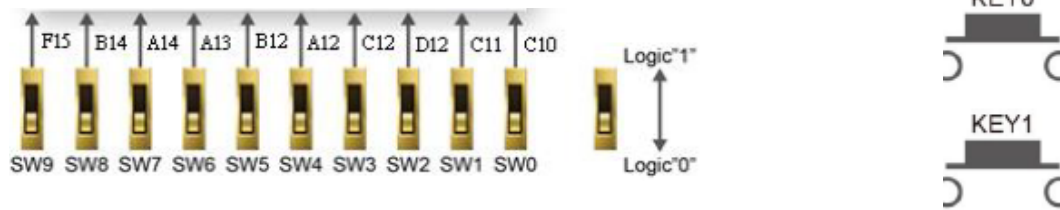


## Switch and Button Controls:



When Switch 0 is on (Logic "1"):

- Neutral (Clock settings cannot be changed or be modified)

When only Switch 1 is Enabled:

- The Clock can be shown with seconds included (replaced Meridien (Hex 1))

When only Switch X is Enabled:

- Time Zones can be changed (Using Switched 7-9)
- Meridiens can be changed (Using Key 0)

When only SwitchX is Enabled:

- Allows for User to create a countdown timer, they can use Key 0 to increment the timer value, Key 1 to decrement the value
- Turn on Switch 3 with Switch 2 to start the timer, pressing Key 0 will pause the timer, and Key 1 will reset the timer

When only Switch X is Enabled:

- The User can use a stopwatch, they can use Key 0 to start the Stopwatch, and Key 1 to Pause the Stopwatch, and if Switch 3 is Disabled, the stopwatch register will be set back to 0

When only Switch X is Enabled:

- The User can increment the hours by using Key 0 and increment the minutes using Key 1



1. Tens Place for Hours
2. Ones Place for Hours
3. Tens Place for Minutes
4. Ones Place for Minutes
5. Tens Places for Seconds or Meridien Display (By Default)
6. Ones Places for Seconds or Time Zone Display (By Default)

Right Display (Ones Space):

Segment Zero (d[0]):

Numbers not included: 1,4

1 (000001) + 4 (000100) + 11 (001011) + 14 (001110) + 21 (010101) + 24 (011000) +  
31 (011111) + 34 (100010) + 41 (101001) + 44 (101100) + 51 (110011) + 54 (110110) +  
61 (111100)

assign f = (~x[5] & ~x[4] & ~x[3] & ~x[2] & ~x[1] & x[0]) | (~x[5] & ~x[4] & ~x[3] & x[2] & ~x[1]  
& ~x[0]) | (~x[5] & ~x[4] & x[3] & ~x[2] & x[1] & x[0]) | (~x[5] & ~x[4] & x[3] & x[2] & x[1] &  
~x[0]) | (~x[5] & x[4] & ~x[3] & x[2] & ~x[1] & x[0]) | (~x[5] & x[4] & x[3] & ~x[2] & ~x[1] &  
~x[0]) | (~x[5] & x[4] & x[3] & x[2] & x[1] & x[0]) | (x[5] & ~x[4] & ~x[3] & ~x[2] & x[1] & ~x[0]) |  
(x[5] & ~x[4] & x[3] & ~x[2] & ~x[1] & x[0]) | (x[5] & ~x[4] & x[3] & x[2] & ~x[1] & ~x[0]) | (x[5] &  
x[4] & ~x[3] & ~x[2] & x[1] & x[0]) | (x[5] & x[4] & ~x[3] & x[2] & x[1] & ~x[0]) | (x[5] & x[4] &  
x[3] & x[2] & ~x[1] & x[0]);

---

Segment One (d[1]):

Numbers not included: 5,6

5 (000101) + 6 (000110) + 15 (001111) + 16 (010000) + 25 (011001) + 26 (011010) +  
35 (100011) + 36 (100100) + 45 (101101) + 46 (101110) + 55 (110111) +  
56 (111000)

assign f = (~x[5] & ~x[4] & ~x[3] & x[2] & ~x[1] & x[0]) | (~x[5] & ~x[4] & ~x[3] & x[2] & x[1] &  
~x[0]) | (~x[5] & ~x[4] & x[3] & x[2] & x[1] & x[0]) | (~x[5] & x[4] & ~x[3] & ~x[2] & ~x[1] &  
~x[0]) | (~x[5] & x[4] & x[3] & ~x[2] & ~x[1] & x[0]) | (~x[5] & x[4] & x[3] & ~x[2] & x[1] & ~x[0]) |  
(x[5] & ~x[4] & ~x[3] & ~x[2] & x[1] & x[0]) | (x[5] & ~x[4] & ~x[3] & x[2] & ~x[1] & ~x[0]) |  
(x[5] & ~x[4] & x[3] & x[2] & ~x[1] & x[0]) | (x[5] & ~x[4] & x[3] & x[2] & x[1] & ~x[0]) | (x[5] &  
x[4] & ~x[3] & x[2] & x[1] & x[0]) | (x[5] & x[4] & x[3] & ~x[2] & ~x[1] & ~x[0]);

