



## ET-BIG CLOCK BOX

**ET-BIG CLOCK BOX** is Dot Matrix Digital Clock 8x32 (256 DOT) with the biggest size of number (Height x Width: 7.5cm. x 5.5cm. per each digit) and the size of number is variable, depending on the display mode. It can show Time, Date, Temperature, and be used as Stop Watch. The Clock uses Time Base from RTC DS3231 internal board and it uses IR Remote to control and setup values for the Clock.

There are various formats of display that can be set for Board ET-BIG CLOCK BOX such as Date, Time, Temperature, Humidity (must be additionally connected to Sensor AM2302), or be used as Stopwatch, or show the flashing message “Open” or “Close”, and including Alarm Clock that can be set in a range of 0-23 hours. There is Buzzer to produce a buzzing sound and Socket Alarm OUT to connect and control external devices while Alarm is happening. Moreover, the Clock can be set to print (Print) Data of Time, Temperature, Humidity and data in Display Buffer through Connector RJ45 (using RS485 Communication) to send above data to show on the second ET-BIG CLOCK BOX. In this case, user can choose and setup the preferable data to show on the Display such as Temperature, Humidity, or user may copy (Copy) all data on the screen of sender to show on the second Clock.

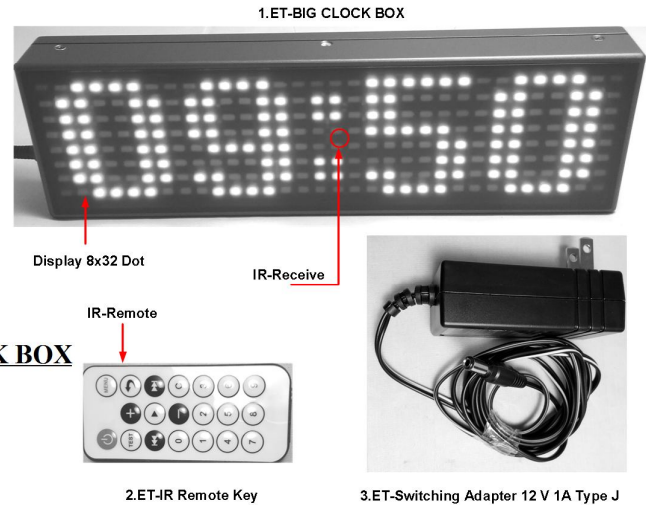
### 1. SPECIFICATIONS OF ET-BIG CLOCK BOX

- ◆ Use 12V DC Type J for Clock with the Current 1A for general work at the brightest level of Display LED
- ◆ Use MCU AVR EASY MEGA328 for processing data; use RTC No.DS3231
- ◆ Have Connector RJ45 (RS485 Communication) to send out data to show on the second Clock's Display (the same model); this Connector RJ45 also provides 12V, so it can use the same Power Supply when connecting 2 Clocks together.
- ◆ Clock receives all commands from user through IR Remote, provided with the model
- ◆ IR-Remote uses Battery 3V #CR2025 (provided with the model); Clock uses Battery Back Up 3V #CR2032 (provided with the model)
- ◆ Display type is red Dot Matrix 8x32 (256 DOT) and time format is only 24-hour.
- ◆ Have various format of display modes such as Date, Time, Temperature, Humidity (must be additionally connected to ET-Sensor AM2302 (OPTION), or be used Stopwatch, or show flashing message “Open” or “Close”. In this case, Font of each display mode might be different.
- ◆ Be used as Alarm Clock in a format of 0-23 hour; there is Buzzer to produce a buzzing sound and Alarm Output 1-CH to give Signal Logic '1' (5V) while Alarm is happening (Default Logic '0'); it can be connected to control external device.
- ◆ ON-OFF, adjust 16-Level brightness of Display(0-15), and reset Clock by IR Remote
- ◆ Choose year format either to be Christian Era or Buddhist Era (only show the last 2-digit)
- ◆ Set and choose the preferable Key of display mode to auto-run after Power-ON
- ◆ For Temperature, it only shows the positive value and the Temperature value that is read from RTC DS3231 internal Clock has Error at  $\pm 3$  degrees Celsius.
- ◆ Have Connector to connect to external Sensor Temperature and Humidity; it supports the model “ET-Sensor AM2302”.
- ◆ Have Connector to receive Signal from Sensor or TTL SW.to control Start and Stop of Stopwatch
- ◆ Clock can be setup to be sender to send and print (Print) Data of Date-Time, value of Display Buffer to Connector RJ45 RS485
- ◆ Clock can be setup to be receiver to receive data from sender and then show the data on its own Display. There are various formats of display that can be setup for the received data as preferred such as Temperature, Humidity, Date-Month, or show all 3 types alternately, or show the same data as the Master (Copy) (except Stopwatch Mode is unavailable).

