Medium and Long Range Legacy System
Installation Manual V 2.2

Date of Purchase	
Place of Purchase	
Transmitter Serial #	
Receiver Serial #	

Installation and Operation Guide

Long Range Legacy System

Medium Range Legacy System

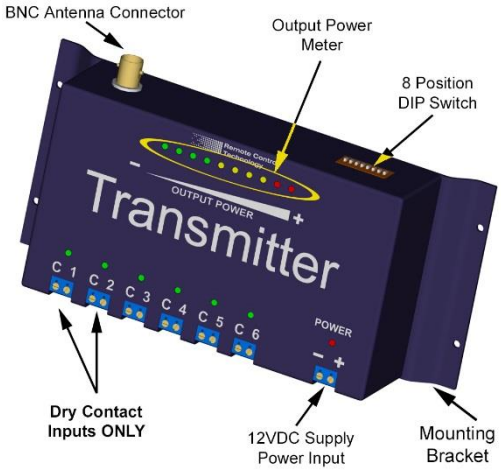
Introduction

Thank you for choosing one of Remote Control Technology's Legacy Systems. This versatile device has numerous practical applications such as Pump Control, Valve Actuation, Conveyor Control, Grain Auger Control, Light Control, Stacker Control, PLC Activation, Engine Control, Alarm Systems and Wireless Automation.

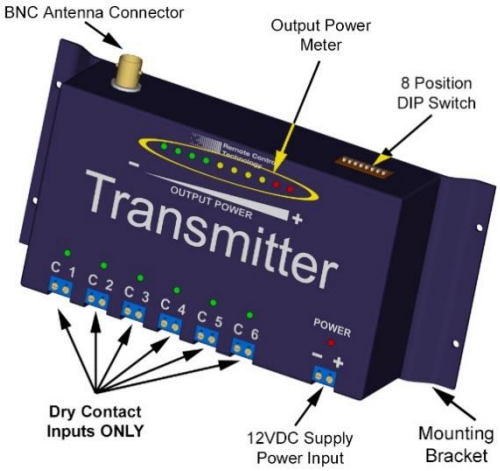
This system is 100% factory tested and consists of:

(1) Legacy Transmitter
(1) Legacy Receiver
(2) NEMA 4x Weather Resistant Enclosures with built-in power supplies
(2) Legacy High Performance Antenna
(2) Antenna mounting brackets
(2) Lightning arrestors (attached to antenna mounting brackets)
(2) Lightning arrestors (attached to enclosures)
(2) 12VDC Relays, contact rating of 6A @ 250 VAC (Medium Range Legacy Receiver)
(6) 12VDC Relays, contact rating of 6A @ 250 VAC (Long Range Legacy Receiver)
(2) 25' length of RG58 coaxial cable with BNC connectors

	Medium Range	Long Range
Potential Range	2 Miles	5 Miles
Transmitter Inputs	2	6
Receiver Outputs	2	6
Enclosure	NEMA 4X Plastic	NEMA 4X Metal



