FRD - 1201U
12 CHANNEL RADIO CONTROL SYSTEM
OPERATOR MANUAL

Futaba Corporation of America

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INTRODUCTION

Dear Customer:

Thank you for purchasing the Futaba Model FRD-1201 remote control system, featuring ***Channel Watch***™ automatic channel selection circuitry. We believe it is the finest radio control system of its type and are confident you will think so too.

This instruction manual has been carefully prepared to ensure that you get out of your radio control system all the capabilities we designed and built into it. The manual will provide you with the information to operate the FRD-1201 system properly. The information explains how to install, operate, inspect and maintain

We invite your comments on the manual or the radio control system at any time, by calling our Industrial Radio Control Marketing Department at 714-455-9888, Ext. 246, during normal business hours, Monday - Friday, 8:30 AM to 5:15 PM.

REQUIREMENT	APPROPRIATE CONTACT
Additional application information for this product or information regarding other Futaba products	Your local Sales Representative
Ordering additional Futaba products or manuals	Your local Sales Representative / Customer Service
Technical assistance or training	Factory Service at 714-455-9888

Futaba Corporation of America
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Irvine, CA 92718-2012

CAUTION

1. Always keep this manual with the equipment for future reference.

2. If you have any questions about the equipment or experience any equipment malfunctions, please contact Futaba Corporation of America or your equipment dealer immediately.

3. Improper operation of this equipment could cause damage to equipment. Please read the manual completely before attempting to operate the system.

4. If the transmitter has been stored in a very hot or cold location beyond the specified operating temperature range for the system, it may not function properly until it is within the proper temperature range.

dealer or Futaba Corporation of America for repair service.

6. It may be a violation of law to open the transmitter or attempt to repair or modify the equipment. Changes or modifications to this equipment not expressly approved by Futaba Corporation of America could void the user's authority to operate the equipment.

7. 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.

DEALERS - PLEASE BE SURE THAT CUSTOMERS RECEIVE THIS MANUAL

Section 1 CARE & HANDLING

Installation

All system wiring connections to the receiver should be made with power disconnected.

Before Use

Before turning the power on, check for safe conditions in the operating area. We recommend that you turn the receiver power on first, then turn on the transmitter.

Transmitter

The FRD-1201 transmitter case is dust and moisture resistant. The transmitter should not be exposed to or immersed in water. Do not drop or subject to hard physical shocks. Doing so could cause damage to the case or internal circuitry.

Storage

Do not store the transmitter in direct sunlight, extreme temperatures or damp/wet areas. Remove the batteries when storing for long periods of time.

Section 2 SPECIAL FEATURES

2.1 The operating distance is 100 meters, line of sight, when there are no obstructions.

2.2 The system uses high accuracy PLL (Phase-Locked-Loop) frequency synthesizers and ***Channel Watch***™ carrier sensing technology. This allows the transmitter to automatically select a clear frequency for operation, providing excellent protection from interference.

2.3 The FRD-1201 is approved under Part 15 of the FCC rules. No user license is required to operate the system.

2.4 The transmitter contains an internal antenna.

2.5 An automatic power off feature helps prolong transmitter battery life.

2.6 The transmitter switch numbers match the output relay numbers of the receiver.

Section 3 EQUIPMENT LIST

Transmitter:	Transmitter Assembly
	Battery Holder
	Belt
Receiver:	Receiver Assembly
	Receiver antenna, whip, 125 mm
	Antenna Cable, 4 meter

Operator Manual

Warranty Registration Card

SECTION 4 SPECIFICATIONS

4.1 General

Frequency	429.2500 MHz ~ 429.7375 MHz
Frequency Control	Crystal controlled PLL Synthesizer
Communications	Simplex
Operating Distance	100 meters - Line of sight, no obstructions
Response Time	130 ms average
Operating Temperature	-10° C to +50° C
Storage Temperature	-20° C to +60° C
Humidity	Up to 90% RH, non-condensing

4.2 Transmitter

Power Source	4 "AA" Alkaline batteries (6 VDC)
	(NiCad batteries may be used, operating time will be reduced)
Power Consumption	60 mA (when sending commands)
Battery Life	25 hours minimum, continuous use with alkaline cells
Antenna	Internal
Case	Plastic molded, dust proof / splash proof
Dimensions	L 175 x W 102 x H 80 mm (6.9 x 4.0 x 3.2 inches)
Weight	726 grams (1.6 lbs.) with batteries installed

