

# **FEX11TB**

## **2.4GHz band module**

### **Instruction Manual**



**Futaba®**

## FCC Warning

### CAUTION:

To assure continued FCC compliance:

1. Any changes or modifications not expressly approved by the grantee of this device could void the user's authority to operate the equipment.
2. This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.
  - i. When used in stationary receivers,  
This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.
  - ii. When used in remote control devices,  
This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

### FCC Label Compliance Statement:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

This radio transmitter has been approved by the Federal Communications Commission (FCC) to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

| No. | Parts Code | Model                 | Manufacturer    | Type                        | Max. Gain |
|-----|------------|-----------------------|-----------------|-----------------------------|-----------|
| 1   | 9M99Z15001 | STDANTEMD-013-0093A3P | Sansei          | $1/2 \lambda$ dipole type   | +1.9dBi   |
| 2   | 9M99Z14601 | MEIHX-2120RSXW-2004   | MAP Electronics | $1/4 \lambda$ monopole type | +3.7dBi   |

## FCC INTEGRATION INSTRUCTIONS

| No. | Item                                                          | Details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----|---------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | List of applicable FCC rules                                  | FCC Part15.247<br>(2400-2483.5MHz, Frequency hopping systems)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 2   | Summarize the specific operational use conditions             | Only the antennas listed in the table on the previous page may be used.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 3   | Limited module procedures                                     | Not applicable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 4   | Trace antenna designs                                         | Not applicable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 5   | RF exposure considerations                                    | <ul style="list-style-type: none"> <li>• This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. <ul style="list-style-type: none"> <li>i. When used in stationary receivers,<br/>This equipment should be installed and operated with minimum distance 20cm between the radiator &amp; your body.</li> <li>ii. When used in remote control devices,<br/>This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.</li> </ul> </li> <li>• Please include the above statement in the end user product manual.</li> </ul> |
| 6   | Antennas                                                      | Only the antennas listed in the table on the previous page may be used.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 7   | Label and compliance information                              | The final end product must be labeled in a visible area with the following: “Contains FCC ID: AZP-FEX11T”. The grantee’s FCC ID can be used only when all FCC compliance requirements are met.                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 8   | Information on test modes and additional testing requirements | <p>Since documents related to test modes and test procedures contain our confidential information, please contact us at the address below.</p> <p style="text-align: center;">FUTABA Corporation of America<br/>Customer Service Desk<br/>service@futabaUSA.com</p>                                                                                                                                                                                                                                                                                                                                                    |
| 9   | Additional testing, Part 15 Subpart B disclaimer              | The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 10  | Note EMI Considerations                                       | Note that a host manufacture is recommended RF design engineering testing and evaluation in case non-linear interactions generate additional non-compliant limits due to module placement to host components or properties.                                                                                                                                                                                                                                                                                                                                                                                            |
| 11  | How to make changes                                           | <p>If a permissive change, such as the addition of an antenna, is required, please contact us at the address below.</p> <p style="text-align: center;">FUTABA Corporation of America<br/>Customer Service Desk<br/>service@futabaUSA.com</p> <p>Please note that we may not be able to accommodate your request depending on the nature of the inquiry.</p>                                                                                                                                                                                                                                                            |

## ISED Warning

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

- (1) This device may not cause interference.
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment.

- i. When used in stationary receivers,  
This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.
- ii. When used in remote control devices,  
This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

French:

Cet appareil radio est conforme au CNR-210 d'Industrie Canada. L'utilisation de ce dispositif est autorisée seulement aux deux conditions suivantes : (1) il ne doit pas produire de brouillage, et (2) l'utilisateur du dispositif doit être prêt à accepter tout brouillage radioélectrique reçu, même si ce brouillage est susceptible de compromettre le fonctionnement du dispositif.

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé.

- i. Lorsqu'il est utilisé dans des récepteurs fixes,  
Cet équipement doit être installé et utilisé avec une distance minimale de 20 cm entre la source de rayonnement et votre corps.
- ii. Lorsqu'il est utilisé dans des dispositifs de télécommande,  
Ce transmetteur ne doit pas être installé ou utilisé en association avec une autre antenne ou un autre transmetteur.

