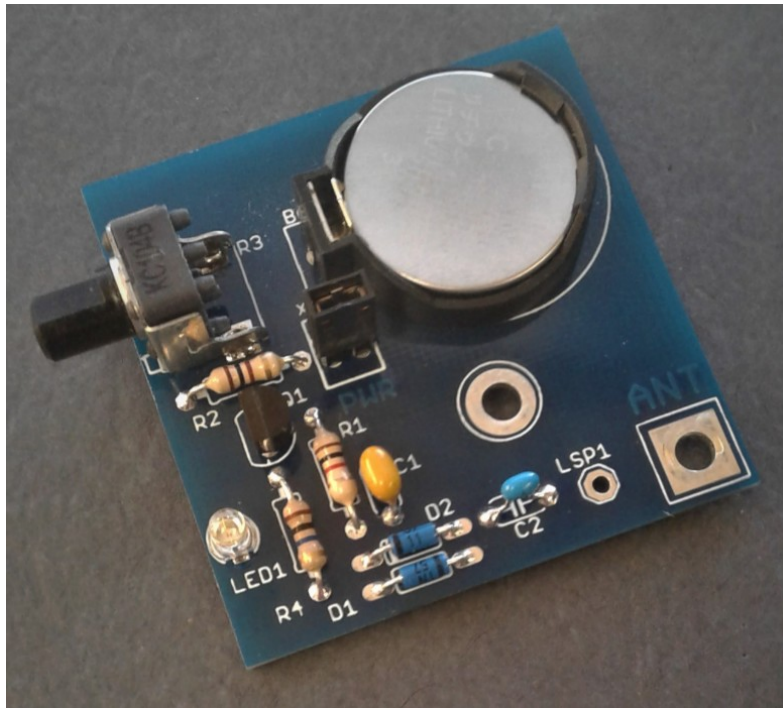


Pacific Antenna Field Strength Indicator Kit



Description

The Field Strength Indicator kit from Pacific Antenna provides a visual way to monitor the presence and relative strength RF fields through the brightness of an LED.

Responds to RF fields from approximately 1MHz to several hundred MHz.

Includes an on board pot for sensitivity and a high brightness LED to indicate field intensity.

Can be built into a housing or used stand alone.

Also, the LED can be replaced or used in conjunction with a 100uA to 1mA current meter and external resistor.

Ideal as a visual indicator for tuning antennas, especially compact loops.

Specifications

Powered by a single CR-2032 battery or external 3-9 VDC

Board Size 1.75" x 1.75"

RF field strength indicated by LED intensity

Support

PACIFIC ANTENNA

Web: www.qrpkits.com

Email: qrpkits.com@gmail.com

Tools Needed

- Temperature Controlled Soldering Station with small tip or 15-35 watt soldering iron with small tip.
- Solder 60/40 or 63/37 Tin-Lead
- Small Diagonal Cutters
- Small Needle Nose Pliers
- Pencil, Pen, and/or Highlighter
- BRIGHT work light

Optional

- Magnifying headpiece or lighted magnifying glass.
- Multi-meter
- Solder Sucker or Solder Wick
- Small multi-blade Screw Driver
- Knife or Wire Stripper
- Small Ruler
- Cookie Sheet to build in and keep parts from jumping onto the floor.

