

Hamster Manual

1. Hamster Technical Specification

	Spec	Detail
Size	35 x 35 x 30 mm	L x W x H
Weight	35 g	
Communication	Bluetooth 4.0 BLE	Supports Bluetooth 4.1 BLE
Required OS	Android 4.3 or above, iOS, OS X	Window OS requires USB dongle
Battery	Li-poly, 3.7 volt, 100mA PCM (Protection Circuit Module)	Operation: 1 hr, Stand by: 12 hr Recharging: 30 min
Display light	BLE connection (blue), recharging (red) left LED (RGB), right LED (RGB)	7 colors
Sampling rate	Sensors: max 50 Hz (20 msec) Actuators: max 50 Hz (20 msec)	10~50 Hz
Actuator	DC geared motor x 2	Planetary gear
Buzzer	1.00 ~ 165,000.00 Hz, monotone	Resolution: 0.01 Hz
Music notes	88 key, A3 ~ A7, 12 equal temperament	precision: +/-0.1 cent
IR Proximity	2 sensors (left/right), max distance 30 cm	50 Hz
Light detection	Front facing, 0~65,000 Lux	10 Hz
Line tracing	2 sensors (left/right)	50 Hz
Accelerometer	3 Axes (x, y, z)	Resolution setting: 2, 4, 8, 16G
Temperature	-40.0 ~ +87.5 deg (Celsius)	Resolution: 0.5 deg (Celsius)
External input*	2 ports: Analog, Digital	0 ~ 3.3 volt
External output*	2 ports: Analog, Digital, Servo, PWM	PWM 255 stages, 0~180 deg
Recharging	Micro-USB	Smart phone cable (5 pin)
BLE host/client	Connects up to 3 other BLE devices	Slower communication speed
Other	Battery voltage, Signal strength	
Power	Slider switch	Power on/off

- External I/O: Each port can use either input mode or output mode at a time. Note that it is possible to change I/O mode during operation.

2. Hamster advertising packet definition

Scanning: Advertising packet broadcasted by Hamster

```
[-] Hamster (0xFC11FF7E6ADD) (-62dBm)
  ... RSSI: -62dBm
  ... Address: FC11FF7E6ADD
  ... Address Type: Random
  ... Advertising Type: Connectable
  ... Bonded: False
  [-] Advertising Data
    ... CompleteLocalName: Hamster
    ... Appearance: 0x0402
    ... Flags: GeneralDiscoverable, BrEdrNotSupported
    ... ServicesCompleteListUuid16: 0xF138
  ... Scan Response Data
```

2.1 Product Name

Complete Local Name: Hamster

2.2 Bluetooth Address: 0xFC11FF7E6ADD is the unique product address

- Address Type: Random

2.3 Advertising Type: Connectable, Bonded: False

- connectible device, no pairing

2.4 Appearance:

- 16 bit ID number: used to differentiate products: Hamster: 0x0403 (PID+DID)

- First byte: Product ID(0x04) - product model

(if model numbers are the same, the control data are the same)

- Second byte: Device ID(0x03) - product version

(number for checking the product type without actual connection)

2.5 Flags:

- General Discoverable: broadcasting Advertising signal continuously until connecting to the host (smart devices/computer)

- BrEdrNotSupported: supports on Bluetooth 4.0 BLE

No registration or pairing required: can connect to any host without pairing process.

2.6 ServiceCompleteListUuid:

- 16 bit UUID: 0xF138.

- Among the devices satisfying conditions 2.1~2.5 above, connect the one with service ID 0xF138.