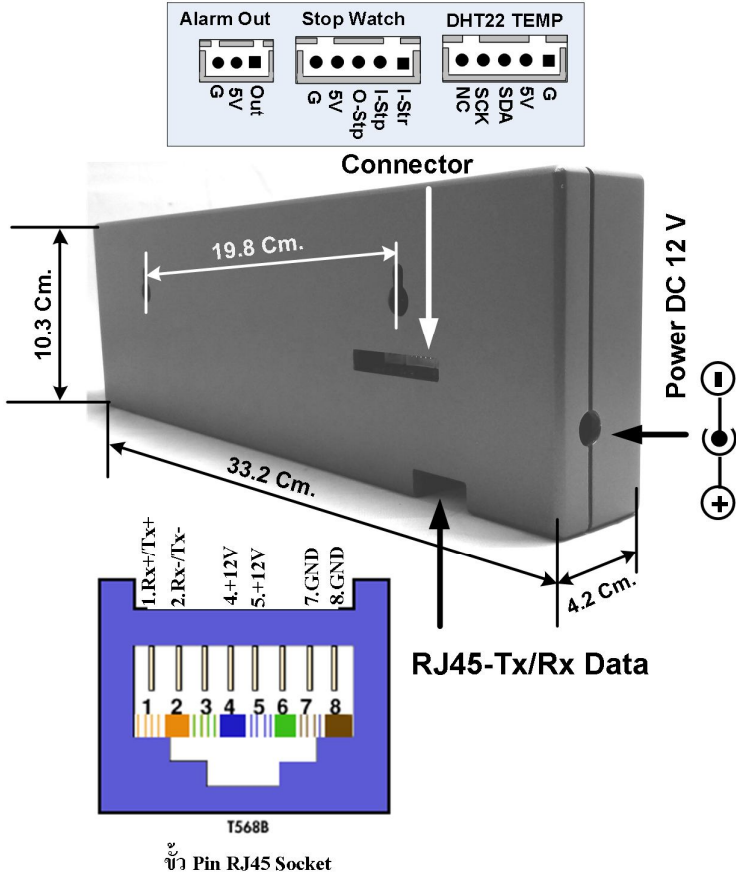


**2. PACKAGE OF ET-BIG CLOCK BOX consists of**

- ET-BIG CLOCK BOX provides with Battery Backup 3V (#CR203) inside
- ET-IR Remote Key
- ET-Switching Adapter 12V 1A Type-J



**3. STRUCTURE AND CONNECTOR OF ET-BIG CLOCK BOX**

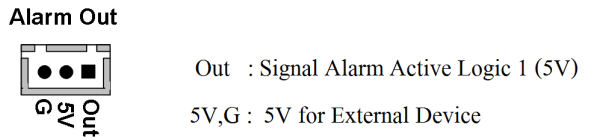


**IR-Remote:** IR Remote controls the display and setup values for the Clock, it uses 3V Battery #CR2025. For more information about Keys, please read in section 5: Function of Keys of Remote.

**Display 8 x32 Dot:** It is red Dot-Matrix 8x32 DOT. Clock has various display modes that can be setup by IR-Remote Key 0-9, C, Test, +, -, <<, >> as preferred.

**IR-Receive:** This position receives Signal from IR-Remote, it will be processed and then control the Clock.

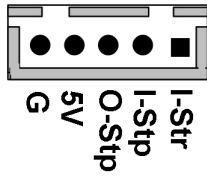
**Con-Alarm Out:** It is Connector Alarm Output. When Alarm does not happen, this Pin OUT gives Logic '0'; but when Alarm happens according to the setting time, this Pin OUT gives Logic '1' (TTL=5V) instead. Logic will become 0 after user presses Key Play (▶) to stop operation of Alarm. Pin Arrangement is shown below.



**Con-Stop Watch:** This Connector receives Signal Input Logic (TTL=5V) from external to control Start and Stop of Stop Watch when it is used in Mode Key 9. When the Display runs in Mode Key9, it shows the data as 00:00:00. If Signal Logic 0 is sent to Pin I-Str, it starts timing; while the Stopwatch is running and if Signal Logic 0 is sent to Pin-Stp, it stops timing instantly. When the state of Stop happens, it also sends Logic 1 (TTL=5V) to Pin O-Stp of this Connector and Pin O-Stp becomes Logic 0 when Remote Key 0 is pressed to clear the display to 00:00:00 again. Pin arrangement is shown below.



### Stop Watch

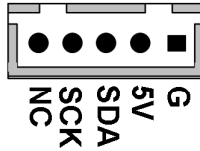


I-Str : Input receives Signal Logic 0 to start timing /Pulse IN (Counter)  
 I-Stp : Input receives Signal Logic 0 to stop timing.  
 O-Stp : Output sends Signal Logic 1 when it stops timing  
 5V,G : 5V for External Device

**Con-DHT22 Temp:** This Connector is connected to Sensor for measuring Temperature and Humidity from ETT “ET-Sensor AM2302”.

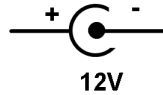
Pin arrangement is shown below (if user connects Sensor while the Clock is running, it has to reset the Clock to update new connective device).

### DHT22 TEMP



5V,G : 5V for External Device  
 SDA : Data Signal  
 SCK : Unused  
 NC : Unused

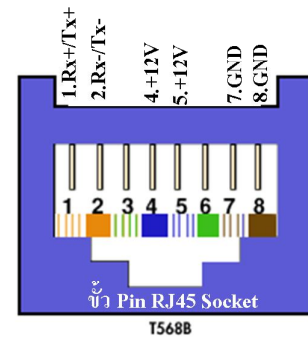
**Jack-PW 12V:** This Connector Power Type J is connected to 12V Power Supply to provide for the Clock and also provides for Connector RJ45. When using this Connector, please be careful about the cathode and anode pole. Please look at the feature of Connector in the picture below (it supports Power Supply from ETT).



**RJ45-Tx/Rx Data:** This Connector RJ45 that is used to transmit data between 2 ET-BIG CLOCK BOX in the format of RS485 Communication; one device is set as Tx and another one is set as Rx. The Rx device receives data from the Tx device and shows on its own Display, user can choose and setup the preferable display mode for the Rx device.

Pin 12V Power Supply of this Connector is pulled from Jack-PW 12V to externally connect and use; so, it can use and pull Power source from this position to provide for the second Display. Pin arrangement of Connector RJ45 is shown below;

- Pin1. Rx+/Tx+ : Pin transmits Data+ is connected to Rx+/Tx+ of Rj45 Display2
- Pin2. Rx-/Tx- : Pin transmits Data- is connected to Rx-/x- of Rj45 Display2
- Pin4,5. +12V : Provide power for Display2 through Rj45
- Pin7,8. GND : Ground for Display2



For more information, please read section 7: How to use ET-BIG CLOCK BOX

**NOTE:** If it uses only one 12V Power Supply to provide power for 2 ET-BIG CLOCK BOX, the power source must provide at least Current 2A.



