

User's Manual 2005-11-16

Closer to Real. **ROBOTIS**

Dynamixel Robot series

9D Hand



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1. Start of 9D Hand

1-1. Product Components

Basic product

9D Hand

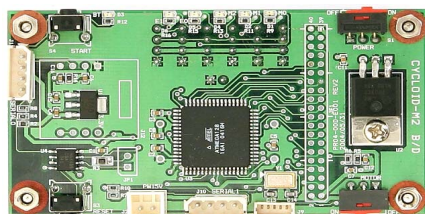
9D Hand is one of multi-joint Robot series using Dynamixel.



- Weight: 950g
- Degree of freedom: 9joints
- Actuator: Dynamixel
- Actuator Network: RS-485

CM-2 board

CM-2 for RS-485 communication is Dynamixel exclusive control board to control Dynamixel Robot.



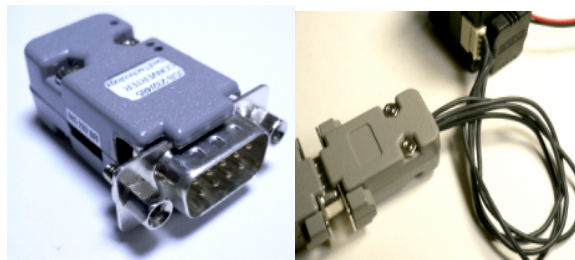
Robot SMPS

Is a exterior power supply for Dynamixel Robot. Exterior power can use not only normal power supply but also SMPS(12V, 3A)



USB tools

Basically, CM-2 controls Dynamixel. This can make the beginner use it if Application range of Dynamixel Robot is not wide. But to high grade developer, it can reduce the application range. To solve this problem, we provide USBto485 modules which connect between PC and Dynamixel.



User Manual

Provide Manual to apply Dynamixel Robot

- **9D Hand manual:** Product explanation and introduction of application
- **Direct Access API manual:** Program developing manual for Direct Access Mode
- **CM2 manual:** To apply CM-2 as a Dynamixel controller
- **Dynamixel manual:** Dynamixel is also one of controlling system. This manual is to apply this part directly

Software

Provide software to apply cycloid. The followings are components.

- **Robot Terminal:** The program as a role of input and output of CM2 at PC
- **Direct access API:** API for developing Dynamixel control program
- **Robot program:** Program operating on CM-2
- **Drivers:** Providing driver of devices connected to PC

1-2. Power supply

Power Supply CM-2 board has to be used to supply power in 9D Hand. Refer to the details about Power Supply in CM-2 manual.

1-3. Demo

9D Hand Demo Dynamixel Robot' s Demo prepared can do by conducting pre-setting data to see the 9D Hand' s movements. You can conduct Demo using exterior input switch of CM-2 board. [Refer to CM-2 manual about each part name and function]

<Step1> Check the CM-2 board program is edit mode using Robot terminal

<Step2> Push the exterior input switch of CM-2 board

<Step3> You can see the demo run. Reset the CM-2 board to stop

2. Dynamixel Robot Application

2-1. Overview

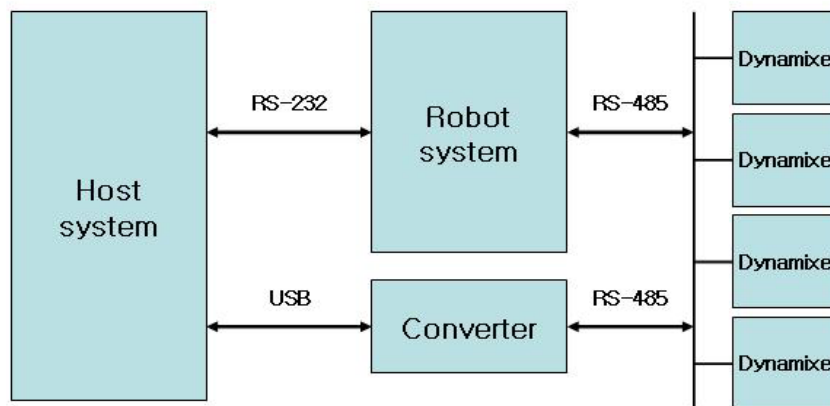
Host system Host system means the user's development environment. That is PC. Software operating in host system is called to Host program. There is Robot terminal.exe.

Robot system Robot system is CM-2 board which is main controller controlling Dynamixel.

Protocol Protocol is a term indicating H/W and S/W which connects system and system. The protocol between Dynamixel and Robot system is RS-485 and the protocol between host system and Dynamixel is RS-232.

Motion Page Mode It tells Robot system controls Dynamixel. In other words, Robot program that is s/w of Robot system controls Robot.

Direct Access Mode It tells Host system controls Dynamixel. S/W of Host system, that is, PC application control Robot. At present, The PC is the best system, so it can provide the best development environment. User will be able to set up new interface which each user needs.



