

## **FCC Notice**

Note: 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.

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.

Any unauthorized changes or modifications to this device not expressly approved by Futaba Corporation of America 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.

## Important Safety Information

The list of dangers, warnings and cautions in this section contain important information that will help ensure safe operation of the system. Please read carefully and understand all of these items. All installers, operators and maintenance personnel should read and understand this information before installation, use, or maintenance of the FRH system.

The FRH system by itself is not inherently dangerous. **HOWEVER, WHEN THE FRH SYSTEM IS CONNECTED TO OTHER EQUIPMENT FOR THE PURPOSE OF CONTROL, SAFETY AND ALL POSSIBLE ASSOCIATED DANGERS MUST ALWAYS BE GIVEN THE UTMOST CONSIDERATION DURING SYSTEM INTEGRATION, DESIGN, INSTALLATION, AND USE.**

The FRH system may be used in virtually unlimited applications. Many of these associated systems can, by themselves, pose a mechanical, electrical or other hazard to operators and other persons or equipment. To address all possible applications and associated safety hazards in this manual would be impossible. The warnings below and throughout this manual give you information that will allow you to install and use the FRH system safely in most applications. If you have questions regarding the safety of your specific application, please contact the appropriate people for help. Your Futaba sales representative, representatives of the equipment you are controlling, and the technical support staff at Futaba Corporation of America are among those who can give you assistance with your safety concerns.

**The following warnings are included in the lists that follow but warrant repetition here:**

In installations where the FRH system is used to control motion or operation of potentially dangerous equipment, it is imperative for safety that all operators and installers be thoroughly trained in the normal function of that equipment before attempting to control it remotely with the FRH system.

To help ensure safe operation of the equipment, the FRH system must be connected so that it will operate in a fail-safe way. In other words, the equipment being controlled should stop or return to its safest state in the absence of a control signal or total loss of RF transmission from the FRH modem. Our system uses one of the most reliable methods available to transmit data using radio signals. Many factors can affect a radio signal that may block it or interfere enough to disrupt regular transmission. Because of this, equipment motion or dangerous electrical current, for example, that continues during a loss-of-signal condition could be very dangerous.

Four symbols are used in the margin of the following section and throughout the manual to indicate the level of hazard or information listed.

The symbols are defined as follows:



Indicates a hazard that *will* cause severe personal injury, death, or substantial property damage if the warning is ignored.



Indicates a hazard that *can* cause severe personal injury, death, or substantial property damage if the warning is ignored.



Indicates a hazard that will or can cause minor personal injury, or property damage if the warning is ignored.

**NOTE**

Indicates installation, operation, or maintenance information that is important but not hazard-related.

Please read the following safety information carefully. Some of these notices are duplicated throughout the manual, in areas of associated content, for your benefit.

### General Safety Hazards and Notes



Improper installation and/or operation of the FRH system can cause serious or fatal injuries to the operator or nearby persons and cause damage to the FRH system, and any equipment it is used to control. Please read and understand this manual completely and the manual of all equipment being controlled before attempting to operate or install this system.



Always keep this manual at a location readily accessible to anyone operating the system and related equipment. Ensure that all operators have read and understood this manual, especially all safety and operation procedures contained in it. Please refer to the section in this manual titled *How to Obtain Help* for the contact that can supply you with additional manuals or for questions not covered in this manual. If this product is passed on to a different user, be sure that this manual accompanies the product.



Be certain that the installer of this equipment reads and understands the instruction manual of *the equipment that you are connecting to* before attempting this installation.

**⚠ DANGER**

The FRH system should **NOT** be used in a manner in which failure of the product or loss of the radio signal could cause damage to the equipment being controlled, or to anything in the area in which such equipment is located. All integrated control systems should be designed for “fail-safe” operation so that a temporary or permanent loss of signal will not endanger any person, critical process, or equipment (refer to the beginning of the safety section for further explanation). The system design should ensure that the equipment being controlled will default to its safest state in the event of signal loss.

**⚠ CAUTION**

The FRH system contains no user serviceable parts. If the unit requires service, contact your sales representative or Futaba Corporation of America for repair service. Contact information can be found in this manual under the section titled *How To Obtain Help*. Do not disassemble or attempt to repair the FRH yourself. Doing so could void your warranty and may void the user’s authority to operate the device.

**⚠ WARNING**

Contact Futaba before using the FRH in safety critical applications such as medical equipment, aircraft, hazardous materials handling, etc.

**Installation Safety Hazards and Notes****⚠ WARNING**

Be sure to wire the power and serial connections correctly. Incorrect wiring can damage the system, cause it to malfunction and/or create a shock and fire hazard.

**⚠ WARNING**

Ensure that the FRH modem power and the power to the equipment to be controlled is turned off before connecting or disconnecting the cable between them. This will help prevent accidental damage to the system and unexpected operation and/or injury.

**⚠ WARNING**

Be sure the FRH modem power, the power to the equipment that you are connecting to it, and the DC power source are all turned off before wiring and connecting the power cable.

**⚠ WARNING**

Be sure that the supplied power is within the specified range (3.3 to 10 VDC). Voltages outside the specified range may damage the FRH modem.

**Antenna Installation Hazards and Notes****⚠ WARNING**

Be sure to keep all systems and antennas clear of power lines. Permanent equipment damage and severe shock injury or death can occur if the system contacts power lines.

**⚠ WARNING**

Contact Futaba before connecting any antenna not provided by Futaba specifically for the FRH system. Attaching any non-authorized antenna may be in violation of FCC regulations..

**⚠ CAUTION**

When using two pedestal antennas with a single FRH for diversity reception, mount the antennas as far apart as possible (30 cm minimum). If the antennas are too close, the diversity advantage will not be achieved.

