

Wireless Switch System

HARWIL CORPORATION, 541 Kinetic Drive, Oxnard, CA 93030

Section 1 Before You Install and Use Your Equipment

1.1 Symbols & Safety Information

Listed below are the International Symbols used on the product, or in this manual.



Danger: Electric Shock Hazard



Warning: Refer To Documentation and User Guide

General Safety Guidelines

- Follow all safety guidelines outlined in this guide and/or marked on the unit.
- Never install or operate this product outside the specifications listed in this guide.
- Never install and operate in flammable or explosive environments.
- Install your unit in a location that is out of the reach of unauthorized personnel.
- Always install additional disconnect and safety devices to provided added protection.
- Never operate this product outside the environmental limits specified in this guide.

Electrical Safety Guidelines

- Never attempt maintenance or service while power is connected.
- Installation and all wiring should be done by a trained professional.

Note: Personnel entrusted with installation, setup and operation of this product must be suitably qualified and trained. The required knowledge and experience can be gained via training courses and appropriate on-the-job instruction. Personnel should have this user guide available to them at all times when working with this product.

RF Safety Guidelines

- Only operate this product with the antenna provided or listed in this guide.
- Never operate this product where there will be people closer than 20 cm during normal use.
- Never operate multiple switch transmitters within 20 cm or less from each other.
- Never operate other RF transmitters within 20 cm or less of this product.

1.2 Condition of Use

Your wireless switch system is not designed, intended or authorized for use in medical applications, applications intended to sustain or support life, in any nuclear facilities or any other application where the failure of the product could create a situation where catastrophic property damage, personal injury or death may occur. In the event that the Customer purchases or uses this product for any such unintended or unauthorized application, the Customer shall indemnify and hold harmless Harwil Corporation and its officers, directors, employees, agents, affiliates, successors and assigns against all claims, costs, damages and expenses (including reasonable attorneys' and expert witness' fees) arising out of or in connection with, directly or indirectly, any claim for property damage, personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Harwil Corporation and its affiliates was negligent regarding the design or manufacture of the subject product.

1.3 Unpacking

Unpack your product carefully and inspect for any shipping damage. Notify the carrier immediately if you find damage.

The following items are included with your system:

- Two Antennas
- Switch Transmitter and Relay Receiver Units (Optional Battery Holder in Switch Unit.
- This User Guide

Section 2 Introduction

2.1 Product Description

The Harwil Wireless Switch Transmitter/Receiver Set provides medium range, point-to-point, license-free I/O communications to remote, or difficult to reach locations up to 1 mile in distance LOS (Line-of-site) between the switch transmitter and relay receiver unit. The switch board is activated by any dry-contact input. The receiver features dual control relays that can be configured for independent operation or one relay can be latched for Pump Up/Pump Down operation.

2.2 Switch Transmitter/ Relay Receiver Boards

Switch Transmitter Board – See Photo back of Catalog for correct Switch Positions