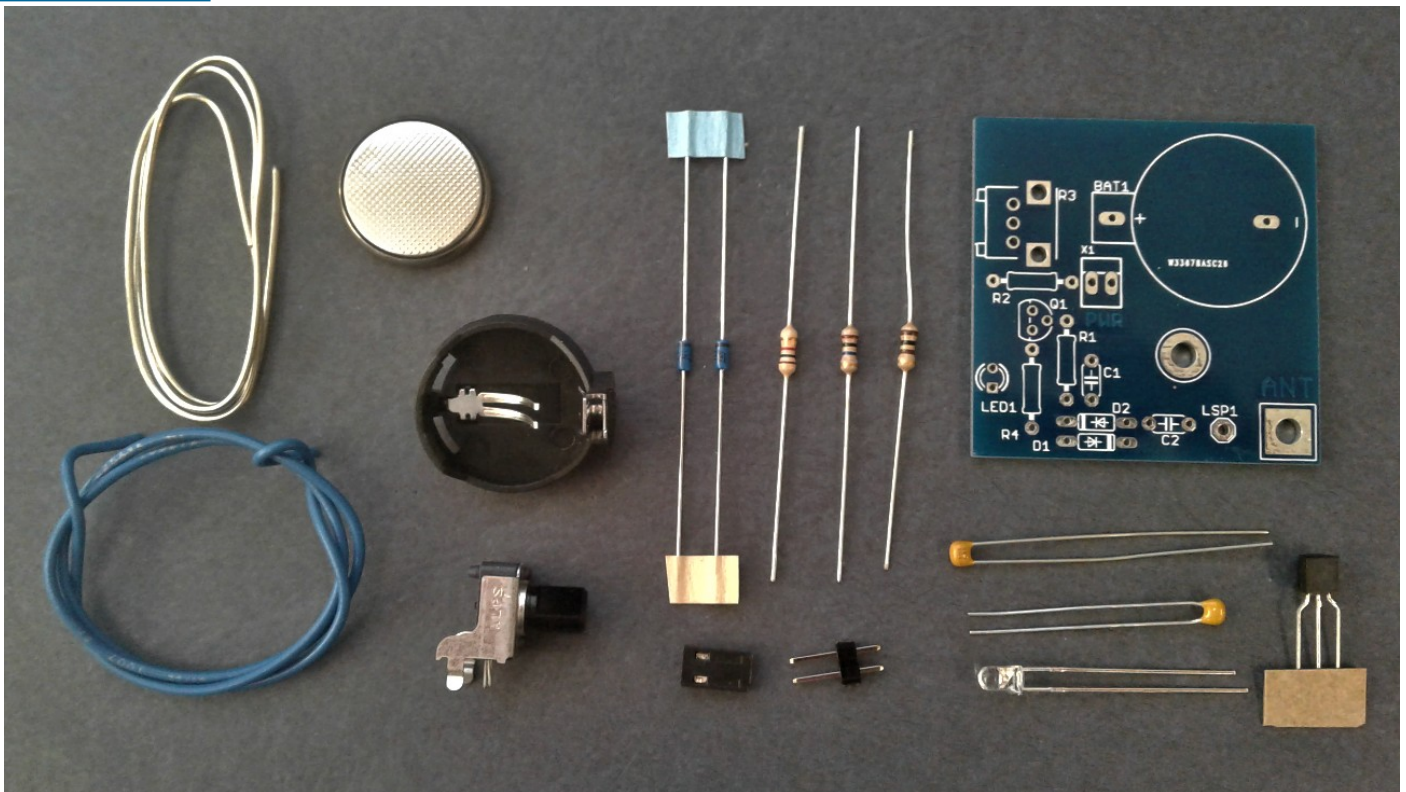
Construction Techniques

- The Parts List has columns for inventory and construction.
- You can insert several parts at a time onto the board. When you insert a part bend the leads over slightly to hold the part in place, then solder all at the same time. Clip the leads flush.
- Most parts should be mounted as close to the board as possible. Transistors should be mounted about 1/8" above the board. Solder one lead on ICs or IC sockets and then check to make sure the component is flush before soldering the remaining leads.
- Use a Temperature Controlled Soldering Station with small tip or 15-35 watt soldering iron with small tip. Conical or very small screw driver tips are best.
- DO NOT use a large soldering iron or soldering gun.
- If you are a beginner, new to soldering, there are a number of resources on the web to help you get on the right track soldering like a pro. Google Soldering Techniques.
- Please take time to inventory the parts before starting. Report any shortages to QRPKITS.com (In many cases it may be faster and cheaper to pull a replacement from your parts supply, but please let us know if we missed something.)
- Pre-sorting the resistors and capacitors can speed up the assembly and reduce mistakes.
- There is no need to print out the whole assembly manual unless you want a copy. Print the Parts List and Schematic (last two pages) then view the rest of the manual on a computer, laptop, or tablet.