This radio transmitter [IC:2914D-FEX11T] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

| No. | Parts Code | Model                 | Manufacturer    | Type                        | Max. Gain |
|-----|------------|-----------------------|-----------------|-----------------------------|-----------|
| 1   | 9M99Z15001 | STDANTEMD-013-0093A3P | Sansei          | 1/2 $\lambda$ dipole type   | +1.9dBi   |
| 2   | 9M99Z14601 | MEIHX-2120RSXW-2004   | MAP Electronics | 1/4 $\lambda$ monopole type | +3.7dBi   |

The final end product must be labeled in a visible area with the following: "contains IC: 2914D-FEX11T". The grantee's IC ID can be used only when all ISED compliance requirements are met.

## FCC Notice

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Any unauthorized changes or modifications to this device not expressly approved by Futaba Corporation could void the user's authority to operate the device and possibly result in damage to the equipment and/or cause serious or fatal injuries to the operator or nearby personnel.

This device is intended to be installed and used in accordance with the instructions contained in this manual. Failure to comply with these instructions could void the user's authority to operate the device and possibly result in damage to the equipment and/or cause serious or fatal injuries to the operator or nearby personnel.

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## 1 Overview

- (1) 2.4 GHz band FH (frequency hopping) type wireless module.
- (2) This module has adopted a communication protocol that is intended to be used as a wireless controller.
- (3) Using the UART, it is set by the command input, and performs input and output operational data.



Table 1 : FEX11TB Appearance photo

## 2 General Specification

### 2.1 High-frequency portion

|                            |                                                                                                   |
|----------------------------|---------------------------------------------------------------------------------------------------|
| • Technical standards      | : ARIB STD-T66 (Japan)<br>FCC Part15.247 (U. S. A.)<br>ISED RS-210 (Canada)                       |
| • Output power             | : $19.0 \pm 2\text{dBm}$                                                                          |
| • Communication method     | : Spread spectrum FH system                                                                       |
| • Spread bandwidth         | : 60MHz                                                                                           |
| • Radio frequency band     | : 2407.5MHz~2467.5MHz                                                                             |
| • Frequency control        | : frequency hopping (31 patterns, 31 waves)                                                       |
| • Data modulation rate     | : 128.143kbps                                                                                     |
| • Coverage area            | : outdoors 365m<br>(according to an external antenna, sight distance, and our measurement method) |
| • Antenna terminal         | : U.FL connector                                                                                  |
| • Antenna                  | : diversity (Tx/Rx)                                                                               |
| • Error detection function | : CRC-CCITT (16bits)                                                                              |

### 2.2 External interface

|                          |                                                                                           |
|--------------------------|-------------------------------------------------------------------------------------------|
| • Physical interface     | : JAM SYB10-15WH (15pin)<br>Mating connector 51146-1400                                   |
| • Interface              | : RS-232C (DCE-mode)<br>input 3.3V CMOS-level (with hysteresis)<br>output 3.3V CMOS-level |
| • Communication method   | : full duplex                                                                             |
| • Synchronization method | : start-stop synchronization method                                                       |

- Baud rate : 9600/19200bps
- Flow control : none
- Data length : 7 bit/8 bit
- Stop bit : 1 bit/2 bit
- Parity : even/odd/none

## 2.3 Power supply

- Source voltage : DC 3.8V~8.5V
- Consumption current : transmission 300mA or less  
reception 35mA or less  
average at communication 50 mA or less

## 2.4 Environmental specifications

- Temperature conditions : Operating temperature limits  
ambient temperature ; -20 to +70°C  
Storage temperature range  
ambient temperature ; -30 to +70°C
- Operating humidity limits : 90%RH or less (no condensing)
- Storage humidity range : 90%RH or less (no condensing)
- Anti-vibration : 50m/s<sup>2</sup> (JIS-C-60068-2-6)
- Anti-shock : 500m/s<sup>2</sup> (JIS-C-60068-2-27)