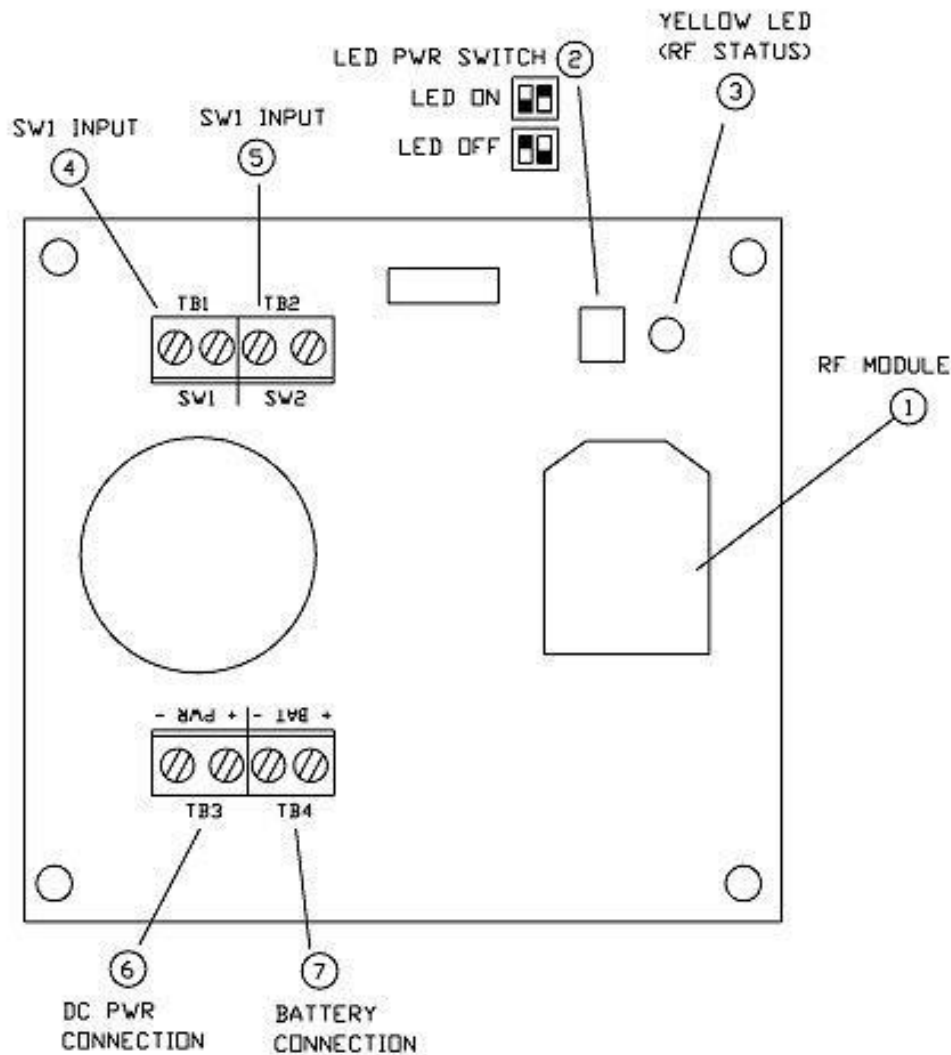


Figure 1. Switch Transmitter Board

- 1). RF Module – The RF Module facilitates communication between the transmitter and receiver boards.
- 2). **Dip Switch 1 – Normal Position OFF** – Controls sleep function of board (Set ON for Set Up Testing)
Dip Switch 2 – Normal Position ON – Status Light #3 (Set OFF to extend Battery Life)
Normal Positions are the **LED ON** Diagram above
- 3). RF Status LED – The “Status” LEDs blinks on/off during switching function to indicate the unit is active.
- 4). Switch #1 (SW1) Input – Connection for Switch #1. This input controls Relay #1 on the receiver board.
- 5). Switch #2 (SW2) Input - Connection for Switch #2. This input controls Relay #2 on the receiver board.
- 6). DC Power Connection – Connection to power unit with a hard-wired DC supply.
- 7). Battery Connection – Connection to power the unit by battery.

Relay Receiver Board

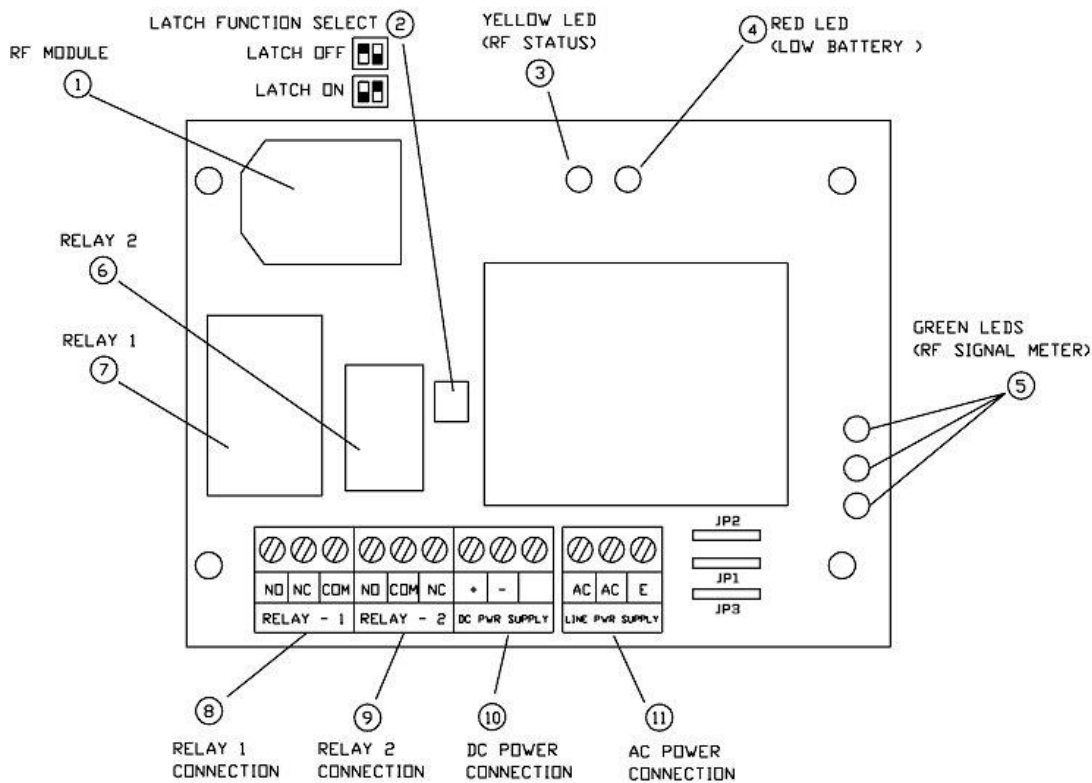


Figure 2. Relay Receiver Board

- 1). RF Module – The RF Module facilitates communication between the transmitter and receiver boards.
- 2). Latch Function Select – Switch is used to select non-latching function “A”, or latching function “B”.
 - A: **Normal Switch Functions** = Latching OFF Dip Switch :1 ON – Dip Switch 2: OFF
 - B: **Latching Switch Relay** – Pump-Up or Pump Down using 2 level Switches
Latching ON = Dip Switch :1 OFF – Dip Switch 2: ON
- 2). Latch Function Select – Switch is used to select Latching, or non-latching function.
- 3). RF Status LED – The “Status” LEDs blinks on/off during switching function to indicate the unit is active.
- 4). Low Power LED – This LED will begin to illuminate as the battery voltage for the switch board gets low.
- 5). RF Signal Strength LEDs – These LEDs act as a signal strength meter that aids in system installation.
- 6). Relay #2 – Location of Relay #2
- 7). Relay #1 – Location of Relay #1
- 8). Relay #1 – Terminal block connection for Relay #1
- 9). Relay #2 – Terminal block connection for Relay #2
- 10). DC Power Input – Terminal block connection for DC power input.
- 11). AC Power Input – Terminal block connection for AC power input.