**⚠ CAUTION**

Do not use two pencil antennas connected directly to the modem antenna connectors for diversity reception, doing so will not allow the diversity advantage to be achieved. If two pencil antennas will be used, remotely mount at least one antenna using an antenna extension cable to facilitate sufficient separation between the two antennas.

**⚠ WARNING**

Before each use, verify that the antenna (and antenna cable, if used) is securely attached and in good condition. A loose antenna or cable may severely reduce the operating range of the system.

**NOTE**

When installing the FRH in a mobile unit such as an Automatic Guided Vehicle (AGV), Futaba recommends using the diversity reception feature as a remedy for multipath fading problems. For diversity reception, install the two antennas as far apart as possible in order to gain maximum benefit (30 mm minimum).

**▲ CAUTION**

The pedestal antenna is designed for indoor use. When using it outdoors, enclose it in a non-metallic, waterproof case or take other steps to protect it from humidity and other corrosive environments.

**▲ CAUTION**

Though the outside of the pedestal antenna is made of silicone rubber, the inside is metallic. The metallic components can be bent or broken if enough force is applied. Mount the antenna in a location where it will be least likely to be damaged by contact with other objects or equipment.

**▲ CAUTION**

The FRH-SD06TU operates at frequencies in the 2.4 GHz band. These frequencies are more directional than lower frequencies and are easily reflected. If there are metal structures nearby, the effective range may be shortened or the directional properties may be further narrowed. To help avoid this, mount the antenna as far away as possible from surrounding metallic structures.

**▲ CAUTION**

Multipath problems occur easily at 2.4 GHz frequencies. When multipath problems are present, moving the antenna as little as 10 cm may result in improved communication or, conversely, a further diminished or total loss of communication. Futaba recommends that the mounting position of the antenna be determined *after* testing and verifying optimal communication conditions. Negative multipath effects can also be overcome with antenna diversity. See the section in this manual titled *Diversity Antenna Setup* and the related register settings for more details regarding antenna diversity.

**▲ CAUTION**

When installing multiple FRH modem systems that will use different frequency groups in the same area, modem antennas of different frequency groups must be mounted at least 6 feet (2 meters) apart. Failure to do so may severely reduce the FRH operating range.

**NOTE**

Please contact Futaba before attempting to install any third party antenna equipment.

**NOTE**

Please contact Futaba for information about antenna separation when using the FRH-SD06TU and other wireless products in the same area.

**NOTE**

The diversity reception function is not available in Mode 1. (See the section titled *Operation Modes* for more details)

**Environmental Safety Hazards and Notes****⚠WARNING**

If the FRH system has been stored at a temperature beyond the specified operating temperature range for the system, it may not function properly. Allow it to return to normal temperatures before use. Refer to *Appendix A – Technical Specifications* for the actual operating temperature range.

**⚠WARNING**

The FRH modem is a precision electronic device. Its rugged design is intended for industrial applications. However, do not install it where it will encounter excessive vibrations. In some cases, isolation mounts may be used to isolate the FRH modem from the equipment vibration. Excessive vibration can permanently damage the FRH modem and/or cause it to malfunction.

**⚠WARNING**

Do not operate the FRH system in environments where it will be subjected to excessive moisture (such as rain or water spray), dust, oil, or other foreign matter (such as metal particles). Doing so may permanently damage the FRH modem and/or cause it to malfunction. If it does become wet or contaminated, correct the situation, verify proper operation and have any problems corrected before using it to control other equipment. If necessary, the modem can be mounted inside a protective or waterproof enclosure. If the enclosure is metallic, the antenna must be mounted externally or the effective operating range will be severely limited.

**⚠WARNING**

The FRH-SD06TU is designed for indoor use. When using it outdoors, the modem should be mounted in a waterproof enclosure and the ambient temperature range should be checked to insure that it is within the modem's specifications. Always use the FRH modem within its specified environmental ranges.

**Operational Safety Hazards and Notes****⚠WARNING**

Before each use of the FRH system, ensure that the area where the equipment will be operated is clear of people or obstacles that may affect its safe operation.

**⚠WARNING**

Before each use of the FRH system, verify that both the equipment being controlled and the FRH system are in proper operating condition.

**▲ CAUTION**

Turn the FRH power off before changing the rotary switch setting. Failure to do so may cause the modem to malfunction.

**▲ CAUTION**

Except when initializing the memory registers, always turn the FRH modem power off before changing any dip switch settings.

**▲ CAUTION**

Do not use rotary switch positions 8 to F. Doing so may cause the modem to malfunction. See the sections in this manual titled *Rotary Switch Setting* and *Frequency Grouping* for a more detailed description of the rotary switch settings.

**▲ CAUTION**

When rewriting the FRH modem's memory registers, do not turn the FRH modem's power off until the FRH modem returns a P0. If the power is interrupted before a P0 is returned the memory contents may be lost or corrupted and the FRH operation will be unpredictable. If the memory contents are lost or corrupted, they may be restored to original default settings by reinitializing them. (See the section in this manual titled *Memory Register Initialization* for more details.)

**▲ CAUTION**

When initializing the memory registers, do not turn the FRH modem's power off until the PW LED flashes green. If the power is interrupted before the LED flashes green, the registers will not be written correctly and the FRH operation will be unpredictable. If a power interruption does occur, restart the initialization procedure from the beginning.

**▲ WARNING**

Do not attempt to operate remotely controlled equipment outside the communication range of the FRH system. Doing so could cause loss of equipment control.

**▲ WARNING**

Without implementing proper flow control settings, the data rate between the FRH modem and its terminal (wired link) can exceed the wireless link data rate and cause the modem buffer to overflow. This can result in malfunction of the systems being controlled and/or data corruption. Ensure that you are using appropriate flow control settings for your application.