Inventory and Parts List

| Inventory | Installed | Qty | Value | Parts | Description |
|-----------|-----------|-----|---------------|--------|---|
| | | 1 | 100 Ohm | R2 | 1/4W RESISTOR, BRN-BLK-BRN-GLD |
| | | 1 | 1K Ohm | R1 | 1/4W RESISTOR, BRN-BLK-RED-GLD |
| | | 1 | 10M Ohm | R4 | 1/4W RESISTOR, BRN-BLK-BLU-GOLD |
| | | 1 | 0.1uF | C1 | CAPACITOR, marked 104 |
| | | 1 | 1000pF | C2 | CAPACITOR, marked 102 |
| | | 2 | 1N5711 | D1, D2 | Schottky Diode, blue cylindrical with black band |
| | | 1 | LED | LED1 | LED, clear |
| | | 1 | 2N3904 | Q1 | NPN TRANSISTOR, black plastic, TO92 case |
| | | 1 | 100K Pot | R3 | 9 mm Square Rotary Potentiometer, Horizontal, B100K |
| | | 1 | 2 Pin Header | X1 | .100" (2.54mm) Center Header - 2 Pin |
| | | 1 | 2 Pin Jumper | JP1 | 2 Pin shorting jumper |
| | | 1 | Antenna Wire | W1 | 12" of #18 tinned copper wire |
| | | 1 | Ground Wire | W2 | 12" of #24 hookup wire |
| | | 1 | Circuit Board | PCB | FSM-LED circuit board |
| | | 1 | Holder | H1 | Battery Holder for 2032 |
| | | 1 | 3V | BAT1 | 2032 BATTERY |

Parts Included



Note: Due to changes in supply, parts appearance may vary slightly from those shown in this image.

Building the FSI

Resistors

Sort the resistors R1, R2 and R4 by value.

Insert each of the resistors into the positions indicated on the board silkscreen, solder them in place and trim the excess leads.



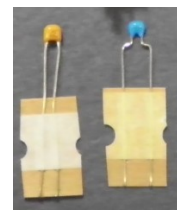
Be sure to check the color code for each resistor as you install.

Measuring with an Ohm meter is always a good idea to confirm the resistance before installation.

Capacitors

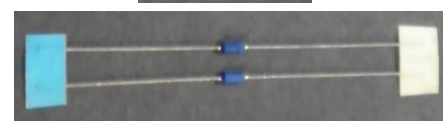
Next identify C1 and install the position shown on the board and solder.

Next, install C2 in the position indicated, solder and trim the excess leads



Diodes

Next, install the two 1N5711 diodes D1 and D2 on the board being careful to match the bands on the diode package to the board outline band.

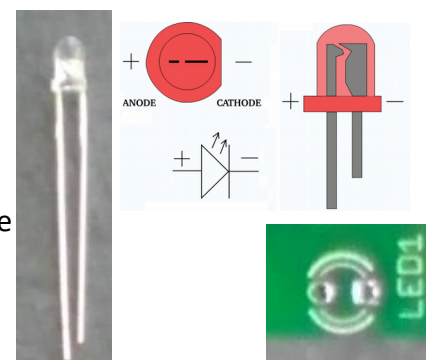


LED

Install the LED. Note that the LED will have a long and short lead and must be installed in the correct orientation or it will not work.

The board has a round and square marking on the LED pads surrounding the holes in the board. The longer lead is the + (Anode) lead and the led should go into the board through the round pad and the shorter (Cathode) lead through the square pad (the one located next to the LED1 label) on the board.

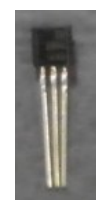
There also may be a flat side of the LED body that indicates the Cathode (-) side.



You may want to leave sufficient lead above the board and pre shape the leads so that the LED faces forward instead of straight up. You can also mount the LED on the panel of an enclosure and use hookup wire to connect to the board.

Transistor

Install Q1 being careful to align the plastic TO-92 case outline to the board outline.



Potentiometer

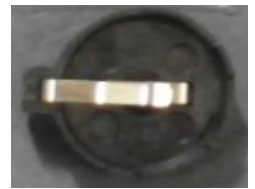
Install R3, the 100K Potentiometer by pushing it into the board and soldering all pins and tabs to secure it in place.

Make sure it is fully seated into the board before soldering as it will be difficult to remove.



Battery Holder

Install the battery holder (if not already on board), making sure to align the + side with the board layout.



Pin Header

Install the two pin header in the location indicated as X1 near the middle of the board.



The short pins go into the board leaving the longer pins above the board.