Medium Range Transmitter



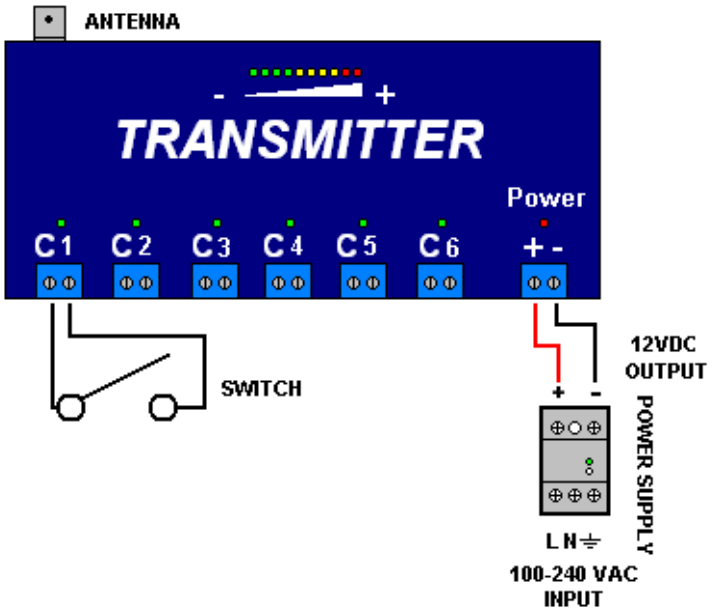
Long Range Transmitter

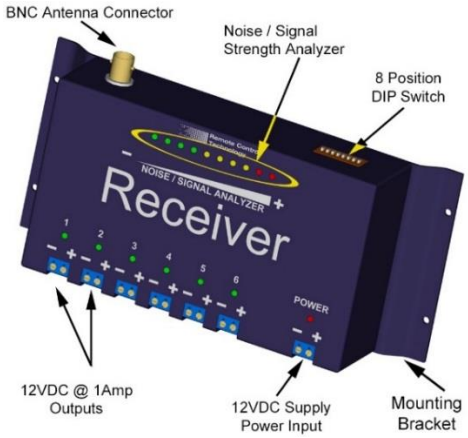
Legacy Transmitter Operation

Operation is simple; connect a switch, relay, or any device with a dry contact closure to the transmitter inputs (terminal block). When a contact is closed, the transmitter will immediately send an "ON" transmission to the receiver, changing the state of the selected receiver output from 0 VDC to 12 VDC @ 1 Amp. The receiver output will then be used to activate the attached external 12 VDC relay.

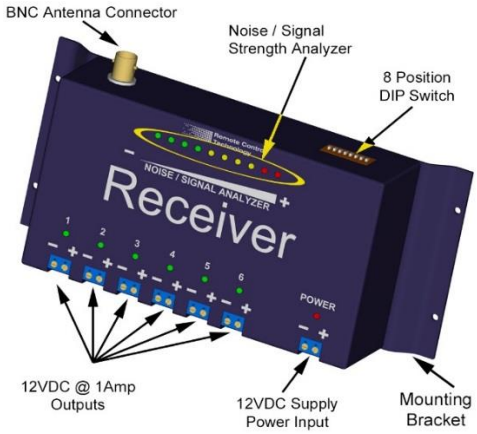
As long as the input remains closed, the transmitter will send a repeat "ON" transmission once every 18 minutes, maintaining the state of the receiver output.

Immediately after a contact is open, the transmitter will send an "OFF" transmission to the receiver, changing the state of the selected output from 12 VDC to 0 VDC, deactivating the attached external relay.





