

Morse Code Trainer

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Buttons:

(From Left to Right)

1. Morse Code Key
2. Unused
3. Unused
4. Asynchronous Reset

Bar LEDs:

- The rightmost LED turns on when a valid dot has been entered.
- The second LED from the right turns on when a valid dash has been entered.

7-Segment Displays:

- The 7-segment displays show the English letter and number representations of the Morse Code patterns entered into the circuit.
- The rightmost display shows the most recent character entered.
- As more characters are entered, the characters shift left to the other displays.

Dip Switches:

- Unused

International Morse Code Language Subset:

Morse Code Pattern	English Letters/Number
.-	A
-...	B
-.-.	C
-..	D
.	E
..-.	F
.----	1
..---	2
...--	3
....-	4
.....	5
-....	6
--...	7

---..	8
----.	9
-----	0

Note: All patterns not shown here are considered invalid. An invalid pattern shows up as a decimal point on the 7-segment displays.

Operation:

This circuit implements a subset of the International Morse Code language. The language is characterized by 4 different characters. These are the dot (.), the dash (-), the next character and the space character. The dot and dash characters are used to specify patterns that denote certain letters, numbers and other symbols in human languages. The next character is used to signal that a dot-dash pattern has ended and a new pattern will follow. The space character denotes that a word has ended and another word will follow.

A dot character is entered by holding down Button 1 for longer than 1 second and less than 3 seconds. When Button 1 has been held down for longer than 1 second, the rightmost bar LED will light up which indicates that a valid dot character has been entered. A dash character is entered by holding down Button 1 for longer than 3 seconds. When Button 1 has been held down for longer than 3 seconds, the second bar LED from the right will turn on which indicates that a valid dash character has been entered. A next character is entered by not pressing Button 1 for 3 seconds. A next character is signified by the displays shifting to the left and the rightmost display showing the most recent character to be entered. A space character is entered by not pressing Button 1 for 7 seconds. A space character is shown on the displays by having a single display be completely blank. It is not necessary to generate a next character to display a space character.

So for example, to enter the sequence of numbers "123" followed by a space, one first enters a valid dot character followed by 4 valid dash characters and a next character to produce the number '1'. Next, one enters 2 valid dot characters followed by 3 valid dash characters and a next character to produce the number '2'. Then one enters 3 valid dot characters followed by 2 valid dash characters and a next character to produce the number '3'. Finally, to enter a space, one must not press Button 1 for seven seconds. So, the final 4 7-segment displays should show:

