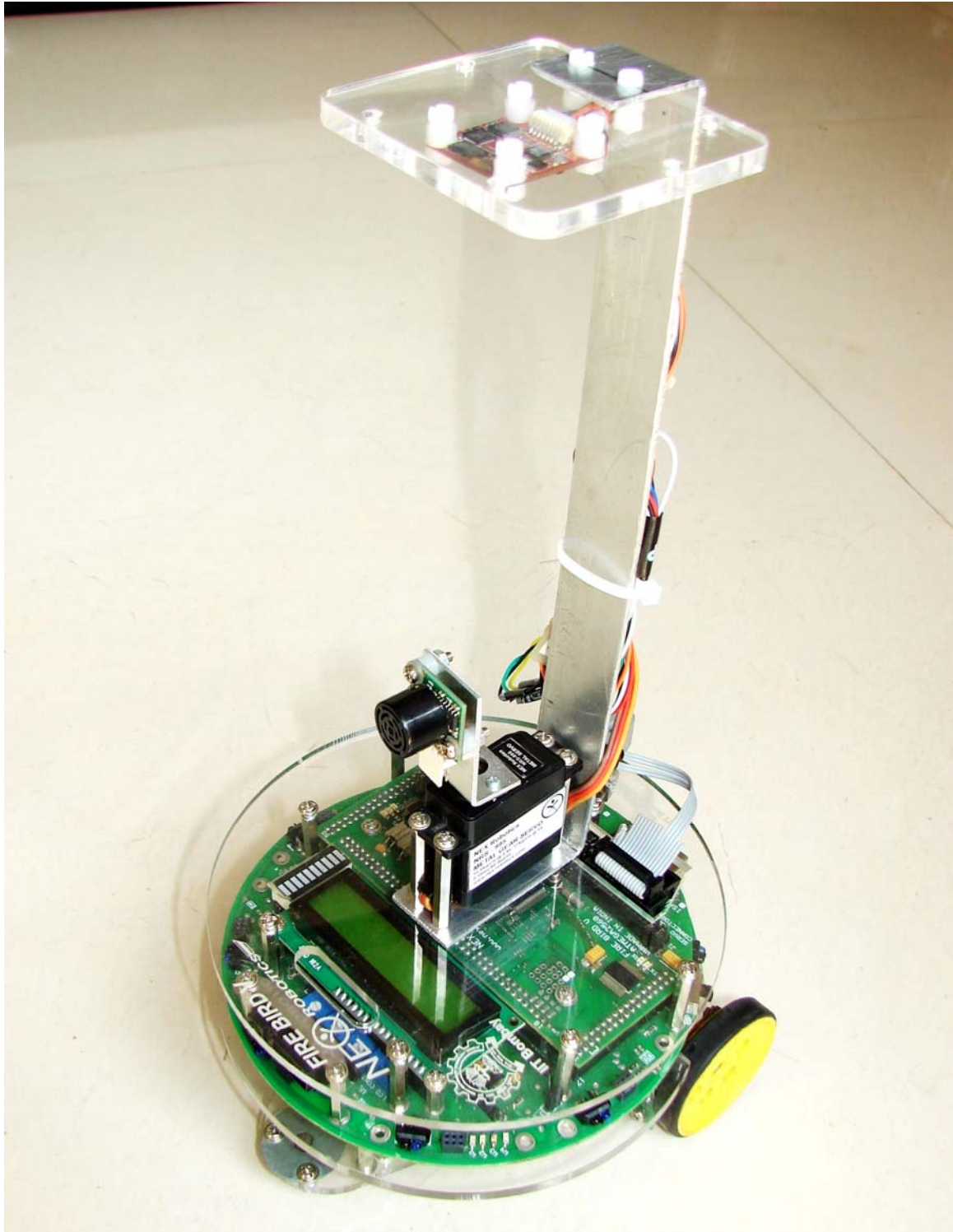# Orientation Tracking Using OS5000-S Digital Compass on Fire Bird V

Introduction:

The OS5000-S is a compact tilt compensated digital compass manufactured by Ocean Server. The compass is connected via a RS232 Serial connection. The OS5000-S provides precise heading, roll and pitch data ideal for rapid attitude measurement. It has 3-axis magnetometer, 3-axis Accelerometer along with the 50MHz 32bit processor for data processing and RS232 communication interface. It gives heading, pitch and roll angels in degrees. It gives out data in various data formats. For more information on the OS5000-S refer to its documentation.

In this application note we are using OS5000-S to track the orientation of the Fire Bird V robot.

Figure 1: OS5000-S Digital Compass from Ocean Server

OS5000-S has 7-pin JST connector for interfacing. Table 1 gives the pin connections.