3. Hamster's BLE Primary Services Definition

3.1 Generic Access Service (0x1800)

- service defined in Bluetooth BLE

- Min/Max Connection Interval: 20 msec

3.2 Generic Attribute Service (0x1801)

- service defined in Bluetooth BLE

3.3 Custom Defined Service "Sensors"

UUID: 0x00009001-9C80-11E3-A5E2-0800200C9A66 communication with host


```

PrimaryService, Value: 00-18, Generic Access (0x1800)
├── CharacteristicDeclaration, Value: 0A-03-00-00-2A, Properties: Read, Write, Characteristic UUID: 0x2A00
│   ├── DeviceName, Value: 48-61-8D-73-74-65-72, DeviceName: Hamster
│   ├── CharacteristicDeclaration, Value: 02-05-00-01-2A, Properties: Read, Characteristic UUID: 0x2A01
│   │   ├── Appearance, Value: 02-04, Appearance: 0x0402
│   │   └── CharacteristicDeclaration, Value: 02-07-00-04-2A, Properties: Read, Characteristic UUID: 0x2A04
│   └── SlavePreferredConnectionParameters, Value: 10-00-10-00-00-32-00, MinConnInterval: 0x0010, MaxConnInterval: 0x0010, SlaveLatency: 0x0000, SupervisionTimeoutMultiplier: 0x0032
├── PrimaryService, Value: 01-18, Generic Attribute (0x1801)
│   ├── PrimaryService, Value: 0A-18, Device Information (0x180A)
│   │   ├── CharacteristicDeclaration, Value: 02-0B-00-23-2A, Properties: Read, Characteristic UUID: 0x2A29
│   │   ├── Manufacturer Name String, Value: 52-6F-62-6F-6D-61-74-69-6F-6E
│   │   └── CharacteristicDeclaration, Value: 02-00-00-26-2A, Properties: Read, Characteristic UUID: 0x2A26
│   │       └── Firmware Revision String, Value: 31-2E-32
│   ├── PrimaryService, Value: 66-9A-0C-20-00-08-E2-A5-E3-11-80-9C-01-90-00-00, 0x00009001-9C80-11E3-A5E2-0800200C9A66
│   │   ├── CharacteristicDeclaration, Value: 14-10-00-66-9A-0C-20-00-08-E2-A5-E3-11-80-9C-0A-90-00-00, Properties: WriteWithoutResponse, Notify, Characteristic UUID: 0x0000900A-9C80-11E3-A5E2-0800200C9A66
│   │   │   ├── UUID: 0000900A-9C80-11E3-A5E2-0800200C9A66, Value: 00-00-10-00-1B-00-65-14-42-BF-12-BF-C7-7F-00-00-3C-F9-F8-00
│   │   │   ├── CharacteristicUserDescription, Value: 53-65-6E-73-6F-72-73, UserDescription: Sensors
│   │   │   └── ClientCharacteristicConfiguration, Value: 00-00, CharacteristicConfigurationBits: None (0x0000)
│   │   ├── PrimaryService, Value: 66-9A-0C-20-00-08-E2-A5-E3-11-80-9C-00-A0-00-00, 0x0000A000-9C80-11E3-A5E2-0800200C9A66
│   │   │   ├── CharacteristicDeclaration, Value: 04-15-00-66-9A-0C-20-00-08-E2-A5-E3-11-80-9C-06-A0-00-00, Properties: WriteWithoutResponse, Characteristic UUID: 0x0000A006-9C80-11E3-A5E2-0800200C9A66
│   │   │   │   ├── UUID: 0000A006-9C80-11E3-A5E2-0800200C9A66, Value: 00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00
│   │   │   │   ├── CharacteristicUserDescription, Value: 45-66-66-66-65-63-74-6F-72-73, UserDescription: Effectors
│   │   │   │   └── PrimaryService, Value: 23-01-BC-EA-5F-78-23-15-DE-EF-12-12-30-15-00-00, DFU (0x00001530-1212-EFDE-1523-785FEABCD123)
│   │   │   │       ├── CharacteristicDeclaration, Value: 04-19-00-23-01-BC-EA-5F-78-23-15-DE-EF-12-12-32-15-00-00, Properties: WriteWithoutResponse, Characteristic UUID: 0x00001532-1212-EFDE-1523-785FEABCD123
│   │   │   │       │   ├── DFU Packet (No values read)
│   │   │   │       │   ├── CharacteristicDeclaration, Value: 18-1B-00-23-01-BC-EA-5F-78-23-15-DE-EF-12-12-31-15-00-00, Properties: Write, Notify, Characteristic UUID: 0x00001531-1212-EFDE-1523-785FEABCD123
│   │   │   │       │   ├── DFU Control Point (No values read)
│   │   │   │       │   └── ClientCharacteristicConfiguration, Value: 00-00, CharacteristicConfigurationBits: None (0x0000)
│   │   │   │       └── CharacteristicDeclaration, Value: 02-1E-00-23-01-BC-EA-5F-78-23-15-DE-EF-12-12-34-15-00-00, Properties: Read, Characteristic UUID: 0x00001534-1212-EFDE-1523-785FEABCD123
│   │   │   │           ├── UUID: 00001534-1212-EFDE-1523-785FEABCD123, Value: 01-00

