Dyadnix Nixie Clock Kit (V1.1) (For Firmware V1.0)

User Manual

Unusual Electronics

WARNING!

This unit generates a high voltage.

High voltages can cause serious injury or death!

Safe operation of this kit is the users responsibility.

This information is provided 'as is'.

No responsibility is accepted for any damage, injury or death as a result of using this kit.

It must be properly en-cased to prevent contact with high voltages and kept out of reach of children.

Contents

1. Reading the Time

The tubes show information in sequences of two digits at a time.
e.g. Hours – blank – Minutes – blank.... repeat
or: Hours – crossfade – Minutes – blank.... repeat (this is the default setting)
or: Hours – blank – Minutes – blank – Seconds (for several seconds) – blank....repeat

There are many other configuration options which allow you to change how the information is shown, display timing, special effects, tube LEDs colours etc.
You can configure the tube leds to show different colours for Hours, Minutes etc.
The default is Blue for Hours, Green for Minutes, Red for Seconds

2. Controls

All settings are adjusted using two push-buttons.
The **SET** button is mainly used to access configuration options.
Depending on how long it is held pressed (see section 5 for more info)

While in setup modes, pressing or holding-down the **UP** button will count-up through the allowed values for each option.
In addition, the **UP** button can be pressed during normal time display to dim the display.

Whilst showing the time:
One short press (less than 2 seconds) of the **SET** button will show the date for 5 seconds.
Two short presses of the **SET** button (within 2 seconds) will switch to continuous temperature display. (Temperature will be shown in the format that you have chosen in the setup options).
To exit from continuous temperature display, another short press of the set button will briefly show the minimum & maximum temperatures since power-on, then return to the normal time display. (power-off or long press the set button whilst showing temperature to reset the minimum & maximum readings).

See the following sections for a full description of the operation for each button.

3. Setting the Time

Press the **SET** button for about 2 seconds during time display.
The display and LEDs will blank, Release the button when the LEDs glow **RED**.
The hours digits begin to flash. (Hours are shown in 24 Hour time)
Now pressing or holding-down the **UP** button will count-up the hours.

The next short press of the **SET** button will flash the minutes and the LEDs will glow **BLUE**
As before, pressing the **UP** button counts up the minutes.

Another short press of the **SET** button will blank the tubes and the LEDs will glow **GREEN**.
(When the button is released clock will resume showing the time. (If you have changed the time setting, the seconds will be zeroed as the button is released).
(If no buttons are pressed for 60 seconds, it will exit back to time display).

4. Manually Dimming the display

While the clock is showing the time, each short press of the **UP** button will dim the display in four steps, and then back to full brightness again. (The set brightness level is briefly shown on the second tube with each button press).

An automatic timed or light level dim or display off can be configured – see the settings section.

5. Accessing the Configuration option mode

Whilst showing the time, enter the **configuration mode** as follows-

Press and hold-down the **SET** button for about 4 seconds. (until the LEDs glow **PURPLE**)

The display will now show a repeating sequence of the first configuration option (**01**) followed by the digits rapidly flashing the current value for that option. (**12 or 24**)

To change an option value, press the **UP** button
To step-on to the next option, press the **SET** button briefly.

There are a total of 45 options , you can either step through each one sequentially as described above or press and hold the **SET** button again for two seconds (until the LEDs glow **GREEN**) to return to the normal clock time display.

(If no buttons are pressed for 60 seconds, it will automatically exit from configuration mode (any changes already made will be saved)).

6. The Configuration options mode list

No.	*Option*	**Detail** (value in bold is the default)	*Range*
1	Show 12 or 24 Hour time		**12** or 24
2	Year	**2010** - 2099	**10** - 99
3	Month		1 - 12
4	Day of month	The available day range depends on month & year being set first	**1** - Last
5	Crossfading level	0=disabled) 4=maximum **3=Default**	0-4
6	Leading zero blanking	**0= disabled** 1=left, 2=right	**0**-2
7	AM/PM indicator	0=off, **1=PM**, 2=AM	0-2
8	Time display options	0=random choice (1-5) for each display cycle **1=hours/mins**, 2=hours/mins/secs, 3=hours/mins with crossfade 4=hours/mins with slots effect, 5=hours/mins with flip effect	0-5
9	Time digits duration (x 0.1sec)	0.5 - 2 seconds. **(0.8 seconds=default)**	5-30
10	Digit gap duration (x 0.1sec)	**0=no gap**, 1=no gap with crossfade	0-10
11	End blank duration (x 0.1sec)	0 secs - 3 seconds **(0.8 seconds=default)**	0-30
12	Seconds display duration.	1 - 10 seconds **(3 seconds=default)**	1-10
13	Mains AC time sync	0=disabled, **1=auto**, 2=Force 60hz	0-2
14	Timed brightness start hour	**23=default** (11pm)	0-**23**
15	Timed brightness end hour	**08=default** (8am)	0-23
16	Timed brightness value	**6=no timed dim,** 0=turn off display	0-6
17	Light sensor autodim	**0=disabled),** 1=dimming only, 2=dimming then off, 3=on/off only	0-3
18	Light sensor threshold	**25=default,** (higher=dims in brighter light)	0-80
19	Date display every x cycles	**0=disabled**	0-60
20	Date duration (x 0.1sec)	0.5 - 3 seconds **(0.8 seconds=default)**	5-30
21	Date Visual effects	**0=day only**, 1=day & month, 2=day & month with crossfade, 3 = day with flip, 4 = day with slots effect.	**0**-4
22	Date format	**0=UK** (day,month), 1=US (month,day)	**0**-1
23	Clock accuracy adjustment	**0=no adjustment**	**0**-99
24	Clock accuracy ±	0=minus, **1=plus**	0-**1**
25	DST zone	**0=disabled**, 1=UK/Europe, 2=USA	**0**-2