---

Segment Two (d[2]):

Numbers not included: 2

2 (000010) + 12 (001100) + 22 (010110) + 32 (100000) + 42 (101010) + 52 (110100) +  
62 (111110)

assign f = (~x[5] & ~x[4] & ~x[3] & ~x[2] & x[1] & ~x[0]) | (~x[5] & ~x[4] & x[3] & x[2] & ~x[1] &  
~x[0]) | (~x[5] & x[4] & ~x[3] & x[2] & x[1] & ~x[0]) | (x[5] & ~x[4] & ~x[3] & ~x[2] & ~x[1] &

$\sim x[0]) \mid (x[5] \& \sim x[4] \& x[3] \& \sim x[2] \& x[1] \& \sim x[0]) \mid (x[5] \& x[4] \& \sim x[3] \& x[2] \& \sim x[1] \& \sim x[0])$   
 $\mid (x[5] \& x[4] \& x[3] \& x[2] \& x[1] \& \sim x[0]);$

Segment Three (d[3]):

Numbers not included: 1, 4, 7, 9

1 (000001) + 4 (000100) + 7 (000111) + 9 (001001) + 11 (001011) + 14 (001110) +  
17 (010001) + 19 (010011) + 21 (010101) + 24 (011000) + 27 (011011) + 29 (011101) +  
31 (111111) + 34 (100010) + 37 (100101) + 39 (100111) + 41 (101001) + 44 (101100) +  
47 (101111) + 49 (110001) + 51 (110011) + 54 (110110) + 57 (111001) + 59 (111011) +  
61 (111101)

assign f =  $(\sim x[5] \& \sim x[4] \& \sim x[3] \& x[2] \& \sim x[1] \& \sim x[0]) \mid (\sim x[4] \& \sim x[3] \& x[2] \& x[1] \& x[0]) \mid$   
 $(\sim x[5] \& \sim x[4] \& x[3] \& x[2] \& x[1] \& \sim x[0]) \mid (\sim x[5] \& x[4] \& x[3] \& \sim x[2] \& \sim x[1] \& \sim x[0]) \mid (x[5]$   
 $\& \sim x[4] \& \sim x[3] \& \sim x[2] \& x[1] \& \sim x[0]) \mid (x[5] \& \sim x[4] \& \sim x[3] \& x[2] \& x[0]) \mid (x[5] \& \sim x[4] \&$   
 $x[3] \& x[2] \& \sim x[1] \& \sim x[0]) \mid (x[5] \& \sim x[4] \& x[2] \& x[1] \& x[0]) \mid (x[5] \& x[4] \& \sim x[3] \& x[2] \&$   
 $x[1] \& \sim x[0]) \mid (\sim x[5] \& \sim x[4] \& \sim x[2] \& \sim x[1] \& x[0]) \mid (\sim x[5] \& \sim x[4] \& x[3] \& \sim x[2] \& x[0]) \mid$   
 $(\sim x[5] \& x[4] \& \sim x[3] \& \sim x[1] \& x[0]) \mid (x[4] \& \sim x[2] \& x[1] \& x[0]) \mid (\sim x[5] \& x[4] \& x[3] \& x[2] \&$   
 $x[0]) \mid (\sim x[4] \& x[3] \& \sim x[2] \& \sim x[1] \& x[0]) \mid (x[4] \& \sim x[3] \& \sim x[2] \& x[0]) \mid (x[5] \& x[4] \& x[3] \&$   
 $\sim x[1] \& x[0]);$

---

Segment Four (d[4]):