IMPORTANT: Jumper Wires in JP2&JP3 = 120VAC or Jumper Wires in JP1 only = 220VAC

Section 3 Specifications

3.1 Specifications

GENERAL SPECIFICATIONS

Radio Frequency: 2.4 GHz, License Free, Spread Spectrum

RF Protocol: 802.15.4

Transmit/Receive Distance: Up to 1 Mile Line-of-sight (300' Indoor/Urban)

Antennas: 7dbi Omni Directional (Supplied with units)

RF Input/output Impedance: 50 Ohms

Operating Temperature: -10 to 130 °F (-23 to 54 °C)

Transmitter/Receiver Code Matching: Factory Set

Wire Connections: Terminal Block, 12-18 AWG

SWITCH TRANSMITTER SPECIFICATIONS

Input Signal: Dry-contact Switch (2 Ea.)

RF Power Output: 63mW

RF Data Rate: 250 Kbps

OPERATING POWER

Hard Wired DC Supply: 9-24Vdc @ 300mA

Battery Power: See table in Section ??

RELAY RECEIVER SPECIFICATIONS

RF Receive Sensitivity: -100 dBm

OPERATING POWER

Hard Wired DC Supply: 15-24Vdc @ 750mA

Hard Wired AC Supply: 120 or 240VAC 50/60Hz @ 12 Watts (Factory Set)

CONTROL RELAYS

Relay 1: SPDT, 15A 120/240VAC

Relay 1 Function: Latching/Non-latching (User Selectable, See section ??)

Relay 2: SPDT, 10A 120/240VAC

Relay 2 Function: Non-latching

Note: Relay #2 is not available for use when Relay #1 is set for latching operation.

3.2 Environmental Operating Conditions

This product has been designed to provide performance and durability over its life time. To keep this product working correctly it should be handled with care and only operated within the following recommended environmental operating conditions.

- A ambient operating temperature range of -10 to 130 °F (-23 to 54 °C)
- A relative humidity of 0-90% Non-condensing

3.3 Regulatory Approvals, Location Use & Export Compliance

REGULATORY APPROVALS

Regulatory: FCC Part 15 (No license required)

FCC (USA): OUR-XBEEPRO

IC (Canada): 4214A-XBEEPRO

The enclosed device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (i.) this device may not cause harmful interference and (ii.) this device must accept any interference received, including interference that may cause undesired operation.

Statement of CE Conformity

Harwil Corporation is committed to compliance with the laws and regulations in each country into which we ship our products. Please contact us to learn the current status of CE compliance for this product.

Location Use

Standard models of this product are limited to the sale and use in North America only. Additional models are available for use in Europe (EU), Australia, New Zealand and Japan. Please contact us for model number and availability.

Export Compliance Policy

Customer shall not, directly or indirectly, export, re-export, transfer, furnish or ship products in violation of any applicable export control laws or regulations of any country having jurisdiction over the products, including any and all US law or US Government export controls. Customer agrees, at Customer's own expense, to comply with all applicable export laws and will, in accordance with the indemnification provisions of these Terms and Conditions, indemnify, defend and hold Harwil Corporation harmless from any claim against Harwil Corporation due to Customer's violation or alleged violation of any export laws.

Section 4 Installation

4.1 General Guidance

Your Wireless Switch System must be installed and maintained as described in this guide to ensure reliable safe operation. Confirm the voltage and current draw of your connected load to the relay board is consistent with the design specifications of this product and your application will not exceed the maximum load capacity listed.

4.2 Mounting and Area Environment

This product has been designed for indoor or outdoor use. Insure that the unit has sufficient area for proper antenna positioning. See below.

******* CAUTION *******

Never operate this product in areas where flammable liquids, gases or any other flammable materials are, or might be present.

4.3 Antenna Installation & Positioning

Proper antenna installation and positioning is important and will allow you to achieve maximum performance and distance between your switch transmitter and relay receiver unit. This will reduce the possibility of a lost connection during operation.

Antenna Basics

When installing your switch transmitter and relay receiver it is important to install both units in such a way as to optimize the position of both antennas within what's known as the "Fresnel Zone". A Fresnel Zone can be thought of as a football shaped invisible tunnel between two antennas that provides an optimum path for the RF signals between your switch transmitter and relay receiver.

