CHRP Schematic Scavenger Hunt

About schematic diagrams

Schematic diagrams describe circuit components and the wiring connecting the components. In simple schematics, circuits are often drawn so that signal inputs flow to circuit outputs in a left to right direction. In more complex circuits, as well as in many digital circuits, schematic diagrams can be broken into functional groups of components instead of a simple left to right arrangement.

Schematic part identification

1. Identify and draw both a power and ground symbol. What are the two different power symbols used in the CHRP circuit?

2. Identify and draw a resistor symbol. How many resistors are there in the CHRP circuit?

3. How many different resistor values are used in the CHRP circuit?

4. Write the colour code of each unique resistor value onto your schematic diagram.

5. Identify and draw both types of capacitor symbols used in the CHRP circuit. How many capacitors are in the CHRP circuit?

6. How many of the capacitors are polarized?

7. What components do capacitors C6 and C10 connect to?

8. Identify and draw the three types of diode symbols used in the CHRP circuit. How many diodes are in the CHRP circuit?

9. How many of the diodes are LEDs?

10. What kind of diode or diode circuit is D1? What does it do?

11. What letter is used to identify ICs (integrated circuits)?

12. How many integrated circuits are in the CHRP circuit?

13. Pin 1 of each IC is used as a reference to identify all of the other pin numbers. How is pin 1 of an IC marked on the circuit board?

14. What other circuit board marking is used to identify the pin 1 end of an IC?

15. Complete the chart. For each integrated circuit, list its part number as well as the pin numbers of the power supply and ground pins.

Integrated Circuit	Part number	Power supply pin(s)	Ground pin(s)
U1			
U2			
U3			
U4			
U5			
T1			

16. Each IC has a capacitor connected to its power supply pin (this might help you identify the power supply pin of U3 in the chart, above). Where are these capacitors located in relation to the IC?

17. What letter is used to identify phototransistors?

18. How many phototransistors are in the CHRP circuit?

19. Identify and draw a piezo transducer (beeper) symbol. What letter is used to identify the piezo beeper?

20. Identify and draw a potentiometer symbol. What letter code is used to represent a potentiometer?

21. What kind of parts do the letters H and J represent?

22. How many pushbutton switches are in the CHRP circuit?

23. Do any of the switches act as power switches for the circuit?

24. What are two ways of powering the CHRP circuit? What is the recommended input potential of the CHRP circuit?

Circuit analysis

25. Under what conditions will LED1 illuminate?

26. Assuming a 20V input to R1, and a 1.8V drop across LED1, calculate the current flowing through LED1.

27. Assuming a 5V output to R20, and a 1.4V drop across LED2, calculate the current flowing through LED2.

28. Assuming a 5V output on pin 21 of U2, calculate the current flow through R4 when S2 is pressed (assume 0Ω resistance through S2).

29. Calculate the current flow through potentiometer VR1.

30. Assuming VR1 is set so that there is 1.2kΩ of resistance between the wiper and ground, calculate the potential at the wiper.

31. The analogue input on the microcontroller connected to VR1 can be set to sense 256 voltage levels between 0V and 5V—an 8-bit range. What voltage represents a 1-bit change?

32. Which port pins control the two motors?

33. How many possible combinations of bits can be used to control motor 1?

34. Which port pins control the LEDs?

35. What other devices do the LED port pins connect to?

Component research

36. Which manufacturer makes PIC microcontrollers. Find and download the datasheet for the PIC16F886 microcontroller.

37. How many I/O pins does the PIC16F886 have?

38. How much program memory does the PIC16F886 have?

39. How fast does the PIC16F886 run?

40. Find and download the datasheet for U5. What does an infrared demodulator such as U5 do?

41. What carrier frequency is U5 designed for?

42. Find and download the datasheet for motor driver U3. How many motors can U3 control?

43. What is the maximum current that U3 can provide to each motor?

44. What temperature range can T1 sense?

45. As the temperature of T1 changes, how many volts correspond to each degree change?

46. What kind of device is U1? What does U1 do?