#### 4. HOW TO RUN ET-BIG CLOCK BOX

After provided 12V DC for the Clock completely, there is running message to tell the currently used model of FW; next, the system read Setup values from EEPROM internal MCU such as brightness of display, display mode, and Flag values and then, it checks display mode and the display. If setting Config Key is shown as Key- and Rj=0, it means that the Clock is setup as Slave to receive external data and show it on the Display and the Clock shows the message “RXD”. But, if Config Key is set to be other Keys, the Clock will show the message “RTC”, it means that program reads Time Base from RTC DS3231 internal its own Clock and directly shows it on the display.

Next, program loops to wait for to press Remote but if user does not press any Remote, the program waits to receive external data to show on the display, or it reads Time Base from RTC to update (depend on Config of user). If the display mode is setup in the Temperature or Humidity, program also reads value of Temperature and Humidity from Sensor to show on the display. Or, if Alarm is enabled, program checks if it reaches the setting Alarm or not; if yes, Buzzer produces a beeping sound (when using Alarm, user can hear beeping sound when the display mode is in Key1 only and it stops Beep sound by Key ► ). While Display is running in any Key Mode, user can press Remote to change the preferable display mode. For more information, please read section 5: Function of Keys on Remote.

#### 5. FUNCTION OF KEYS ON REMOTE

ET-BIG CLOCK BOX receives Commands through IR-Remote only. Please look at the structure of Remote on the right side. Now, it describes function of each Key as follow;

1) **Key-Power** [ ]: This is Key ON/OFF in the format of Toggle; when pressing this Key, it is ON and OFF the Display alternately. When the Display is turned off, the system internal the Clock still runs as normal but user cannot press any Key on Remote, except this Key ON/OFF. When the Display is turned on again, other Keys on Remote can be used as normal.

2) **Key-Menu** [ ]: Enter Mode Setup to setup values and exit from Mode Setup instantly to return to normal screen display (for more information, please read section 6: Mode Setup).

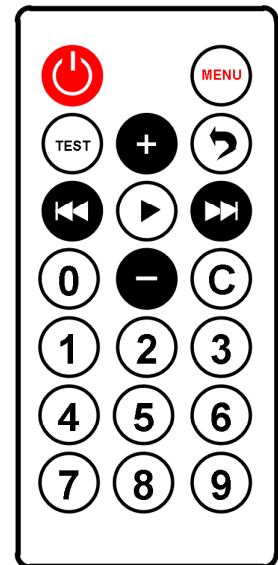
3) **Key-Test** [ ]: Show the flashing message “Open” or “Close alternately. This Key runs in the format of Toggle; the display alternates between “Open” and “Close” when pressing this Key each time.

4) **Key-Up** [ ]: Show value in Mode Counter. It can press this Key to show the Target value - - > Actual value - - > Remain value, alternately. When the Key is pressed, it clears all values of Actual and Remain (for more information, please read section 7 (How to use ET-BIG CLOCK BOX). When this Key is in Mode Setup, it is used to move up a Main Menu or a Setup value, respectively.

5) **Key-Return** [ ]: Reset the Clock as the same as ON/OFF and it has no any effect on any setting value of user. When this Key is in Mode Setup, it is used to return from Menu step by step until it exits from Mode Setup and becomes function Key Reset again.

6) **Key-Left** [ ]: Show time, Hour, Minute, Second, on the Display in the format of Invert as “hh:mm:ss”. When this Key is in this Mode Setup, it is used to move a Sub-Menu to the right side.