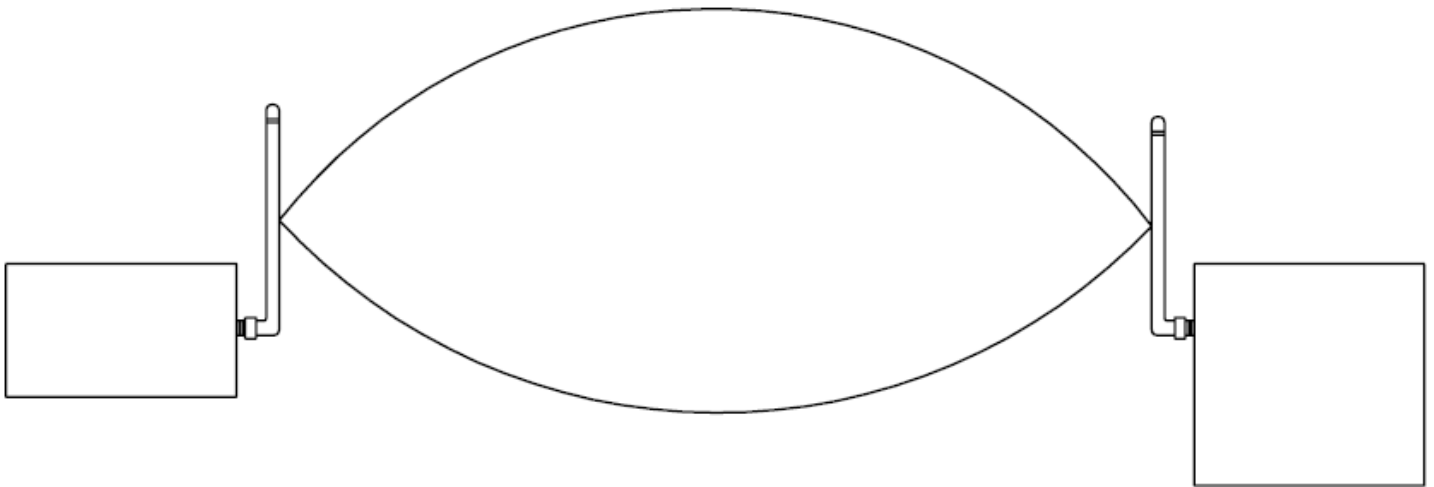


Figure 3. The "Fresnel Zone"

In order to achieve maximum distance, the path in which the RF signals travel must be free of all obstructions. Obstacles in the path will decrease the transmit/receive distance. Also, if the antennas are mounted too low to the ground, most of the Fresnel zone ends up being obstructed by the earth resulting in significant reduction in transmit/receive distance. Your antennas should be mounted as high off of the ground as possible.

NOTE:

It is important to understand that your application environment may change over time due to new equipment, buildings or other RF equipment being installed. There can also be change within your building such as new construction, etc. If new obstacles are added between your switch transmitter and relay receiver you may need to move and reposition your antennas.

Connecting Your Antennas

Your Switch Transmitter/Relay Receiver has been shipped to you with standard antennas already included. In some difficult installations you may wish to place a remote antenna farther away to maximize transmission range to the relay receiver. A remote antenna kit option can be ordered that include an antenna extension cable and antenna mounting bracket. Please note that very long antenna extension cables will always add loss to the signal strength. The longer the cable the more signal will be lost over the cable. Because of this the length of the cable should be kept as short as possible. Use of any other antenna than what's supplied with your system or what's available as an option may void FCC and IC regulatory compliance.

Horizontal Antenna Placement

If the antenna for you switch transmitter is mounted in a horizontal position you should mount your relay receiver antenna in the same polarization.

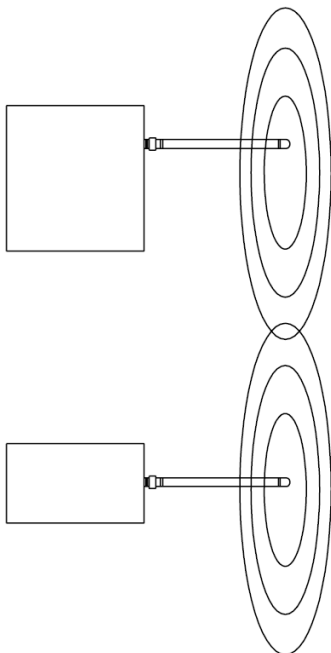


Figure 4: Horizontal Antenna Example

Vertical Antenna Placement

If your switch transmitter is mounted in a vertical position in your application you should mount your relay receiver antenna so that the same polarization.

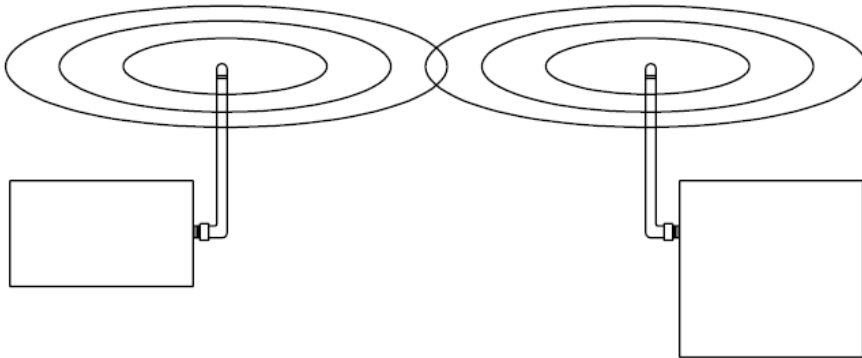


Figure 5. Vertical Antenna Example

4.4 RF Signal Strength LEDS

The switch transmitter board has three green LEDs near the bottom right side. These LEDs act as an RF signal strength indicator to aid during the installation process. The LEDs will illuminate as the RF signal between the switch transmitter and relay receiver gets stronger.

- (1) LED Illuminated – Good signal strength
- (2) LEDs Illuminated – Very good signal strength
- (3) LEDs illuminated – Maximum signal strength

Note: Signal strength LEDs provide aid during installation and positioning of your antennas. The LEDs only illuminate always during normal operation. Each time a switching function occurs the LEDs will illuminate and update their status. During sleep periods in between switching the LEDs will not be illuminated.

