Dr Robot®

WiFi Mobile Robot Development Platform with Video/Audio Capability and Animated Head System

X80-H

Quick Start Guide

WARNINGS

Do NOT power on the robot before reading and fully understanding the operation procedures explained in this manual.

Neither the robot, nor the program is bug free, accidence could happen; you have to make sure that the robot always maintains a safe distance from people during operation.

The robot should be turn off (i.e. the power switch should be on OFF position) when not in used. Battery should be fully charged before storage. Battery pack should be recharged every two weeks while in storage.

Failure to follow these warnings could cause serious injury or death and/or damage to the robot.

Copyright Statement

www.DrRobot.com

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Table of Contents

Introduction

The X80-H integrates Dr Robot's animated head system with an X80 base. It provides broader versatility for researchers and developers who like the features of the DRK-8080, but would prefer a platform whose size and power are closer to that of the X80.

Key Features

- *5 DOF animated head with integrated camera*

- *Two 12V motors with over 300oz.-inch(22kg.cm) torque each*

- *7 inch driving wheel*

- *Max speed of 1 m/sec*

- *Weight: 3.5 kg*

- *Additional carrying payload:*

  - *10 kg*

  - *25 Kg (Optional, please contact info@drrobot.com for detail)*

- *Pre-programmed fine speed and position control achieved by an integrated PMS5005 module employing two 1200 count per wheel-cycle quadrature encoders*

- *Fully wireless networked 802.11g*

- *OS independent application development tools*

- *128x64 graphic LCD, Display image , message or sensor data*

- *Collision detection sensors include 3 Ultrasonic range sensors and 8 IR range sensors*

- *2 Pyroelectric Human Motion Sensors*

- *Comprehensive circuit protection*

- *Dimension 38cm (L) x 35cm(W) x 46cm (H)*

- *Extended operating time. 3 hours nominal operation time for each recharging*

- *Upgrade options:*

  - *Vision-landmark base indoor localization (indoor GPS, position/orientation) sensor and the landmarks together provide precise position and direction information covering every inch of the floor*

  - *Laser scanner*

 - *Power and battery systems for 6 hours operation time are available*

Sensors and External Components

The figure below illustrates the key functional components you will identify on the outside of X80-H robot.
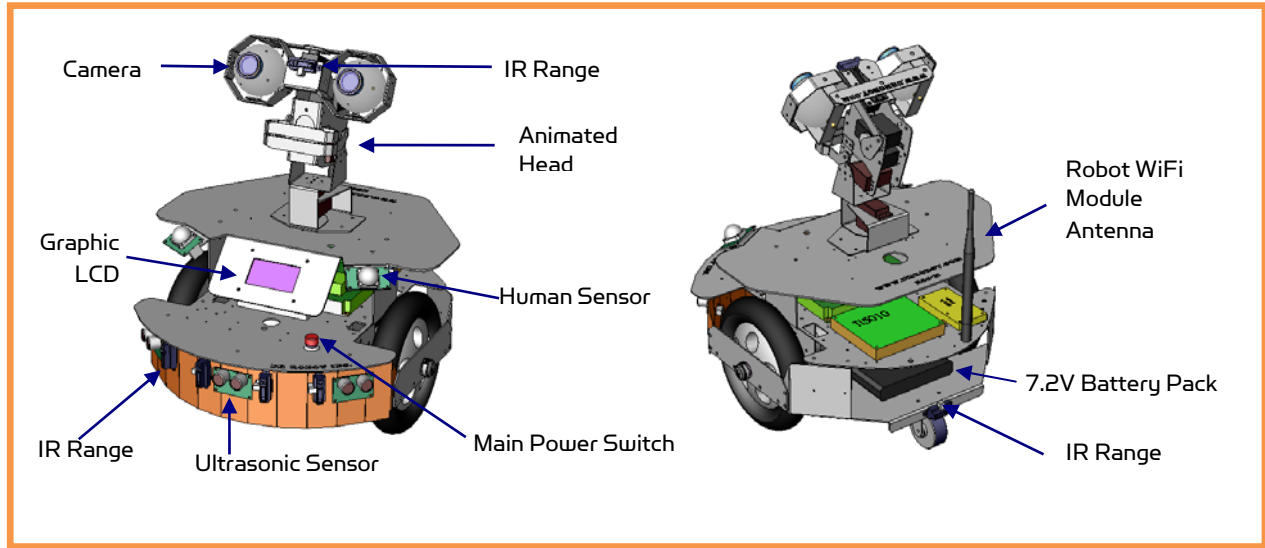
X80-H Overview