7) **Key-Play** [ ]: - Stop Alarm sound that is produced by Buzzer (Beep) and Reset Pin Alarm Out from Logic ‘1’ to Logic ‘0’  
- Clear Actual value and Remain value when it is in Mode Counter  
- Save values that are setup by user in EEPROM when it is in Mode Setup







8) **Key-Right** [ ]: Show time, Hour, Minute, Second in the format of Digital Code 8421. When this Key is in Mode Setup, it is used to move a Sub-Menu to the left side.

9) **Key -Down** [ ]: Show the data that received from external through Connector RJ45; it has to setup Config Rj=Rx and user can choose data to show on the Display by setting Config Td value as follows;

Td = Tm (Time): Show the incoming value of Temperature (Default)

Td = Hu (Humidity): Show the incoming value of Humidity

Td = Dt (Date): Show abbreviation of Day and Month

Td = Rt (Rotate): Alternately show 3 values above and change every 10 seconds (LOOP)

Td = Cp (Copy): Show the same data as the Clock Master (except Mode Stop Watch, it doesn't show any data)

If setting Config Rj=Rx, the display shows the message “ -Tx- ”, it means that the Clock is setup to Print data to RJ45. When this Key is in Mode Setup, it is used to move down a Main Menu or a Setup value, respectively.

10) **Key-C** [ ]: Show Temperature value on the Display in the format of “ **TT.T °C** ” with the unit of degree Celsius. The Temperature value is read from Sensor that is externally connected first (ET-Sensor AM2302). If it is not connected to any external Sensor, it reads the Temperature value from Sensor internal RTC DS3231 internal the Clock instead.

11) **Key-0** [ ]: Show a percentage of Humidity on the Display in the format of “ **HH.H %** ”. It has to connect to ET-Sensor AM2302 from external to read the value. If it is not connected any external Sensor device to Display, the value on the Display will be shown as “ **0.0%** ”.

12) **Key-1** [ ]: Show time value of Hour, Minute on the Display in the format of “ **HH:MM** ”. If Alarm is enabled, the Display Mode must be setup in this Mode Key only; otherwise user can't hear any Alarm sound.

13) **Key-2** [ ]: Show time value of Hour, Minute, Second on the Display in the format of “ **HH:MM ss** ”.

14) **Key-3** [ ]: Show time value of Hour, Minute, Second on the Display in the format of “ **hh:mm:ss** ”.

15) **Key-4** [ ]: Show Date, Month, Year on the Display in the format of “ **dd.mm.yy** ”.

16) **Key-5** [ ]: Show Date, Month, Days of a week on the Display in the format of “ **DD.MM dd** ”.

17) **Key-6** [ ]: Show Time, Day, Temperature on the Display, it alternately shows 3 values and changes every 10 seconds in the format of

Time “ **HH:MM** ” , Day “ **dd.mm.yy** ” , Temperature “ **TT.T °C** ”, respectively

18) **Key-7** [ ]: Show Time, Days of a week-Date, Month-Year on the Display, it alternately shows 3 values and changes every 10 seconds in the format of

Time “ **HH:MM** ” , Day-Date “ **Day,DD** ” , Month-Year “ **Mon,YY** ”, respectively

19) **Key-8** [ ]: Show Temperature value with the unit of degree Celsius, a percentage of Humidity, it alternately shows both values and changes every 10 seconds in the format of

Temperature “ **TT.T °C** ” , Humidity “ **HH.H %** ”, respectively.