## 2.5 Others

- External dimensions : 63(W) × 35(D) × 3(H) mm
- Weight : about 14g

**2.6** External TerminalTable 1 : Terminal function

| No. | Terminal name | I/O | Function                      | Internal terminal processing |
|-----|---------------|-----|-------------------------------|------------------------------|
| 1   | NC            | —   |                               |                              |
| 2   | RxD           | OUT | UART RxD<br>(Response Output) |                              |
| 3   | TxD           | IN  | UART TxD<br>(Command Input)   |                              |
| 4   | NC            | —   |                               |                              |
| 5   | GND           | —   | signal ground                 |                              |
| 6   | CLK           | IN  | reserved                      | Pull-down                    |
| 7   | STE           | IN  | reserved                      | Pull-down                    |
| 8   | SDA           | IN  | reserved                      | Pull-down                    |
| 9   | SCL           | IN  | Reserved                      | Pull-down                    |
| 10  | VCC           | —   | Power DC 3.8~8.5 V            |                              |
| 11  | RST           | IN  | CPU reset                     |                              |
| 12  | 3.3V          | OUT | Test                          |                              |
| 13  | Reserved      | OUT | Reserved                      | Low                          |
| 14  | TEST          | IN  | Test                          |                              |
| 15  | None          | —   | —                             |                              |

## 2.7 Reset terminal

Resetting with the Reset terminal provides the pulse below.

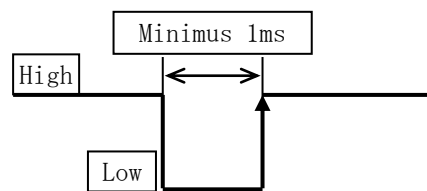


Figure 2 : Reset pulse

## 2.8 Initialization time

- (1) The initialization time (after power up until accept command) is 90ms or less.
- (2) The initialization time by the RST command input is 1200ms.

## 2.9 Appearance

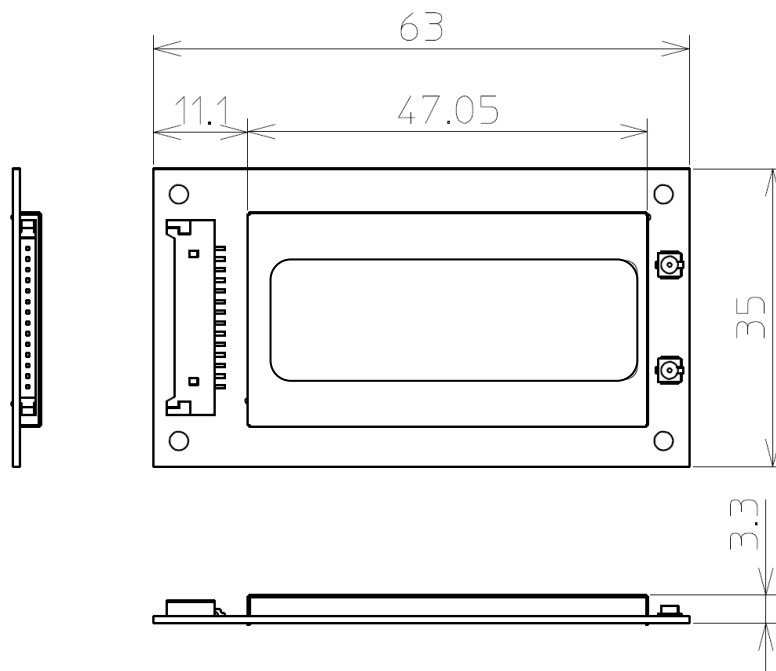


Figure 3 : FEX11TB External view

### 3 Communication Method

#### 3.1 Frequency hopping

This wireless module employs an FH system as a diffusion method. In the FH system, diffusion signals with a wide bandwidth are produced by hopping the frequency according to a certain pattern. The pattern is called a frequency hopping pattern. This device has 31 types of frequency hopping patterns. The same hopping pattern is set for the wireless machines that are intended to mutually communicate.

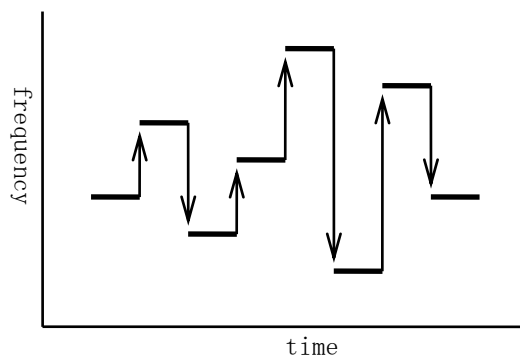


figure 4 : frequency hopping

Even when the hopping pattern is the same, mutual communication is impossible when a wireless module randomly hops the frequency. Therefore, in the frequency hopping system, one of the wireless machines works as a standard, while other wireless machines synchronize the frequency and hopping timing of each machine by receiving packets from the standard machine. This is called synchronization.