The robot comes with 3 ultrasonic range sensors and 8 IR range sensors. These range sensors are for environment detection and collision avoidance.
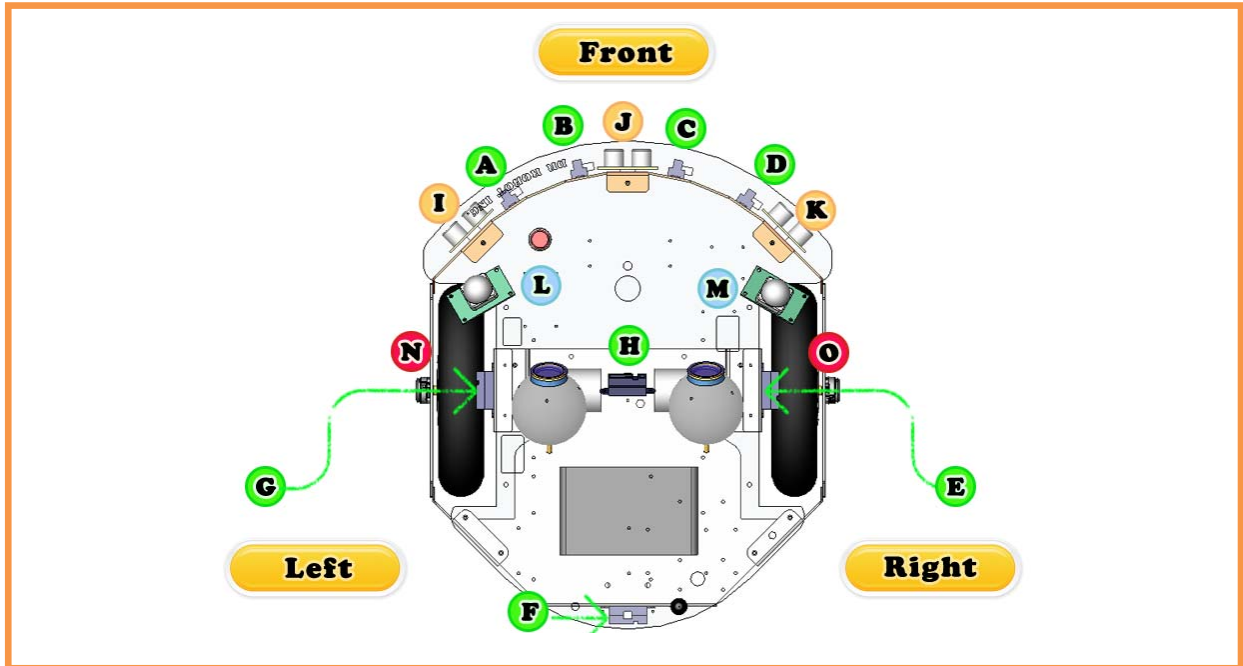
X80-H Sensor Module Location (Top View)

Sensor Module	Location
Ultrasonic #1	I – Left front
Ultrasonic #2	J – Middle front
Ultrasonic #3	K – Right front
Human Sensor #1	L – Left front
Human Sensor #2	M – Right front
Infrared Range Sensor #1	A – Front left
Infrared Range Sensor #2	B – Front middle
Infrared Range Sensor #3	C – Front middle
Infrared Range Sensor #4	D – Front right
Infrared Range Sensor #5	E – Right
Infrared Range Sensor #6	F – Rear
Infrared Range Sensor #7	G – Left
Infrared Range Sensor #8	H – on Animated head
Quadrature Encoder #1	N - Left , use channel 1
Quadrature Encoder #2	O - Right, use channel 2