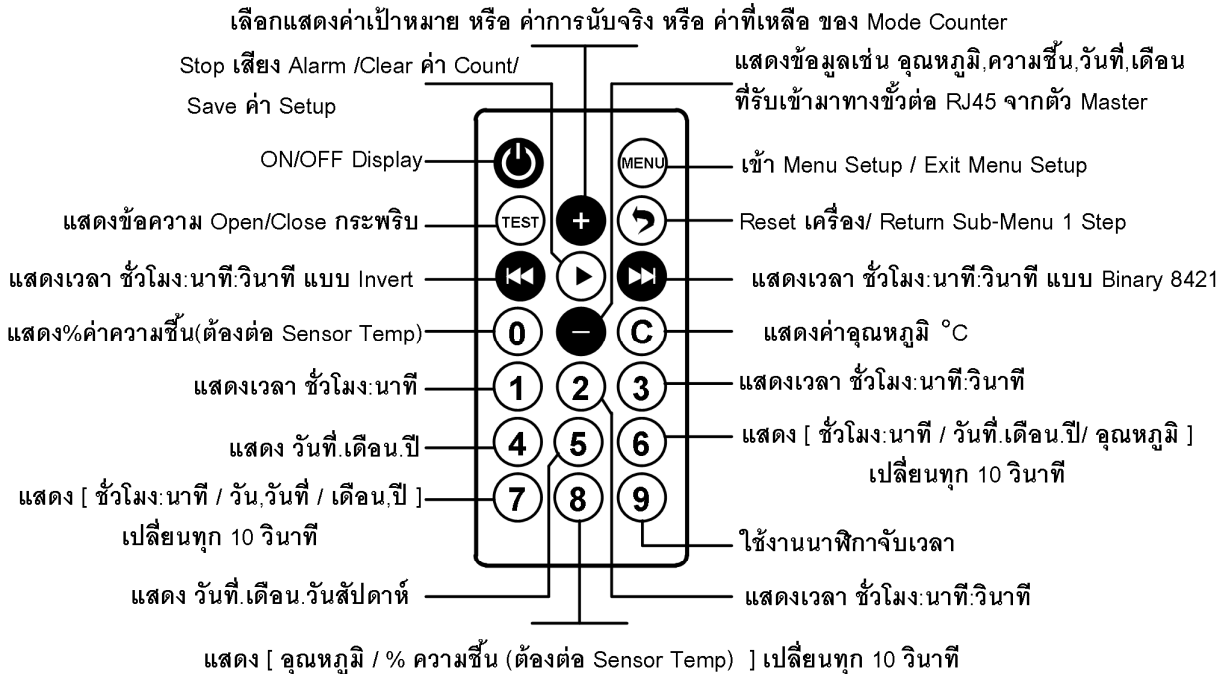
For Humidity, it needs to connect ET-Sensor AM232 from external to read the value, otherwise the Display shows “ 0.0% ”.

20) **Key-9** [ **9** ]: Enter Mode Stop Watch to Start, Stop, and Clear by all one Key. The order of operation is run as mentioned above.

For more information about Stop Watch, please read section 7: “HOW TO USE ET-BIG CLOCK BOX”

*NOTE: As mentioned above, function of Keys run when it is not in Mode Setup (when Key Menu is pressed). For Key Menu, Key Up, Key Down, Key Left, Key Right, Key Play, and Key Return can be used together as co-switch in Mode Setup.*

