# Instructions For 6-Tube IN-12 and IN-14 Clocks

Thank you for purchasing this hand-made Nixie clock.  The clock has several features which allow you to customize its operation.

## *To Set the Time:*

Press and hold one button at a time.  Pressing the left button changes the hours, and pressing the right button adjusts the minutes. Changing the minutes sets the seconds back to 0.

## *Changing Settings:*

There are 4 groups of settings.

Pressing then releasing both buttons at the same time will move to the next setting group.  When viewing a setting, pressing one button at a time will either increase or decrease the value of the setting.

After a few seconds of not pressing any buttons, the clock will toggle back to the time display automatically.

**Setting Group 1**: *24 vs. 12 Hour mode*.  Press either button (but not both) to highlight the number 12 or 24.  If 24 is highlighted, the clock will show 24 hour time.  If the 12 is highlighted, it will show 12 hour time.

**Setting Group 2**: *Brightness*.  The clock will display a number on the middle two nixies, between 00 and 10, which is the default brightness level.  10 is the brightest, and 00 is the darkest (nixies off).  Press the right button to decrease the brightness setting, and the left button to increase it.

**Setting Group 3**: *Auto-Dim*.  The nixie clock can be set to automatically lower the brightness between two specified hours in the day (such as between 09 and 17 hundred hours, or when you are not at home).  There are three, two digit numbers shown at once.  The left two nixies show the start hour (0 to 23)  of the auto-dim.  The middle two nixies show the end time of the auto dim.  And the right two nixies show the brightness level (00 to 10).  Each time both buttons are pressed and released, the setting being changed will move from start hour, to end hour then to brightness level.  You can tell which value is being edited because it will be highlighted.  If the start and end hours are the same, the auto-dim is disabled.

**Setting Group 4**: *Time adjustment*.  The internal oscillator may up to 0.005% fast or slow, causing the clock to be slightly fast or slow.  To compensate, a small adjustment can be added to the internal time counter.  To calculate the correction factor, set the time to a reliable source (i.e., www.time.gov).  Wait at least a couple of days, and record how many seconds the clock is fast or slow.  The correction factor can be found on the attached table, or calculated as follows:

$$CF = 3100 - (65536000 * (\text{Number of seconds fast}) / (\text{Duration of test}))$$

The (Duration of test) is the time, in seconds, that the clock was allowed to run.  If the clock was slow, then (Number of seconds fast) will be a negative number.  The number to enter in the middle two nixies is CF/64, rounded down.  The number to enter in the right two nixies is the remainder of CF/64.

The factory default value for the time adjustment is 48 28.

Enjoy your clock!  If you encounter any trouble, please e-mail me, Peter Jensen, at jensen@tubeclock.com.

# Table of Time Adjustment settings for IN12 and IN-14 clocks.

*Set the time adjustment factor to (48 28) and then accurately measure how fast the clock is over the course of 24 hours, 72 hours, or 240 hours. The longer the test, the more accurate the adjustment setting can be.*

*After the test, change the time adjustment factor to the settings in the tables below.*

*NOTE: All time accuracy tests must be done with the time adjustment setting set to (48 28) during the test.*

**24 Hour Test**

Number of seconds in test          86400

| Seconds FAST (use the negative number if it's slow) | CF | First 2 Digits | Second 2 Digits |
|---|---|---|---|
| -4 | 6134 | 95 | 54 |
| -3 | 5376 | 84 | 0 |
| -2 | 4617 | 72 | 9 |
| -1 | 3859 | 60 | 19 |
| 0 | 3100 | 48 | 28 |
| 1 | 2341 | 36 | 37 |
| 2 | 1583 | 24 | 47 |
| 3 | 824 | 12 | 56 |
| 4 | 66 | 1 | 2 |

**72 Hour Test (3 days)**

Number of seconds in test          259200

| Seconds FAST (use the negative number if it's slow) | CF | First 2 Digits | Second 2 Digits |
|---|---|---|---|
| -12 | 6134 | 95 | 54 |
| -11 | 5881 | 91 | 57 |
| -10 | 5628 | 87 | 60 |
| -9 | 5376 | 84 | 0 |
| -8 | 5123 | 80 | 3 |
| -7 | 4870 | 76 | 6 |
| -6 | 4617 | 72 | 9 |
| -5 | 4364 | 68 | 12 |
| -4 | 4111 | 64 | 15 |
| -3 | 3859 | 60 | 19 |
| -2 | 3606 | 56 | 22 |
| -1 | 3353 | 52 | 25 |
| 0 | 3100 | 48 | 28 |
| 1 | 2847 | 44 | 31 |
| 2 | 2594 | 40 | 34 |
| 3 | 2341 | 36 | 37 |
| 4 | 2089 | 32 | 41 |
| 5 | 1836 | 28 | 44 |
| 6 | 1583 | 24 | 47 |
| 7 | 1330 | 20 | 50 |