4.3 Receiver

Design Type	Double Conversion Superheterodyne
Outputs	SPST N.O. relays, 12 channels plus main relay
Relay Ratings	Resistive Load 5A @ 31 VDC max
Antenna	External whip antenna, [illegible]
Power Source	External +12VDC or +24 VDC
	(Will operate from 9 to 31 VDC)
Power Consumption	1.2 A @ 12VDC (with 6 relays actuated)
	(Does not include customer equipment)
Case	Formed metal, dustproof
Dimensions	L 260 x W 245 x H 80 mm (10.3 x 9.7 x 3.2 inches)
Weight	1.3 Kg (2.9 lbs.)

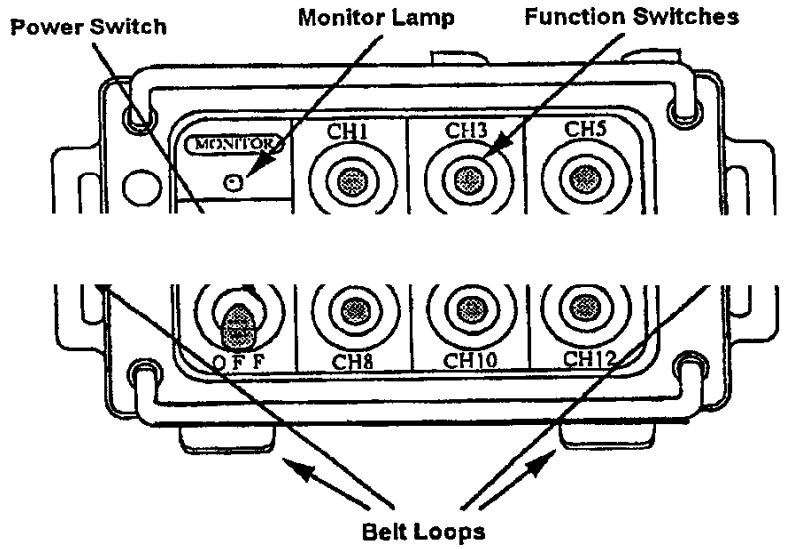
Section 5 TRANSMITTER

5.1 Transmitter Designations

Operator Panel Layout

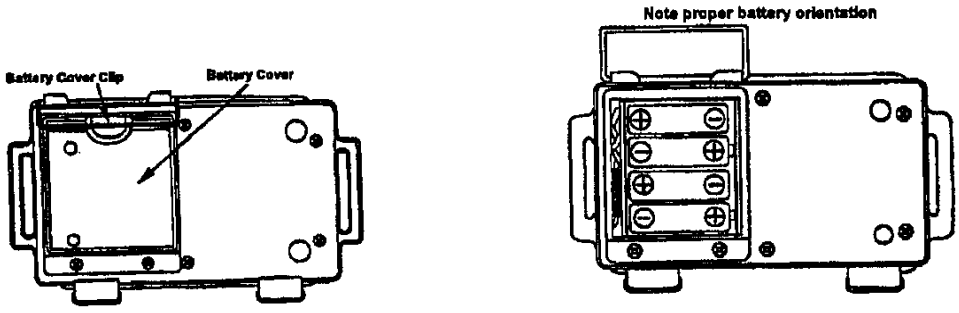
Function control switches are three position momentary spring loaded toggle switches.

Transmitter Panel Layout



5.2 Changing Transmitter Batteries

Battery Compartment



Remove battery clamp and cover plate. Insert 4 "AA" batteries, observing correct polarity.

To open clamp, insert coin between cover and clamp and lift up coin to release clamp.

Always use four new batteries of the same type.

Do not attempt to charge dry cell batteries. Damage or leakage, as well as personal injury, may result.

NOTE: NiCad Battery Use:

If NiCad batteries are used, be sure to use "AA" size cells.

When charging, follow battery manufacturer's charging instructions.

Use of NiCad batteries will reduce operating time to approximately 30% of

5.3 Monitor LED

When the power switch is first turned on, the monitor LED should be steady green for approximately three seconds, followed by a fast blinking green at two blinks per second. When the LED changes to red the batteries are weak. With alkaline batteries, about one hour of continuous operation time remains after the LED first changes to red. If the LED stays off, the batteries are dead and must be replaced before operating the system. With good batteries installed, the monitor LED will be flashing green during idle periods and steady green when any function switch is activated.

