Operator's Manual

LOR Manufacturing Radio System

LDA Transmitter

Transmitter—900 MHz/2.4 GHz

MANUFACTURING COMPANY, INC.

Publication—LMRS_LDA_TX_050415_US

Version

Thoroughly read and understand all information presented in this manual before using your digital control.

Notice: The information contained in this manual is subject to change without notice.

LOR Manufacturing shall not be liable for errors contained herein or for consequential damages in connection with the furnishing, performance, or use of this material.

One Year Limited Warranty

LOR Manufacturing Company, Inc. (LOR), shall, for a term of not longer than one (1) year from date of shipment from LOR's facilities, repair or replace any item (FOB from Weidman, MI U.S.A) should it prove that the item is defective in materials or workmanship. **LOR will cover UPS Ground Shipping only**. Expedited shipping is available at the customer's discretion. This warranty does not cover damage resulting from: mishandling in transit, vandalism, misuse, abuse, acts of nature, alteration or lack of reasonable care. LOR does not assume, nor is LOR responsible for any real or consequential damages from claims against the performance of our product. LOR is not liable for any cost related to loss of life, property, or revenue. Further, LOR is in no way responsible for installation of our product, and will assume no cost of re-installation or removal. This warranty is in lieu of all other warranties expressed or implied.

LOR's Radio Controls must conform to the FCC Part 15 requirements. Therefore, the range and power of our radios are within the specified limits set forth therein.

You should test your entire system daily to ensure that all components are in good working order.

No implied warranty of merchantability or fitness for a particular purpose shall extend beyond one year from date of shipment. The liability of LOR under any such implied warranty and under this limited warranty shall be limited to the repair or replacement of defective parts within one year from date of shipment from LOR's facilities. LOR shall not be liable for any incidental or consequential damages. Some states do not allow limitations of incidental or consequential damages, so the above limitations or exclusions may not apply to you. This warranty gives you specific rights, and you may also have other rights which vary from state to state.

Contents

Cautions and Warnings

Caution

All LOR Products must be physically disconnected from the Machine **before** welding. Failure to do this may cause damage to integrated circuit chips and other electronic components, thus voiding the warranty.

Caution

Make sure machinery and surrounding area is clear before operating. Do not activate the remote system unless it is safe to do so.

Warning

Disconnect all power before making any wiring connections to the Receiver

Caution

Improper operation of these controls could cause damage to equipment. Do not allow anyone to operate this equipment before completely reading the manual.

⚠ *Caution*

These controls are intended as general purpose switches. They are not safety devices. Malfunctions may occur. These Products are used to initiate an operation where false operation could be dangerous. Point-of-Operation guarding devices must be installed and maintained to meet OSHA and ANSI Machine Safety Standards. Manufacturer shall not accept responsibility for installation, application, or safety of systems.

Read this first

- Always keep this manual readily available for future reference
- Make sure the area is safe to operate equipment before turning power on
- This device complies with Part 15 of the FCC regulations. 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

- If you encounter any problem or malfunction, refer to the Troubleshooting Guide located on page 3. If the problem or malfunction persists, call your equipment dealer immediately
- Contact your equipment dealer for replacement parts and/or service

Care & Handling

- Do not immerse transmitter in water or expose to excess amounts of water
- Do not drop the transmitter
- Do not expose the transmitter to hard physical shocks
- Do not expose the transmitter to extreme temperatures
- Remove the battery if the transmitter is to be stored for long periods of time[1]
- Do not handle the transmitter by the antenna[2]

[1] Periods in excess of 30 days

[2] Only applies to models equipped with antenna.