Medium Range Receiver



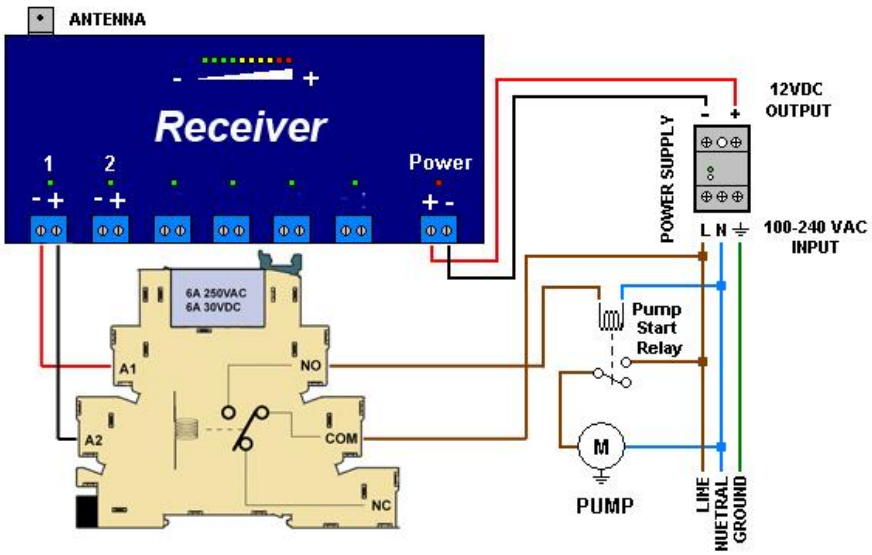
Long Range Receiver

Legacy Receiver Operation

Upon successful reception of the transmission from the transmitter, the receiver will activate the selected output(s). Each output is designed to provide 12 VDC and 1 A of current. The MRWSS comes with two SPDT class C relays with a contact rating of 6 A @ 250 VAC resistive load. Any devices connected to an output must not have a current draw of more than 6 A @ 250 VAC or 6 A with 110 VAC coils, lights, motors, etc.

The relays have three (3) output contacts: Normally Open (NO), Common (C), and Normally Closed (NC). When the relay is inactive the contacts between NC and C will be closed. When the relay is activated by the receiver it will close the contacts between NO and C and open the contacts between NC and C. When controlling AC (single phase only) devices, connect the Line or Hot lead between power and the device through either the C and NO contacts or the C and NC contacts (depending on the desired operation). For DC devices connect the Positive lead as described for the Line or Hot lead of an AC device.

Once an output is activated, it will remain active for 20 minutes. The output is maintained by the 18-minute repeat transmission of the transmitter. With every transmission from the transmitter, the 20-minute off delay is reset. Immediately upon receiving an "OFF" transmission from the transmitter, the selected output(s) are deactivated. The 20-minute "OFF" delay prevents the receiver output from remaining active in the event that the "OFF" transmission is not received.



DIP Switch Configuration

Each transmitter and receiver has one eight-position DIP switch. The DIP switches for the transmitter and the receiver come pre-configured from RCT.

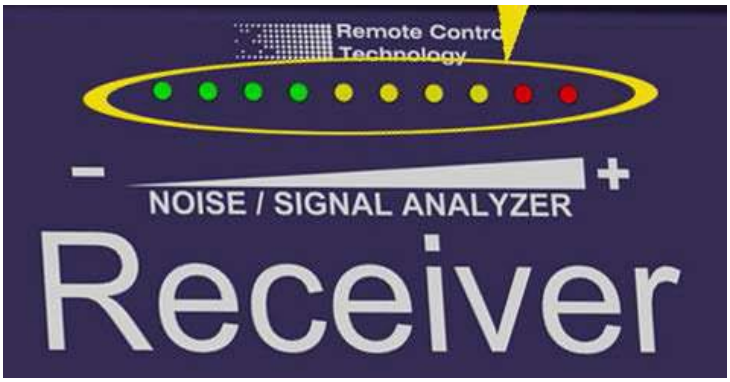
DIP switches must:

1. The positions of the DIP switch for the transmitter must match the positions of the DIP switch for its corresponding receiver(s).
2. At least one switch must be in the "ON" position
3. If DIP switch settings are changed on either unit, it must be powered off and then on again in order for the change to be recognized

Noise / Signal Strength Analyzer

Integrated in the receiver is a noise/signal strength analyzer. This will display the level of ambient noise and the strength of the incoming transmission from the transmitter. The green LEDs indicate a low to medium level of ambient noise, the amber LEDs indicate a medium to high level of ambient noise, and the red LEDs indicate a very high level of ambient noise. Eliminating sources of ambient noise, shielding your product from them, and/or relocating the antenna can help reduce the noise level and increase signal reception. When receiving a transmission from the transmitter, the noise/signal strength analyzer will display the signal strength of the transmitter. The green LEDs indicate a low to medium level of signal strength, the amber LEDs indicate a medium to high level of signal strength, and the red LEDs indicate a high level of signal strength.

