FSR

H/W Specifications

- Voltage : 9V~12V
- Running Temperature : -5℃ ~ +80℃
- Command Signal : Digital Packet
- Protocol Type : Half duplex Asynchronous Serial Communication (8bit,1stop,No Parity)
- Link (Physical) : TTL Level Multi Drop (daisy chain type Connector)
- ID : 254 ID (0~253)
- Communication Speed : 7843bps ~ 3 Mbps
- Feedback : Position, Temperature, Load, Input Voltage, etc.
- Standby current : 50 mA.

Control Table

Control Table consists of data regarding the current status and operation of Dynamixel. The user can control Dynamixel by changing data of Control Table via Instruction packet.

EEPROM and RAM

Data in RAM area is reset to initial values whenever the power is turned on while data in EEPROM area is kept once values are set even if the power is turned off.

Address

Represents the location of data. To read from or write data to the control table the user should assign the correct address in the Instruction packet.

Access

Dynamixel has two kinds of data: Read-only data, used mainly for sensing, and read-and-write data used for driving.

Initial Value

In case of data in the EEPROM Area, the initial values on the right side of the below Control Table are the factory default settings.

In case of data in the RAM Area, the initial values on the right side of the following control table are the ones when the power is turned on.

Highest/Lowest Byte

Area	Address	Name	Description	Access	Init Value
EEPROM	0 (0X00)	Model Number(L)	Lowest byte of model number	R	84 (0X54)
	1 (0X01)	Model Number(H)	Highest byte of model number	R	1 (0X01)
	2 (0X02)	Version of Firmware	Information on the version of firmware	R	-
	3 (0X03)	ID	ID of Dynamixel	RW	100 (0X64)
	4 (0X04)	Baud Rate	Baud Rate of Dynamixel	RW	34 (0X22)
	5 (0X05)	Return Delay Time	Return Delay Time	RW	250 (0XFA)
	16 (0X10)	Status Return Level	Status Return Level	RW	2 (0X02)
RAM	25 (0X19)	LED	LED On/Off	RW	0 (0X00)
	26 (0X1A)	FSR1_L	Lowest byte of FSR 1 sensor data	R	-
	27 (0X1B)	FSR1_H	Highest byte of FSR 1 sensor data	R	-
	28 (0X1C)	FSR2_L	Lowest byte of FSR 2 sensor data	R	-
	29 (0X1D)	FSR2_H	Highest byte of FSR 2 sensor data	R	-

	30 (0X1E)	FSR3_L	Lowest byte of FSR 3 sensor data	R	-
	31 (0X1F)	FSR3_H	Highest byte of FSR 3 sensor data	R	-
	32 (0X20)	FSR4_L	Lowest byte of FSR 4 sensor data	R	-
	33 (0X21)	FSR4_H	Highest byte of FSR 4 sensor data	R	-
	34 (0X22)	FSR_Central_X	Center point of the X-axis force	R	-
	35 (0X23)	FSR_Central_Y	Center point of the Y-axis force	R	-
	42 (0X2A)	Present Voltage	Current Voltage	R	-
	44 (0X2C)	Registered	Means if Instruction is registered	R	0 (0X00)
	47 (0X2F)	Lock	Locking EEPROM	RW	0 (0X00)

In the Control table, some data share the same name, but they are attached with (L) or (H) at the end of each name to distinguish the address. This data requires 16-bit, but it is divided into 8bit each for the addresses (low) and (high). These two addresses should be written with one Instruction Packet simutaneously.

Address Function Help

EEPROM Area

Model Number

Represents the Model Number.

Firmware Version

Represents the firmware version.

ID

Is a unique number to identify Dynamixel.

Values range from 0 (0x00) to 253 (0xFD), Value 254 (0xFE) is used as the Broadcast ID.

If the Broadcast ID is used to transmit Instruction Packet, then it can command to all Dynamixels.

when it's searched as Unknown Device, change the baudrate to 1(1000000).

Connect with DARWIN-OP after setting the ID as 111 for the right foot and 112 for the left.

> Please be careful not to duplicate the ID of connected Dynamixels.

Baud Rate

Represents the communication speed. 0 (0x00) to 254 (0xFE) can be used for it.

This speed is calculated by using the below formula.