No.	*Option*	**Detail** (value in bold is the default)	*Range*
26	Digit cycling effect	**0=randomly chosen effect**	**0**-8
27	Digit cycling effect run-times	(**0=Off)**,1=every five time cycles, 2=every ten cycles, 3=minute, 4=15min, 5=30min, 6=hour,7=midnight for 5mins, 8=midnight for 59mins.	**0**-8
28	Digit cycling effect run speed	(8 is slow) **0= random speed**	**0** - 8
29	Digit cycling run duration	**5 Seconds=default**	2 - 30
30	Temperature every x cycles	**0=disabled**	0-60
31	Temperature duration (x0.1sec)	0.5 - 3 seconds **(0.8 seconds=default)**	5-30
32	Temperature Visual Effects	0=degrees only,**1=degrees and tenths** 2=degrees & tenths with crossfade 3=degrees (flip) 4=degrees (slots)	0-4
33	Temperature mode	**0=Centigrade**, 1=Fahrenheit	**0**-1
34	Temperature offset adjustment	**0=no adjustment** (max ± 1 degree C)	**0**-10
35	Temperature offset ±	**0=minus**, 1=plus	**0**-1
36	LEDs Maximum brightness	0=leds off, **3=maximum**	0-**3**
37	LEDs HOURS colour	0=off, 8=random **4=default (blue)**	0-8
38	LEDs MINUTES colour	0=off, 8=random **2=default (green)**	0-8
39	LEDs SECONDS colour	0=off, 8=random **1=default (red)**	0-8
40	LEDs DATE colour	**0=off**, 8=random	**0**-8
41	LEDS Temperature colour	**0=off**, 8=random	**0**-8
42	LEDs EFFECTS colour	**0=off**, 8=random	**0**-8
43	LEDs while tubes blanked colour	**0=off**, 8=random	**0**-8
44	LEDs during timed/opto tubes-off colour	**0=off**, 8=random	**0**-8
45	LEDS glow effects during timed/opto off	**0=off**, 1 = Dim one colour, 2 = One colour fade per second, 3 = Random colour fade per second, 4 = Random colour fade per 5 seconds, 5 = Random colour fade per10 seconds, 6 = Random colour fade with random delay, 7 = Single colour flicker, 8 = Chooses option 1-7 at random, 9 = As option 8 except random choice changes every minute	**0**-9

7. Some Configuration options explained

Option 1 - 12 or 24 hour time selection

You can choose to display the time in 12 or 24 hour mode.
(It always shows 24 hour mode when in time setup.)

Options 2 to 4 – Date settings.

If the time is lost due to a long power failure, you will need to also re-set the date.

Option 5 - Crossfading level

The digits can be set to gently fade between numbers instead of change abruptly.
A setting of 3 gives a nice effect. (0 = no crossfade)
(The crossfade effect looks best with the display at full brightness).

Options 6 to 12 – Time display settings

These settings determine how the time is displayed. You can choose to include Seconds, suppress the hours leading zero, adjust how long each part of the sequence lasts or select special effects such as a rolling “slot machine” display for the minutes.

Option 13 - Mains AC time sync.

If you power the clock with a 9-12 volt AC supply, you can use the mains frequency for timekeeping instead of the crystal oscillator.
(In some countries, the mains frequency timekeeping is very accurate.)
If power fails, the clock will use the crystal until power resumes.

Options 14 to 18 – Timed and Light sensor dimming.

Dimming or turning-off the tubes when not needed helps make them last longer.

You can set it to occur between set hours or by room light level or both.
Option **18** sets the brightness threshold for dimming the display, if set to a high value the display may start to dim even in a bright room.

When the tubes are completely off, the HV supply also turns off to save power.

Pressing either button, will turn the tubes back on again for 1 minute.
Timed brightness settings take priority over light sensor dimming.

When using the timed brightness feature, you can either set the hours range for when you want to dim or turn-off the display e.g. set option **16** to 0 or 1 or **OR** you can set the hours range to be when you want to override the opto-dim feature by setting option **16** to 5 and it will then only allow opto-dimming outside of that time range.

Options 19 to 22 – Date display options.

These control how many time sequence cycles to count before showing the date, how the date is shown, day only or day and month, any special effects and UK or US date format if set to show days and months.