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|---|---|---|---|
| 8 | 1077 | 16 | 53 |
| 9 | 824 | 12 | 56 |
| 10 | 572 | 8 | 60 |
| 11 | 319 | 4 | 63 |
| 12 | 66 | 1 | 2 |

## 240 Hour Test (10 days)

Number of seconds in test      864000

| Seconds FAST (use the negative number if it's slow) | CF | First 2 Digits | Second 2 Digits |
|---|---|---|---|
| -40 | 6134 | 95 | 54 |
| -39 | 6058 | 94 | 42 |
| -38 | 5982 | 93 | 30 |
| -37 | 5907 | 92 | 19 |
| -36 | 5831 | 91 | 7 |
| -35 | 5755 | 89 | 59 |
| -34 | 5679 | 88 | 47 |
| -33 | 5603 | 87 | 35 |
| -32 | 5527 | 86 | 23 |
| -31 | 5451 | 85 | 11 |
| -30 | 5376 | 84 | 0 |
| -29 | 5300 | 82 | 52 |
| -28 | 5224 | 81 | 40 |
| -27 | 5148 | 80 | 28 |
| -26 | 5072 | 79 | 16 |
| -25 | 4996 | 78 | 4 |
| -24 | 4920 | 76 | 56 |
| -23 | 4845 | 75 | 45 |
| -22 | 4769 | 74 | 33 |
| -21 | 4693 | 73 | 21 |
| -20 | 4617 | 72 | 9 |
| -19 | 4541 | 70 | 61 |
| -18 | 4465 | 69 | 49 |
| -17 | 4389 | 68 | 37 |
| -16 | 4314 | 67 | 26 |
| -15 | 4238 | 66 | 14 |
| -14 | 4162 | 65 | 2 |
| -13 | 4086 | 63 | 54 |
| -12 | 4010 | 62 | 42 |
| -11 | 3934 | 61 | 30 |
| -10 | 3859 | 60 | 19 |
| -9 | 3783 | 59 | 7 |
| -8 | 3707 | 57 | 59 |
| -7 | 3631 | 56 | 47 |
| -6 | 3555 | 55 | 35 |
| -5 | 3479 | 54 | 23 |
| -4 | 3403 | 53 | 11 |
| -3 | 3328 | 52 | 0 |
| -2 | 3252 | 50 | 52 |
| -1 | 3176 | 49 | 40 |

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|---|---|---|---|
| 0 | 3100 | 48 | 28 |
| 1 | 3024 | 47 | 16 |
| 2 | 2948 | 46 | 4 |
| 3 | 2872 | 44 | 56 |
| 4 | 2797 | 43 | 45 |
| 5 | 2721 | 42 | 33 |
| 6 | 2645 | 41 | 21 |
| 7 | 2569 | 40 | 9 |
| 8 | 2493 | 38 | 61 |
| 9 | 2417 | 37 | 49 |
| 10 | 2341 | 36 | 37 |
| 11 | 2266 | 35 | 26 |
| 12 | 2190 | 34 | 14 |
| 13 | 2114 | 33 | 2 |
| 14 | 2038 | 31 | 54 |
| 15 | 1962 | 30 | 42 |
| 16 | 1886 | 29 | 30 |
| 17 | 1811 | 28 | 19 |
| 18 | 1735 | 27 | 7 |
| 19 | 1659 | 25 | 59 |
| 20 | 1583 | 24 | 47 |
| 21 | 1507 | 23 | 35 |
| 22 | 1431 | 22 | 23 |
| 23 | 1355 | 21 | 11 |
| 24 | 1280 | 20 | 0 |
| 25 | 1204 | 18 | 52 |
| 26 | 1128 | 17 | 40 |
| 27 | 1052 | 16 | 28 |
| 28 | 976 | 15 | 16 |
| 29 | 900 | 14 | 4 |
| 30 | 824 | 12 | 56 |
| 31 | 749 | 11 | 45 |
| 32 | 673 | 10 | 33 |
| 33 | 597 | 9 | 21 |
| 34 | 521 | 8 | 9 |
| 35 | 445 | 6 | 61 |
| 36 | 369 | 5 | 49 |
| 37 | 293 | 4 | 37 |
| 38 | 218 | 3 | 26 |
| 39 | 142 | 2 | 14 |
| 40 | 66 | 1 | 2 |