Operation Scenario

Diagram below shows the typical operation scenario. The X80-H is a wireless networked robot. It connects to the wireless AP or router via IEEE 802.11b/g network. The Local PC running the X80-H Control program could connect to this network via either:

- Network cable – Connect the host PC to one of the LAN ports on the back of the router (DO NOT connect to the WAN port), or

- Wireless – To connect the Local PC to the wireless router, configure the Local PC's wireless settings using the default wireless configuration settings found in the Network Connection session of this manual.

User could write his own remote control program or contact support@DrRobot.com for further support.

Local PC

Typical Operation Scenario

Note: The Local PC could also be mounted on the robot instead off the robot if your application requires so.

User could be able to control the robot, see, talk and listen through the robot via the Dr Robot® Control program.
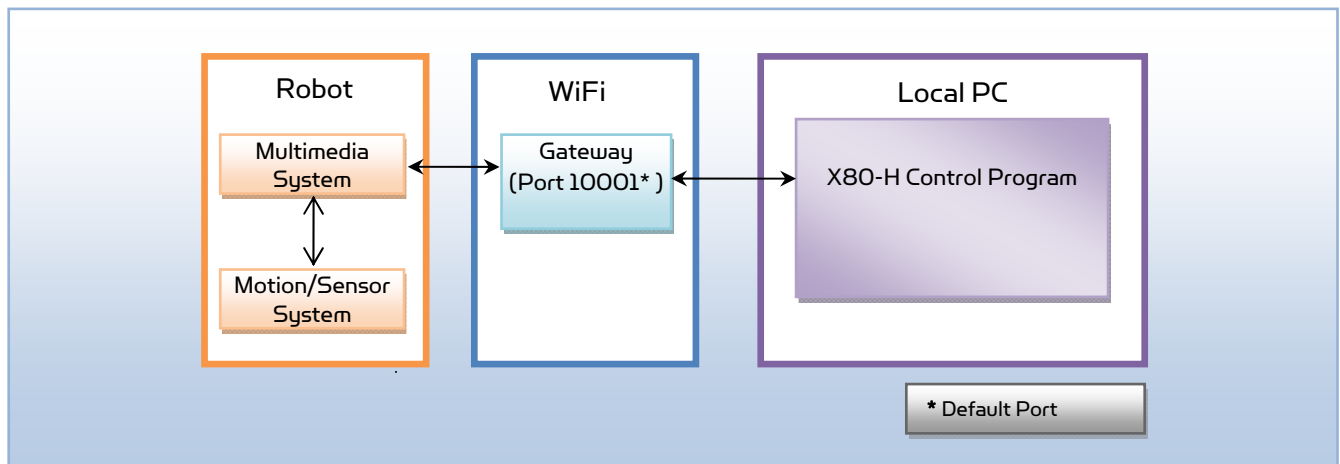
Software Installation

You should install the "X80HControl" program from the installation CD.

After program installation, you will find the following programs under the "Start-All Programs" list, and they are installed under the "Program Files" folder.

Dr Robot Inc   –   X80H Control

Dr Robot Inc   –   WiRobotGateway.exe

"SourceCode" folder contains a copy of X80-H sample code for Visual Studio 2008. It is locate under default installation folder (such as "C:\Program Files\Dr Robot Inc\Dr Robot X80H\")

* DirectX $^{®}$ SDK is required. You could download it from Internet

* Microsoft$^{®}$ .Net 3.5 Framework is required. You could download it from Internet

Robot Operations

Step 1: If you have not installed the demo and support programs, insert the installation CD to CDROM and run the "Setup.exe" program that is under "X80H Control Installation" folder.