Options 23 & 24 – Clock timekeeping accuracy adjustment.
Without adjustment the clock should be accurate to within about ± 1.7 seconds per day.
To adjust, first set the time against a very accurate clock such as a time signal.
After ten days compare the number of seconds error.
e.g. if the clock was 12 seconds slow, set option **23** to 12 and set option **24** to 1 (plus).
(You may subsequently need to make further small adjustments because the accuracy depends on temperature and the ageing of the timekeeping crystal).

(These settings have no effect if the clock is using mains AC for timekeeping or during any power failure.)

Options 25 – DST (Daylight Savings Time).
If enabled here, the clock will automatically adjust the hour at the start and end of Daylight Savings Time (**DST)** (for UK, Europe or USA).

Options 26 to 29 – Digit cycling effects.
Nixie tube life can be prolonged by regularly cycling through all of the digits.
It can also create some nice effects!
Option 26 determines how often the effects run. Set it to 7 or 8 if an extra long run is ever needed due to some digits beginning to fade.

Options 30 to 35 – Temperature display settings.
Temperature can be shown periodically in a similar way as the date is. It can show degrees only or degrees and tenths and has also effects such as “slots”.
The DS18B20 sensor is factory calibrated to be within ± 0.5 Degrees C.
Options 33 & 34 allow fine tuning of it's accuracy if needed.
(Pressing the set button twice during time display can also be used to constantly show the temperature)

Options 36 to 44 – LEDs settings.
You can choose the colour of the LEDs for the information being shown.
0=off 1=red 2=green 3=orange 4=blue 5=purple 6=cyan 7=white 8=choose colour randomly.

Options 44 & 45 – LED settings when tubes are off.
If the tubes are completely off (during timed or opto off) the LEDs colour can be chosen by option **44** as above. (they are off by default)
Option **45** enables some simple LED effects such as flickering, fading to run during this time.
Setting it to **1** provides a very dim glow.
7 does a candle-like flicker.
8 chooses settings 1-7 at random each time the display turns off.
9 randomly changes the setting choice every minute.

8. Accessing the Special Configuration option mode

The second configuration option mode contains settings that are usually less frequently needed to be adjusted.

Press and hold-down the **SET** button during power-on.
The LEDs will glow GREEN, then show the first configurable option (90) as before.

To change an option, follow the same procedure as with the main configuration options.

No.	*Option*	**Detail** (value in bold is the default)	*Range*
90	HV voltage adjust ±	**0=Minus** 1=Plus	**0**-1
91	HV voltage offset	Allows adjustment in 1.24v increments	**0** - 20
92	HV load monitor sensitivity	**0=default**, 1=low sensitivity, 2= HV load monitor off	**0** - 2
93	Show firmware version	(not adjustable by user)	00-99
94	Reset all settings to defaults	1=Reset to defaults (factory reset)	**0**-1

9. The Special Configuration options explained.

Option 90, 91 - HV voltage adjustments.
The HV voltage should already be about 180 Volts and does not have to be precise.
If you wish to fine-adjust the voltage, you will need to first carefully measure the voltage on pin 1 of the pcb connector.
Set option 90 to increment either minus or plus, then adjust option 91.
The voltage can then be checked again on pin 1 of the pcb connector.

Option 92 - HV load monitor sensitivity.
By default, the HV generator checks for overload and shuts-down if detected.
You can reduce the sensitivity if you are using larger Nixie tubes.

Option 93 – Show firmware version.
Use this option to view the firmware revision. The firmware is not user-upgradable.
Any firmware updates would only be made available by obtaining a new PIC chip from us.

Option 94 – Reset to defaults.
You can use this to reset everything back to the initial default settings – all user settings will be lost.

10. Specifications

Power supply adapter requirements:
A 9 – 12 Volts AC or DC power adapter (wall-wart) (Regulated or Unregulated) rated at 300mA or better.

Power consumption:
Measured with a 12V DC regulated supply: approx 155mA (1.9 Watts) **maximum** with both tubes and LEDs on.
Approx 16mA (0.2 Watts) with all tubes, LEDS and HV off. (Timed/Opto off mode).

(Actual total power consumption when using a mains adapter (wall-wart) may be higher depending on it's efficiency and your mains supply voltage.)

Dimensions:
PCB only - 64mm X 45mm X 1.6mm (2.52" X 1.77" X 0.06") (PCB has rounded corners)
Height (including tubes) approx 76mm (3")

Timekeeping Accuracy:
Unadjusted crystal accuracy is within ± 20ppm. (about ± 1.7 seconds per 24 hours)
(Crystal frequency will drift with temperature changes and crystal ageing)

Software adjustments can be made to compensate for up to ± 5 seconds per day in 0.1 second per day increments (i.e. Approx ± 50ppm in 1ppm increments) while the clock is continuously powered.

Temperature Display:
0 - 125°C (the unadjusted accuracy is ± 0.5°C between 0 - 85°C)
The displayable Fahrenheit range is 32 - 199°F

Weight: (no case)
Approx 76 Grams (2.7oz)

11. Feedback

We welcome your comments and suggestions. If there is a feature you particularly like or dislike, or you have any feature requests:
Please email using the contact form on the website: unusualelectronics.co.uk