Numbers not included: 1, 3, 4, 5, 7, 9

1 (000001) + 3 (000011) + 4 (000100) + 5 (000101) + 7 (000111) + 9 (001001) +  
11 (001011) + 13 (001101) + 14 (001110) + 15 (001111) + 17 (010001) + 19 (010011) +  
21 (010101) + 23 (010111) + 24 (011000) + 25 (011001) + 27 (011011) + 29 (011101) +  
31 (011111) + 33 (100001) + 34 (100010) + 35 (100011) + 37 (100101) + 39 (100111) +  
41 (101001) + 43 (101011) + 44 (101100) + 45 (101101) + 47 (101111) + 49 (110001) +  
51 (110011) + 53 (110101) + 54 (110110) + 55 (110111) + 57 (111001) + 59 (111011) +  
61 (111101) + 63 (111111)

assign f =  $(x[0]) \mid (\sim x[5] \& \sim x[4] \& \sim x[3] \& x[2] \& \sim x[1]) \mid (\sim x[5] \& \sim x[4] \& x[3] \& x[2] \& x[1]) \mid$   
 $(\sim x[5] \& x[4] \& x[3] \& \sim x[2] \& \sim x[1]) \mid (x[5] \& \sim x[4] \& \sim x[3] \& \sim x[2] \& x[1]) \mid (x[5] \& \sim x[4] \& x[3]$   
 $\& x[2] \& \sim x[1]) \mid (x[5] \& x[4] \& \sim x[3] \& x[2] \& x[1]);$

---

Segment Five (d[5]):

Numbers not included: 1, 2, 3, 7

1 (000001) + 2 (000010) + 3 (000011) + 7 (000111)  
11 (001011) + 12 (001100) + 13 (001101) + 17 (010001)  
21 (010101) + 22 (010110) + 23 (010111) + 27 (011011)

31 (011111) + 32 (100000) + 33 (100001) + 37 (100101)  
 41 (101001) + 42 (101010) + 43 (101011) + 47 (101111)  
 51 (110011) + 52 (110100) + 53 (110101) + 57 (111001)  
 61 (111101) + 62 (111110) + 63 (111111)  
 assign f = (~x[5] & ~x[4] & ~x[3] & ~x[2] & x[1]) | (~x[5] & ~x[4] & x[3] & x[2] & ~x[1]) | (~x[5] & x[4] & ~x[3] & x[2] & x[1]) | (x[5] & ~x[4] & ~x[3] & ~x[2] & ~x[1]) | (x[5] & ~x[4] & x[3] & ~x[2] & x[1]) | (x[5] & x[4] & ~x[3] & ~x[2] & x[1] & x[0]) | (x[5] & x[4] & ~x[3] & x[2] & ~x[1]) | (x[5] & x[4] & x[3] & x[2] & x[1]) | (~x[5] & ~x[4] & ~x[3] & ~x[2] & x[0]) | (~x[5] & ~x[4] & ~x[3] & x[1] & x[0]) | (~x[5] & ~x[4] & ~x[2] & x[1] & x[0]) | (~x[5] & x[4] & ~x[3] & ~x[1] & x[0]) | (~x[5] & x[4] & x[3] & ~x[1] & x[0]) | (x[5] & ~x[4] & ~x[3] & ~x[1] & x[0]) | (x[5] & ~x[4] & ~x[2] & ~x[1] & x[0]) | (x[5] & ~x[4] & x[3] & x[1] & x[0]) | (x[5] & x[4] & x[3] & ~x[1] & x[0]);

---

Segment Six (d[6]):

Numbers not included: 0, 1, 7

0 (000000) + 1 (000001) + 7 (000111)  
 10 (001010) + 11 (001011) + 17 (010001)  
 20 (010100) + 21 (010101) + 27 (011011)  
 30 (011110) + 31 (011111) + 37 (100101)  
 40 (101000) + 41 (101001) + 47 (101111)  
 50 (110010) + 51 (110011) + 57 (111001)  
 60 (111100) + 61 (111101)

assign f = (~x[5] & ~x[4] & ~x[3] & ~x[2] & ~x[1]) | (~x[5] & ~x[4] & ~x[3] & x[2] & x[1] & x[0]) | (~x[5] & ~x[4] & x[3] & ~x[2] & x[1]) | (~x[5] & x[4] & ~x[3] & x[2] & ~x[1]) | (~x[5] & x[4] & x[3] & x[2] & x[1]) | (x[5] & ~x[4] & ~x[3] & x[2] & ~x[1] & x[0]) | (x[5] & ~x[4] & x[3] & ~x[2] & ~x[1]) | (x[5] & ~x[4] & x[3] & x[2] & x[1] & x[0]) | (x[5] & x[4] & ~x[3] & ~x[2] & x[1]) | (x[5] & x[4] & x[3] & x[2] & ~x[1]) | (~x[5] & ~x[3] & ~x[2] & ~x[1] & x[0]) | (~x[5] & x[3] & ~x[2] & x[1] & x[0]) | (x[5] & x[3] & ~x[2] & ~x[1] & x[0]);