LED Indication of Operating Modes	
Steady Green	Power Up, and Function Switch Active
Fast Blink Green (2 per second)	Standby, RF Off, Channel Selected
Slow Blink Green (1 per second)	Standby, RF Off, No Channel Selected
Red (steady or blinking, as noted above)	Batteries Weak - Replace

5.4 Transmitter Auto-Power-Off Feature

With the transmitter power switch on, if no function switches are activated for approximately eight minutes, the power is automatically shut off to conserve battery life. The LED will change from a slow blink rate of one blink per second to off.

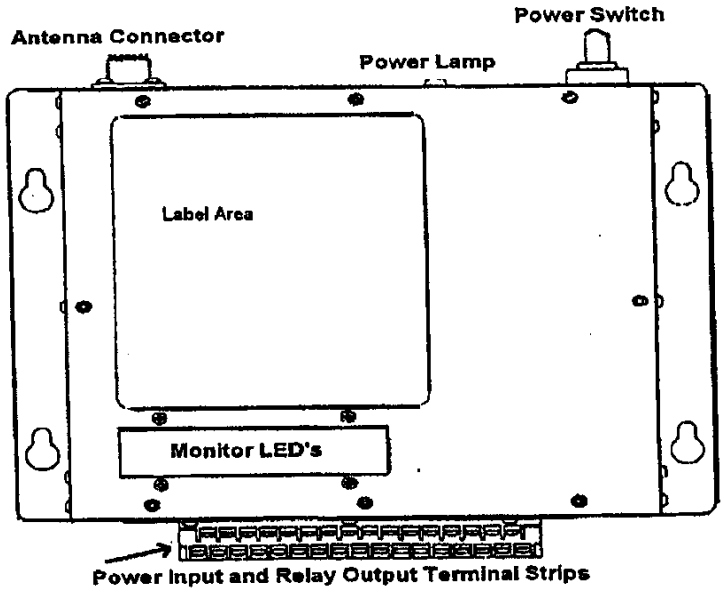
Once the power-off feature is activated, the power switch must be cycled to off and then back on to resume operation.

In the auto-power-off mode, some battery power is still being used by the microprocessor. The power switch should be turned off when the system is not being used.

Section 6 RECEIVER

6.1 Receiver Designations

Top view of receiver



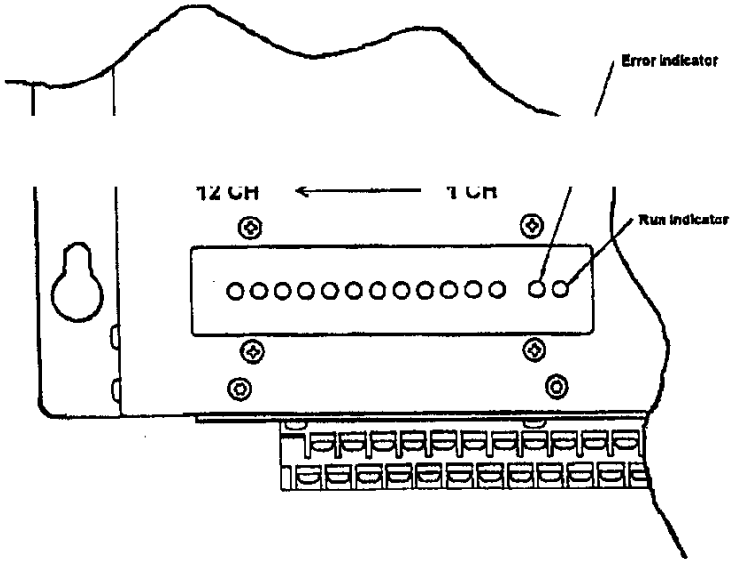
6.2 Monitor LED's

OUTPUTS: LED for each output relay will light while that relay is activated.

ERROR: LED will light when a valid transmitter signal is not present. The following factors will cause the error LED to light:

1. No function switches activated, or transmitter power switch off.
2. Transmitter Auto-power-off feature is activated
3. Radio signal interference present in the area.