#### 3.2 Synchronization

The slave switches frequency while waiting for a wireless packet from the master. When a wireless packet is received, it switches to the next frequency and waits for a wireless packet again. When received, it is judged that the synchronization with the master was successful. After that, the slave matches the timing and sends wireless packets to the master.

No timeout is set, even for cases when synchronization is unsuccessful due to a poor communication environment. It continues receiving until synchronization succeeds. In the case when synchronization fails during communication for some reason, a maximum of 1000ms is required to re-synchronize.

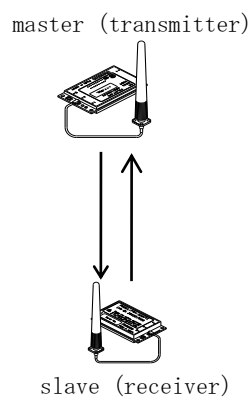


figure 5 : master and slave

## 4 Communication procedure

### 4.1 Overview

Communication is done in the following manner :

- (1) Right after the power is turned on, the master and slave does not have wireless communication and is in an invalid state.
- (2) For sending/receiving a wireless packet, start the FH operation by inputting the @FHS command (the master and the slave).  
The master initiates RF transmission and reception.  
The slave starts RF reception, wait for communication from the master.
- (3) If FH synchronization acquisition, slave start also sent. After that, the slave will continue in automatic synchronization.
- (4) By TLC command to set the data you want to send.
- (5) In FH synchronization acquisition, it will receive the data periodically from the communication partner.  
If the synchronization is out, it does not receive the data.
- (6) To stop sending/receiving a wireless packet, type the @FHE command and quit the FH operation.

### 4.2 Send command

The command header is "@TLC", the terminator is CR+LF (0x0D 0x0A). There is no response to the command.

Please send data as a binary data of 14-byte fixed.

Radio transmission will be run every 24ms. By @TLC command, it will update the transmitted data. If @TLC command is not inputted, the previous data is wirelessly transmitted. If you also send command has not been entered once, the data of all 0 is wireless transmitted.

**【Send (update) format】**

@TLC[Binary data 14 bytes][CRLF]

### 4.3 Received data

The received data is appended "RLC" of 3 bytes as a header.  
The Received data is binary data of 14-byte fixed.

Radio reception will be run every 24ms. In a state that can't be wireless communication, it will not be output to the wired.

**【Reception format】 Repeat**

RXT[Binary data 14 bytes]

#### 4.4 Master communication procedure

- (1) After the power is turned on, the master does not perform the wireless communication.
- (2) If you want to transmit and receive wireless packet, enter FHS command.
- (3) As long as the FH synchronization acquisition, the data from the slave is output to the wired.  
The received data will be "RLC" header is added.
- (4) If you send the data to the slave, enter the @TLC command. By sending @TLC command regularly, the transmitted data is updated.
- (5) If you stop the wireless communication, enter the @ FHE command.

#### 4.5 Slave communication procedure

- (1) After the power is turned on, the slave does not perform the wireless communication.
- (2) If you want to transmit and receive wireless packet, enter FHS command.
- (3) As long as the FH synchronization acquisition, data from the master is output to the wired.  
The received data will be "RLC" header is added.
- (4) If you send the data to the master, enter the @TLC command. By sending @TLC command regularly, the transmitted data is updated.
- (5) If you stop the wireless communication, enter the @ FHE command.

#### 4.6 Communication time

Interval of the frequency hopping (switching frequency) is 24ms. This 24ms is one frame. The master wirelessly transmits (1 packet transmission) at the beginning of the frame. Communication time is about 1.5ms. The slave that is synchronized with the master wirelessly receives the packet at the beginning of the frame.

The figure below shows the timing.