---

Left Display (Tens Space):

Segment Zero (d[0]):

Numbers not included: 0-, 1-, 4-

0 (000000) + 1 (000001) + 2 (000010) + 3 (000011) + 4 (000100) + 5 (000101) +  
6 (000110) + 7 (000111) + 8 (001000) + 9 (001001) + 10 (001010) + 11 (001011) +  
12 (001100) + 13 (001101) + 14 (001110) + 15 (001111) + 16 (010000) + 17 (010001) +  
18 (010010) + 19 (010011) + 40 (101000) + 41 (101001) + 42 (101010) + 43 (101011) +  
44 (101100) + 45 (101101) + 46 (101110) + 47 (101111) + 48 (110000) + 49 (110001)

assign f = (~x[5] & ~x[4]) | (~x[5] & ~x[3] & ~x[2]) | (~x[4] & x[3]) | (x[4] & ~x[3] & ~x[2] &  
~x[1]);

---

Segment One (d[1]):

Numbers not included: 0-, 5-, 6-

0 (000000) + 1 (000001) + 2 (000010) + 3 (000011) + 4 (000100) + 5 (000101) +  
6 (000110) + 7 (000111) + 8 (001000) + 9 (001001) + 50 (110010) + 51 (110011) + 52  
(110100) + 53 (110101) + 54 (110110) + 55 (110111) + 56 (111000) + 57 (111001) + 58  
(111010) + 59 (111011) + 60 (111100) + 61 (111101) + 62 (111110) + 63 (111111)

assign f = (~x[5] & ~x[4] & ~x[3]) | (~x[5] & ~x[4] & ~x[2] & ~x[1]) | (x[5] & x[4] & x[1]) | (x[5] &  
x[4] & x[2]) | (x[5] & x[4] & x[3]);

---

Segment Two (d[2]):

Numbers not included: 0-, 2-

0 (000000) + 1 (000001) + 2 (000010) + 3 (000011) + 4 (000100) + 5 (000101) +  
6 (000110) + 7 (000111) + 8 (001000) + 9 (001001) + 20 (010100) + 21 (010101) + 22  
(010110) + 23 (010111) + 24 (011000) + 25 (011001) + 26 (011010) + 27 (011011) + 28  
(011100) + 29 (011101)

assign f = (~x[5] & ~x[4] & ~x[3]) | (~x[5] & ~x[3] & x[2]) | (~x[5] & x[4] & x[3] & ~x[2]) | (~x[5]  
& ~x[4] & ~x[2] & ~x[1]) | (~x[5] & x[4] & x[2] & ~x[1]);

Segment Three (d[3]):

Numbers not included: 0-, 1-, 4-,

0 (000000) + 1 (000001) + 2 (000010) + 3 (000011) + 4 (000100) + 5 (000101) +  
6 (000110) + 7 (000111) + 8 (001000) + 9 (001001) + 10 (001010) + 11 (001011) +  
12 (001100) + 13 (001101) + 14 (001110) + 15 (001111) + 16 (010000) + 17 (010001) +  
18 (010010) + 19 (010011) + 40 (101000) + 41 (101001) + 42 (101010) + 43 (101011) +  
44 (101100) + 45 (101101) + 46 (101110) + 47 (101111) + 48 (110000) + 49 (110001)

assign f = (~x[5] & ~x[4]) | (~x[5] & ~x[3] & ~x[2]) | (~x[4] & x[3]) | (x[4] & ~x[3] & ~x[2] &  
~x[1]);

---

Segment Four (d[4]):

Numbers not included: 0-, 1-, 3-, 4-, 5-

0 (000000) + 1 (000001) + 2 (000010) + 3 (000011) + 4 (000100) + 5 (000101) +  
6 (000110) + 7 (000111) + 8 (001000) + 9 (001001) + 10 (001010) + 11 (001011) +  
12 (001100) + 13 (001101) + 14 (001110) + 15 (001111) + 16 (010000) + 17 (010001) +  
18 (010010) + 19 (010011) + 30 (011110) + 31 (011111) + 32 (100000) + 33 (100001) +  
34 (100010) + 35 (100011) + 36 (100100) + 37 (100101) + 38 (100110) + 39 (100111) +  
40 (101000) + 41 (101001) + 42 (101010) + 43 (101011) + 44 (101100) + 45 (101101) +  
46 (101110) + 47 (101111) + 48 (110000) + 49 (110001) + 50 (110010) + 51 (110011) +  
52 (110100) + 53 (110101) + 54 (110110) + 55 (110111) + 56 (111000) + 57 (111001) +  
58 (111010) + 59 (111100)

assign f = (~x[4]) | (~x[3] & ~x[2]) | (~x[5] & x[3] & x[2] & x[1]) | (x[5] & ~x[3]) | (x[5] & ~x[2]);