Speed(BPS) = 2000000/(Data+1)

Data	Set BPS	Target BPS	Tolerance
1	1000000.0	1000000.0	0.000 %
3	500000.0	500000.0	0.000 %
4	400000.0	400000.0	0.000 %
7	250000.0	250000.0	0.000 %
9	200000.0	200000.0	0.000 %
16	117647.1	115200.0	-2.124 %
34	57142.9	57600.0	0.794 %
103	19230.8	19200.0	-0.160 %
207	9615.4	9600.0	-0.160 %

> Note : Maximum Baud Rate error of 3% is within the tolerance of UART communication.

Return Delay Time

Is the delay time per data value that takes from the transmission of Instruction packet until the return of Status packet.

0 (0x00) to 254 (0xFE) can be used. The delay time per data value is 2 microseconds (usec).

If the data value is delayed by 10, 20 usec the initial value is 250 (0xFA) (i.e., 0.5 msec).

Status Return Level

Decides how to return Status packet. There are three possibilities:

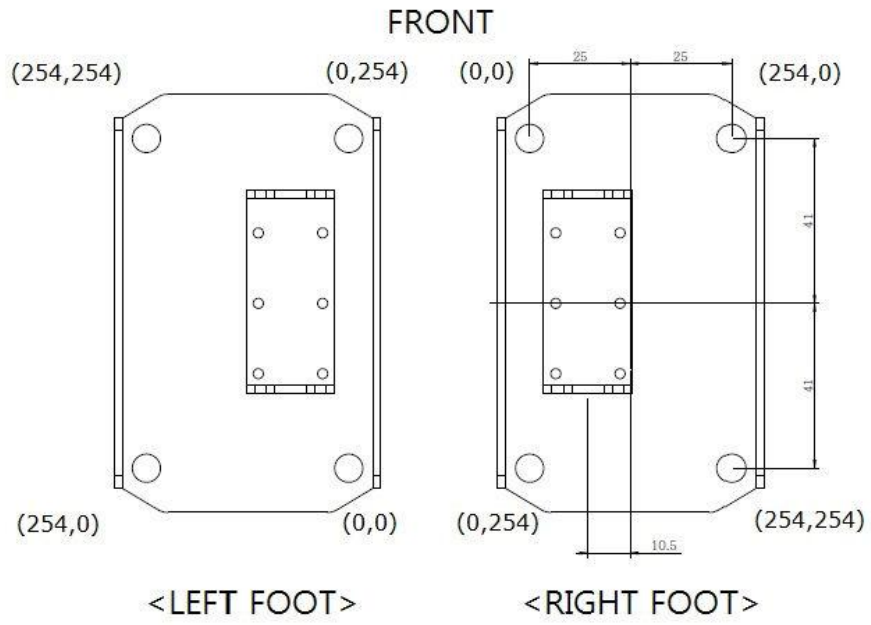
Value	Return of Status Packet
0	No return against all commands (Except PING Command)
1	Return only for the READ command
2	Return for all commands

When Instruction packet is Broadcast ID, Status packet is not returned regardless of Status return level.

RAM Area

LED

Value	Meaning
0	Turns LED off.
1	Turns LED on.



< Diagram 1 >

FSR1,FSR2,FSR3,FSR4

FSR sensor data

<Diagram 1> shows the location of each sensor.

Value range is 0 ~ 65535. Each value has 1/1000 N units.

For example, FSR1 has a load of 9.8N(1kgf); the value of FSR1 is 9800.

The smallest measurement load is 0.493N.

The measurement range is 0.493 N ~ 65.535N.

FSR_Central_X, FSR_Central_Y

DARWIN-OP's load is at the center of the foot.

Value range is 0 ~ 254.

When no load is present values will read 255.

<Diagram 1> shows of the center point of each foot.

Present Voltage

Current input voltage.

This value is 10 times larger than the actual voltage. For example, when 10V is supplied the data value is 100 (0x64).

Registered Instruction

Value	Meaning
0	There are no commands transmitted by REG_WRITE
1	There are commands transmitted by REG_WRITE.

Notes: If ACTION command is executed, the value is changed into 0.

Lock

Value	Meaning
0	EEPROM area can be modified.
1	EEPROM area cannot be modified.

Caution: If Lock is set to 1, the power must be turned off and then turned on again to change into 0.