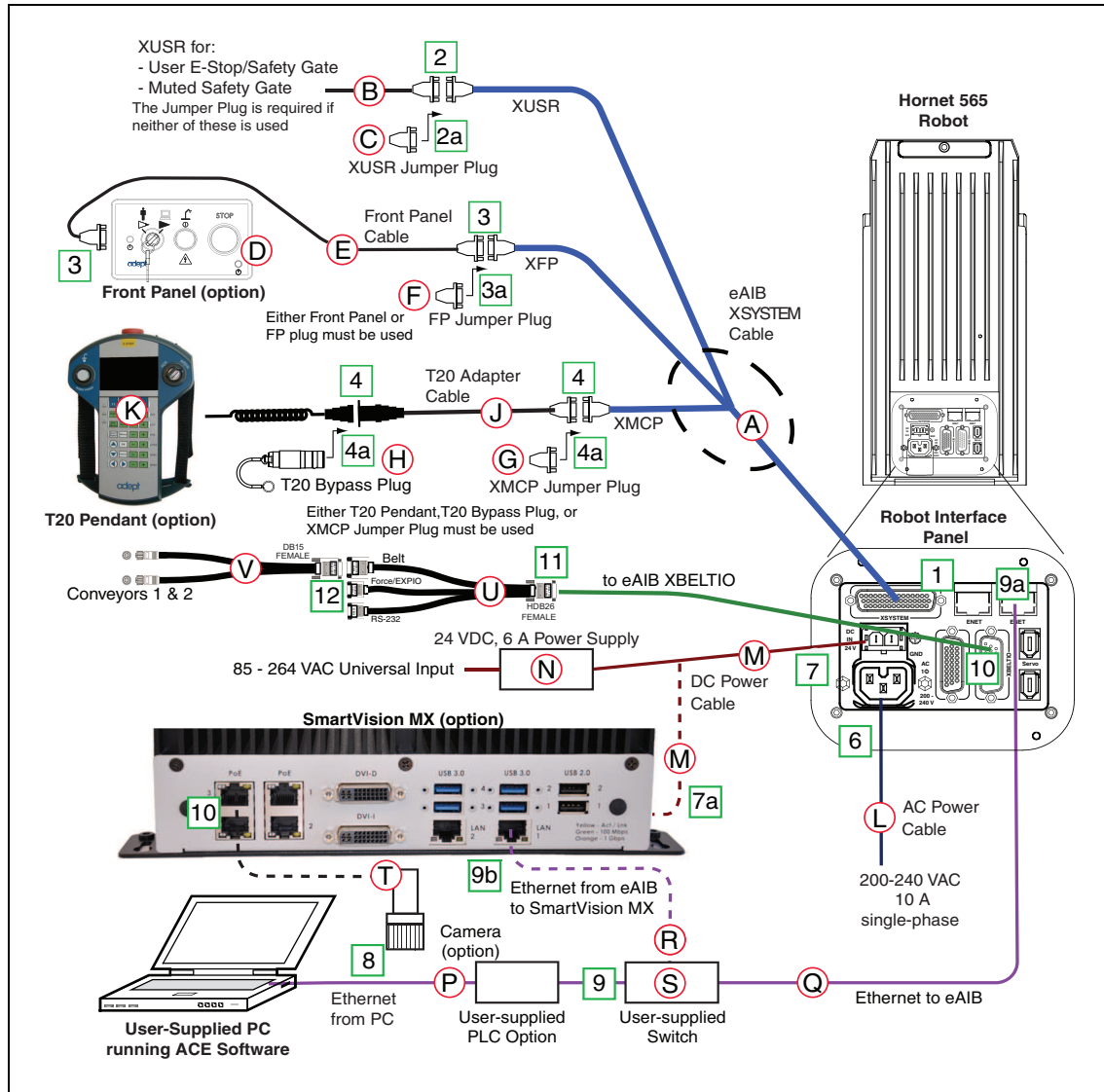


Figure 1-10. System Cable Diagram, with SmartVision MX, Front Panel, and T20 Pendant Options



WARNING: If you do not purchase a Front Panel, you must provide your own E-Stop circuit and button.