Pin No.	OS5000-S Connector signals
1(White)	No connection
2	Ground
3	Vin supply. 3.3V - 5V
4	No connection
5	Ground used with RS232 signal
6	RS232 Transmit
7(Blue)	RS232 Receive

Table 1: OS5000-S Connector signals

Fire Bird V ATmega 2560 Robot:

Figure 2: Fire Bird V ATmega 2560 Robot from Nex Robotics

Experimental Setup:

Mounting of OS5000-S Digital Compass on Fire Bird V

OS5000-S should be mounted on the robot in such a way that it should have minimum exposure to the any magnetic materials. Figure 3 shows the mounting of the OS5000-S. Its mounted on the aluminium plate with plastic nuts-bolts. It is mounted on top of the robot at the height of 24cms approx, so that robot's motors, electronics will not interfere the magnetic signals in the sensing path of OS5000-S.
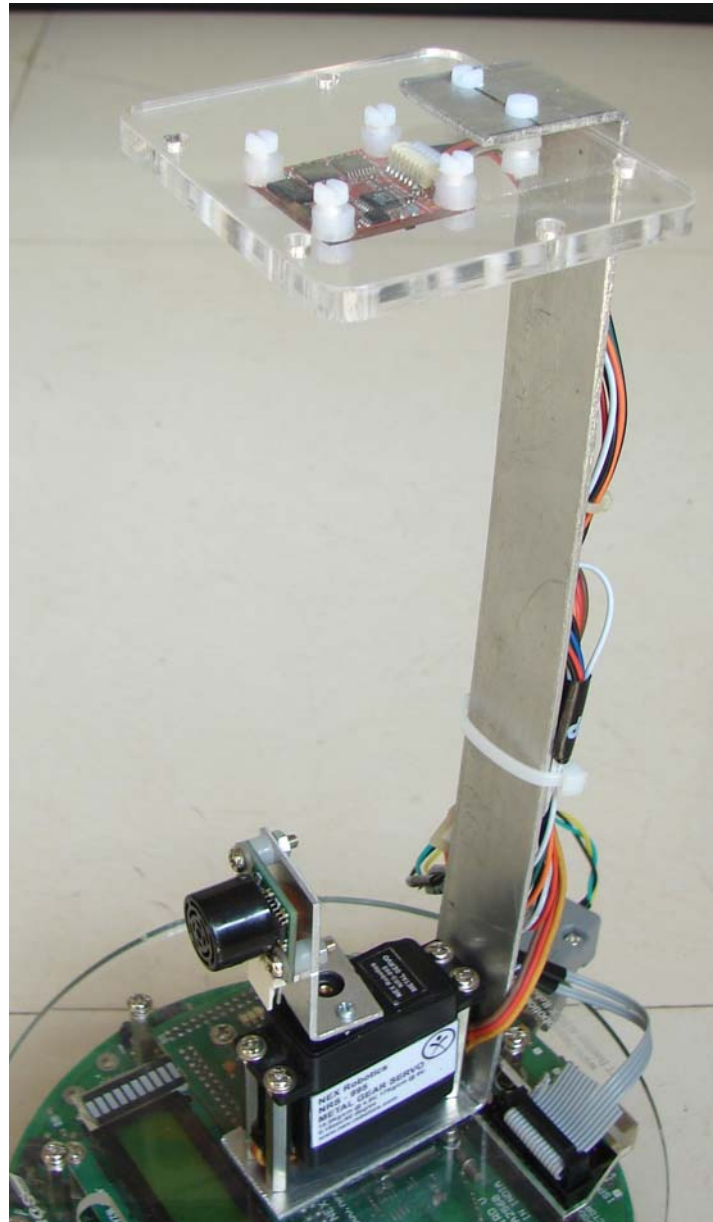