Section 5 Powering Your Boards

5.1 Powering Your Boards



WARNING: Electrical Shock Hazard

All wiring should be done by a qualified suitably trained person.



CAUTION: Insure all control output connections are well insulated.

CAUTION: Additional fusing is recommended in series with relay board control connections.

5.2 Powering the Switch Transmitter Board

The Switch Transmitter Board has two different power connections. One that you can power with a standard battery marked TB4, and one marked TB3 that you can hard-wire with a DC power supply. Descriptions, figures and tables that follow provide guidance on what different power sources you can use and how to connect them.

Battery Power Only Operation

The switch transmitter board can be by a primary cell battery alone. There are two different ways you can connect and use a battery. Terminal block TB4 is for battery power from 2.7 - 4.5V DC, You can also connect a 12 – 24V DC battery to the TB3 Terminal block. See diagrams below.

Connection for Battery Power Only Operation

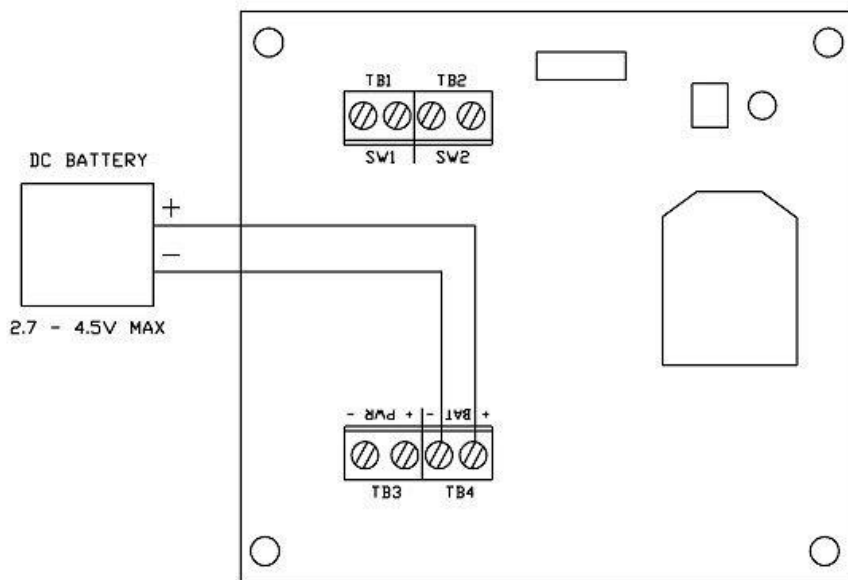


Figure 6. For Battery Power of 2.7-4.5 Volts DC

CAUTION: NEVER CONNECT A VOLTAGE GREATER THAN 4.5V TO THE TB4 TERMINAL BLOCK OR YOU WILL DAMAGE YOUR UNIT.

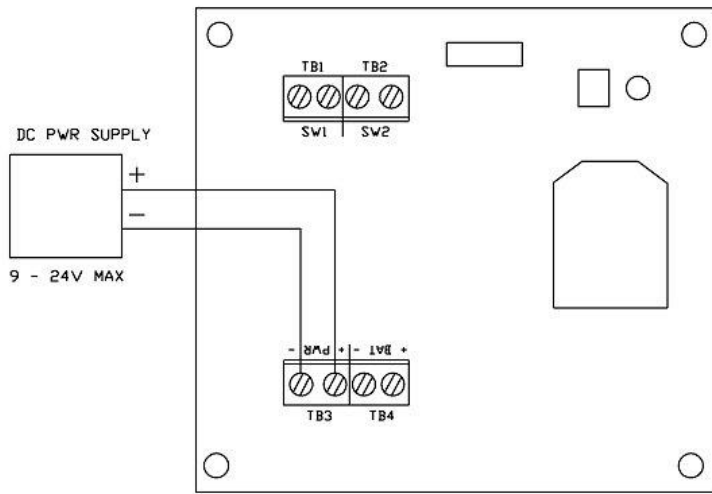


Figure 7. For Battery Power of 12-24 Volts DC

Non-rechargeable Primary Cell Battery with Solar Module Operation

Your switch transmitter board can also be power with a solar panel connected to terminal block TB3 (+PWR-). The solar panel will power the unit when direct sun or ambient light on the panel is present. A battery can also be connected to terminal block TB4 (+BAT-) at the same time. The battery will power the unit during periods of no light. This will extend the life of your battery greatly. The amount of time you gain on battery life is dependent on how many hours the solar panel provides power.