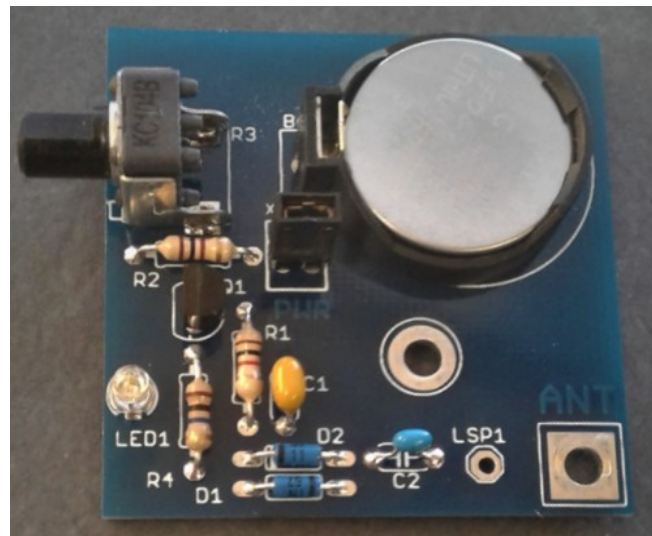
The included jumper will be used as a switch to disconnect the battery when not in use.



Alternatively, the pin header and jumper can be omitted and an off board switch wired to the two pads of X1 to serve as an on-off switch.

Congratulations, this completes assembly of your Easy Field Strength Indicator Kit!

Completed Assembly

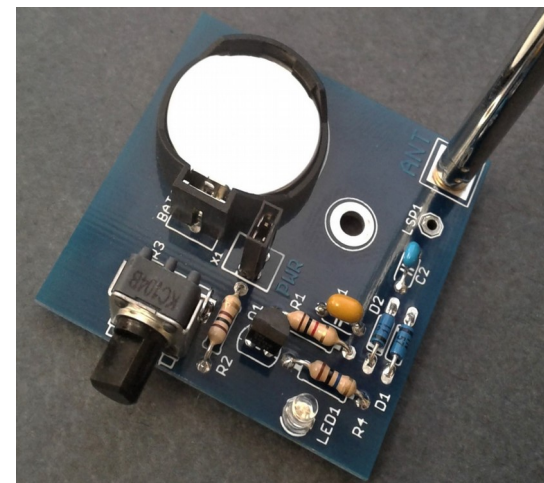


Antenna and Ground Connection

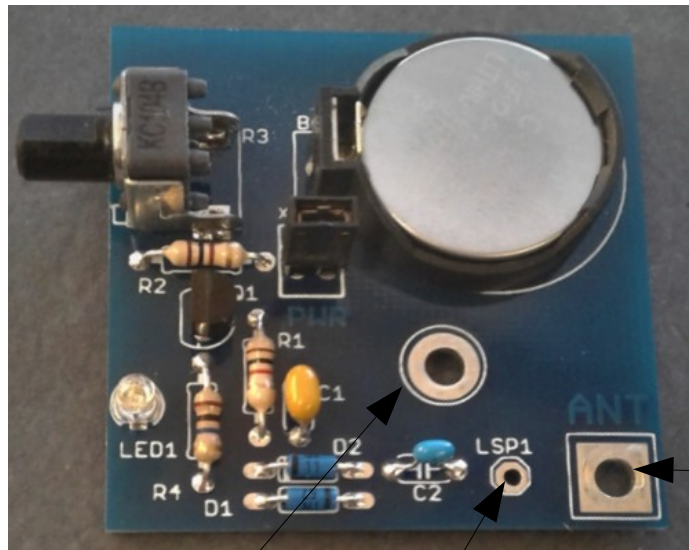
In order for the FSI kit to detect RF signals, an antenna will be needed. If building into an enclosure, you can use an external antenna.

An optional telescoping antenna is available and will mount in the hole marked "ANT" as shown here. You can also use any surplus telescoping antennas as long as the mounting screw will fit the board hole. Length is not critical.

Alternatively, if you are not planning to connect to an external antenna, or use a board mounted telescoping antenna, create an antenna wire, using about 10-12" of the tinned copper wire supplied in the kit and solder into the hole marked "LSP1".



Again, the length is not critical but a longer antenna will increase RF sensitivity.



Hole for Telescoping whip

Mounting and Ground Connection

Wire or remote Antenna Connection

To further increase sensitivity, you can connect a ground wire using the included, flexible hookup wire.

Adding an approximately 10" wire to one of the ground connections on the bottom of the board will improve sensitivity. The pad for the mounting screw is a good location to connect this wire.