Minimum Safe Distance

Per EN ISO 14982 §6.6.2, electric field strength is tested at $24V/m$. Use the following formula to determine the safe distance to operate an RF Transmitter. Online field strength calculator can be found at http://www.compeng.com.au/rf-calculator/

$$d = \sqrt{W \times 30 \times \frac{10^{\frac{1}{10}(dBi)}}{(24V/m)^2}} \tag{1}$$

Where:

d is the safe distance in meters

dBi is the gain of the antenna

W is power in watts into the antenna

Example 1:

1 watt transmitter

$1dBi$ gain antenna

$$0.256 = \sqrt{1watt \times 30 \times \frac{10^{\frac{1dBi}{10}}}{(24V/m)^2}} \tag{2}$$

Example 2:

1 watt transmitter

$1dBi$ gain antenna

$$0.512 = \sqrt{4watt \times 30 \times \frac{10^{\frac{1dBi}{10}}}{(24V/m)^2}} \tag{3}$$

Diode Suppression

Be advised that it is **strongly recommended** to use **Diode Suppression** on all electro-hydraulic valve coils. Please see the following.

Field observation of a machine with bad coils and no Diode Suppression led to the following conclusions:

Diode suppression on all coils are essential to protect electronic equipment from being damaged. This can be accomplished by installing the suppression diode (See Fig: 1) to the output harness for the hydraulic coil. In order to help protect the coils from damaging voltage spikes each coil should have this protection installed as closely to the hydraulic coil as possible.

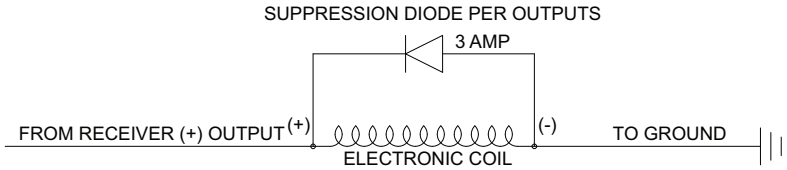


Figure 1: *Diode Suppression*

Specifications

Table 1 *– General Specifications (900 MHz)*

General Specifications (900 MHz)	
Frequency Range	ISM 902—928 MHz
Frequency Control	7 Frequency Hopping Channels (Software Selectable)
Modulation	DSSS (Direct Sequence Spread Spectrum)
Error Correction	Automatic Error Detection and Automatic Retransmission
Operating Range	Approximately 1500 ft (Line of Sight)
Operating Temperature	-40°—85°C (-40°—185°F)
Humidity	Up to 90% RH, non-condensing

Table 2 *– General Specifications (2.4 GHz)*

General Specifications (2.4 GHz)	
Frequency Range	2403.328—2480.128 MHz (ARIB STD-T66)
	2473.984—2493.440 MHz (RCR STD-33)
Frequency Control	7 Frequency Hopping Channels (Software Selectable)
Modulation	DSSS (Direct Sequence Spread Spectrum)
Error Correction	Automatic Error Detection and Automatic Retransmission
Operating Range	Approximately 600 ft (Line of Sight)
Operating Temperature	-40°—85°C (-40°—185°F)
Humidity	Up to 90% RH, non-condensing

Table 3 *– Transmitter Specifications*

Transmitter Specifications

Supply Voltage	4.8 VDC Min
	10 VDC Max
	6 VDC Typical (4 x AA Alkaline Batteries)[3]
Max. Current Consumption	< 180 mA (RF Active)
	< 10 mA (Idle Mode)
Digital Inputs	20 Available
Analog Inputs	8 Available—0-5 VDC[4]
LED Outputs	2 (Battery Status)
CAN Connection	J1939 (2-wire)
Power Saving Features	RF Emissions Off Delay < 1s; Sleep Mode after 3 minutes (< 1 mA)
Antenna	Internal[5]
Dimensions	Approx. 8” x 4” x 3.25”
Weight	Approx. 2 Lbs.
Approvals	**USA**: FCC **Europe**: CE **Japan**: Telec

3 Rechargeable option available
4 Configurable as Digital Inputs
5 External option available

LED Maps & Codes

Receiver LED Map

The following table contains the label and corresponding pin-out for each function LED on the Receiver Board.