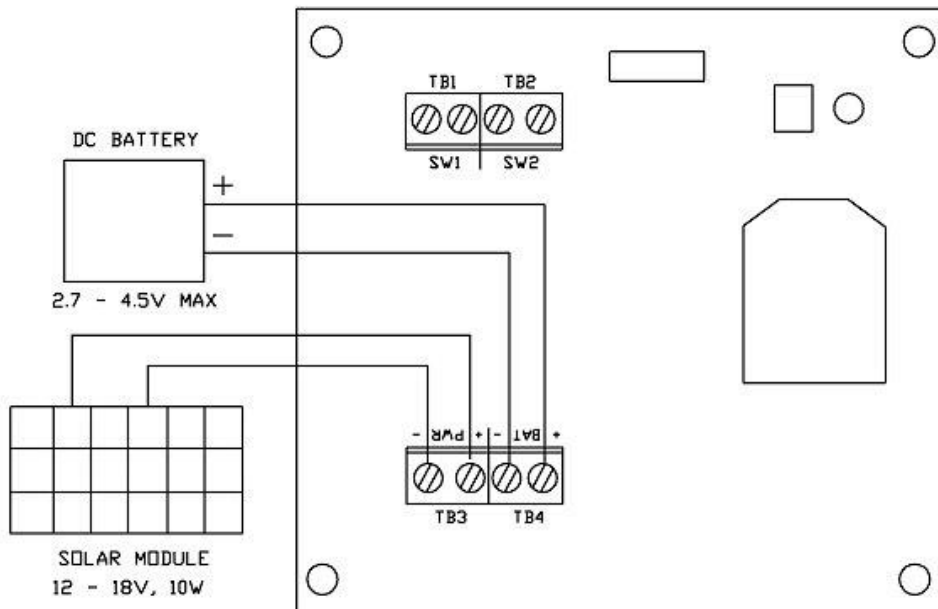


Figure 8. For Battery Power of 2.7-4.5 Volts DC and Solar Module

Rechargeable Battery with Solar Module Operation

Your switch transmitter board can also be powered with a 12V rechargeable battery, solar panel and solar charge controller. The battery is connected to terminal block TB3 (+PWR-). The solar panel and solar charge controller will re-charge the battery each day. This setup will provide uninterrupted power to your switch transmitter for many years.

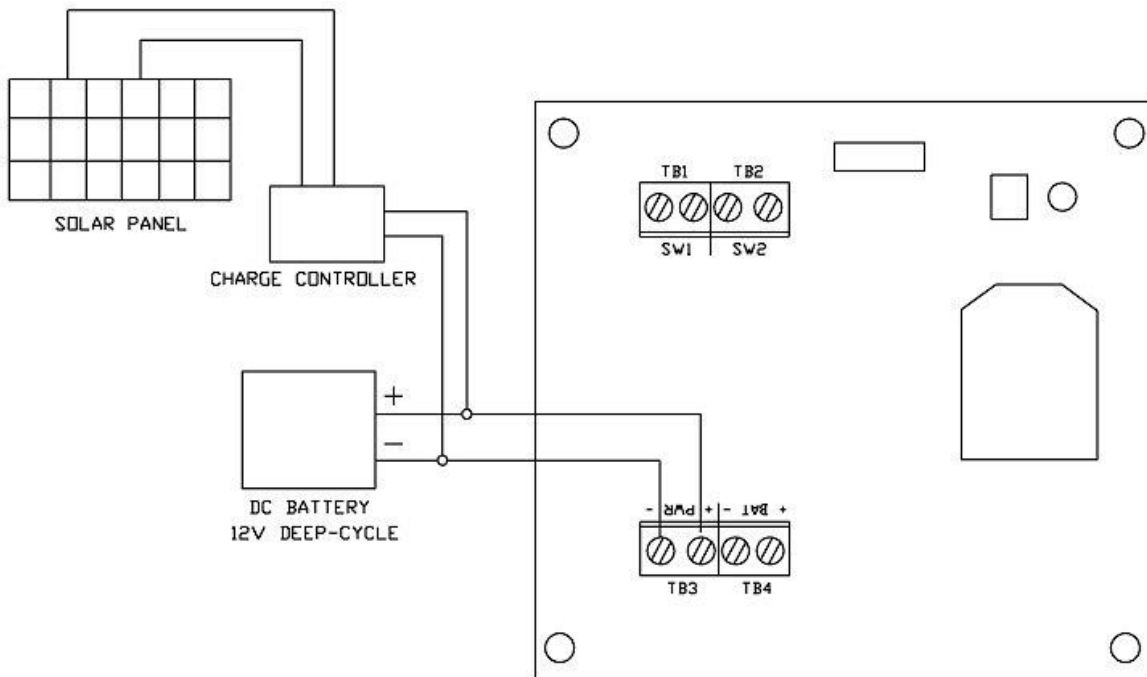


Figure 9. For 12V Rechargeable Battery and Solar Module

Battery Power Estimated Life (Battery Only)

The tables below provide an estimated life of your battery(s) during normal, ideal conditions. The values provided are an estimate.

NOTE: Quality of the batteries, ambient temperature cycling and the number of switch operations can effect these estimates greatly.

Battery(s) Connected to the +BAT- (TB4) input

Battery	Example Battery	1-2 Switch Changes/day	3-4 Switch Changes/day
2 Ea. AA, Lithium, 1.5V	Energizer L91	210 Days	135 Days
3 Ea. C, Alkaline, 1.5V	Energizer Industrial EN93	375 Days	179 Days
1 Ea. C, Lithium, 3.6V	XENO XL-145F	275 Days	155 Days
3 Ea. D, Alkaline, 1.5V	Energizer Industrial EN95	510 Days	282 Days

Battery Power Estimated Life (Battery used in conjunction with Solar Module (SM) option)

These tables provides the estimated life of your battery(s) during normal operation with the optional Solar Module (SM) installed. The values provided are an estimate. Quality of the batteries, ambient temperature cycling and the number of switch operations can effect these estimates.