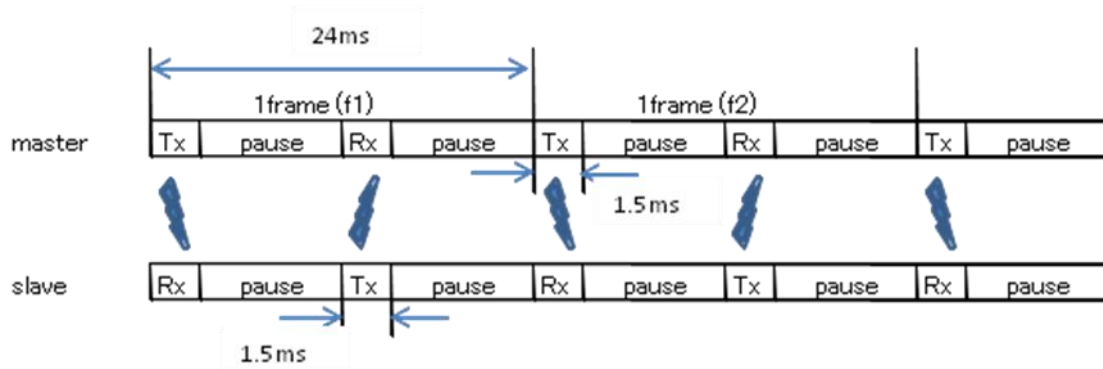


Figure 6 : FH communication timing

## 5 Other functions

### 5.1 ID Registration

In order to associate the master and the slave, an ID code is used. Each wireless module has a unique value.

For wireless communication, registration of the ID code of the communication partner is necessary. Wireless machines without ID code registration are unable to communicate. This prevents improper connections.

To make the pairing, in a state in which the closer to the master / slave, and then run the @IDS command to both the master / slave. In the case of slave, it is possible to register up to two. Please refer to the description of @IDS command for how the second unit of the specified.

If the pairing is successfully complete, "Pair" response is output, pairing ID code is written to the memory. In order to perform the normal communication, please do the once reset.

If the pairing is not completed, approximately becomes a time-out within 5 seconds, it is returned NO response.

The slave is possible to register the master up to two.

However, communication is carried out in a one-to-one, you will not be able to communicate from two masters. The slave keeps a connection with the master that initiated the first communication.

### 5.1.1

## 6 Commands

### 6.1 List of commands

Table 2: List of commands

| No. | Command name | Function                                           |
|-----|--------------|----------------------------------------------------|
| 1   | ARG          | Display all register values                        |
| 2   | DBM          | Reference a reception intensity of received packet |
| 3   | ERR          | Reference error status                             |
| 4   | FHE          | End FH operation                                   |
| 5   | FHS          | Start FH operation                                 |
| 6   | ID1          | Reference and set pairing ID1                      |
| 7   | ID2          | Reference and set pairing ID2                      |
| 8   | IDS          | Start ID registration                              |
| 9   | INI          | Initialize register values                         |
| 10  | ODA          | Disable output                                     |
| 11  | OEN          | Enable output                                      |
| 12  | REG          | Reference and set register values                  |
| 13  | RST          | Reset                                              |
| 14  | TLC          | Set wireless data                                  |
| 15  | VER          | Display version                                    |

### 6.2 How to use commands

- (1) When inputting a command to the wireless module, add 1 byte header for command recognition (command header) at the beginning of the command, in order to differentiate from regular data. The command header is “@” (40H).
- (2) Command is case-sensitive.
- (3) A 2-byte terminator is used to terminate a command. The terminator is [CRLF] (0DH: carriage return + 0AH: line feed).
- (4) The wireless module executes a command process after recognizing a command. For a command with a response, it returns the response to external devices after the process is completed.
- (5) Do not input subsequent commands or data before getting a response.
- (6) Command example  
@ARG[CRLF]

### 6.3 Command responses

#### 6.3.1 Types of command responses

Command responses and their meanings are:

- P0: normal termination
- P1: running command
- N0: command error
- N6: memory register writing error

## 6.4 Details of the command functions

The symbols used in this section have the following meaning:

[ ] : Required input parameter/s  
 ( ) : Optional input parameter/s

ARG : Display all register values

---

**【Format】**

ARG

**【Response】**

Setting list display

NO : command error

**【Function】**

- Refers to all contents of memory register. Displays a two-digit hexadecimal number plus H at the end.