Table 4 *– Receiver LED Map*

Label	Pin Number	Connector
G05	5	Gray
G08	8	
G04	4	
G09	9	
G03	3	
G10	10	
G02	2	
G11	11	
B02	2	Black
B11	11	
B03	3	
B10	10	
B04	4	
B09	9	
B05	5	
B08	8	

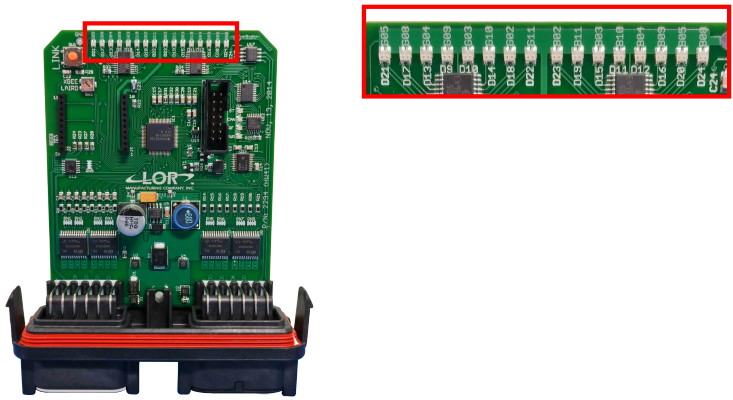


Figure 2: *Receiver LED Locations*

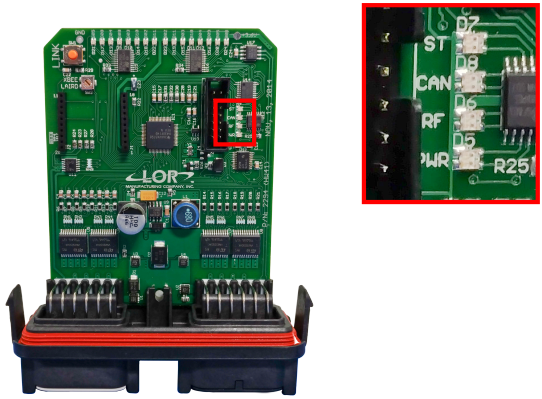


Figure 3: *Receiver Status LED Locations*

***Table 5** – Receiver Status LED Color Codes*

Code	Description
ST	Green: System is operating normally
	Red: System is in LINK mode
CAN	Green: System detecting CAN signal
	Red: No CAN Signal detected
RF	Green (Flashing): Good link with the Transmitter
	Red: No link detected
PWR	Green: Voltage detected; System operating normally
	Red: System under recommended operating voltage (< 9VDC)

***Table 6** – Receiver Output LED Status Codes*

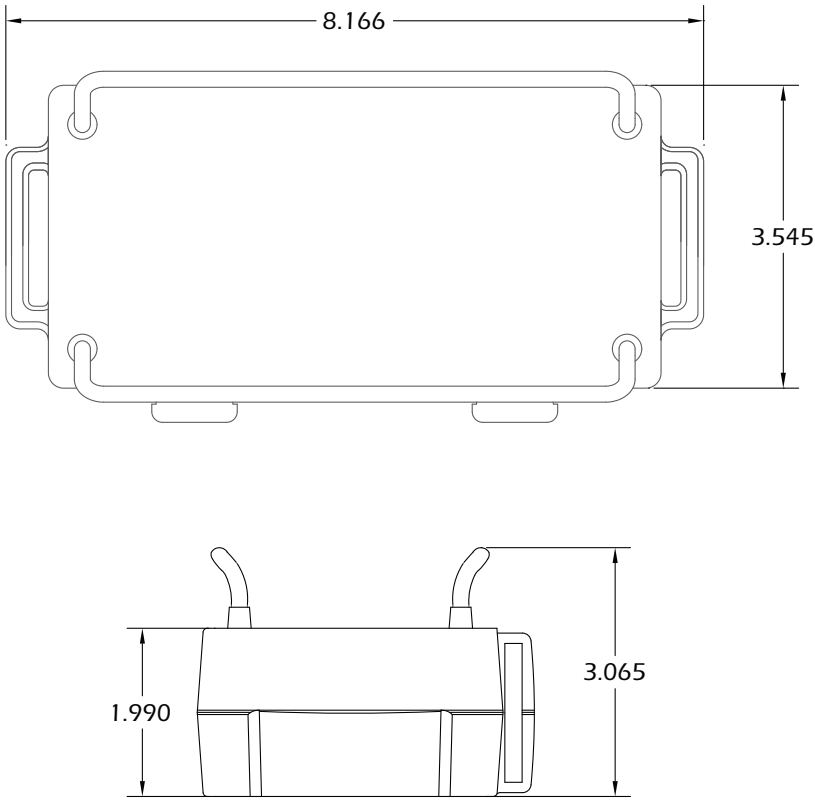
Code	Description
Red	Over Current Shutdown
Green	On and Load Detected
Orange	On and No Load Detected