Parts Table

Part	Cable and Parts List	Part #	Part of:	Notes
A	eAIB XSYSTEM Cable Assembly	13323-000		standard, eAIB
B	User E-Stop, Safety Gate	n/a	n/a	user-supplied
C	XUSR Jumper Plug	04736-000	13323-000	standard, eAIB
D	Front Panel	90356-10358		or user-supplied
E	Front Panel Cable	10356-10500	90356-10358	or user-supplied
F	Front Panel Jumper Plug	10053-000	13323-000	standard, eAIB
G	XMCP Jumper Plug	04737-000	13323-000	standard, eAIB
H	T20 Bypass Plug	10048-000	10055-000	standard, T20
J	T20 Adapter Cable	10051-003	10055-000	standard, T20
K	T20 Pendant (option)	10055-000		option
L	AC Power Cable (option)	04118-000	90565-010	or user-supplied
M	24 VDC Power Cable (option)	04120-000	90565-010	or user-supplied
N	24 VDC, 6 A Power Supply (option)	04536-000	90565-010	or user-supplied
P	Ethernet Cable - PC -> PLC (Only while programming PLC)	n/a	n/a	user-supplied
Q	Ethernet Cable - switch -> eAIB	n/a	n/a	user-supplied
R	Ethernet Cable - switch -> SmartVision MX	n/a	n/a	user-supplied
S	Ethernet switch, cable for SmartVision MX.	n/a	n/a	option, user-supplied
T	Camera and cable	n/a	n/a	option
U	eAIB XBELTIO cable	13463-000		option
V	Y-adapter cable	09443-000		option

The XUSR, XMCP, and XFP jumpers intentionally bypass safety connections so you can test the system functionality during setup.



WARNING: Under no circumstances should you run the system, in production mode, with all three jumpers installed. This would leave the system with no E-Stops.

Connection Steps Table

Step	Connection	Part
1	Connect eAIB XSYSTEM cable to XSYSTEM on eAIB.	A
2	Connect a user E-Stop or Muted Safety Gate to the eAIB XSYSTEM cable XUSR connector or	B
2a	verify XUSR jumper plug is installed in eAIB XSYSTEM cable XUSR connector.	C
3	If you purchased a Front Panel, connect Front Panel cable to Front Panel and eAIB XSYSTEM cable XFP connector or	D, E
3a	if using user-supplied Front Panel, connect Front Panel to eAIB XSYSTEM cable XFP. See warning after table.	A, E
4	Connect T20 adapter cable to eAIB XSYSTEM cable XMCP connector or	J, K
4a	if no T20, install XMCP jumper or T20 Adapter Cable with T20 bypass plug.	G or H
5	Connect user-supplied ground to robot.	n/a
6	Connect 200-240 VAC to AC Input on eAIB Interface Panel; secure with clamp.	L
7	Connect 24 VDC to DC Input on Interface Panel.	N, M
7a	Connect 24 VDC and shield ground to SmartVision MX, if used. See SmartVision MX user's guide for location.	N, M
8	Connect Ethernet cable from PC to PLC, if a PLC is used.	P
9	Connect Ethernet cable from PLC to switch, if a PLC is used.	S
9a	Connect Ethernet cable from switch to eAIB.	Q, S
9b	Connect Ethernet cable from SmartVision MX, if used, to switch.	R, S
10	Connect optional camera and cable to SmartVision MX, if used.	T
11	Connect optional eAIB XBELTIO cable to the XBELTIO port on eAIB.	U
12	Connect the Y-adapter cable to the eAIB XBELTIO cable, Belt branch	V



WARNING: If you do not purchase a Front Panel, you must provide your own front panel with equivalent circuits to be able to enable power and have an E-Stop button.

XBELTIO pinouts are covered in the full Hornet User's Guide.