See "Troubleshooting Receiver Noise" for tips on how to reduce noise levels at the receiver location.



Bench Testing

Bench testing is recommended prior to installation in order to better understand system operation.

- The Transmitter transmits an "ON" and an "OFF" signal when the inputs are closed and opened respectively.
- The Receiver receives the transmissions and activates the corresponding output accordingly.
- The Transmitter sends repeat "ON" transmissions every 18 minutes as long as the input remains closed.
- The Receiver receives the repeat "ON" transmissions and maintains the output accordingly.
- The Receiver times out after 20 minutes when it does not receive either a repeat "ON" transmission or an "OFF" transmission.

Set-up

1. Connect line power to 12 VDC supply for Transmitter and Receiver.
2. Transmitter **must be** connected to an antenna at all times.
3. Receiver should **not** be connected to an antenna while bench testing.
4. Transmitter and receiver should be at least 3 feet apart when testing.
5. The DIP switches on both the Transmitter and Receiver **must be identical.**
6. In order to send test transmissions, it is preferable to use a manual switch at each input of the transmitter, one for Input C1 and another for Input C2.
7. Make all connections prior to applying system power.

Sending "ON" Transmission

1. Close the switch at Input C1 on the transmitter. The Output Power Meter across the top of the transmitter will read from green to red (all LEDs light up) for 1-2 seconds.
2. The green LED over Input C1 will light up.
3. On the receiver, the Signal Strength Analyzer across the top will read from green up to the red (all LEDs light up) for 1-2 seconds.
4. The green LED over Output 1 will light up.
5. The red LED over the receiver's 12 VDC input will flash slowly (indicating that one or both of the outputs are activated).
6. There will 12 VDC at Output 1 and the external 12 VDC relay will have continuity between "C" and "NO".
7. Note: If no wires are connected to the relay outputs, the relay screws should be tightened for the most accurate continuity readings.
8. Repeat for Input C2 / Output 2.
9. An "ON" transmission has now been sent for both inputs on the transmitter and both outputs at the receiver are providing 12 VDC to the external relays.

Sending "OFF" Transmission

1. Reverse the process by opening the switch at input C1 at the Transmitter.
2. The Output Power Meter across the top of the transmitter will read from green up to the red (all LEDs light up) for 1-2 seconds.
3. The green LED over Input C1 will turn off.
4. On the receiver, the Signal Strength Analyzer across the top will read green up to the red (all LEDs light up) for 1-2 seconds.
5. The green LED over Output 1 will turn off.
6. There will be 0 VDC at Output 1 and the external 12 VDC relay will have continuity between "C" and "NC".
7. Repeat for Input C2 / Output 2.
8. The red LED over the receiver's 12 VDC input will stop flashing.
9. An "OFF" transmission has now been sent for both inputs on the transmitter and both outputs at the receiver are no longer providing 12 VDC to the external relays.

Repeat Transmission

1. Send an "ON" Transmission for both inputs as you did in Part 1.
2. After approximately 18 minutes the Transmitter will send another "ON" transmission, which will maintain the 12 VDC at both outputs of the Receiver and continuity between "C" and "NO" on the external relay.
3. The Transmitter will continue to send "ON" transmissions every 18 minutes as long as the input contacts are closed.

