Kit Contains:
- Pre-Programmed microcontroller
- Acrylic Stand
- Resistors (Nine Plus A Spare)
- LED Spacers
- Battery Case
- Switch
- Capacitor

You Need... Tools!
1. Soldering Iron
2. Solder!
3. Little Wire Clippers
* And batteries, AA size.

Install Resistors:

1. Install resistors. Bend a resistor like so. Insert it at location R0 of the circuit board, and push it flush against the surface.

Options, Choices...
This kit can be built in a couple of different ways: Center or side Shamash, LEDs on-board or above. You get to decide later. Right now, we start building!

Soldering Hints:
- Wear eye protection—having eyes that work is awesome!
- Your tip should be shiny (tinned). If not, melt some fresh solder against it and swipe it quickly against a wet sponge.
- Place the solder against the joint that you wish to connect.
- Touch the iron to the solder and joint for about 1-2 seconds (maximum). Count it out: "One thousand one."
- The solder should melt to the joint and leave a shiny, wet-looking joint. If not, let it cool and try again with fresh solder.

On the back side, bend both leads out...

...and solder them in place.
1. Use the same procedure to install the capacitor at C1.

2. Use the same procedure to install resistors R1-R8.

3. Next: add the switch at S1. Snap it into place and solder both pins.

   [(TRIM THESE LEADS TOO!)]

   [(LEADS CAN FLY—WEAR EYE PROTECTION!)]

4. The microcontroller chip, an ATtiny2313. Locate the end with the half-circle shape, both on the board and chip.

   [MATCHING THESE ENDS... ]

   [ÆNSERT THE CHIP, FLUSH TO THE BOARD.]

   [4. THE MICROCONTROLLER CHIP, AN ATtiny2313.]

5. Solder all 20 pins of the chip to the board.

   [HINT: BEND OUT THE CORNER PINS VERY SLIGHTLY TO HOLD THE CHIP IN PLACE.
   [SOLDER ALL 20 PINS OF THE CHIP TO THE BOARD.]]

5. Battery box. Pull wires thru the circuit board: red by V+, black by V-.

   [(SIZE: 2xAAA, FOR KITS WITH YELLOW LEDS; 3xAAA FOR BLUE OR WHITE LEDS.)]

   [LOOP 'EM BACK: RED TO V+, BLACK TO V-]

   [SOLDER BOTH WIRES.]

5. LEDs. You will choose where to put the LEDs, but watch the polarity:

   [LEDS VARY CONSIDERABLY IN SHAPE, SIZE, AND COLOR.
   [THE LOOPS SERVE AS A STRAIN RELIEF FOR THE WIRES.
   [IDENTIFY THE SIDE WITH THE SHORT LEAD.
   [THE SHORT LEAD ALWAYS GOES TOWARDS THE FLAT SIDE.]

5. Use the little clippers. Trim excess leads on the back side. Clip them close to flush, but not so far that you clip the board itself.

   [(LEADS CAN FLY—WEAR EYE PROTECTION!)]