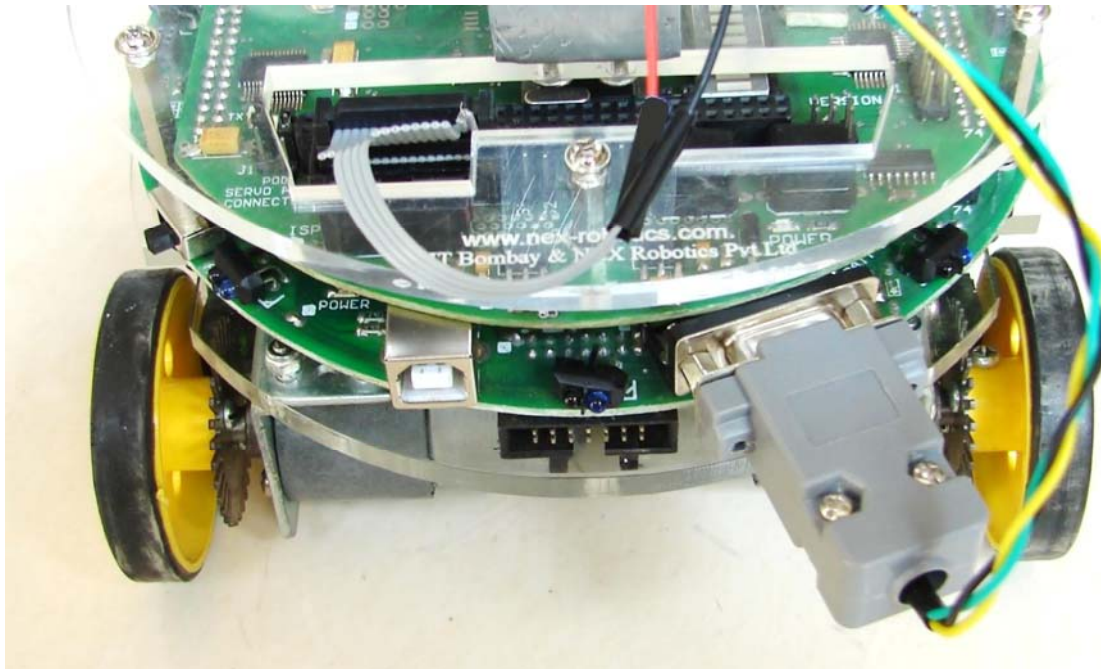**Figure 3: 'OS5000-S Digital Compass' mounted on mechanical assembly.**

Figure 4: connections for DB9 RS232 connector and servo pod 16 pin FRC connector on Fire Bird V ATmega2560 robot

Connections:

OS5000-S digital compass works on 3.3 to 5V. 5V supply is taken from the 16 pin FRC connector marked as servo pod connector. Pin no. 11, 12 gives ground and pin nos. 13, 14 gives 5V. RS232 UART of the OS5000-S is connected to the serial port connector of the robot.

OS5000-S connector	Fire Bird V ATmega2560 robot connections
1(White)	No Connection
2 (Vin)	Pin no.13, 14 of Servo pod 16 pin FRC Connectors (5V)
3(Ground)	Pin no.11, 12 of Servo pod 16 pin FRC Connectors (Gnd)
4	No Connection
5(RS-232 Ground)	Pin no.5 DB9-RS232 connector(Gnd)
6(RS-232 Transmit)	Pin no.3 DB9-RS232 connector(Rx-UART1)
7(RS-232 Receive)	Pin no.2 DB9-RS 232 connector(Tx-UART1)

Table2: ultrasonic connection

Firmware Description:

The firmware is written in AVRStudio Ver. 4.7 IDE. We have to load the "OS5000-S_Compass.hex" file on the ATmega2560 microcontroller. For more information on compiling program and loading hex file on the robot, refer to the Fire Bird V ATMEGA2560 Robot's software manual.

The ATmega2560 microcontroller has UARTs. The UART1 of the microcontroller is connected to the back side DB9 serial port via MAX232 TTL to RS232 converter. The NEMA sentence '$OPHR' messages are received from UART1 isr, **'SIGNAL (SIG_USART1_RECV)'**. The received sentence is 1st verified for correct sentence **'$OHPR'** and later stored in array buffer **'rx_string []'**. As we need the Declination angle (Azimuth Angle), which is at 6th & onwards position in the array buffer **'rx_string [],** till next comma **','**. Declination angle is read by calling the **'readazimuth_angle ()'** function. Finally Azimuth angle is displayed on LCD as shown in figure below.

Figure 5: Declination (Azimuth) Angle on LCD

References:

1. OS5000 Digital Compass Manual
2. Fire Bird V ATmega2560 Robot software manual
3. Fire Bird V ATmega2560 Robot hardware manual

Notice

The contents of this manual are subject to change without notice. All efforts have been made to ensure the accuracy of contents in this manual. However, should any errors be detected, NEX Robotics welcomes your corrections. You can send us your queries / suggestions at
info@nex-robotics.com

Content of this manual is released under the Creative Commence cc by-nc-sa license. For legal information refer to: http://creativecommons.org/licenses/by-nc-sa/3.0/legalcode

⚠ **Product's electronics is static sensitive. Use the product in static free environment.**
⚠ **Read the user manuals completely before start using this product**

Recycling:

Almost all the parts of this product are recyclable. Please send this product to the recycling plant after its operational life. By recycling we can contribute to cleaner and healthier environment for the future generations.