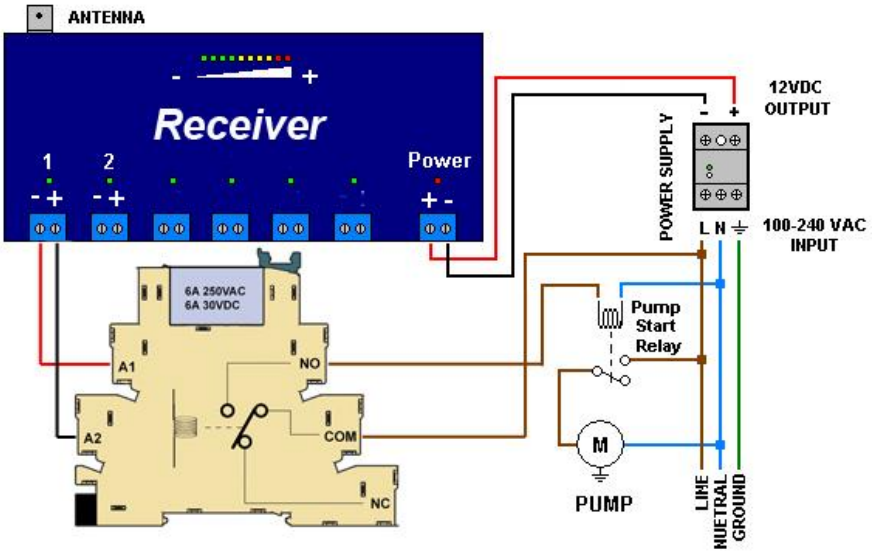
Receiver Time-out

1. With the output(s) activated on the Receiver, remove power from the Transmitter ONLY (simulating a power failure) **without** sending an "OFF" transmission.
2. Approximately 20 minutes after the last "ON" transmissions, the green LEDs over Receiver Outputs 1 & 2 will turn off, there will be 0 VDC at the outputs and the external relay contacts will have continuity between "C" and "NC".

Before Installation

- Remote Control Technology recommends that you have your new wireless switch system installed by a professional electrician
- Bench Testing: In order to better understand system operation, bench testing is recommended prior to installation. Please see page 5 for testing instructions
- Be sure to install the receiver and transmitter at least 20-40 feet away from any other device that would cause interference, such as variable frequency drives, large power transformers and other radio equipment
- Keep AC and DC wiring in separate bundles
- Use a multi-conductor shielded cable to connect any devices
- Provide a good earth ground to the receiver and transmitter power supplies
- Locate the receiver and transmitter antennas away from any device that would cause interference

Receiver Installation



1. Route either the Line of and AC device or Positive of a DC device, such as a light, motor, or contactor through one of the holes at the bottom of the receiver enclosure and connect them to their corresponding terminals on the desired output relay. The outputs will be labeled from 1-2. See the Receiver Operation section for details on Relay operation.
2. ***Caution:*** Do not connect any devices that draw more than 6A at 250 VAC directly to the relay outputs. Doing so will result in damage to the relay and/or receiver.
3. Attach the antenna to the antenna bracket assembly. The lightning arrestor is shipped connected to the antenna bracket. DO NOT disassemble the antenna bracket or the lightning arrestor.
4. Connect the antenna bracket assembly to the coaxial cable provided and attach the cable to the BNC connector at the top of the receiver enclosure.
5. **Note:** Do not loop excess coaxial cable into a coil. This will cause a radio frequency choke and reduce your signal range. Lay excess cable in a straight line or loosely route it back and forth in an "S" configuration.