DBM : Reference the reception intensity of received packet

---

**【Format】**

DBM

**【Response】**

-XXXdBm : reception intensity

NO : command error

**【Function】**

- Reads the reception intensity of the most recent, correctly received packet, and displays it in decibels.
- When none has been received after resetting, “-134dBm” is displayed.
- The signal strength indication is not absolute. It can be used for accurate relative measurements but should not be considered an absolute value.

ERR : Reference error status

---

**【Format】**

ERR

**【Response】**

xxH : error status

NO : command error

**【Function】**

- This command display the error information of the internal this module. If 00H is no error.
- bit2=1: memory (settings area) error
- bit1=1: memory (user area) error
- bit0=1: RF error

F H E : End FH operation**【Format】**

FHE

**【Response】**

P0 : normal termination  
 NO : command error

**【Function】**

- End FH operation. At this status, wireless transmission does not occur.
- Master/Slave stops radio transmission and reception. If state that FH synchronization acquisition, and then release it.
- Even when there is received data from a paired module, wired output does not occur.

F H S : Starts FH operation**【Format】**

FHS

**【Response】**

P0 : normal termination  
 NO : command error

**【Function】**

- Starts FH operation.
- Master/Slave starts radio transmission and reception.
- When there is received data from a paired master, wired output starts.
- If there is data received from pairing the communication partner, to start the output to the wired.

I D 1 : Reference and set pairing ID1**【Format】**

ID2(:pairing ID code 1)

pairing ID code 1 : xxxxxxxxx (9-digit)

**【Response】**

xxxxxxx : pairing ID code 1 (when when referencing)  
 P0 : normal termination (when setting)  
 NO : command error

**【Function】**

- References and sets the pairing ID code 1.
- By inputting only the command, currently set values can be referenced.
- Specify the ID code (9-digit Serial Number) of the module that is the communication partner.
- Both master and slave are valid.
- The setting becomes effective after a reset.

**I D 2 : Reference and set pairing ID2**

---

**【Format】**

ID2(:pairing ID code 2)

pairing ID code 2 : xxxxxxxxx (9-digit)

**【Response】**

xxxxxxx : pairing ID code 2 (when when referencing)

P0 : normal termination (when setting)

N0 : command error

**【Function】**

- References and sets the pairing ID code 2.
- By inputting only the command, currently set values can be referenced.
- Specify the ID code (9-digit Serial Number) of the module that is the communication partner.
- Slave only is valid.
- The setting becomes effective after a reset.

**I D S : Start ID registration**

---

**【Format】**

IDS:[pairing area]

pairing area : x (1= pairing ID code 1, 2= pairing ID code 2)

**【Response】**

P0 : normal termination

Pair : pairing is completed

N0 : command error, or pairing is not completed

N6 : memory register writing error

**【Function】**

- Starts pairing operation.
- In the case of master, please specify '1' to the pairing area.
- In the case of slave, please specify '1' or '2' to the pairing area.

**I N I : Initialize register value**

---

**【Format】**

INI

**【Response】**

P0 : normal termination

N0 : command error

**【Function】**

- Resumes all contents of the memory register in the wireless module to the status at factory shipment.

---

**ODA** : Disable output

---

**【Format】**

ODA

**【Response】**

P0 : normal termination  
N0 : command error

**【Function】**

- Disable the radio transmission and wired output. Temporarily used when you want to stop FH communication. If this module already has FH synchronization acquisition, also it will continue to maintain FH synchronization after executing this command.
- Output in the initial state is enabled.
- Slave only.

---

**OEN** : Enable output

---

**【Format】**

OEN

**【Response】**

P0 : normal termination  
N0 : command error

**【Function】**

- Enable the radio transmission and wired output.
- Output in the initial state is enabled.
- Slave only.

---

**REG** : Reference and set register values

---

**【Format】**

REG[register number]( :set value)

Register number : 00~XX

Set value : input a two-digit hexadecimal number with H at the end,  
or a three-digit decimal number without any suffix.

**【Response】**

XXX : currently set value (when referencing)  
P0 : normal termination (when setting)  
N0 : command error  
N6 : memory register writing error

**【Function】**

- References and sets the memory register.
- By inputting only a register number, currently set values can be referenced.
- The setting will be valid after reset.