Step 2: Connect the PC to the wireless router (one of the LAN ports) (the router has IP 192.168.0.200) included in the package.

Step 3: Push red power switch on the front to turn on the robot.

Step 4: Run the "WiRobotGatewayforWiFi.exe" from Start -> All Programs -> Dr Robot Inc -> WiRobotGateway.exe, Use "drrobot1" as robot ID, enter your robot IP address to "IP" textbox, "10001"as "Port", and then click "Connect".
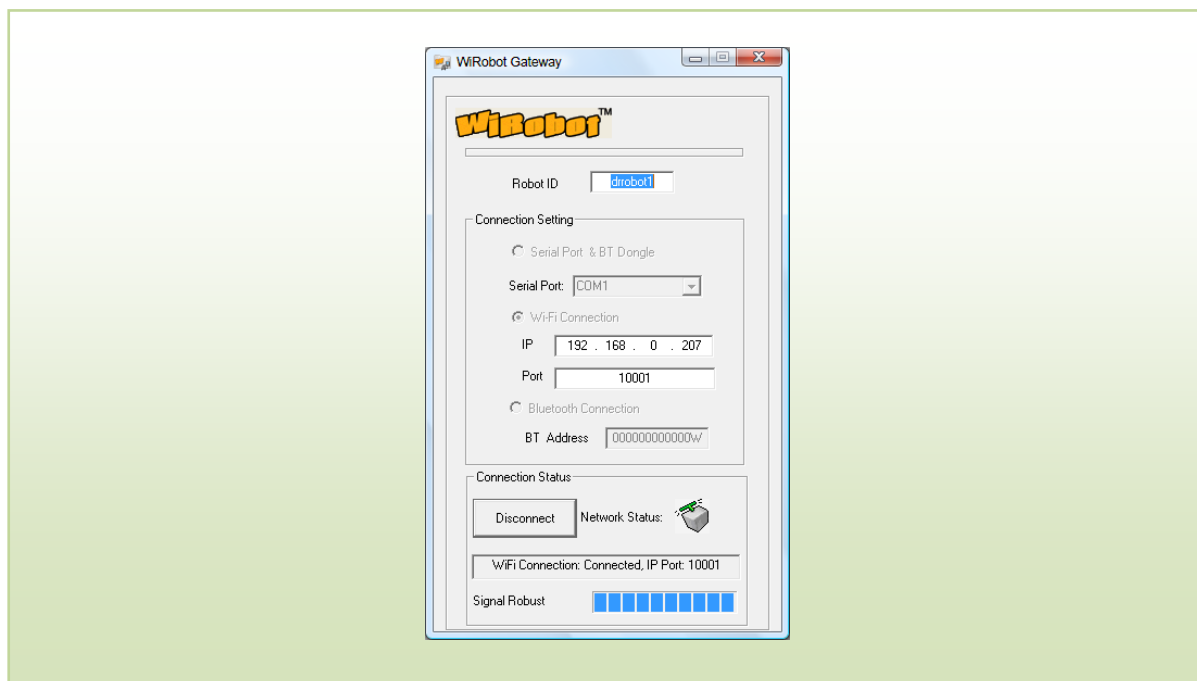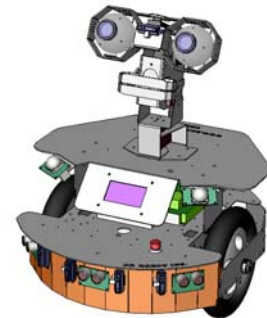
Step 5: Run the "X80H.exe" from Start -> All Programs -> Dr Robot Inc -> X80H Control. Once the GUI popup, enter the camera login information, and then click "Connect".