Receiver Output Indicators



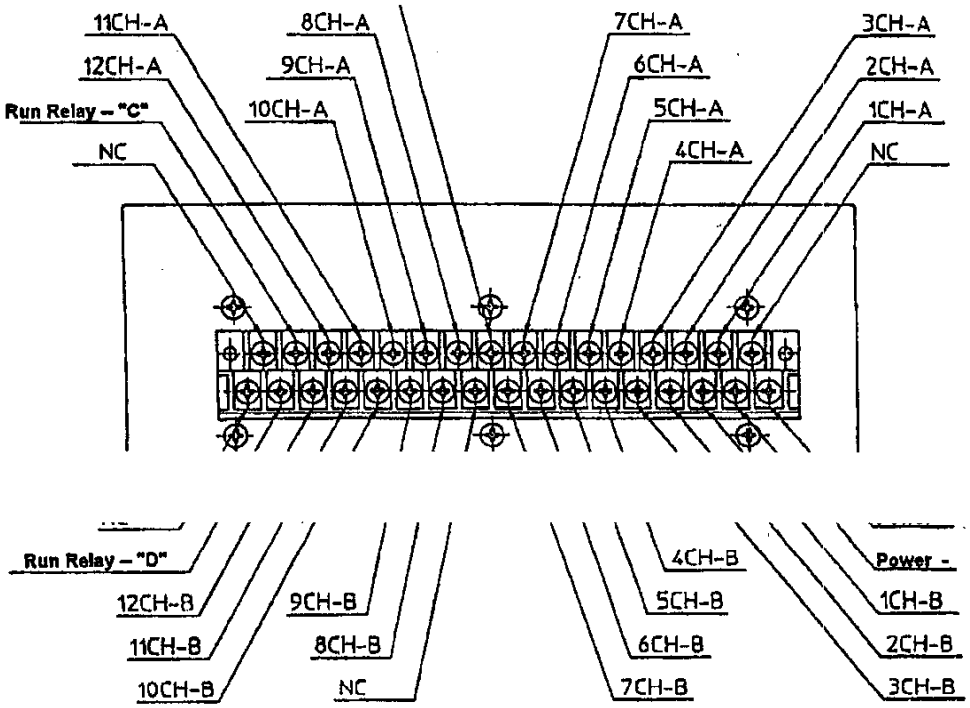
6.3 Relay Output Description

The system provides 12 output relays plus one main or "run" relay. All relays are SPST, N.O. type. The main relay will remain closed any time a valid data signal is being received from the transmitter. When no function switches are active and the RF from the transmitter is off, the main relay will open. The individual

channel relays will close any time their corresponding function switch is held on at the transmitter, and will release as soon as the transmitter switch is released.

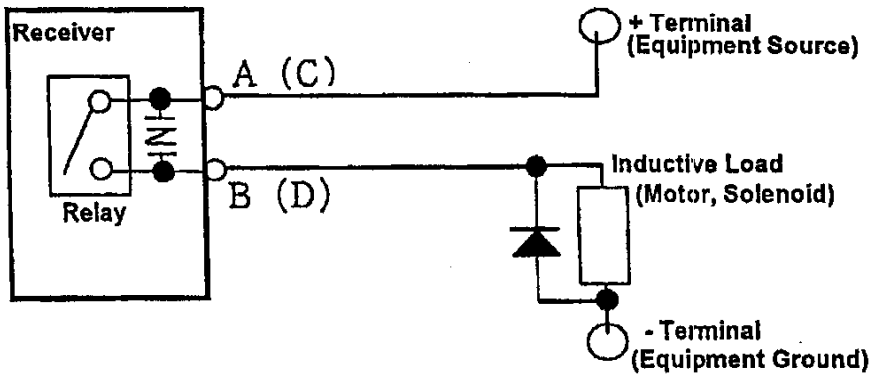
Do not exceed voltage and current ratings at relay output connections.

Terminal Strip Connections



When directly connecting motor, solenoid or other inductive loads, install a diode as shown in the following illustration. The diode rating should be at least ten times the rated load voltage and capable of handling the maximum DC load current.

Diode Installation - Inductive Loads

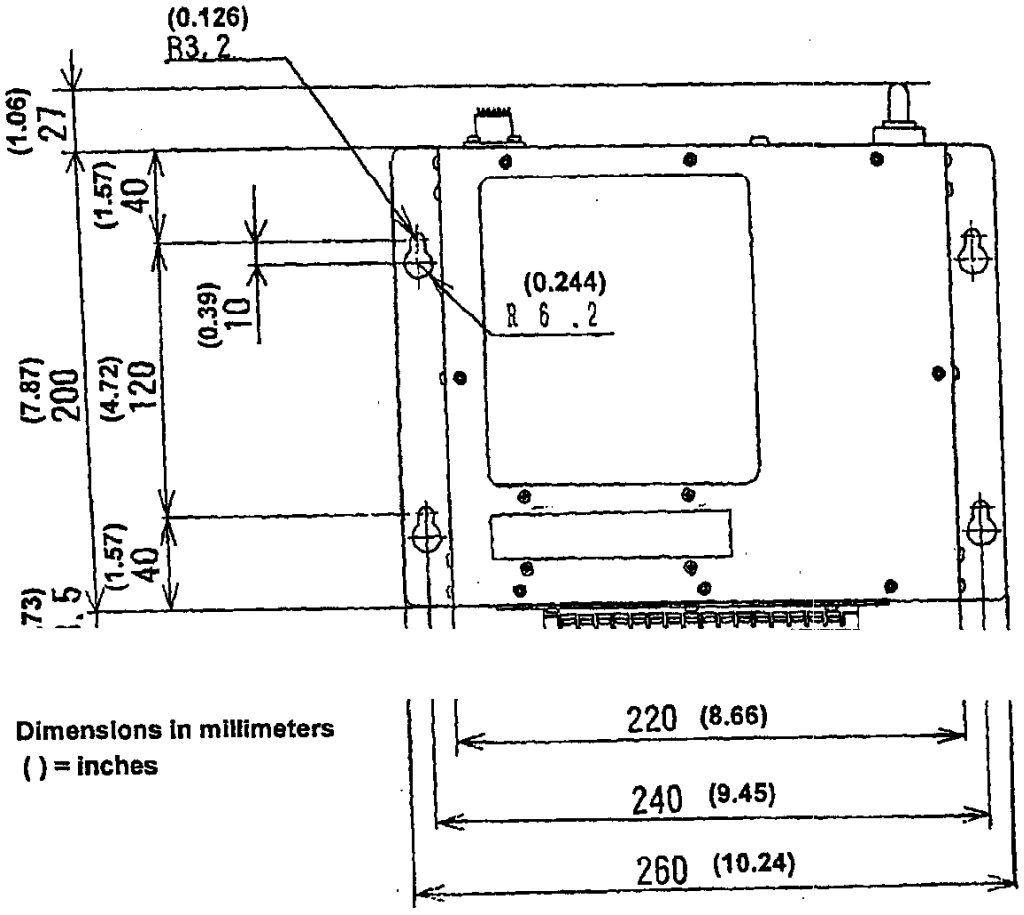


6.4 Receiver Installation Instructions

If the receiver will be installed on vibrating machinery or in an area subject to vibration, vibration damping mounts should be used to minimize vibration to the

The receiver must not be exposed to water or moisture, or installed in a damp area. For installations in these environments, the receiver should be mounted inside a waterproof enclosure properly rated for the application.

Receiver Dimensions



Dimensions in millimeters
( ) = inches

6.5 Receiver Power Connections

Observe polarity of receiver power terminals when connecting to power source. Verify correct polarity before applying power.

Verify that the supply voltage to the receiver is within the proper range.

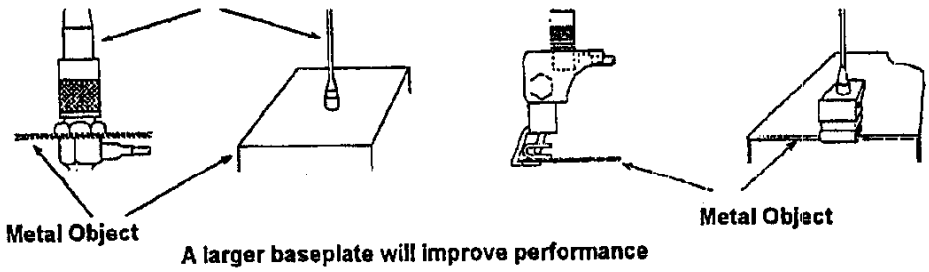
6.6 Receiver Antenna Installation - Remote Antenna Mounting

For installations where the antenna will be remote mounted from the receiver, use the supplied antenna cable assembly and mounting bracket.

For best operating range, mount the antenna at a high location, such as on top of the cab for truck installations. Avoid mounting the antenna and cable close to sources of electrical noise.