R S T : Reset**【Format】**

RST

**【Response】**

P0 : normal termination

N0 : command error

**【Function】**

- This module will be reset.

T L C : Set wireless data**【Format】**

TLC[binary data]

Binary data : 14-bytes fixed

**【Response】**

None

**【Function】**

- It specifies the data you want to send to the communication partner. It is 14-bytes fixed in binary data.
- In order to avoid the mixing of the received data, there is no response to this command.
- Input of this command, please as a 50ms interval at the shortest.

V E R : Display version**【Format】**

VER

**【Response】**

Program Version 1.000 : display version

N0 : command error

**【Function】**

- Reads a program version of the wireless module.
- X. XXX
  - Improvements and bug fixes within a range of specifications
  - Minor specification change
  - Major specification change

## 7 Memory register

The memory register is a register that sets and memorizes operation modes and communication parameters for the wireless module. These values are read when the power is turned ON, and the module starts operating according to the setting.

### 7.1 Memory register list

Table 3 : Memory register list

| Register number | Function                                   | Default | Default function  |
|-----------------|--------------------------------------------|---------|-------------------|
| REG00           | Operation mode                             | 00H     | Master            |
| REG01           | Reserve                                    | 00H     |                   |
| REG02           | Frequency hopping pattern                  | 00H     |                   |
| REG03           | Reserve                                    | 00H     |                   |
| REG04           | Wireless communication setting 1           | 08H     | Antenna diversity |
| REG05           | Wireless communication setting 2           | 00H     |                   |
| REG06           | Reserve                                    | 00H     |                   |
| REG07           | Reserve                                    | 00H     |                   |
| REG08           | Wired communication setting 1              | 01H     | 19200bps          |
| REG09           | Wired communication setting 2              | 00H     |                   |
| REG10           | FH synchronization determination setting 1 | 00H     |                   |
| REG11           | FH synchronization determination setting 2 | 00H     |                   |
| REG12           | Detailed setting                           | 08H     |                   |
| REG13           | Reserve                                    | 00H     |                   |
| REG14           | Pairing ID code 1                          | 00H     |                   |
| REG15           |                                            | 00H     |                   |
| REG16           |                                            | 00H     |                   |
| REG17           |                                            | 00H     |                   |
| REG18           |                                            | 00H     |                   |
| REG19           | Reserve                                    | 00H     |                   |
| REG20           | Pairing ID code 2                          | 00H     |                   |
| REG21           |                                            | 00H     |                   |
| REG22           |                                            | 00H     |                   |
| REG23           |                                            | 00H     |                   |
| REG24           |                                            | 00H     |                   |
| REG25           | Reserve                                    | 00H     |                   |

## 7.2 Memory register function detail

REG 0 0 : Operation mode [default : 0 0 H]

\* Sets an operation mode (for the master or the slave).

Table 4 : Operation mode

|     |                  |
|-----|------------------|
| 00H | Master (default) |
| 01H | Slave            |

REG 0 1 : Reserved [default : 0 0 H]

\* Not used in this wireless module. Leave default setting.

REG 0 2 : Frequency hopping pattern [default : 0 0 H]

\* Sets the frequency hopping pattern. It can be set to 00~1E (0~30).

\* Master only settings are valid. Slave sets the frequency hopping pattern automatically based on the information of the master.

\* In the initial state, a specific frequency hopping pattern is set. Because it is set to 00H if you initialize, please set again.

\* When using multiple systems within the same area, the frequency may periodically match and interfere with each other even when the frequency hopping patterns are different.

REG 0 3 : Reserved [default : 0 0 H]

\* Not used in this wireless module. Leave default setting.

REG 0 4 : Wireless communication setting 1 [default : 0 8 H]

Bit7~4 : Reserved

\* Not used in this machine. Make sure to set to 0.

Bit3 : Antenna diversity

Table 5 : Antenna diversity

|   |                                    |
|---|------------------------------------|
| 0 | Disable antenna diversity          |
| 1 | Enable antenna diversity (default) |

\* Enables/disables antenna diversity.

\* When used with two antennas, set to 1 in this bit.

Bit2 : Antenna selection

Table 6 : Antenna selection

|   |                                 |
|---|---------------------------------|
| 0 | Antenna is fixed to A (default) |
| 1 | Antenna is fixed to B           |

\* At the non-diversity reception, decide the antenna terminal.