Motion control
* Joystick Control (Optional)
* Click "Turn 90" to command robot to turn 90°
* Click "Forward 1M" to command robot to go forward by 1 meter
* Click "Patrol 1M x 1M" to command robot to patrol on 1 meter by 1 meter square

Camera display and multimedia control

Head motion control

IR, Ultrasonic, Human sensors reading

Voltage reading

Tilting, Temperature sensor reading and Infrared Controller reading (Optional)

Encoder reading

X80H

Multimedia
Save Image
PlayMusic
Start Listen
Talk to Robot
WheelSpeed

Motion Control
Forward 1M
Turn 90
Patrol 1M x 1M
Disable Joystick

Joystick
X: 5000
Y: 4960
MaxPower:
75%

Head Control
HeadPan:
HeadTilt:
Mouth:
EyePan:
EyeTilt:
Time: 1000   Disable
Reset
HeadMotionFile:
Go

Sensor Data

IR Sensor
#1: 0.81m   #5: 0.22m
#2: 0.81m   #6: 0.20m
#3: 0.81m   #7: 0.81m
#4: 0.44m   #8: 0.10m

Ultrasonic
#1: 2.55m   #4: 2.55m
#2: 0.84m   #5: 2.55m
#3: 2.55m   #6: 2.55m

Human Motion
Left: Right:
Alarm: 2032   Alarm: 2034
Motion: 2038   Motion: 2040

Voltage
Board Vol: 6.08V
Motor Vol: 6.17V

Temperature
3060

Tilting
X: 3054   Y: 3027

Infrared Controller
0   0   0   0

LCD Display
WiRobot™
The Heart of ROBOT
Voltage Display

Encoder
          Left   Right
Position: 508   32179
Speed: 0   0
Current: 0.01A   0.01A

Exit

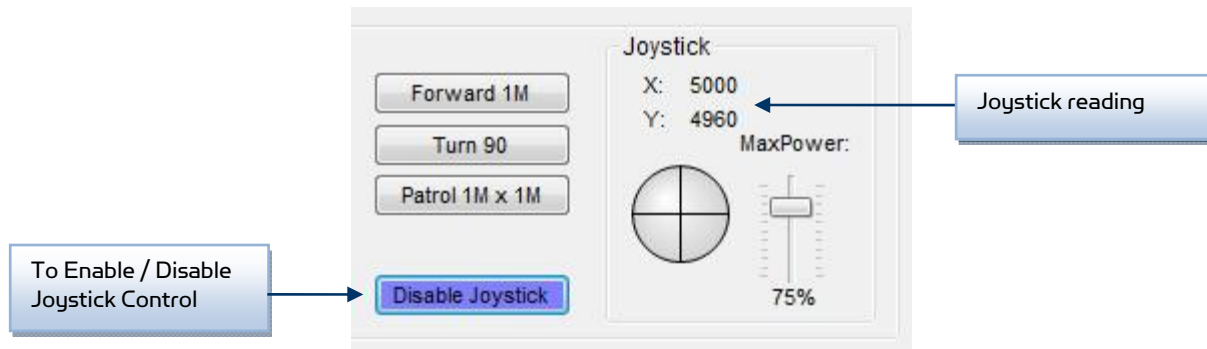Copyright © 2009 Dr. Robot, Inc. All right reserved.

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* Select 128x64 monochrome Bitmap file to display on LCD
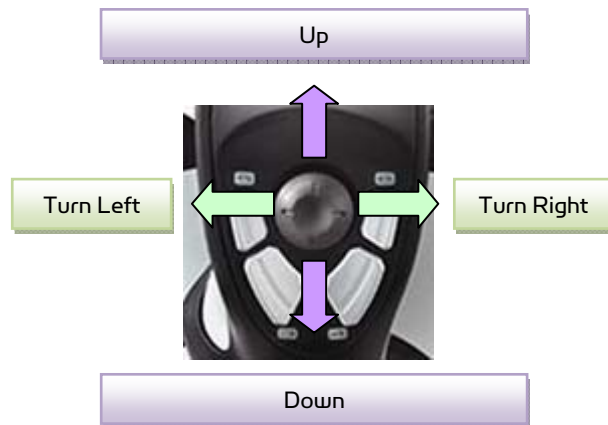* Click "LCD Display" to display the battery voltage reading on LCD

