

freETarget - Interface Control Document

1. Executive Summary

This document describes the interface between the freETarget PC and Arduino.

1.1. Applicable Documents

Overview of JSON protocol: https://www.w3schools.com/js/js_json_objects.asp

2. Interface

The overall connection between the target Arduino and display computer is illustrated in Figure 2-1.

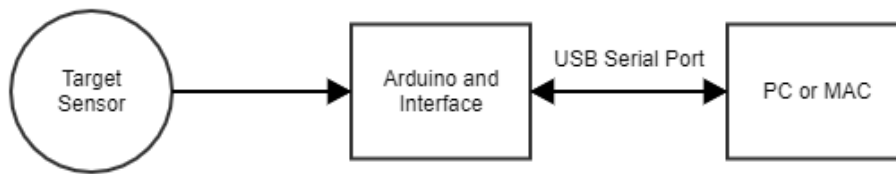


Figure 2-1: General Connection

The data is transferred between the Arduino and PC using a USB serial port. The baud rate shall be set to 115,200

All messages shall be transmitted as a JSON payload between the two computers. See the applicable documents section for an illustration

2.1. Arduino to PC

Target information, for example impact location is transmitted from the Arduino to the PC.

2.1.1. Shot Information

Shots are recorded as

```
{"shot": s, "x":xPosition, "y":yPosition, "r":radius, "a":angle, "N":north, "E":east, "S":south, "W": west, "V":reference_voltage, "T":temperature}
```

Where

shot - Current shot number 1 ...

xPosition - Location of the shot in mm from the centre of the target. Positive to the right

yPosition - Location of the shot in mm from the centre of the target. Positive up

radius - Distance in mm from centre of the target.

angle - Angle in degrees (0-360) from centre of the target. Counter Clockwise positive

north - Value read from North counter

east - Value read from East counter

south. - Value read from South counter

west - Value read from West counter

reference_voltage - Shot recognition trip point

temperature - Air temperature at time of shot

It is up to the display program in the PC to determine if the shot originates from a pistol or rifle, and hence the score associated with a given distance.

2.1.2 Bad Trigger Response

On occasion, one or two of the sensors will pick up the shot, but the remainder of the sensors will not. In this case, there is not enough information to compute a shot location. The Arduino will output a test message

{"timer": "Detected", "N":nTimer, "E":eTimer, "S":sTimer, "W":wTimer, "I":Software ID}

timer – Timer message showing which timers were triggered,

for example: "N—S—" Showing that the shot was detected on the North and South sensors

nTimer – Value read from North timer

eTimer – Value read from East timer

sTimer – Value read from South timer

wTimer – Value read from West timer

Software ID- Software revision number

2.2. PC to Arduino

The PC can send JSON messages to the Arduino for testing or configuration. Entering an unsupported command will result in the current command list being displayed

The messages are shown in Table 2.2-1

Table 2.2-1: PC to Arduino JSON commands

Command	Action	Use
{"DIP":value}	Set the DIP switch to a value and store in persistent storage.	Allows for remote configuration without the need to disassemble the target
{"ECHO":value}	Returns the value as a JSON string. Also returns the values of other settings in persistent storage	Used to verify the communications path, and display the current settings
{"PAPER":value}	Programs the witness paper motor driver in 100 ms increments	Sets the ON time of the witness paper motor drive when a hit has been identified
{"SENSOR": value}	Sets the distance between the sensor faces used in the impact calculations	Allows for the use of larger targets
{"TEST": value}	Starts a hardware self test	value = 0 Display installed tests
		value = 1 Digital I/O test.
		Value = 2 Counter test. Wait for external trigger from sensors

		Value = 3 Counter test Internally triggered
		Value = 4 Run the digital oscilloscope. Ends when five (5) serial characters are received
		Value = 5 Format the digital oscilloscope for display on the PC
		Value = 6 Advance the paper one position as programmed by {"PAPER":value}

2.3. Sensor Connector

The sensors are connected to the main board using a 12 pin IDC (0.100" spacing) connector. The pinning of the connector is illustrated in Figure 2-3. Each sensor, North, East, South, West is carried over a separate conductor, and the sensor module is responsible for managing the cable.