Battery(s) Connected to the +BAT- (TB4) input and a Solar Module Connected to +PWR- (TB3) Input

Battery	Example Battery	1-2 Switch Changes/day	3-4 Switch Changes/day
2 Ea. AA, Lithium, 1.5V w/SM	Energizer L91	245 Days	161 Days
3 Ea. C, Alkaline, 1.5V w/SM	Energizer Industrial EN93	425 Days	209 Days
1 Ea. C, Lithium, 3.6V w/SM	XENO XL-145F	331 Days	186 Days
3 Ea. D, Alkaline, 1.5V w/SM	Energizer Industrial EN95	585 Days	330 Days

Estimated Values are based on the Solar Module option (SM) receiving direct light a minimum of 4-5 hours/day.

******* CAUTION *******

CONNECTING A POWER SOURCE ABOVE 4.2VDC TO THE +BAT- (TB1) INPUT OF YOUR SWITCH TRANSMITTER BOARD WILL CAUSE DAMMAGE TO THE UNIT.

Using a 12V Battery Connected to the +PWR- (TB3) input

Battery	Recommended Product	1-2 Switch Changes/day	3-4 Switch Changes/day
12V, 18Ah Battery	Universal Battery – UB12180	250 Days	225 Days
12V, 26Ah Battery	Universal Battery – UB12260	355 Days	315 Days

******* CAUTION *******

NEVER CONNECT BOTH A BATTERY AND A HARD-WIRED POWER SUPPLY TO THE +PWR- (TB3) INPUT AT THE SAME TIME. THIS WILL OVER CHARGE THE BATTERY AND CAUSE A SAFETAY HAZARD.

Powering the Switch Board with a Hard-wired DC Supply

The switch board can be powered by a hard-wired dc supply. When a hard-wired supply is used a battery is not needed unless you want to have a battery backup in the event of power loss.

5.2 Powering the Relay Receiver Board

The Relay receiver board can be power by either AC or DC voltage. Never connect both AC and DC power at the same time to power the board. There are two different models for AC voltage. The unit must be factory configured for 120VAC or 240VAC. Any model of the Relay board can also be powered by 15-24V DC.

NOTE: EVEN IF YOU POWER THE RELAY BOARD WITH DC POWER YOU CAN STILL CONNECT AC VOLATAGE 120/240VAC TO THE RELAY CONTACTS TO CONTROL YOUR AC POWERED EQUIPMENT.

Using a AC Power Source to Power the Board (120VAC Model Relay Receiver)

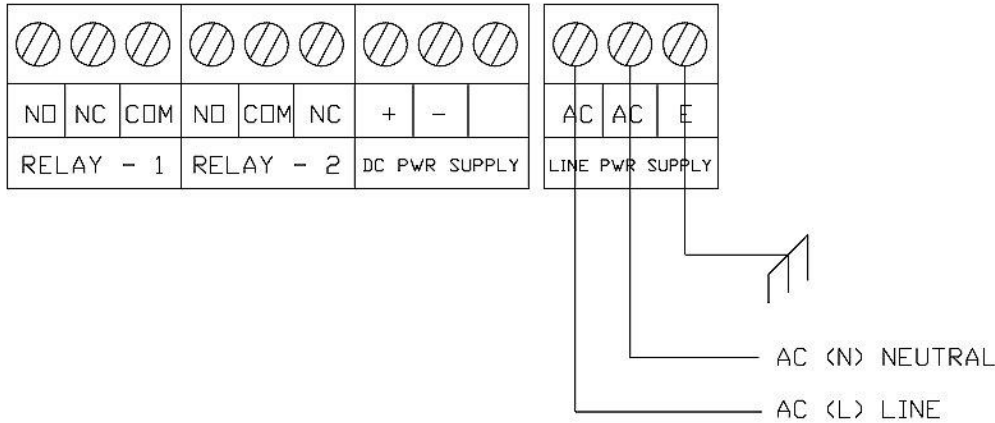


Figure 10. Powering the Relay Board with 120VAC, 50/60 Hz

Using a AC Power Source to Power the Board (240VAC Model Relay Receiver)

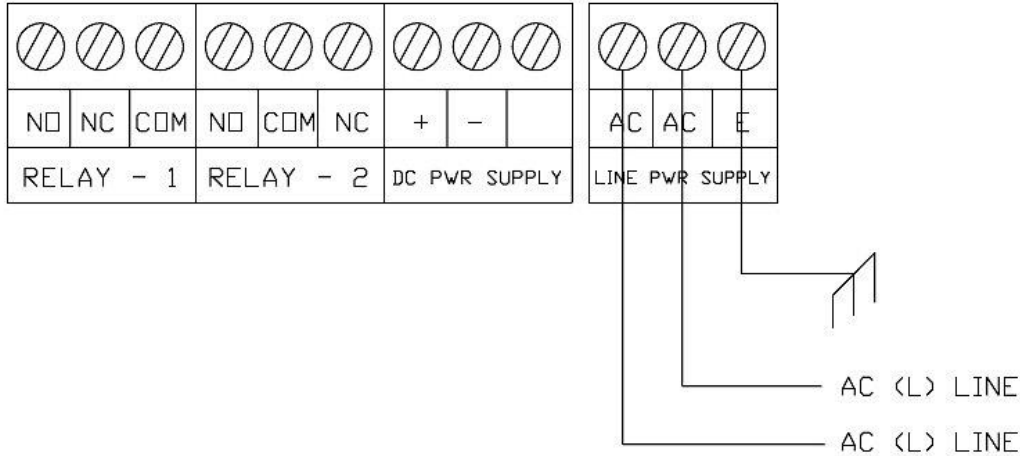


Figure 11. Powering the Relay Board with 240VAC, 50/60 Hz

******* CAUTION *******

THE RELAY BOARD MUST BE CONFIGURED FOR 240VAC IN THE FACTORY. PLEASE CONFIRM YOU HAVE A 240VAC MODEL BEFORE CONNECTING POWER. IF YOU ARE NOT SURE WHAT MODEL YOU HAVE PLEASE CONTACT US BEFORE POWERING THE BOARD.