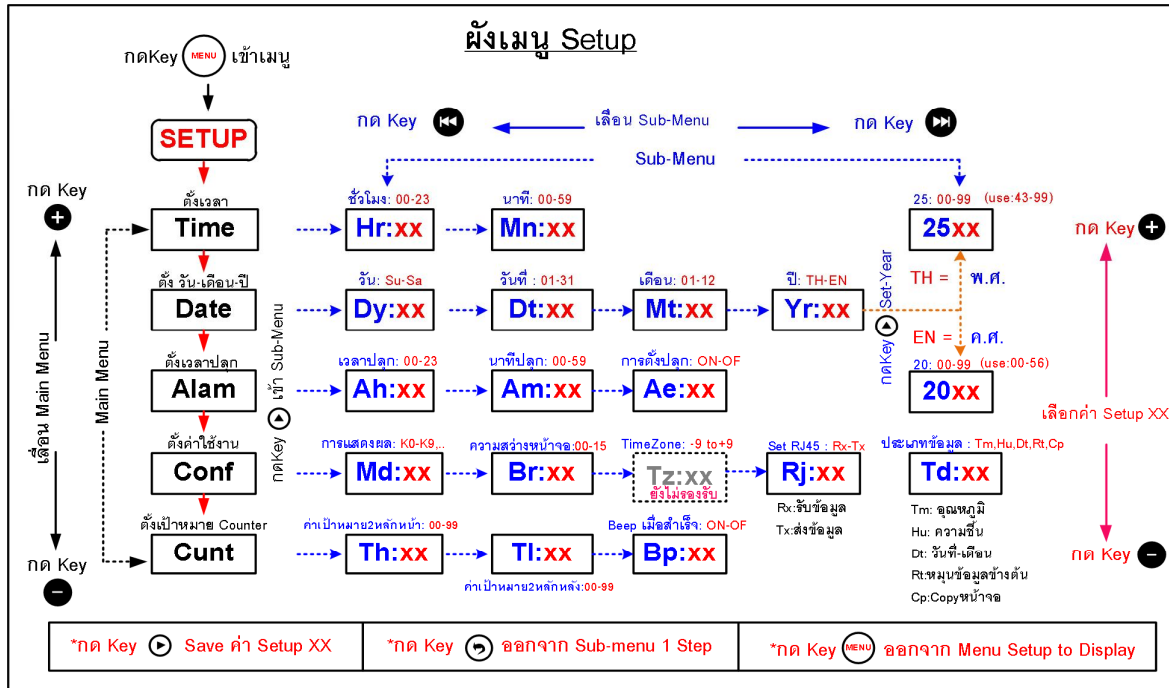
### หน้าที่ Key Remote





### 6. MENUS OF MODE SETUP AND HOW TO USE MENUS

This Mode Setup is to setup values for the Clock. When entering this Mode, the available Keys are Key Menu, Key Up, Key Down, Key Left, Key Right, Key Play and Key Return; function of each Key is described above. This Mode Setup consists of various Menus as shown in the diagram below;



Referred to the diagram above, it consists of 5 Main Menus and Sub-menus of each Main Menu to setup values. Meaning of each abbreviation that is used in each sub-menu is described as follows;

#### Main Menu

**Time:** Setup Time value of Hour, Minute for Time Base RTC DS3231; Setting values are

*Sub-Menu* (value of Second is setup as 0 when saving the value)

Hr:xx (Hour) = Setup time value as 24-hour in a range of 0-23 hour

Mn:xx (Minute) = Setup time value as Minute in a range of 0-59 minutes

**Date:** Setup Days of a week, Date, Month and Year (Christian Era or Buddhist Era) for Time Base RTC DS3231. Setting values are

#### *Sub-Menu*

Dy:xx (Day) = Setup days of a week from Su-Sa; when Su:Sunday, Mo:Monday, Tu:Tuesday, We:Wednesday,

Th:Thursday, Fr:Friday, Sa:Saturday

Dt:xx (Date) = Setup Date of Month in a range of 1-31

Mt:xx (Month) = Setup Month in a range of 1-12

Yr:xx (Year) = Setup Year type either to be Christian Era or Buddhist Era (the chosen value will be the display format of the Clock)

TH: Setup Year type as B.E. 25xx (Default); only last 2-digit is setup in a range of 00-99 (should setup as 43-99)



EN: Setup Year type as A.D.20xx; only last 2-digit is setup in a range of 00-99 (should setup as 00-56)

*NOTE: It should setup Year value for RTC DS3231 in a range of A.D. 2000-2100 or B.E. 2543-2643. However, the Year value of both Christian Era and Buddhist Era that is setup for RTC must be conformed with and RTC can run correctly. Moreover, the Year value should be setup in a range of A.D. 2000-2056 or B.E. 2543-2599.*