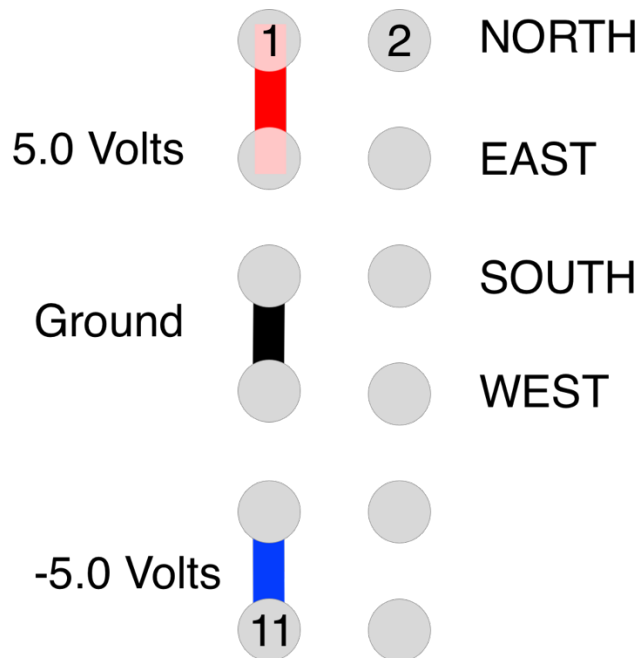


Figure 2-3: Sensor Connector

2.4. Sensor Location

The sensors are located around the edge of the target at a distance of 150mm from each other. The location of the sensors is shown in Figure 2-4.

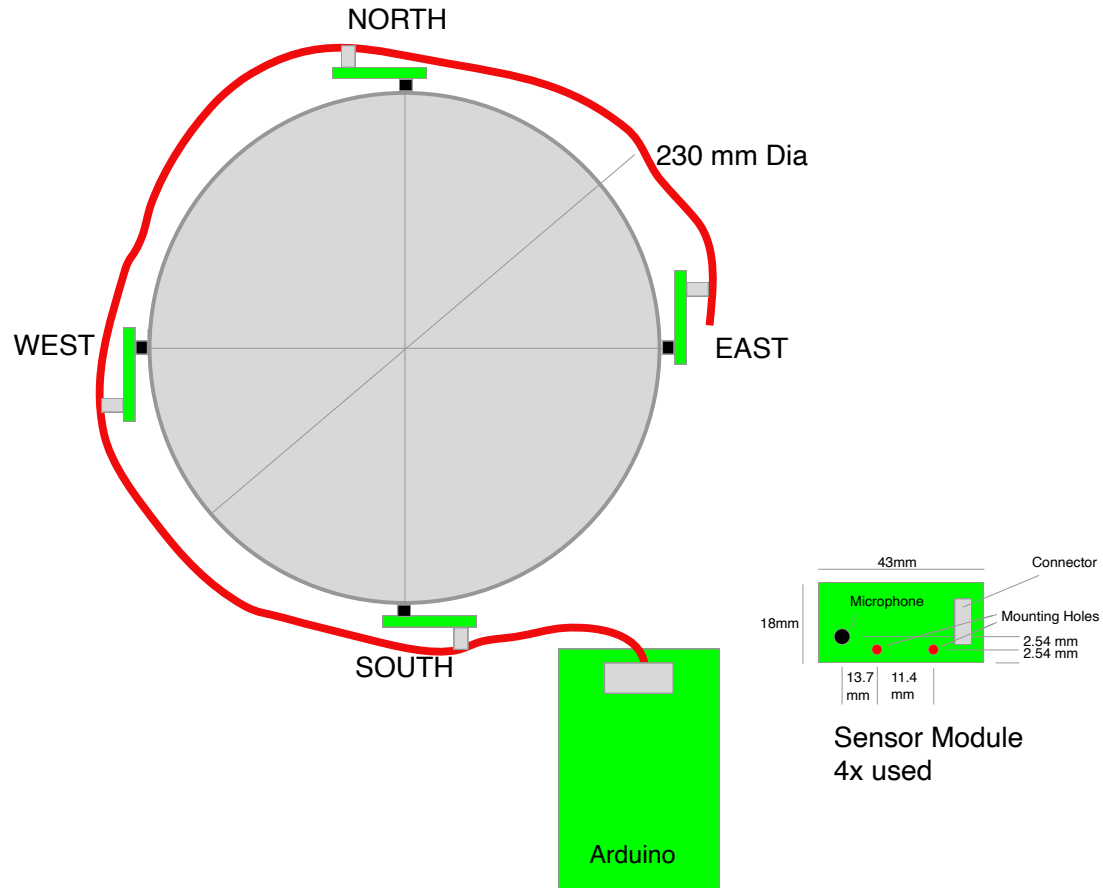


Figure 2-4: Sensor Mechanical Assembly

The critical dimensions to observe are:

- Edge-to-edge distance of the sensors (230 mm)
 - Errors in this dimension will shift the centre location
- Angular alignment of the sensors
 - Errors in this dimension will rotate the shot group.