Power Requirements

The power requirements for the SmartVision EX and the Hornet 565 robot are covered in their respective user guides. For 24 VDC, both can be powered by the same power supply.

Grounding the System

NOTE: The resistance of all ground conductors must be $\leq 10 \Omega$.

The following ground connections need to be made:

- End effector-to-robot base, if hazardous voltage is present on the end-effector
- Robot base-to-frame
- Frame-to-Earth
- 24 VDC cable shield to power supply and eAIB

1.6 Configuration

The user-supplied PLC and Hornet 565 robot are connected either through a shared network or via a user-supplied Ethernet cable.

When the Hornet 565 robot is powered on and waiting for a PLC connection, the robot status panel will display its IP address, two digits at a time.

The format will be:

IP xxx-xxx-xxx-xxx OK

NOTE: If you can use the robot's default IP address, then you can skip the ACE software installation completely.

Installing ACE Software

ACE is used to change the IP address of the robot and for troubleshooting. You install ACE from the software disk.

NOTE: You will have to restart the PC after installing ACE software.

Setting the Robot IP Address

Configure the IP address of the Hornet 565 robot using ACE software.

1. Connect the PC and the robot, either through a shared network or with an Ethernet cable between them.
2. Start the ACE software.
3. Click the Detect and Configure button, circled in the following figure.

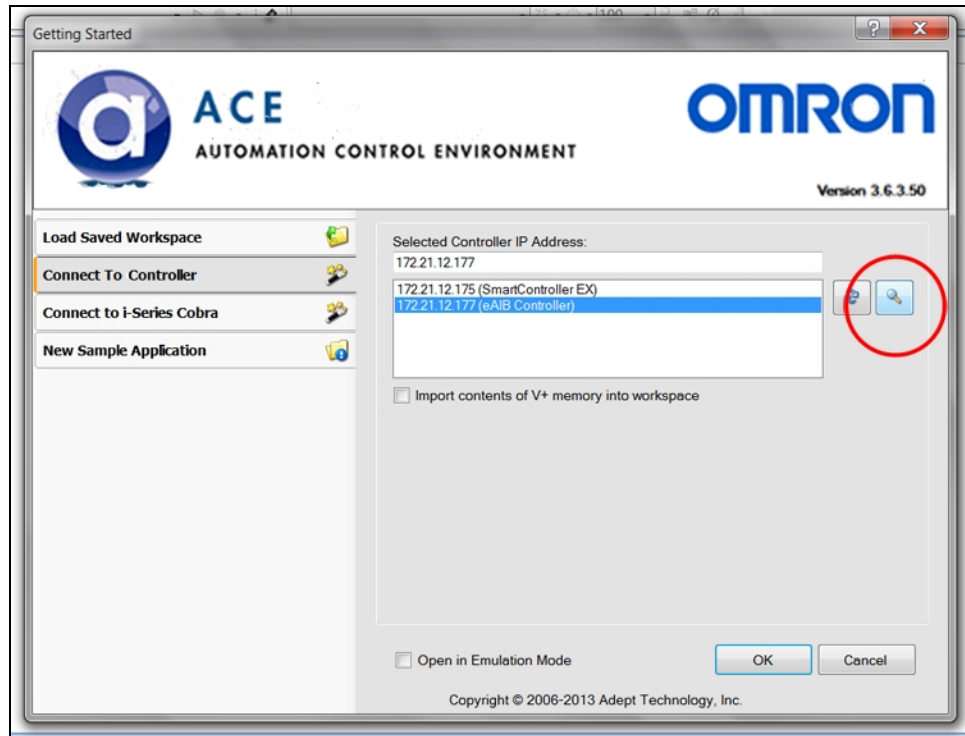


Figure 1-11. Detect and Configure Button

The IP address detection and configuration window will open. The ACE software will show the IP address of any controllers it detects. See the following figure.