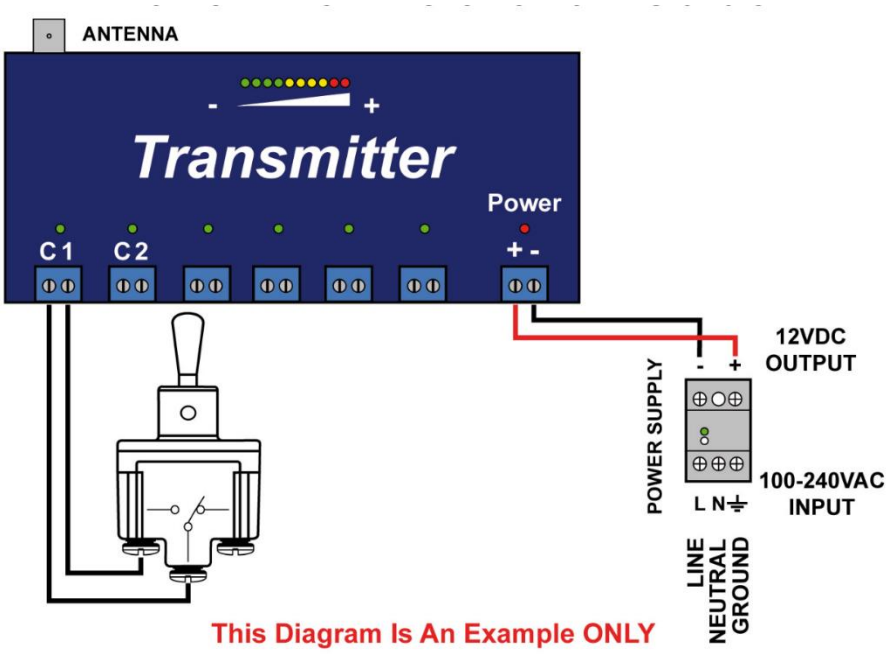
6. Affix the wall mounting brackets included with the system to the back of the receiver enclosure and then mount it to a wall, pole or another enclosure.
7. Route the leads of a 110-240 VAC power source through one of the holes at the bottom of the enclosure and connect it to the 12 VDC power supply. When not using utility power or when using solar panel equipped systems, connect a 12 VDC battery or any other 12 VDC source directly to the power terminal of the transmitter.

Caution: Check all wiring connections before applying power. Failure to do so ran result in serious damage to your product.

This product includes 2 to 6 SPDT Class C Relays that have been installed into the enclosure and wired to the receiver by Remote Control Technology, Inc. These Relays have a contact rating of 6 amps @ 250 VAC and 6 amps @ 30 VDC (Resistive Load). A sample wiring-diagram has been included for your convenience.

Once your MRWSS or LRWSS receiver output is activated, it will output 12 VDC to the inputs of the Relay. The Relay coil is then energized and will switch continuity from COM (Common) and NC (Normally Closed) to COM and NO (Normally Open). In the example above, this will create a complete circuit for the motor, and the motor will turn on.