```

Sensors service: packet format definition (20 bytes)

	Details	Value from Robot	User converted value	Etc
0	Version / Topology	0 ~ 255	0 ~ 255	Ref.1
1	Network ID	0 ~ 255	0 ~ 255	Ref.2
2	Command / Security	0 ~ 255	0 ~ 255	Ref.3
3	Signal Strength	-128 ~ 0	-128 ~ 0 dBm	Ref.4
4	Left Proximity	0 ~ 255	0 ~ 255	Ref.5
5	Right Proximity	0 ~ 255	0 ~ 255	
6	Left Floor	0 ~ 255	0 ~ 255	Ref.6
7	Right Floor	0 ~ 255	0 ~ 255	
8	Acc X High	-32768 ~ 32767	-32768 ~ 32767	Ref.7
9	Acc X Low			
10	Acc Y High			
11	Acc Y Low			
12	Acc Z High	-32768 ~ 32767	-32768 ~ 32767	
13	Acc Z Low			
14	Flag			Ref.8
15	Light High or Temperature	0 ~ 65535 -128 ~ 127	0 ~ 65535 Lux -40 ~ 88 °C	Ref.9 Ref.10
16	Light Low or Battery	0 ~ 255	0 ~ 100 %	Ref.11
17	Input A	0~255	0 ~ 255 (0 ~ 3.3 V)	Ref.12
18	Input B			
19	Line Tracer State	0 ~ 255	0 ~ 255	Ref.13

Effectors service: packet format definition (20 bytes)

	Data	Value to Robot	User input value	Etc
0	Version / Topology	0 ~ 255	0 ~ 255	Ref.1
1	Network ID	0 ~ 255	0 ~ 255	Ref.2
2	Command / Security	0 ~ 255	0 ~ 255	Ref.3
3	Left Wheel	-100 ~ +100 (+fwd, -bwd)	-100 ~ 100 %	
4	Right Wheel			
5	Left LED	0 (off) ~ 7	0 (off) ~ 7	Ref.4
6	Right LED			
7	Buzzer High	0(off) 1 ~ 16777215	0(off) 1.00 Hz ~ 167.77215 KHz,	Ref.5
8	Buzzer Middle			
9	Buzzer Low			
10	Musical Note	0(off) ~ 88 (piano key)	0 (off) ~ 88	Ref.6
11	Line Tracer Mode/Speed	0x11 ~ 0x6A 0x0?(off)	0x11 ~ 0x6A 0x0?(off)	Ref.7
12	Proximity IR Current	0 ~ 7 (default 2)	0 ~ 7 (default 2)	Ref.8
13	G-Range, Bandwidth	0 ~ 3 (default 0), 0 ~ 8 (default 3)	0 ~ 3 (default 0), 0 ~ 8 (default 3)	Ref.9
14	IO Mode(A, B)	0 ~ 127	0 ~ 127	Ref.10
15	Output A	0 ~ 255	0 ~ 255	
16	Output B			
17	Wheel Balance	-128 ~ 127	-128 ~ 127	Ref.11
18	Input Pull	0~16		Ref.12
19	not assigned			