When mounting the antenna directly to a surface rather than using the supplied bracket, pick an area providing the largest available ground plane (metal surface), such as the center of the cab roof on a truck. This will provide the best operating range for the system. If there is no available metal surface, (i.e.: a truck cab using fiberglass or other non-metallic material) a ground plane (metal surface) should be added if at all possible. As a minimum, a metal plate one foot in diameter or one foot square, with a thickness of one millimeter or greater should be used. With a larger ground plane, the receiver will have better sensitivity and provide a more uniform coverage area.

Antenna Mounting Examples



A larger baseplate will improve performance
170 x 170 mm (6.7 x 6.7 in.) minimum
305 x 305 mm (12 x 12 in.) recommended

Section 7 OPERATION

STEP	CHECK
1. Turn Receiver power on	Check to be sure the transmitter is off
2. Turn Transmitter power switch on	Make sure all function switches are off
3. Start operating the system	Observe safe operating procedures!
4. Finish system operation	
5. Turn Transmitter power switch off	Do not turn the receiver off first
6. Turn Receiver power off.	Make sure all switches are off

After power has been applied to the system as outlined above, operating the function switches on the transmitter will cause the corresponding relay to activate at the receiver. The relays are momentary operation only. They will [illegible] as long as the switch is held at the transmitter.

At power-up, the receiver is scanning all available channels. When the transmitter is first turned on, the ***Channel Watch***™ circuitry scans for, and selects, the first available clear channel. The receiver then locks onto that channel for operation. If no function switch is activated on the transmitter for three minutes, the channel is released and the receiver returns to scan mode. The next time a function switch is activated, ***Channel Watch***™ repeats the search and lock process.

In the event of radio interference disrupting operations, there are two methods to solve the problem:

1. If the receiver is accessible, turn the power switch to off for a few seconds and back on, then turn the transmitter power switch off and back on. A new channel will be selected

2. If the receiver is not accessible, wait three to four minutes without activating a function switch on the transmitter. The monitor LED will change from a fast blink to a slow blink, indicating the channel has been dropped. Activating a function switch at this time will cause a new channel to be selected.

8.0 TROUBLESHOOTING

8.1 Installation

SYMPTOM	CHECK	CORRECTIONS
Turn transmitter on, nothing happens	Monitor LED not on?	Be sure power switch is on.
	Is the power switch on?	Check that batteries are good.
	Are the batteries OK?	Check that batteries are installed properly.
	Batteries correctly installed?	
	Auto-power-off feature active?	Cycle the power switch off and back to on.
No receiver pilot lamp	Is receiver power wiring properly connected?	Check for proper wiring
	Is the polarity correct?	Check wiring polarity
	the receiver?	
	Is the receiver power fuse good?	Check fuse, replace with a fuse of the correct rating.
Receive pilot lamp on, but error LED stays on, no channel activity LED's when transmit functions are operated.	Is the receive antenna properly connected?	Check antenna connection.
	Is the receiver in a wet location or outside of proper operating temperatures?	Check for correct installation environment.
	Has the receiver been subjected to a high voltage source (i.e.: welding currents, etc.)?	If an over-voltage condition has occurred, contact service personnel for repair.
	Has the transmitter been dropped or subjected to severe shock?	If dropped, the transmitter may be damaged. Contact service personnel for repair.

8.2 Operation

SYMPTOM	CHECK	CORRECTIONS
Nothing happens when transmitter is turned on	Power switch turned on?	Turn on power switch
	Monitor lamp on?	Check batteries
	Batteries OK?	Replace batteries if bad
	Is auto-power-off active?	Cycle power switch off and on.
System operates, but range is limited or operation is intermittent.	Receive antenna broken?	Repair or replace antenna or connections if necessary
	Strong radio frequency interference in the area?	Receiver will not operate correctly in the presence of strong interference or a local on-channel signal. Powering the system down and back on will allow the carrier sense circuits to find a clear channel. Removing the interference source is the best cure.
	Electrical noise sources close to receiver or	Electrical noise (i.e.: motor brushes,
		receiver operation. Remove interference source.
	Reinforced concrete or metal obstructions between transmitter and receiver antenna?	Specified operating ranges are based upon line-of-sight conditions.
		Physical obstructions, especially those with high metal content, may reduce operating range. Avoid obstructions or relocate receiver antenna.
	Transmitter monitor LED showing proper indications?	Check transmitter operation per previous sections.
	Receiver subjected to high voltage spikes or transients?	Voltage spikes or transients may damage receiver circuits. If this is the case, contact service personnel.