Transmitter Installation

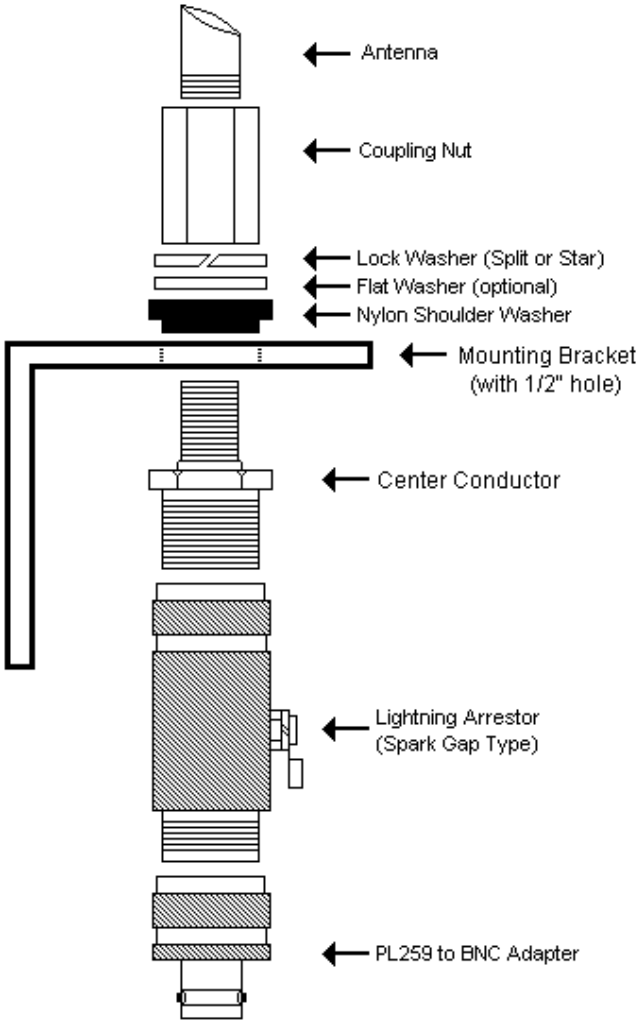


1. Connect the wires of your dry contact closure(s) to the desired terminal block(s) on the transmitter.
2. ***Caution:*** Dry contacts only. **DO NOT** apply any power to the input terminals or the transmitter. Doing so WILL damage the transmitter and void the warranty.
3. Attach the antenna to the antenna bracket assembly. The lightning arrestor is shipped connected to the antenna bracket. **DO NOT** disassemble the antenna bracket or the lightning arrestor.
4. Connect the assembly to the coaxial cable provided and attach the cable to the BNC connector at the top of the receiver enclosure.
5. ***Note:*** Do not loop excess coaxial cable into a coil. This will cause a radio frequency choke and reduce your signal range. Lay excess cable in a straight line or loosely route it back and forth in an "S" configuration.
6. Affix the wall mounting brackets included with the system to the back of the transmitter enclosure and then mount it to a wall pole or another enclosure.
7. Route the leads of a 110-240 VAC power source through one of the holes at the bottom of the enclosure and connect it to the 12 VDC power supply. When not using utility power or when using solar panel equipped systems, connect a 12 VDC battery or any other 12 VDC source directly to the power terminal of the receiver.

Caution: Check all wiring connections before applying power. Failure to do so can result in serious damage to your product.

Lightning Arrestors

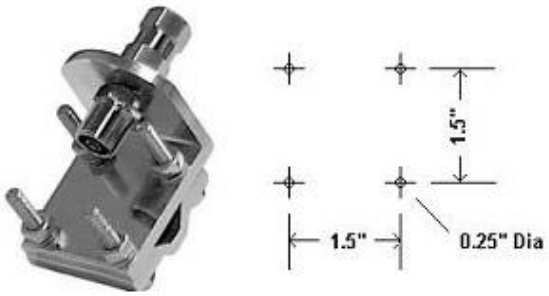
A spark-gap style lightning arrestor is provided as part of the antenna mounting hardware for each transmitter and receiver and should be connected to an earth ground.



NOTE: Nylon Shoulder Washer lip MUST be seated inside Mounting Bracket hole for proper insulation!

Lightning Arrestor

Right Angle Bracket Assemble Diagram



Right Angle Bracket Hole Locations

An optional Gas Discharge Tube style lightning arrestor is available separately for additional protection and is mounted at the enclosure.

Antenna Installation

- Mount the antennas at least 40 feet away from electric motors, large power transformers, power lines, VFDs or any equipment that produces ambient electrical noise
- Supply the antennas for the receiver and the transmitter with a good ground plane by either attaching a 10 AWG or larger wire from the lightning arrestor to an earth ground or mounting the antenna to a metal pole or conduit connected to an earth ground
- Mount all antennas outdoors; for equipment located indoors, run a length of RG-58 coaxial cable from the receiver to an antenna mounted outdoors
- Mount antennas as high as possible, at least 3 feet away from vertical surfaces and not under roof awnings; if mounting the antenna on a building, mount it at the apex or the highest point of the building
- When mounting on or near a metal roof, raise the base of the antenna at least 3 feet above the roof surface
- When mounting the antenna to a metal pole, mount the antenna at the top of the pole or at least 3 feet away from the pole
- Avoid mounting the antenna on the same pole as the power service
- Avoid mounting the antenna on or near a chain link fence; if necessary, the antenna can be mounted at least 3 feet above the fence
- Use only high-quality antenna and cable connectors, which are available from Remote Control Technology
- Make sure that the antenna-mounting bracket is assembled as shown above

Troubleshooting Receiver Noise

Integrated in the receiver is a Noise/Signal Strength Analyzer. This will display the level of ambient noise and the strength of the incoming transmission from the transmitter.