2-2. Motion Page Mode

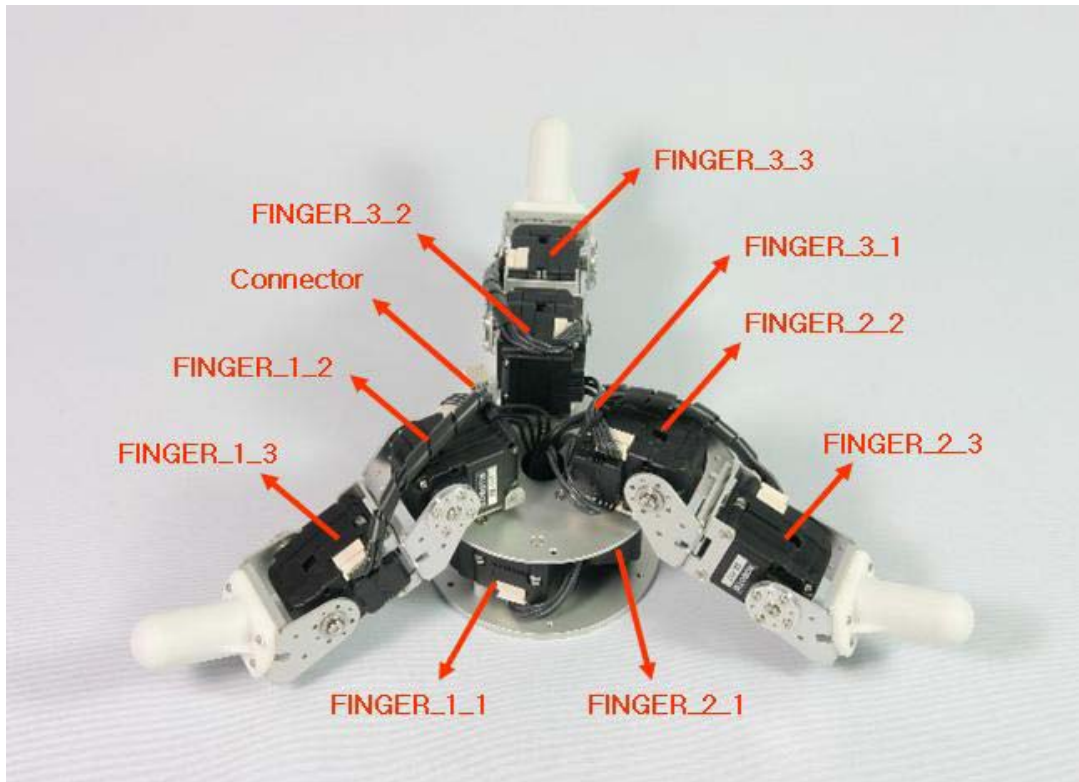
- Robot program** Even if a user's special Robot program can be made by using Win AVR, This motion page node control Dynamixel Robot based on provided Robot program. The followings are Robot program components. Refer to CM-2 manual for details.
- **System:** The most basic program of Robot system. It is attached when CM-2 Board is released.
 - **Monitor:** The program to control Dynamixel. You can test in case of changing the set up of Dynamixel or something wrong.
 - **Edit:** The program produce and edit motion to operate Dynamixel Robot. You can operate Robot easily using this program.
 - **Toss:** It can be used to control Dynamixel directly by pc. It transforms RS-232 into RS-485
 - **Dump:** This program can make user see the middle data as the expanded function of Toss. It is often used by debugger
- Boot application** If the power is on like PC, Robot system operates while s/w runs automatically. User can make wanted Robot program operate. This is called to Boot application.
- Terminal program** Input/output device of Robot system is very limited comparing to PC. To solve it, use the resource of Host system. The host system which connects between Host and Robot is terminal program. Provided terminal program is Robot terminal.exe. If this program is used, Robot system can be used like PC.

2-3. Direct Access Mode

- USB tools** To use Direct Access Mode needs a device which can transform RS-485 of PC's USB and Dynamixel. USBto485 converters do this role. PC and Dynamixel Robot are connected by this device USBto485 converter is USB device so that need to set the driver up to be recognized in PC.
- Direct Access API** The most important reason that use Direct Access mode is to control directly by Dynamixel Robot in PC. That is Dynamixel Robot control program for it and user have to develop it. Direct Access API helps to develop Direct Access API. Program developing environment is that Operating System is Window and compiler is our visual C++ 6.0. Direct Access API is library so that can use through linking to developing program. Program development using Direct Access API refers to the Direct Access API manual.
- Direct Access Tools** Direct Access tools are Application program mode. PC using Direct Access API can apply as an example because some provide source. It's also possible that use Dynamixel Robot as a utility.

Appendix

A. Dynamixel ID



Name	ID
FINGER_1_1	0x00
FINGER_1_2	0x03
FINGER_1_3	0x06
FINGER_2_1	0x01
FINGER_2_2	0x04
FINGER_2_3	0x07
FINGER_3_1	0x02
FINGER_3_2	0x05
FINGER_3_3	0x08