Again, Length is not critical, however, longer will increase RF sensitivity. Alternatively, if the kit is installed in a metal box, a metal mounting screw through the board mounting hole can provide a ground connection.

Inspection

Inspect the completed board for any solder bridges between pads and for any component leads that are not soldered. Compare the component location and orientations to those shown above.

Initial Testing

Insert the included battery with the side marked "+" up, place the jumper across the pins of X1 and turn the potentiometer fully clockwise for maximum sensitivity

You can use any nearby transmitter, including a 2M or 440 HT to test the FSI.

When a nearby transmitter is putting out RF, you should see the LED illuminate.

Turning the potentiometer counterclockwise will reduce the sensitivity and result in reduced brightness of the LED.

Also moving the FSI further away from the transmitter antenna will result in reduced brightness.

Troubleshooting

If the LED does not illuminate, check that the battery is inserted correctly with the side marked + on top.

Check that the battery voltage is approximately 3V by measuring the battery terminals on each end with a DMM.

Make sure the jumper on X1 is connecting the two pins.

Check for proper component orientation of the diodes, transistor and LED.

Operation

In operation, the potentiometer controls sensitivity to RF fields. Turning it clockwise, increases the sensitivity.

Optionally, a switch may be wired in place of the two pin header X1 to provide a power switch on a front panel.

If you have a nearby transmitter, you should see the LED illuminate when it is transmitting and you can adjust the pot if necessary to give the desired level of brightness. Brightness will vary depending on the strength of the RF field.

The FSI can be placed near your antenna during adjustment of your tuner to visually indicate when you have achieved a match that is giving maximum signal to your antenna. This is particularly useful for compact loop antennas where tuning is very critical.

It is recommended to remove the jumper from X1 to disconnect the battery when not in use and/or remove the battery.

Packaging

Packaging is left up to the builder. The FSI kit can be built into another kit, installed in a cabinet, or installed in a builder supplied case.

External Meter

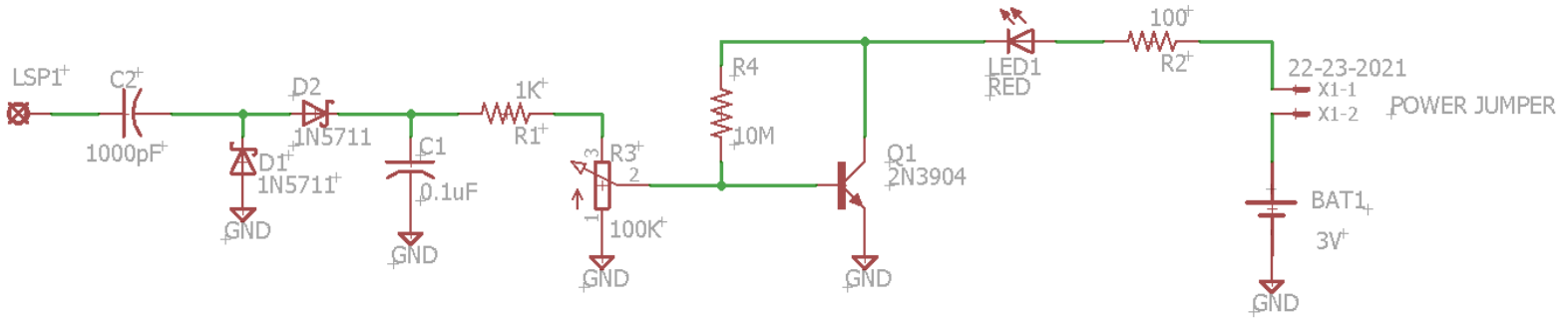
The Easy FSI kit can also be used with an analog current meter replacing the LED to indicate field strength. In this case, it will be necessary to vary the resistance of R2 and/or use an external resistor in series with the meter to control current.

Most dc current meters will have a full range current specification and common ones vary from 100 uA to 1 mA full scale. Some experimentation will be required to find the resistor value needed with a specific meter.

A resistor should be chosen to limit the current so that full scale corresponds to the strongest field you expect to indicate with the onboard potentiometer fully clockwise. Then, you can vary the sensitivity by reducing the potentiometer setting as needed.

Q1 will act to control the current through the meter and the series resistance is there to ensure that the current will not exceed the meter capabilities.

Schematic Diagram



Board Layout