Transmitter LED Codes

***Table 7** – Transmitter LED Status Codes*

Code	Description
Solid Green	Transmitting
Flashing Green	Idle Mode
Flashing Red	Batteries Low. Replace as soon as possible

Transmitter Dimensions



CHAPTER 1

Linking Procedure

In the event that you need to (re)link the transmitter and receiver together follow the steps listed below:

1. Disconnect Power from the Receiver
2. Remove the Receiver Board from the enclosure and locate the push button labeled "LINK"
3. Ensure that the Transmitter is powered off
4. Remove the battery door on the Transmitter and depress the button located on the rim of the battery compartment, just under the cover[1]
5. Supply Power to the Transmitter and Receiver
6. Depress and hold the "Link" button on the Receiver. When the system enters "LINK" mode the "ST" LED will turn Red.
7. The Receiver will then scan each channel looking for activity. Once it locates the Transmitter the "RF" LED on the Receiver will start flashing green
8. Once this occurs the system is linked and ready to use

[1] A ballpoint pen, small screwdriver, or paper clip can be used to perform this operation

9. Release the button on the Receiver
10. Place the Receiver back into the enclosure
11. Replace the battery door on the Transmitter

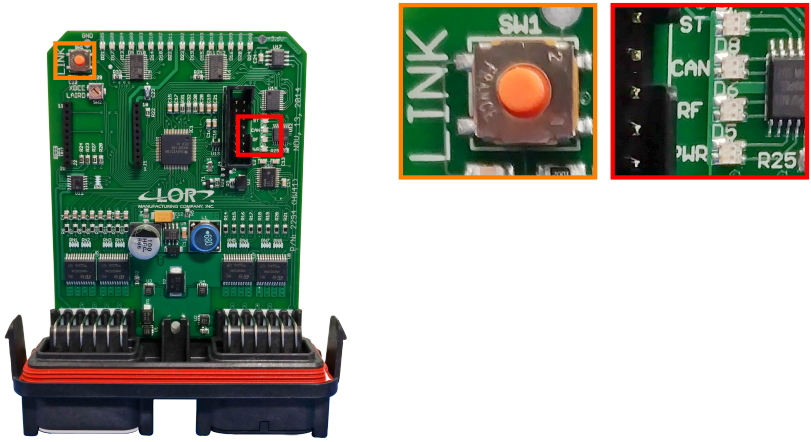


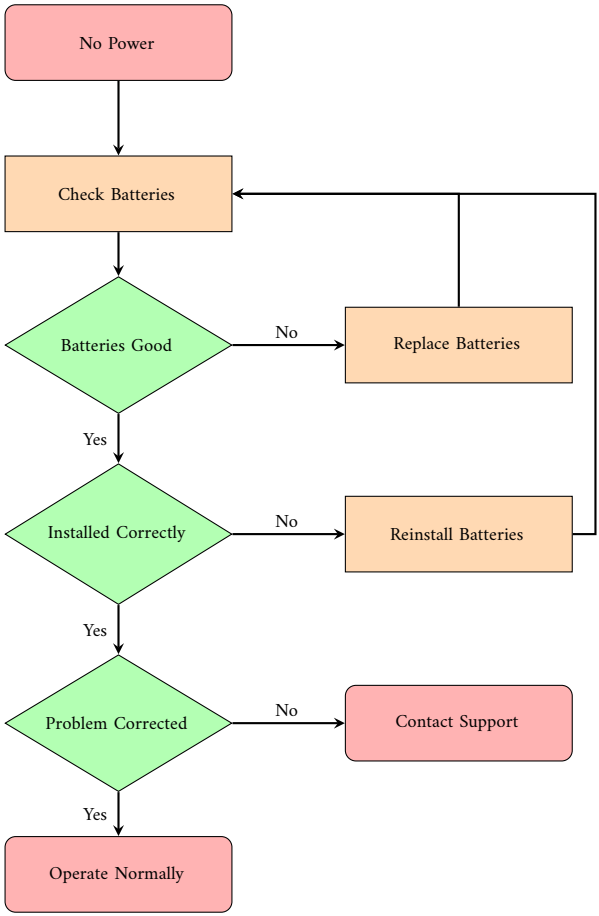
Figure 1.1: *Receiver Board Locations*

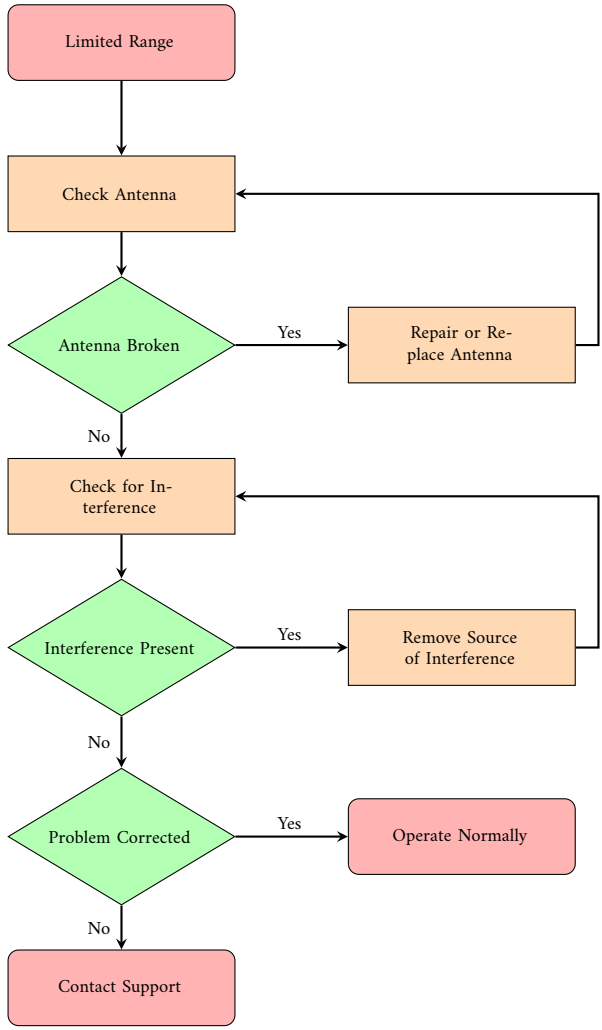
Figure 1.2: *Transmitter Button Location*

