

IN-14 6-Tube Digit NIXIE Clock Quick Setup Manual V2.2 Standard

Version: 2.2. (08-18-2016).

Download product documentation and the related software at:

[HTTP://vfdclock.jimdo.com](http://vfdclock.jimdo.com)

You can contact us via email:

zjjszhangf@gmail.com

For reference only, we may change the Circuit and Functions without notification!



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Notice

In order to drive the NIXIE tube, some internal equipment are under the High Voltage (up to ~180V DC), please do not use this clock outside or in any wet conditions, please do not touch any part inside the clock when power supply is turned on. Always keep it away from kids.

Specifications

Tube Name: IN-14 (Made in the U.S.S.R.)

Tube Diameter: 18mm;

Tube Height: 55mm (approx including glass nipple);

Digit Height: 17mm;

Digit Width: 10mm;

Clock Supply: 5V DC via USB;

Max Current: ~650mA;

Clock Size: 198mm(L) * 56mm(W) * 17mm(H) (~68mm(H) with IN-14 tubes installed);

PCB Size: 186mm*45mm;

PCB Color: Black;

Weight: 198g;

The clock works with any standard USB supply, please use high-quality adapter or the clock may not work!

Features

- 1). 5V **USB** powered, easy to be used. Can connect to your computer's USB plugs directly (* For some old computers you may need to use the USB Cable that Have Two USB Connectors at the end.).
- 2). High efficiency HV circuit, you get almost no heat in 24*7 working condition;
- 3). All **SMT** components, very **thin** PCB, only 8mm(max) high with the Top & Bottom components; **Static driving, No Flashing, High Brightness;**
- 4). Support **12H** or **24H** display modes. **Leading zero** blanking is programmable.
- 5). Display date in **all format**: YY.MM.DD or DD.MM.YY or MM.DD.YY or even MM.YY.DD; Can display week info too.
- 6). Support a lot of different Effects: **Normal/ Fading/ Cross Fading/Flash /Loop /Random Loop/ Scroll + Mix1/mix2** for displaying time(* **Effects may will be changed in the future**). All Effects support "SLOT MACHINE" effect except Mix1&Mix2;
- 7). High accuracy RTC inside, **DTCXO** (temperature compensated crystal oscillator) version, High Stability, Highly accurate. It has **±1.9ppm** (Equivalent to **±4.94s seconds** of month deviation) under 0°C~+40°C. Usually you don't need to set the time for over a year.

- 8).Simple setting by using **3 buttons** only and supports **IR remote control (optional)**. Also has a new **SNOOZE** button.
- 9).**Three alarms** with weekends ON/OFF support can be controlled individually.
- 10).**Three programmable Auto Power ON/OFF** mode, can turn ON/OFF NIXIE tubes in any time you want. This function can save tubes life.
- 11).**CR1220** battery socket on-board for the RTC power which keeps RTC running during power outages. (***Prepare the CR1220 battery by yourself.**)
- 13).**Tri-colored RGB LED** mounted under the each NIXIE tube. These LED(s) can display pre-defined auto color change effects.
- 14).Store user settings in **non-volatile memory**.
- 15).Beautiful CAD designed **acrylic case** made using a laser cutter makes the clock look beautiful. You can assemble/disassemble the case by using only 4 screws on the bottom of the case. The case also has **4 bumpers** as feet on the bottom of the case in order to stop to prevent case's damage.
- 16).Can install **Temperature Sensor(optional)**;

Turn Power ON/OFF

When you plug the MINI-USB with power supply to the clock, the clock will turn on automatically, with NIXIE tube displays current time with the LED running in breathing mode. (***The clock may do the self testing if you press the [+] or [-] or [SET] key down when power on first, depends on the firmware.**)

In this mode (**[Time display mode]**), press and keep the **[+]** and **[-]** button down then single click the **[SET]** button, you can turn the clock **[soft power on/off]**. When you turn the clock power off, the HV supply will shutdown, and the LED will turn off, but all the Alarms and Auto Power ON/OFF and RTC functions will still be running;

***Let the clock face to you, the left button is [SET], and the middle button is [+], the right button is [-]. And the button on the other side is [SNOOZE];**

Tips: When you turn the clock **[Soft power Off]**, and you want to peek the time, you can just need to single click the **[+]** or **[-]** button, the clock will turn on for about 4 seconds and will turn off automatically. And if you want to turn the clock on from the **[Soft power off]**, long click any keys (except **[SNOOZE]**) for at least 2 seconds the clock will turn on, then you can release the key.

Turn LED ON/OFF

In **[Time display mode]**, single click **[SET]** button will switch the LED in Play/Pause/OFF modes.

Tips: You can control the LED(s) individually, even in the **[soft power off]** mode. (***Depends on the firmware**)

The small LED for indicating the GPS signal

For the clock with the **wire GPS** been installed, **may** have a small LED on board which can do fast blinking when received the GPS signal but invalid, after received valid GPS signal, it will sync the RTC time and turn the light off. After that the clock will sync the time per each minute, and will blinking once per each sync time. It will be no blinking in **Soft Power Off** mode.
(*The LED may be replaced by the dot inside the IN-14, depends on the hardware.)

Quick Start Guide for setting up the current time

When the power on, the clock displays the current time. If the time it displays is not correct, you need to set it by yourself. Here is the quick guide for you to set the current time.



Long Click
the [SET]
button



Single Click
the [SET]
button



When power on, the clock displays the current time, like 23:47:49;

Displays current time effect, ignore it.

Current time format, 024=24H&0-leading, ignore it.



Single Click
the [SET]
button



Single Click
the [SET]
button



Single Click
the [SET]
button

Return to the NORMAL TIME DISPLAY MODE.

Now you can set the **HOUR(S)**. Use [+] / [-] key to change the number.

Now you can set the **MINUTE(S)**. Use [+] / [-] key to change the number.

The SNOOZE function

Whenever you single click the [SNOOZE] key, the clock will start a 1/5/10/15 minutes count ticking down, when count to zero, the clock beeps.

Switch display mode and change settings

1. Time Display Mode

After power on initialization, the clock will display the current time in **[HH.MM.SS.]** format, where **[HH.]** is the current Hours (in 00-23 or other range/style, depends on the time format you have set), **[MM.]** is current Minutes (in 0~59), **[SS.]** is current Seconds (in 0~59).

In this mode, after press the **[SET]** key down for at least 2-sec(Long Click), it will switch to the time related setting mode, and you can short or long click the **[+]** and **[-]** buttons to change the value, and single click the **[set]** button to switch to another settings.

In this setting mode you can set:

[Display Effect: xx]: 00: Normal/ 01: Fading/ 02: Cross Fading/03: Flash /04: Loop/05: Random Loop/06:Scroll; +07:Mix1/08:Mix2 (These two mixed options can switch the effects on each 10-Second, and can display the Date/Temperature on each 30-Second, we recommend using the 08:Mix2 mode);

[Time Format]:24 (24H without 0-leading)/024 (24H with 0-leading)/12 (12H)/012 (12H with 0-leading)/ [.012 or 112] (12H with dot as PM. ***[.012] may not exist**);

[Set Hour]: set time hour in [0~23];

[Set Minute]: set time minute in [0~59];

*if you changed the time value (hour and (or) minute), the second will be reset to 00 automatically.

Tips: For saving the tubes life and to prevent the cathode poisoning, recommend you set the clock to the effects with loop functions inside, like [06: Random Loop] /07/08 mixed] at least one day per month.

2. Date Display Mode

When in the **[Time Display Mode]**, if you click the **[+]** button you can switch to the **[Date Display Mode]**. In this mode the tube displays date in preset format, like DDMMYY/MMDDYY/YMMDD/YDDMM. The format displays in digital, easy to understand, like 12-31-00, means MM-DD-YY format. The week displays in one single digit;

eg: In **[MMDDYY]** format, the date shows like **[05 01 14]** which means May.01,2014;

You can long click the **[SET]** button to switch to another setting, which you can set:

[DATA Format]:DDMMYY/MMDDYY/YMMDD/YDDMM, display in actually date info;

[Set Year]: set year in [2013~2099];

[Set Month]: set month in [01~12];

[Set Day]: set day in [01~28, 29, 30, 31], depends on the year and the month that you have set.

*Week will be calculated automatically;

*After you finished setting all the values in this mode, you will return back to the current display mode, then you can single click the **[+]** button to switch to other mode, or single click the **[SET]** button to return the **[Time Display Mode]** immediately.

3. Temperature Display Mode (Optional)

When in the **[Data Display Mode]**, if you click the **[+]** button you can switch to the **[Temperature Display Mode]**. In this mode the tube displays the temperature got from the temperature sensor.

eg: The temperature date shows like **[26.58 0]** which means 25.68° C or ° F(if the last number shows [1]), depending on the unit you have set; If the clock has no temperature sensor been installed, it shows 00.00;

[Temperature Unit]: temperature display unit, [0] for ° C, [1] for ° F;

[Temperature error adjustment]: adjustable temperature display error adjustment value, $\pm 0.1^{\circ}$ C per step. The last number shows [0] when set a positive value, and shows [1] when set a negative value;

Note: This mode may not exist or will display 0.00 when no temperature sensor been installed!

4. Alarm Display Mode

Same, click the **[+]** button, switch to the **[ALERT DISPLAY Mode 1/2/3]**;

The clock supports 3 individually alarms with weekends ON/OFF;

[11 HHMM]/[00]: displays the first alarm information. The first [1] means "alarm", the next 1 means "alarm 1"(for alarm2/alarm3 shows [12]&[13]), the HH & MM shows the alarm time in hour : minute, the last [00] shows whether the alarm is Enable([01] / Disable[00]);

Long click the **[SET]** button for setting the alarm information:

[Set Hour]: set alarm hour in [00~23];

[Set Minute]: set alarm minute in [00~59];

[Set Alarm Option]: 00(Alarm OFF)/01(Alarm ON)/02(Alarm ON-except weekends).

5. Auto Power ON/OFF Display Mode

Same, click the **[+]** button, switch to the **[AUTO POWER ON/OFF DISPLAY Mode 1/2/3]**;

The clock supports 3 programmable Auto Power ON/OFF modes;

[21 HH.MM.] / [HHMM]: displays the Auto ON/OFF mode and the index num. The first [2] means "Auto Power ON/OFF mode ", the next 1 means "Auto Power ON/OFF 1"(It shows auto2 and auto3 mode like [22]&[23]).

And if current mode is enabled, the On/Off data will be shown in flip way automatically;

Long click the **[SET]** button for setting the Auto Power ON/OFF information:
[Set Enable]: set this Auto Power ON/OFF enable or disable,00(Disable)/01(Enable);
[Set Turn On Hour: 01]: set auto turn on hour in [00~23];
[Set Turn On Minute: 02]: set auto turn on minute in [00~59];
[Set Turn Off Hour: 03]: set auto turn off hour in [00~23];
[Set Turn Off Minute: 04]: set auto turn off minute in [00~59];

6. GPS related Setting Mode (Optional)

* If don't have the GPS function be installed, ignore it.

For timing related setting mode, it displays the **[3]** as index. And with the current time zone setting value behind;

Long click the **[SET]** button you can enter the miscellaneous setting mode.

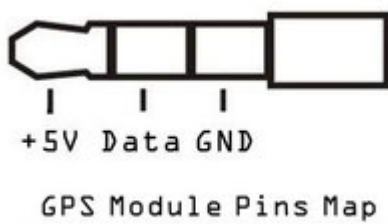
[GPS Enable / Disable]: 0(Disable)/ [1] (Enable);
[Time Zone Hour:31]: Set the time zone hour; The number [1] will light up when set a negative value;
[Time Zone Minute:32]: Set the time zone minute, selectable 00/30/50 ;

*If you have a GPS module, please connect it inside the 3.5mm socket at the back side of the clock. Remember to set the **[GPS Enable]** or the GPS function will not work.

TIPS: If have GPS installed, for the DST (Daylight Saving Time) you can change the time zone setting instead!

If use your own GPS receiver, please check the info blow:

- UART TTL serial output in 4800bps;
- NMEA protocol output;



(* No guarantee the clock will work with other GPS receiver!)

7. Misc Mode

For misc. mode, it displays the **[.4.]** as index.

Long click the **[SET]** button you can enter the miscellaneous setting mode.

[Set SNOOZE Interval:41]: 01(1 Min)/5(5 Min)/10(10 Min)/15(15 Min);
[Set LED Brightness:.42]: 0(Off)/[1~3] for brightness(3 is the brightest);
[Set LED Auto Change Pattern function:.43]: 0(Disable)/[01]per 1Min/[10]per 10Min/[30]per 30Min/[60] per one hour/[24.] per one day with the constant color depends on the

current week day
(SUN;MON;TUE;WED;THU;FRI;SAT = [Red;Orange;Yellow;Green;Cyan;Blue;Purple]);
[Click Beep Enable:.44]: 0(Disable)/1(Enable);
[Set Beep Alert Style:.45]: [0~3] for 4 different beep styles;
[Set Alarm Beep Loop Times:.46]: in [05~99] range;
[Set Middle dots display method:.47]:[01]On 1 sec/[02]On half sec/[03]Always On/[04]Always Off;
[Set Slot Machine Style:.48]:[00]Off;/[01]:Random;/[02]:Loop;
(* When turn the Slot Machine on, in every Half Minute, the clock will show the effect for about 3~4 seconds. (*When in the Mix1/Mix2 time display modes, the slot machine will be turned off automatically.)

8. Version Display Mode

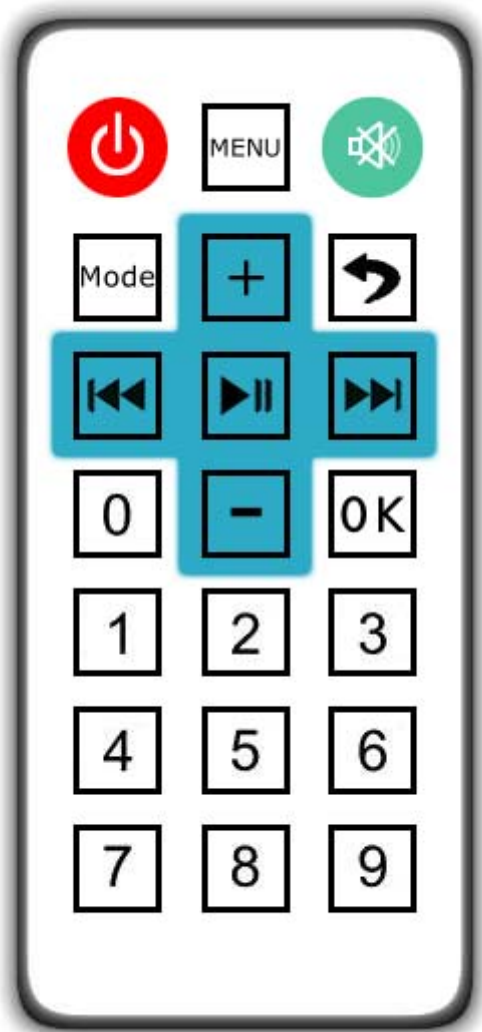
For this mode it displays the version num on NIXIE tube, like [.5. 1.00.] means current software version is 1.00;

Long click the **[SET]** button to enter the setting mode:

[51XXXX] IR Test Mode; It will display the decoded value of IR codes; Can be used to determine whether the infrared remote control is working properly;

[Reset All]: Set this number to **[01]**, then click the **[set]** button, all the settings will be reset to the default, and the clock will reboot itself when finished.

Infra Red (IR) Remote Controller functions:



Power: Press the button to shut down/turn on the clock.

Menu: Press the button to enter the setting menu of the current display mode, same as [SET] button.

Mute: Press for mute the buzzer.

Mode: Press the button to switch the time display effects.

Return [<-']: Press the button to return the [Time display mode] directly.

[+]: Press to change values in ascending order.

[-]: Press to change values in descending order.

Previous [>>|]: Press the button to go back to the previous menu.

Next [|<<]: Press the button to go to the next menu.

PLAY [>||]: Press the button to switch the LED in Off/Pause/On modes.

OK: Press the button to switch the LED color.

[0~9]: Press the buttons to change the values directly.

Tips:

Any IR keys can turn on the nixie clock for about 4 seconds when the clock is on the soft power off mode;

If you are trying to use the remote control for the first time, unplug the plastic film in the battery

case.

If there is no battery included, place a CR2025 battery by yourself, and make sure the battery is placed at the right polarity according to the marking on the battery holder.

Make sure the batteries in the remote control are fresh.

*To insert the battery into the remote control, follow the instructions printed on the back side of the remote control.

6-Tube Digit Nixie Clock Operations Cheat Sheet

1 st Level	2 nd Level	3 rd Level	Operation set with [+]
Long [SET]			Enter Time Display Mode [.0.x] [Display Effect 0:x]: 00:Normal/01:Fading/02:Cross Fading /03:Flash /04:Loop/05:Random Loop/06:Scroll+07:Mix1/08:Mix2;
	[SET]		[Time Format]: 24(24H without 0-leading) /024(24H with 0-leading)/12(12H)/012(12H with 0-leading)/ [.012 or 112] (12H with dot as PM * may not exist);
	[SET]		[Set Hour]: set time hour in [0~23];
	[SET]		[Set Minute]:set time minute in [0~59];
	[SET]		Return to Time display
[+]			Date Display
	Long [SET]		Date Display Mode: [DATA Format]: (DMMYY)/(MMDDYY)/(YYMMDD)/(YYDDMM);
		[SET]	[Set Year]: set year in [2013.~2099];
		[SET]	[Set Month]: set month in [01~12];
		[SET]	[Set Day]: set day in [01~28,29,30,31], depends on the year and the month that you have set.
		[SET]	Return to Date display
[+]			Temperature Display Mode
	Long [SET]		[Temperature Unit]: temperature display unit, [0] for ° C, [1] for ° F ;
		[SET]	[Temperature error adjustment]: step+-0.1° C
		[SET]	Return to Temperature Display Mode
	[+]		Alarm 1 [.1.1 HH.MM.]
		Long [SET]	[Set Hour]: set alarm hour in [00~23];
		[SET]	[Set Minute]: set alarm minute in [00~59];
		[SET]	[Set Alarm Option]: 0(Alarm OFF)/1(Alarm ON)/2(Alarm ON-except weekends).
		[SET]	Return
	[+]		Alarm 2 [.1.2 HH.MM.] (Set options same as above)
	[+]		Alarm 3 [.1.3 HH.MM.] (Set options same as above)
	[+]		Auto Power ON/OFF Display Mode 1 [.2.1]
		Long [SET]	[Set Enable]: set this Auto Power ON/OFF enable or disable: 0(Disable)/1(Enable);
		[SET]	[Set Turn On Hour]: set auto turn on hour in [00~23];
		[SET]	[Set Turn On Minute]: set auto turn on minute in

			[00~59];
		[SET]	[Set Turn Off Hour]: set auto turn off hour in [00~23];
		[SET]	[Set Turn Off Minute]: set auto turn off minute in [00~59];
		[SET]	Return
	[+]		Auto Power ON/OFF Display Mode 2 [.2.2] (Set options same as above)
	[+]		Auto Power ON/OFF Display Mode 3 [.2.3] (Set options same as above)
	[+]		Timing related Setting Mode [.3.]
		Long [SET]	[GPS Enable / Disable]: 0 (Disable)/ [1] (Enable);
		[SET]	[Time Zone Hour:.3.1.]: Set the time zone hour; The number [1] will light up when set a negative value;
		[SET]	[Time Zone Minute:.3.2.]: Set the time zone minute , selectable 00/30/50 ;
		[SET]	Return
	[+]		Misc. Mode [.4.]
		Long [SET]	[Set SNOZEE Interval.4.1.]: 01/05/10/15 Minute (s);
		[SET]	[Set LED Brightness:.4.2.]: 0 (Off)/[1~3] for brightness(3 is the brightest);
		[SET]	[Set LED Auto Change Pattern function:.4.3.]: 0 (Disable)/[01]per 1Min/[10]per 10Min/[30] per 30Min/[60] per one hour/[24] per one day in constant color;
		[SET]	[Click Beep Enable:.4.4.]: 0 (Disable)/1 (Enable);
		[SET]	[Set Beep Alert Style:.4.5.]: [0~3] for 4 different beep style;
		[SET]	[Set Alarm Beep Loop Times:.4.6.]: in [05~99] range;
		[SET]	[Set Middle dots display method:.4.7.]: [01]On 1 sec/[02]On half sec/[03]Always On/[04]Always Off;
		[SET]	Return
	[+]		Version Display Mode [.5. 1.0.]
		Long [SET]	[IR Test Mode .5.1.]: Shows the IR remoter code which you pressed. You can test your IR remote controller in this mode;
		[SET]	[Reset All]: Set this number to [1], then click the [set] button, all the settings will be reset to the default, and the clock will auto reboot itself when finished.

[SET]=Left Button; [+]= Middle Button; [-]= Right Button;

Install new NIXIE tube

If you want to change the tube or install the new tube by yourself, here is the step:
Please turn the clock Power Off first(Unplug the USB!!!);

1. Cut the IN-14 NIXIE tube's legs into right length, usually 10mm length is recommended. Then use "needle-nose pliers" or other tools to make all the legs straight, make sure all the legs is clean, contain no soldering tin or other stuffs.

Tip 1: If possible, use scissors to cut the end of the legs in 45 degree sharp edge(make sure the edge is clean);

Tip 2: Cut some legs in a little bit long, and others in a little bit short, will be easier for installing.

Tip 3: Use knife or sandpaper to clean the surface of the legs if necessary;

2. Plug all the legs into the socket pins on PCB. Please note that the anode pin(with white pipe inside the tube) need to connect to the middle socket pins(Check the picture) . After all the legs are all plugged into the socket pins, you can push the tube down gently.

3. After pushed all the legs in the socket pins, if you find the legs are too long, you can cut it short, and you can adjust the height of the tube by yourself or twirl the tube a little bit to make the tube just faces the front.

4. Make sure all the tubes' legs have no short before turn the power on!



Note: In order to protect the socket pins, if not necessary, do not plug /unplug the tube frequently.

Install Middle Dots

Please turn the clock Power Off first (unplug the USB) before install the middle dots; Just make the neon bulbs' legs straight, then plug the 4 legs inside the middle sockets. Please make the short bulbs at the front, and 2 bulbs all face the front.



And if you feel necessary, after plug the middle legs into the sockets, you can use sharp scissors to cut the bulbs' legs short on the back side of the PCB. And in order to prevent some guys pull the middle dots out the sockets when the clock in working, you can band the middle bulbs legs into 90 degree or even into a fish hook looking (do not short the legs). And the last thing about the middle dots is please do not twist the middle dots or will short the circuit.

FAQ

Q1. How long does the IN-14 NIXIE tube last?

A: In some of the IN-14 tube's instructions, the tube's life ≥ 5000 hours; But please note that all the tubes are older tubes, some may can last more than 10 years, but we actually can't guess it's actually life.

Our clock is pluggable, you do not need to worry about the tube's life, because you can replace it by yourself by hand;

Q2. What is the type of the battery on the PCB ?

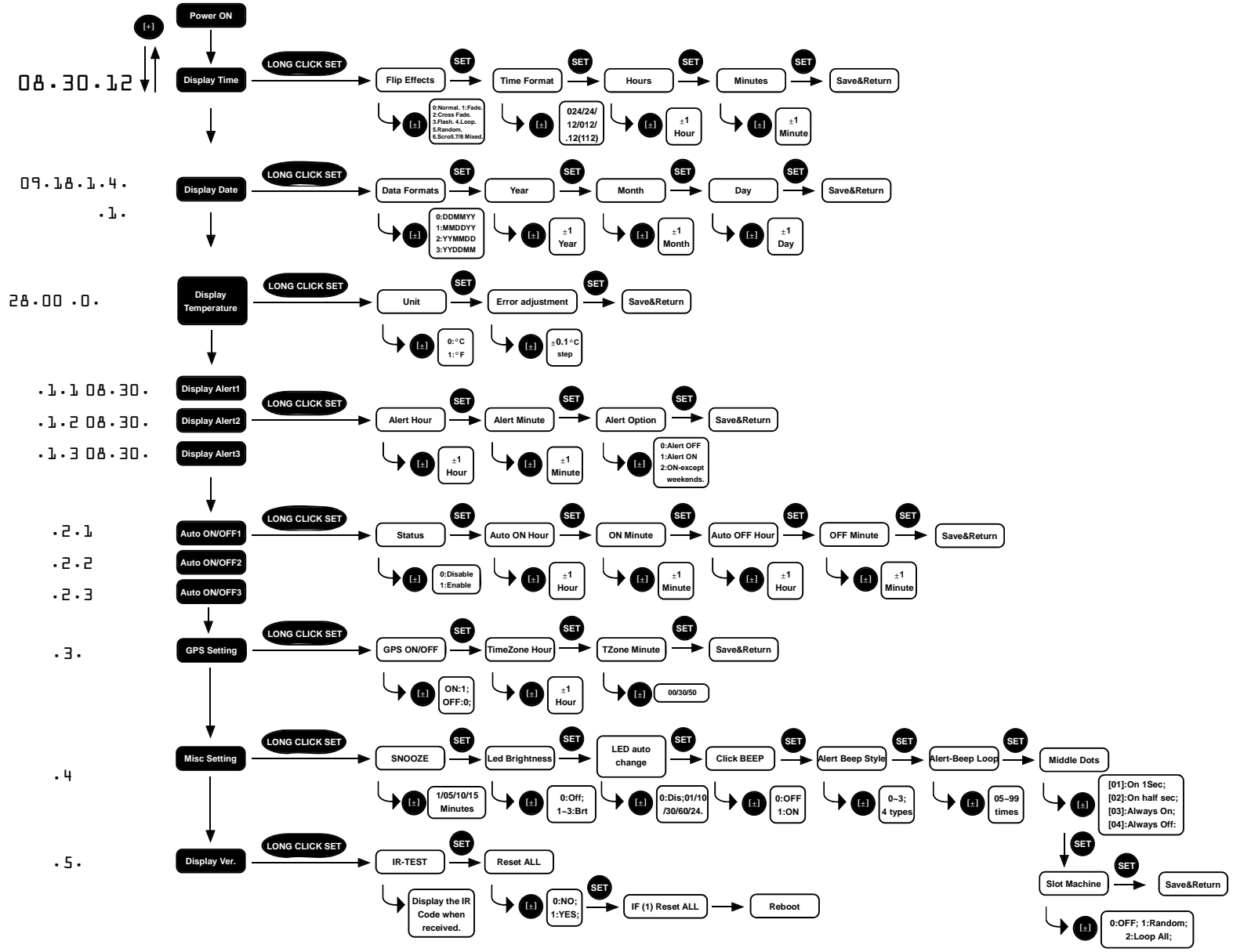
A: CR1220 3V battery for RTC;

Q3. Some segments inside the tube light up together?

A: If you find that some segments light up together, usually because of the transport shake, here is the way to solve it by yourself: just use your thumb work in with index finger flick the front of the tube for few times, that's it.

Q4: Tube not 100% faces the front?

Very few tubes will 100% face the front. If not, for the tube with soft legs, you can twist the tube a little bit by yourself.



The State Machine of 6-Tube IN-14 NIXIE CLOCK V2.20