---

Segment Five (d[5]):

Numbers not included: 0-, 1-, 2-, 3-

0 (000000) + 1 (000001) + 2 (000010) + 3 (000011) + 4 (000100) + 5 (000101) +  
6 (000110) + 7 (000111) + 8 (001000) + 9 (001001) + 10 (001010) + 11 (001011) +  
12 (001100) + 13 (001101) + 14 (001110) + 15 (001111) + 16 (010000) + 17 (010001) +  
18 (010010) + 19 (010011) + 20 (010100) + 21 (010101) + 22 (010110) + 23 (010111) +  
24 (011000) + 25 (011001) + 26 (011010) + 27 (011011) + 28 (011100) + 29 (011101) +  
30 (011110) + 31 (011111) + 32 (100000) + 33 (100001) + 34 (100010) + 35 (100011) +  
36 (100100) + 37 (100101) + 38 (100110) + 39 (100111)

assign f = (~x[5]) | (~x[4] & ~x[3]);

Segment Six (d[6]):

0-, 1-

0 (000000) + 1 (000001) + 2 (000010) + 3 (000011) + 4 (000100) + 5 (000101) +  
6 (000110) + 7 (000111) + 8 (001000) + 9 (001001) + 10 (001010) + 11 (001011) +  
12 (001100) + 13 (001101) + 14 (001110) + 15 (001111) + 16 (010000) + 17 (010001) +  
18 (010010) + 19 (010011)

assign f = (~x[5] & ~x[4]) | (~x[5] & ~x[3] & ~x[2]);

---

Meridiem:

Reg [1:0] Meridiem;

00 = No Meridiem, 01 = AM, 10 = PM

---

Segment Zero (d[0]):

assign d[0] = (~x[1] & ~x[0]);

---

Segment One (d[1]):

assign d[1] = (~x[1] & ~x[0]);

---

Segment Two (d[2]):

assign d[2] = (~x[1]);

---

Segment Three (d[3]):

assign d[3] = 0;

---

Segment Four (d[4]):

assign d[4] = (~x[1] & ~x[0]);

---

Segment Five (d[5]):

assign d[5] = (~x[1] & ~x[0]);

---

Segment Six (d[6]):

assign d[6] = (~x[1] & ~x[0]);



## Time Zone Codes:

Uses all the time zones in Canada and UTC

Terms of UTC:

U ← UTC	Coordinated <b>U</b> niversal Time	0:00
N ← NST	<b>N</b> ewfoundland Standard Time	-3:30
A ← AST	<b>A</b> tlantic Standard Time	-4:00
E ← EST	<b>E</b> astern Standard Time	-5:00
C ← CST	<b>C</b> entral Standard Time	-6:00
S ← MST	Time in Lloydminster, <b>S</b> askatchewan (Mountain Standard Time)	-7:00
P ← PST	<b>P</b> acific Standard Time	-8:00
Y ← YST	<b>Y</b> ukon Standard Time	-9:00

NOTE: Daylight Savings Time can be turned on with a switch, depicted with d[7] on the Same

Reg [2:0] timeZone;

000 = UTC (U), 001 = NST (N), 010 = AST (A), 011 = EST (E), 100 = CST (C), 101 = MST (S), 110 = PST (P), 111 = YST (Y)

---

Segment Zero (d[0]):

assign d[0] = ((~x[2] & ~x[1] & ~x[0]) | (x[2] & x[1] & x[0]));

---

Segment One (d[1]):

assign d[1] = ((~x[2] & x[1] & x[0]) | (x[2] & ~x[1]));

---

Segment Two (d[2]):

assign d[2] = ((~x[2] & x[1] & x[0]) | (x[2] & ~x[0]));

---

Segment Three (d[3]):

assign d[3] = ((~x[2] & ~x[1] & x[0]) | (x[1] & ~x[0]));

---

Segment Four (d[4]):

assign d[4] = (x[2] & x[0]);

---

Segment Five (d[5]):

assign d[5] = 1;

---

Segment Six (d[6]):

assign d[6] = ((~x[2] & ~x[1]) | (~x[1] & ~x[0]));