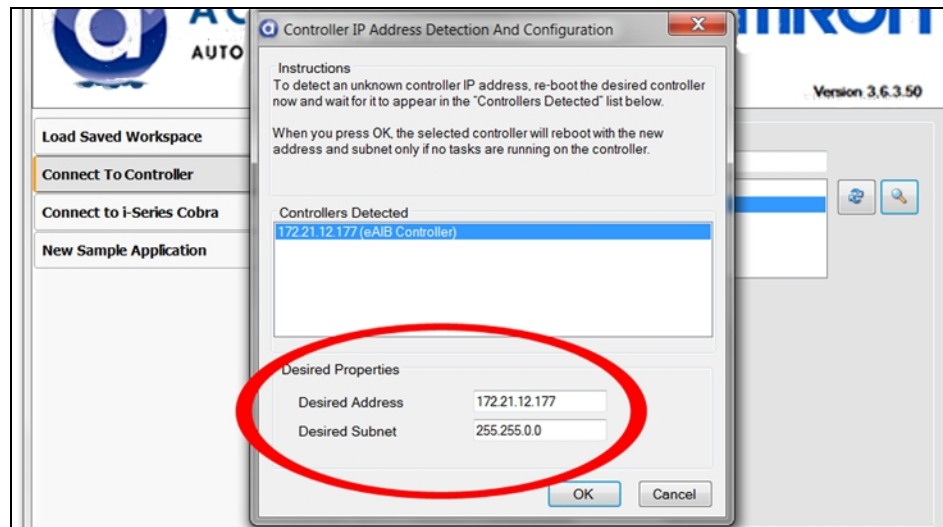


Figure 1-12. IP Addresses Detected

4. You can change the IP address and subnet mask in the Desired Address and Desired Subnet fields, if needed.
5. Click OK. The ACE software will ask you to wait for the controller to reboot.

Configuring the Omron PLC

Refer to the EtherNet/IP Connection Guide (P649-E1-01) for configuring the Omron PLC to work with Omron Adept robots. Refer to Resources on Omron Web Sites on page 3.

Using your PLC software, set the IP address for the PLC to connect to on the robot.

Enabling High Power

The details of enabling high power to the robot are covered in the EtherNet/IP Connection Guide (P649-E1-01).

Once high power is enabled, the Robot Status Panel displays ON, and the amber Robot Status LED is on.

1.7 Start-up Procedure

Aligning the Platform and J4 Motor

It is possible for either the motor shaft or the platform shaft to be turned, manually, before the theta drive shaft is connected to both. If not detected, the software may assume the robot's tool flange is at a different angle than it really is. To ensure that the software knows the actual rotation of the tool flange with respect to the J4 motor, you need to use the ACE software to establish this alignment.

1. Within the ACE software, open the Hornet robot object.
2. In the Configure tab, click Adjust J4 Zero.
This will launch a utility for aligning the theta drive shaft.
3. Follow the instructions in the utility.

Contact Omron Adept Technologies, Inc. for more information on this procedure.

NOTE: Once the theta drive shaft is installed, the J4 motor and the tool flange will always rotate together, so the software will know the orientation of the tool flange.

1.8 Finding Additional Information

Installing Optional Equipment

For details on installing optional equipment, see the following topics in the Optional Equipment Installation chapter of the Hornet 565 user's guide:

- Installing end-effectors
- Connecting user air and electrical lines to user connection panel
- Mounting external equipment on the robot
- Mounting the robot solenoid option kit

NOTE: For dimensions and specifications, see Technical Specifications in the Hornet 565 User's Guide.

System Operation

For details on system operation, see the following topics in the System Operation chapter of the Hornet 565 user's guide:

- Robot Status LED Indicator
- Status panel fault codes
- Brake Release button (located above or in diagnostic panel). To move Joint 3 manually, press the Brake Release button.
- Connecting digital I/O on the XIO connector at the robot interface panel
- Connecting a user-designed E-Stop System

For information on the ePLC Connect software interface, refer to the ePLC Connect 3 Software User's Guide.

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