Using a DC Power Source to Power the Relay Board

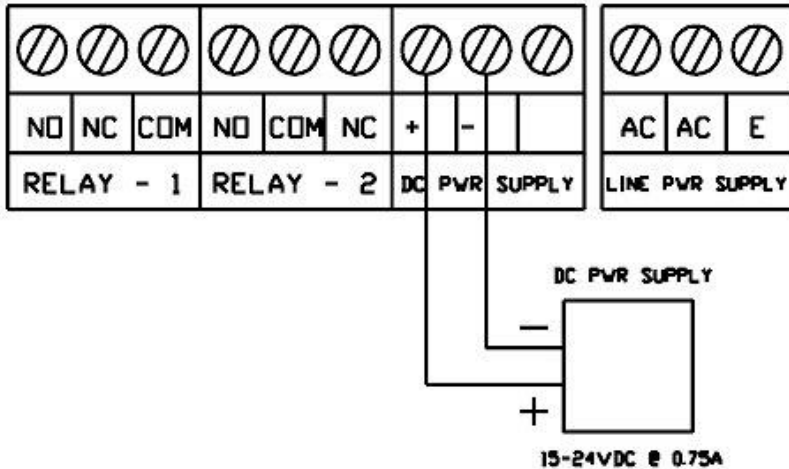


Figure 12. Powering the Relay Board with 15 - 24V DC Power Supply

Section 6 Switch Transmitter Operation

6.1 Connecting switches to your transmitter

The inputs connected to the transmitter must be "dry-contact type. That means you do not need to supply any power on the input. The input is a two wire connection that can be a simple mechanical manual operated switch, a level or flow switch, or the contacts of a relay.

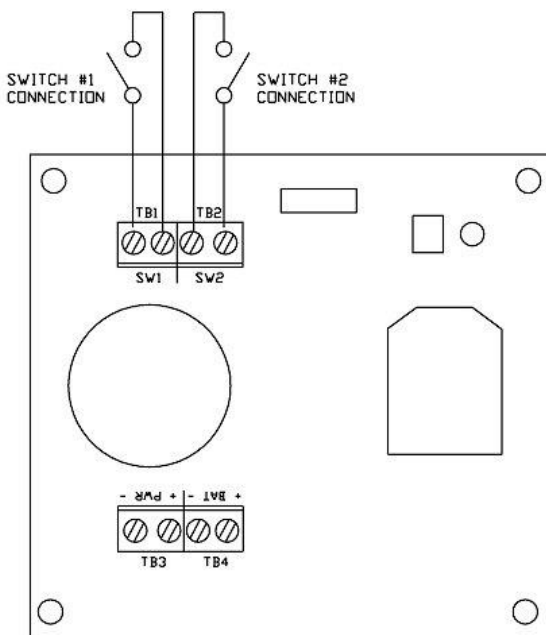


Figure 13. Switch Board - Switch Input Connection

Section 7 Relay Receiver Operation

7.1 Connecting Your Equipment to the Relays

Each of the two relays on the board provide one set of SPDT contacts. The relays are marked with "NO" for normally open, "NC" for normally closed, and "C" for the contact that's common to both. The capacity of each relays is listed on the specification page in this guide.

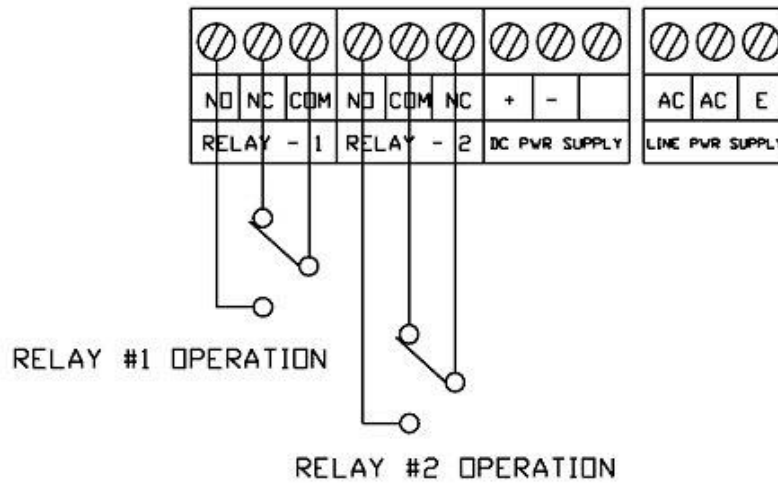


Figure 14. Relay Board - Relay Connections

7.2 Latching Function for Relay #1

Relay #1 can be latched to provide Pump up/ Pump down operation when two switches are used on the switch transmitter board. See figure 1. For setting the latch function.

NOTE: WHEN THE BOARD IS CONFIGURED FOR LATCHING OPERATION RELAY #2 IS NOT AVAILABLE FOR USE AND YOU SHOULD NEVER CONNECT WIRES TO THE CONTACTS FOR RELAY #2.

Switch Board Photo (Normal Switch Positions)



Relay Board Photo (Normal Switch Positions - Not Latching)