WiRobot X80H
Power :7.35V
Dr Robot Inc

Joystick Control (Optional)

Joystick

Forward 1M

Turn 90

Patrol 1M x 1M

Disable Joystick

X: 5000
Y: 4960

MaxPower:

75%

Joystick reading

To Enable / Disable Joystick Control

Controlling Head with Joystick

Up

Turn Left

Turn Right

Down

Driving with Joystick

Go Forward
More you push, faster the robot goes

Turn Left

Turn Right

Go Backward
More you push, faster the robot goes
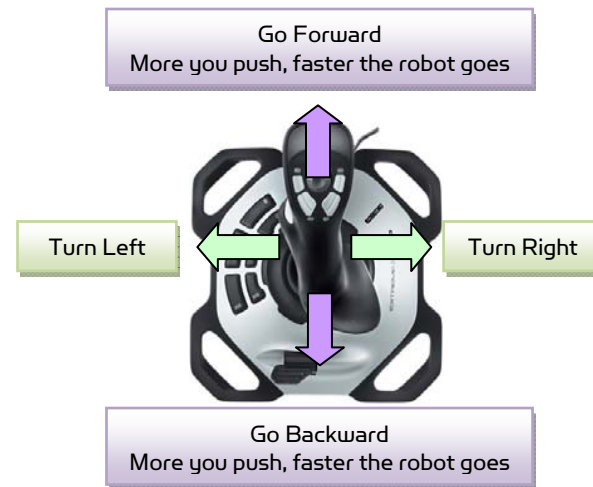
Recharging

To keep the battery at ideal condition, we recommend recharging the robot at least once every two weeks during storage (e.g. robot is not in use).

Open the Sample Source Code

Open "C:\Program Files\Dr Robot Inc\Dr Robot X80H\SourceCode" folder, run "X80H.csproj" to open project in Microsoft® Visual Studio 2008.

Further Development & Programming

The X80-H Control program is written with C# program with Visual Studio 2008 express under .Net 3.5 framework. You could download the development tools (Visual Studio 2008 express under .Net 3.5 framework) free from Microsoft. Please refer to the "Dr Robot Application Development Notes on C# Programming for Robot Control" for further information.

The control program uses the supporting components and libraries that should have been installed when you install the control programs from the installation CD:

1. **DRROBOTSentinelCONTROL.OCX:** Please refer to "WiRobot SDK API Reference Manual.pdf" for detail.

2. **WiRobotGatewayforWiFi.exe**

3. **DirectX®** SDK

4. **Microsoft® .Net 3.5 Framework**

For support on development using Microsoft Robotics Studio, development on operation system other than MS Windows, or obtaining raw communication protocol, please contact support@DrRobot.com.

Network Connection and Login Information

Network Settings

The included pre-configured wireless 802.11 b/g router has the following pre-set settings:

SSID	dri	Router LAN	192.168.0.200
WEP	128bits	Login ID	admin
KEY	112233445566778899AABBCCDD	Password	drrobot
Key Type	Open Key		

WiFi module connects to two serial devices through channel I and II (TCP/IP port 10001 and 10002 respectively). They are pre-configured as below:

Name	Robot WiFi Module	IP	192.168.0.207
Channel-I (10001)	115200, 8,N,1, flow control, UDP, Datagram 01, remote IP:0.0.0.0	Channel-II (10002)	115200, 8,N,1, flow control, UDP, Datagram 01, remote IP:0.0.0.0

Advanced Network Settings

It's possible to use different network settings (e.g. IP) for the server PC, but the "Virtual Server" settings on the router must also be changed accordingly in order for the Internet remote monitoring feature to work properly.

You could also change the router settings such as IP and SSID etc. If you need to do so, you are required to change the network settings on the WiFi modules on the robot by following the guidelines as illustrated on the WiFi Module manual.

Support Team Contact Information:

Email: support@drrobot.com
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