When receiving a transmission from the transmitter, the noise/signal strength analyzer will display the signal strength of that transmission.

When a transmission occurs, the green LEDs indicate a low to medium level of signal strength, the amber LEDs indicate a medium to high level of signal strength, and the red LEDs indicate a high level of signal strength.

Otherwise, the green LEDs indicate a low to medium level of ambient noise, the amber LEDs indicate a medium to high level of ambient noise, and the red LEDs indicate a very high level of ambient noise.

Eliminating sources of ambient noise, shielding your product from them, and/or relocating the antenna can help reduce the noise level and increase signal reception.

Signal Analyzer (ideally <u>all</u> LEDs will be lit)

- During reception of an "ON" transmission (for about 1-2 seconds)
- During reception of an "OFF" transmission (for about 1-2 seconds)

Noise Analyzer (ideally <u>no</u> LEDs will be lit)

- In between reception of either an "ON" or "OFF" transmission, if any LEDs are lit up they are indicating the presence of ambient electrical noise.

Sources of Noise

Generally speaking, there are three sources of noise that will generate a reading of the noise analyzer:

1. AC power source is "dirty" (power is contaminated with noise and distortion); this can occur without an active load but can also become more of a problem once the circuit being completed by the receiver becomes active.
2. Receiver is physically too close to sources of noise such as motors, electrical panels, transformers, VFDs, power meters, etc.
3. The receiver antenna is too close to sources of noise such as high voltage cables or wires, transformers, AC service hook-ups, etc.

Before troubleshooting noise

- Be sure to install the receiver and transmitter at least 20-40 feet away from any other device that would cause interference, such as variable frequency drives, large power transformers, and other radio equipment.
- Make sure that the receiver back plate and power supply is connected to an earth ground
- Make sure that the antenna lightning arrestor is connected to an earth ground
- Make sure that signal wires are not bundled with power wires
- Make sure that AC wires are not bundled with DC wires
- Uses a multi-conductor shielded cable to connect any devices

Troubleshooting Tips

Readings on the noise analyzer can be a combination of sources and reducing noise levels can be a matter of trial and error, so it is important to keep track of your findings as you troubleshoot.

A 12 VDC battery is an important troubleshooting tool for two reasons; it allows you to power the receiver "off the power grid" and allows you to move the receiver in order to determine a good permanent location.

It is important to observe noise levels both with and without an active load; there may be cases where noise levels are at a minimum without an active load but where noise level increases once a receiver output is activated and the connected circuit turns on.

Troubleshooting Noise

First, determine whether dirty AC power is a factor:

Observe noise levels both with and without an active load. Now remove the AC power source and connect a 12 VDC battery (voltage should read no more than 14 VDC). Observe noise levels both with and without an active load.

If the noise level drops while powering the receiver with a 12 VDC battery, then dirty power is likely causing at least part of the noise.

Second, determine whether the receiver is too close to sources of noise:

With the receiver still powered by the 12 VDC batter, try relocating the receiver away from sources of noise such as motors, electrical panels, transformers, VFDs, power meters, etc.

Observe noise levels both with and without an active load. If the noise level drops after relocating the receiver away from these sources of noise, then the receiver will likely need to be relocated.

Third, determine whether antenna location is a factor:

If noise levels still persistent at this point, relocating the antenna may be necessary. This can be a bit more difficult due to:

- The available length of coax cable
- The fact that the antenna should ideally be grounded

Following the antenna installation guidelines (see Antenna Installation) can eliminate most noise issues caused by poor antenna placement.

Summary

The Noise/Signal Analyzer can be a critical tool for determining proper receiver placement. Short-term exposure to noisy environments can prohibit proper receiver functionality and long-term exposure can cause poor overall system performance. If you have additional questions or require real-time technical support, please contact Remote Control Technology for assistance.

NOTES: