Quick Setup Manual B7971 6-Tube Digit NIXIE Clock

Version:1.0. (06-18-2019).

Download product documentation and the related software at:

HTTP://vfdclock.jimdo.com

or You can contact me via email:

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Contents

Notice

In order to drive the NIXIE tube, some internal equipments 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: B7971
Tube Diameter:50mm;
Tube Height:11.5mm(12.3mm +leg);
Digit Height:52mm;

Clock Supply: 5V DC via MINI-USB;
Working Current: ~1600mA;
Clock Size: 468mm(L)*83mm(W)*18mm(H)-(*no including the tube);
PCB Size:458mm*73mm;
PCB Color:Black;
Weight:~650g(+tube);

The clock works with any standard 5V/2AUSB supply,use only high-quality adapter!

Features

You can replace the tube by yourself without using any tools.

1).5V **Mini-USB** powered, easy to be used. Can connect to your computer's USB plugs directly.
2).High efficiency HV circuit, you get almost no heat in HV DC-DC part under 24*7 working condition;
3).**Static driving, No Flashing, High Brightness, No blue dots;**
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;
16).Can install **Temperature Sensor(optional)**;
17).Can Install **PIR(Human Sensor Module) (optional)** to turn the clock ON/OFF by detecting the human body;
18).**8-level adjustable NIXIE tube bright** with **Auto-brightness** feature (it is able to adjust the tube brightness depending on the current environment).
19).Support **Wireless GPS Module (optional)**, can sync time via wireless signal(*Need to have a GPS wireless time station as time signal sender);

Turn Power ON/OFF

When you plug the 12V power supply to the clock, the clock will turn on automatically, with NIXIE tube displays current time with the LED in lighting. (*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]**; usually you can also find the Keys' function on the bottom side of the PCB.

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.

*May have a **PIR(Human Sensor Module) (optional)** 3-Band switch be installed on the PCB or on the back of the PRI sensor depends on PCB version. User can turn the clock ON/AUTO/OFF via this switch, This swtich are connect with main power ON/OFF in serial relation in software, if wanna use the **PIR(Human Sensor Module)**,please remember to switch this 3-Band switch to [AUTO], or you can switch it to ON/OFF to turn the clock

ON/OFF too;

Turn LED ON/OFF

In **[Time display mode]**, single click **[SET]** button will switch the LED in Play/Pause/OFF modes.
Tips: You may will be able to control the LED(s) individually, even in the **[soft power off]** mode. (*Depends on the firmware version)

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.

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

Long Click the **[SET]** button

Displays current time effect, ignore it.

Single Click the **[SET]** button

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

Single Click the **[SET]** button

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

Single Click the **[SET]** button

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

Single Click the **[SET]** button

Return to the NORMAL TIME DISPLAY MODE.

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/YYMMDD/YYDDMM. 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/YYMMDD/YYDDMM, 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, +-0.1° 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];
[Nixie Brightness]: 0(Auto-Brightness)/[1~8]for brightness(8 is the brightest),and other numbers for the customize modes;
[Led States]: 0(Play)/1(Pause)/2(Off)/3(keep the last led state, no change);

6. GPS related Setting Mode (Optional)

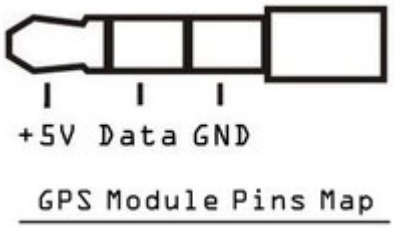
* If don't have the GPS function be installed, ignore it.

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 miscellanies setting mode.
[GPS Enable / Disable]: 0(Disable)/ [1](Enable Cable GPS) / [2](Enable Wireless GPS);
[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 9600bps;
- NMEA protocol output;



GPS Module Pins Map

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

!!!In some of the version,may have a **Wireless Time Receiver Module** be installed on the PCB.
In this type of clock, this GPS plug is not for receiving the GPS data,just for output the Wireless Module Data only. Please do not plug any GPS receiver in this type of clock!!!
And if the Wireless time station(sender) has a setting function about

TimeZone,it will send out your local time signal,thus the TIMEZONE setting you set on the clock will be ignored.

7. Misc Mode

For misc mode, it displays the **[.4.]** as index.
Long click the **[SET]** button you can enter the miscellanies setting mode.
[Set NIXIE Brightness]: 0(Auto-Brightness)/[1~8] for brightness(8 is the brightest);
[Click Beep Enable]: 0(Disable)/1(Enable);
[Set Beep Alert Style]:[0~3] for 4 different beep style;
[Set Alarm Beep Loop Times]: in [05~99] range;
[Set Font]: in [0~5] range;

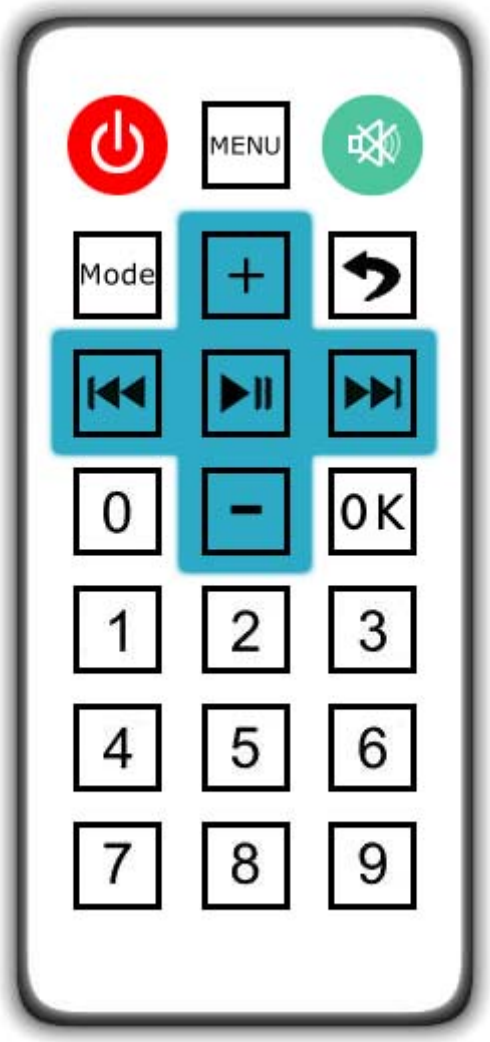
8. Version Display Mode

For this mode it displays the version num on NIXIE tube, like **[.5. 1.0.]** means current software version is 1.0;
Long click the **[SET]** button to enter the setting mode:
[IR Test Mode]:Shows the IR remoter code which you pressed. You can test your IR remote controller in this mode;
[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.

Tips

1.In any [**Display Mode**],single click [**SET**] button, can return to the [**Time Display Mode**] directly;
2.You can save the current Led color by just pause it, and when the next time you turn the clock on(Soft Power On),this color appears automatically;

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.

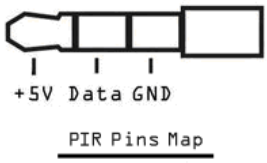
Tips:
Any IR keys can turn on the nixie clock for about 4 seconds when the clock is on the soft power off mode;

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.

The HC-SR501 Passive Infrared (PIR) Motion Sensor

The SR501 PIR Sensor will detect human motion via infrared changes.The device will detect motion inside a 110 degree cone with a range of 3 to 7 meters.The Pins map is shown blow.



PIR Pins Map

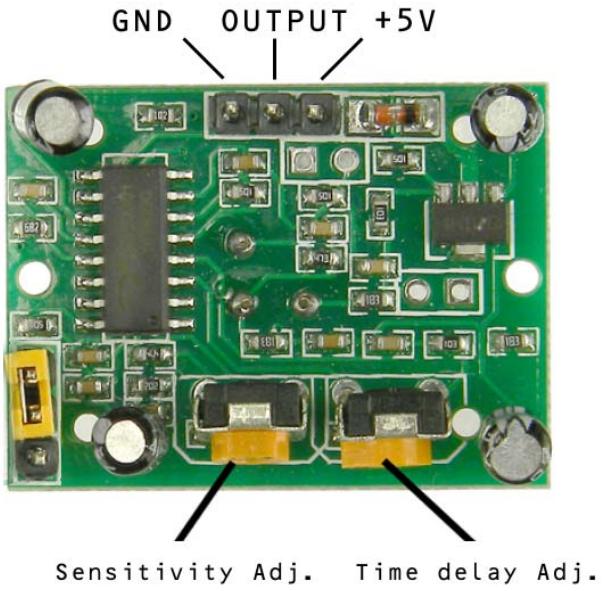
* May have a 3-Band switch on PCB or PIR, with [OFF] [Auto] [ON] function,when [ON]/[OFF] will turn the clock on or off,when switch to [AUTO] will connect to the PIR sensor, and controled by the sensor detections.

if wanna use the PIR,please remember to turn the switch to [AUTO];

To prevent the circuit short, recommend turn the main power off when plug the 3.5mm Sensor plug in the socket.There are two 3.5mm socket on PCB,one is for PIR(with "Motion Detector"), the other is for GPS(With GPS or UART mark),do not go wrong;

The module features adjustable sensitivity and time delay adjustments,you can chenge the value by turn the potentiometer;

Jumper Set:
H:Repeat Trig Jumper may not exist,
L:Single Trig set to [H] in default



PIR Range (Sensitivity) Adjustment

Recoommend to turn the potentiometer into middle location,it will cover about 3m range.

Time Delay Adjustment

It determines how long the output of the PIR sensor module will remain high after detection motion. We recommend set range to 1~2minute(s),it means turn the potentiometer into the middle part;

Please note this is a MOTION DETECTOR sensot, if it turns off but your are still near it, try to move your body or wave your hand in from of the sensor to turn it ON again.

Do not cover anything in front of sensor lens,PLS!!!

Menu: 6-Tube Digit Nixie Clock Operations Cheat Sheet

1st Level	2nd Level	3rd 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/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 mode
[+]			**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]	[Nixie Brightness]: 0(Auto-Brightness)/[1~8]for brightness(8 is the brightest);other numbers for customized modes;
		[SET]	[LED state]:0(Play);1(pause);2(Off);3(No change);
		[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 Cable GPS)/[2](Enable Wireless GPS);
		[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 methord:.4.7.]: [01]On 1 sec/[02]On half sec/[03]Always On/ [04)]Always Off;
		[SET]	[Set Font]:in [0~5] range;
		[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;

Fonts List:

Install new NIXIE tube

!!!High Voltage!!!
Please turn the main power off(unplug the power adapter) before you install/change any tubes!!!

The B7971 NIXIE tube has the hard legs, very easy to be installed on the clock, just plug the tube in the socket pins by hand (make sure the tube is turned in the right direction, do not go invert).

FAQ

Q. What is the type of the battery on the PCB ?
A: CR1220 3V battery for RTC;(Always palce the [+] side of battery face the top)

The State Machine of B7971 6-Tube NIXIE Clock V3.0 Pro.