Bit1~0 : Reserved

\* Not used in this machine. Make sure to set to 0.

REG 0 5 : Wireless communication setting 2 [default : 0 0 H]

\* Not used in this wireless module. Leave default setting.

REG 0 6 : Reserved [default : 0 0 H]

\* Not used in this wireless module. Leave default setting.

REG 0 7 : Reserved [default : 0 0 H]

\* Not used in this wireless module. Leave default setting.

REG 0 8 : Wired communication setting 1 [default : 0 1 H]

Bit 7: data length

Table 7: Data length

|   |                      |
|---|----------------------|
| 0 | 8 bit data (default) |
| 1 | 7 bit data           |

Bit 6: parity bit

Table 8: Parity bit

|   |                          |
|---|--------------------------|
| 0 | Without parity (default) |
| 1 | With parity              |

Bit 5: Even/odd parity

Table 9: Parity

|   |                       |
|---|-----------------------|
| 0 | Even parity (default) |
| 1 | Odd parity            |

\* Invalid when “without parity” is set in bit 6.

Bit4: Stop bit

Table 10: Stop bit

|   |                      |
|---|----------------------|
| 0 | 1 stop bit (default) |
| 1 | 2 stop bit           |

Bit3 : Reserved

\* Not used in this machine. Make sure to set to 0.

Bit2~0 : Baud rate setting

Table 11 : Baud rate

| Bit2 | Bit1 | Bit0 | Baud rate          |
|------|------|------|--------------------|
| 0    | 0    | 0    | 9600bps            |
| 0    | 0    | 1    | 19200bps (default) |
| 0    | 1    | 0    | Reserved           |
| 0    | 1    | 1    | Reserved           |
| 1    | 0    | 0    | Reserved           |
| 1    | 0    | 1    | Reserved           |
| 1    | 1    | 0    | Reserved           |
| 1    | 1    | 1    | Reserved           |

REG 09 : Wired communication setting 2

[default : 0 0 H]

Bit7~5 : Reserved

\* Not used in this machine. Make sure to set to 0.

Bit4 : Addition and deletion of CRLF

Table 12 : Addition and deletion of CRLF

|   |                                                          |
|---|----------------------------------------------------------|
| 0 | Do not add the CR+LF code to the receive data. (default) |
| 1 | Add the CR+LF code to the receive data.                  |

\* Sets whether adding the CRLF code or not to the received data.

Bit3~0 : Reserved

\* Not used in this machine. Make sure to set to 0.

REG 10 ~ 11 : Reserved

[default : 0 0 H]

\* Not used in this wireless module. Leave default setting.

REG 12 : Detailed setting

[default : 0 8 H]

Bit7 : Startup message output

Table : Startup message output

|   |                                          |
|---|------------------------------------------|
| 0 | Disable startup message output (default) |
| 1 | Enable startup message output            |

- \* When you want to output message at startup, set to 1 in this bit.
- \* At startup, "Input command" is output to the wired. By this message, you can recognize the activation timing.

Bit6~4 : Reserved

- \* Not used in this machine. Make sure to set to 0.
- \* No function assignment.

Bit3 : Receive level control

Table : Receive level control

|   |                                        |
|---|----------------------------------------|
| 0 | Disable receive level control          |
| 1 | Enable receive level control (default) |

- \* When used with “Receive level control” , set to 1 in this bit.
- \* “Receive level control” turns LNA Off and decreases the reception level when communication at the short distance.

Bit2~0 : Reserved

- \* Not used in this machine. Make sure to set to 0.
- \* No function assignment.

REG 13 : Reserved [default : 0 0 H]

- \* Not used in this wireless module. Leave default setting.

REG 14 ~ 18 : Pairing ID code 1 [default : 0 0 H]

- \* Sets an ID code for a pairing machine.
- \* Both the master and slave use this.

REG 19 : Reserved [default : 0 0 H]

- \* Not used in this wireless module. Leave default setting.

REG 20 ~ 24 : Pairing ID code 2 [default : 0 0 H]

- \* Sets an ID code for a pairing machine.
- \* Only the slave use this.

REG 2 5 : Reserved[default : 0 0 H]

\* Not used in this wireless module. Leave default setting.