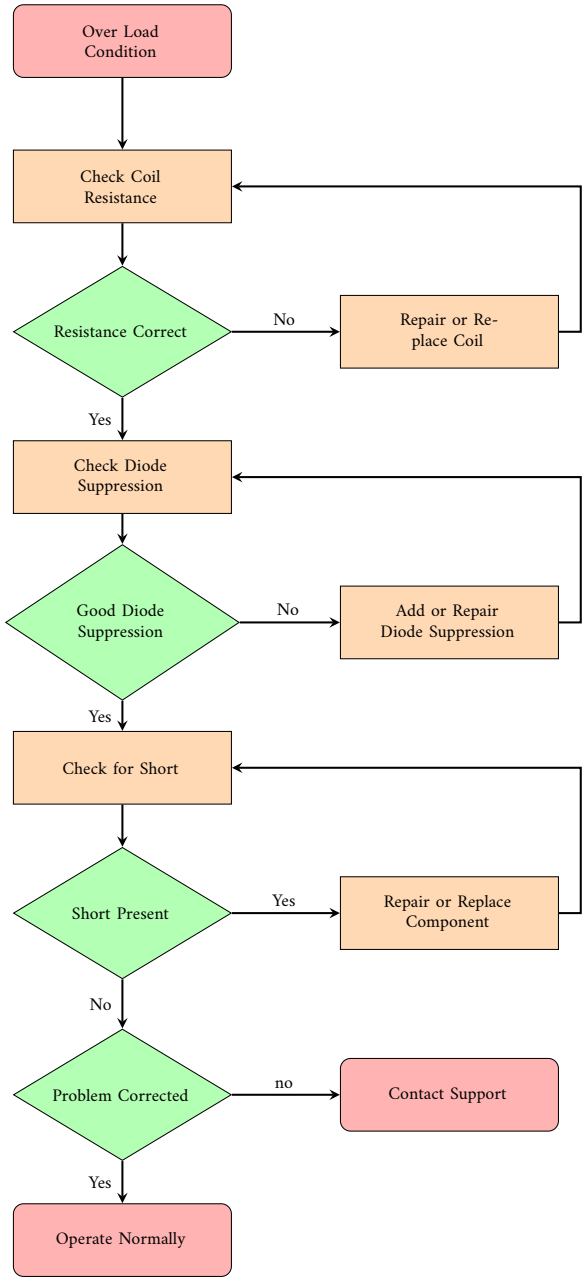
CHAPTER 2

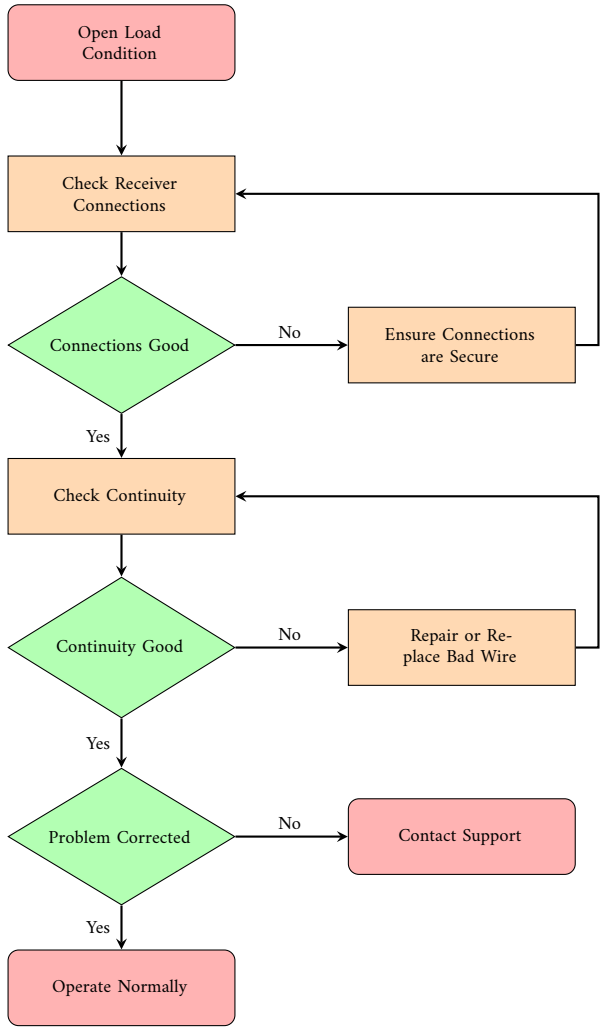
Troubleshooting

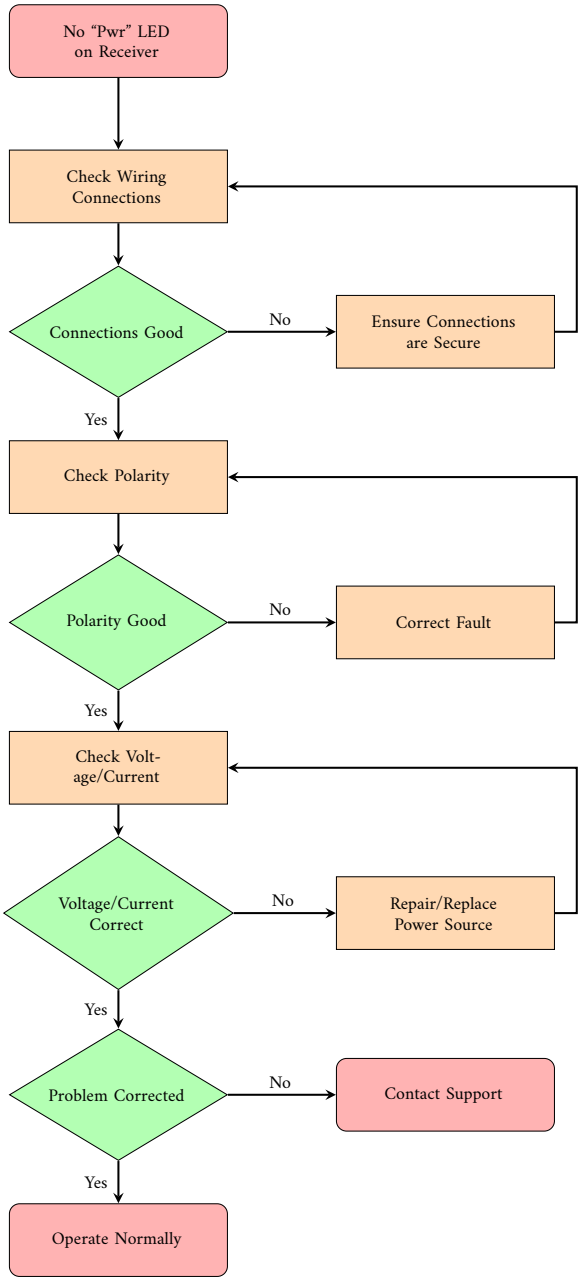
This section provides some common steps you can take when troubleshooting in the field.


No Power
Check Batteries
Batteries Good
No
Replace Batteries
Yes
Installed Correctly
No
Reinstall Batteries
Yes
Problem Corrected
No
Contact Support
Yes
Operate Normally


Limited Range
Check Antenna
Antenna Broken
Yes
Repair or Replace Antenna
No
Check for Interference
Interference Present
Yes
Remove Source of Interference
No
Problem Corrected
Yes
Operate Normally
No
Contact Support


Over Load Condition
Check Coil Resistance
Resistance Correct
No
Repair or Replace Coil
Yes
Check Diode Suppression
Good Diode Suppression
No
Add or Repair Diode Suppression
Yes
Check for Short
Short Present
Yes
Repair or Replace Component
No
Problem Corrected
no
Contact Support
Yes
Operate Normally


Open Load Condition
Check Receiver Connections
Connections Good
No
Ensure Connections are Secure
Yes
Check Continuity
Continuity Good
No
Repair or Replace Bad Wire
Yes
Problem Corrected
No
Contact Support
Yes
Operate Normally


No "Pwr" LED on Receiver
Check Wiring Connections
Connections Good
No
Ensure Connections are Secure
Yes
Check Polarity
Polarity Good
No
Correct Fault
Yes
Check Volt-age/Current
Voltage/Current Correct
No
Repair/Replace Power Source
Yes
Problem Corrected
No
Contact Support
Yes
Operate Normally