6. Use the same procedure to install the capacitor at C1.

7. Use the same procedure to install resistors R1-R8.

8. Use the same procedure to install the capacitor at C1.

9. Use the same procedure to install resistors R1-R8.

10. Use the same procedure to install the capacitor at C1.

11. Use the same procedure to install resistors R1-R8.

12. Use the same procedure to install the capacitor at C1.

13. Use the same procedure to install resistors R1-R8.

14. Use the same procedure to install the capacitor at C1.

15. Use the same procedure to install resistors R1-R8.

16. Use the same procedure to install the capacitor at C1.

17. Use the same procedure to install resistors R1-R8.

18. Use the same procedure to install the capacitor at C1.

19. Use the same procedure to install resistors R1-R8.

20. Use the same procedure to install the capacitor at C1.

21. Use the same procedure to install resistors R1-R8.

22. Use the same procedure to install the capacitor at C1.

23. Use the same procedure to install resistors R1-R8.

24. Use the same procedure to install the capacitor at C1.

25. Use the same procedure to install resistors R1-R8.

26. Use the same procedure to install the capacitor at C1.

27. Use the same procedure to install resistors R1-R8.

28. Use the same procedure to install the capacitor at C1.

29. Use the same procedure to install resistors R1-R8.

30. Use the same procedure to install the capacitor at C1.

31. Use the same procedure to install resistors R1-R8.

32. Use the same procedure to install the capacitor at C1.

33. Use the same procedure to install resistors R1-R8.

34. Use the same procedure to install the capacitor at C1.

35. Use the same procedure to install resistors R1-R8.

36. Use the same procedure to install the capacitor at C1.

37. Use the same procedure to install resistors R1-R8.

38. Use the same procedure to install the capacitor at C1.

39. Use the same procedure to install resistors R1-R8.

40. Use the same procedure to install the capacitor at C1.

41. Use the same procedure to install resistors R1-R8.

42. Use the same procedure to install the capacitor at C1.

43. Use the same procedure to install resistors R1-R8.

44. Use the same procedure to install the capacitor at C1.

45. Use the same procedure to install resistors R1-R8.

46. Use the same procedure to install the capacitor at C1.

47. Use the same procedure to install resistors R1-R8.

48. Use the same procedure to install the capacitor at C1.

49. Use the same procedure to install resistors R1-R8.

50. Use the same procedure to install the capacitor at C1.

51. Use the same procedure to install resistors R1-R8.

52. Use the same procedure to install the capacitor at C1.

53. Use the same procedure to install resistors R1-R8.

54. Use the same procedure to install the capacitor at C1.

55. Use the same procedure to install resistors R1-R8.

56. Use the same procedure to install the capacitor at C1.

57. Use the same procedure to install resistors R1-R8.

58. Use the same procedure to install the capacitor at C1.

59. Use the same procedure to install resistors R1-R8.

60. Use the same procedure to install the capacitor at C1.
6A. **SHAMASH LOCATION**

**PICK ONE:**

**CENTER:**

**OR RIGHT:**

6B. **LED ALTITUDE**

**ELEVATED:**

**FLUSH:**

**SOLDER THEM & TRIM THE LEADS.**

6C. **ELEVATED LEDS**

**MOUNT THE LED SPACER ON THE CIRCUIT BOARD.**

PLACE ALL LEDS EXCEPT YOUR SHAMASH (D4 OR D8).

LEDS STRADDLE THE SPACER, LOOSELY.

ON THE BOTTOM SIDE, BEND OUT THE LEADS SLIGHTLY, AND SOLDER ONLY ONE PIN OF EACH LED, THE LONG ONE.

POLARITY MATTERS! SHORT LEADS GO TO FLAT SIDES. (SEE LAST FRAME OF PAGE 2.)

6D. **ADD THE SHAMASH**

ADD THE FINAL LED, WHICH SITS HIGHER THAN THE OTHERS.

SOLDER ONE PIN AT FIRST TO TACK IT IN PLACE.

STRAIGHTEN IT BY HAND, AND THEN SOLDER THE OTHER EIGHT PINS.

7. **THE STAND**

THERE ARE TWO ACRYLIC STAND PIECES: BE GENTLE WITH THEM.

HOLD THE BOARD UP SIDE DOWN AND SLIDE ON EACH STAND.

IF THEY LOOK BROWN AND PAPERY, PEEL OFF THE PROTECTIVE LINER.

>>Skip to 6D.

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**CONGRATULATIONS! YOU BUILT IT!**

YEP, THAT’S IT! PUT BATTERIES IN THE HOLDER AND SWITCH IT ON.

(CAN AND SWITCH IT OFF TO SAVE YOUR BATTERIES!)

- **THE PUSHBUTTON ADVANCES BETWEEN NIGHTS.**
- **HOLD THE BUTTON TO TOGGLE BETWEEN LOW-POWER AND HIGH-POWER MODES, WITH OR WITHOUT "CANDLE" FLICKERING.**
- **HOLD DOWN THE BUTTON AT POWER-ON FOR DEMO MODE.**

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