**Alam: (Alarm)** Setup Alarm Clock each day. Setting values are

*Sub-Menu* (Second value will be setup as 0 when saving the value)

Ah:xx (Alarm Hour) = Setup Hour value in a range of 0-23 hours

Am:xx (Alarm Minute) = Setup Minute value in a range of 0-59 minutes

Ae:xx (Alarm Enable) = Setup state of ON/OFF Alarm as follows;

ON: Enable Alarm

OF: Disable Alarm (Default)

**Conf: (Configuration)** Setup the essential values for the Clock as follows;


*Sub-Menu*

Md:xx (Mode Display) = Choose and setup any preferable display format on the screen that will be conformed with the pressed Key on the Remote. It can setup values in a range of K0-K9, KC, KT, KR, KL, K+, and K-. When any Key is chosen, every time the device is Power-ON, the screen always show the chosen Key (Default=K1).

Br:xx (Brightness) = Adjust brightness of Display in a range of 00-15 (00:Dimmest, 15:Brightest)

Tz:xx (Time Zone) = Setup Time Zone that will be valid when using Time Base from GPS, it can setup the value in a range of -9 to +9 ( Time Zone of Thailand is +7) (**NOTE: It is currently not supported by GPS**).

Rj:xx (RJ45) = Setup values for transmitting data of Connector RJ45 (RS485 Communication) as follows;

Rx: Connector RJ45 is setup to receive data and the Clock is assumed as Slave-Rx to receive external data from the Clock that is setup as Master-Tx. Please press the Key  on Remote, the received data will be shown on the Display according to the data format that is setup in Sub-Menu Td:xx.

Tx: Connector RJ45 is setup to send data and the Clock is assumed as Master-Tx, it prints data to the Clock that is setup as Slave-Rx through Connector RJ45 all the times.

Td:xx (Type Data) = Choose the received data through Connector RJ45 to show on the Display. Please press Key  and choose following values;

Tm(Temp) : Choose Temperature value to show on The Display

Hu(Humidity) : Choose Humidity value to show on The Display

Dt(Date/Mount) : Choose Date and Month to show on The Display

Rt (Rorate) : Show each of 3 values above and alternately change every 10 seconds.

Cp(Copy Display) : Show the same data as Master device according to the pressed Key (except Key9)

**Cunt: (Counter):** It sets Target value for Counter and enables Buzzer to produce a beeping sound when the counting value





Sub-Menu

Th:xx (Target ByteHigh) = Setup the first 2-digit value of Target (1000 and 100) in a range of 00-99

Tl:xx (Target ByteLow) = Setup the last 2-digit value of Target (10 and last digit) in a range of 00-99

(Ex. If setting Target = 200, please setup the value as Th= 02, Tl = 00

If setting Target = 7501, please setup the value as Th=75, Tl = 01 )










Bp:xx (Beep) = Produce a beeping sound when Counter reached the specified Target value, please choose

ON: Produce a beeping sound when the counting value reaches the specific Target


OF: No Beep sound when the counting value reaches the specific Target (Default)

**NOTE:** Values that are setup in each Menu will be saved in EEPROM of MCU; when POWER-OFF, it still remains and will be called and used after POWER-ON. Moreover, some values will be setup for RTC DS3231 and it will be called and used after POWER-ON as well. So, it has to provide Battery Backup for the Clock, all values that are setup for RTC still run correctly when POWER-OFF.



**HOW TO USE MENUS OF MODE SETUP:** Referred to the diagram of Menu above, it summarizes how to use Menu of Mode Setup as follows;

- 1) Press Key  to enter Mode Setup; the Display shows the message “SETUP” for a while and then enter the first Main Menu “Time”.
- 2) Press Key  or Key  to choose the preferable Main Menu to setup value
- 3) After chose and entered the preferable Main Menu completely, press Key  to go to the sub-menu of the Main Menu, and the Display shows the first sub-menu.
- 4) Press Key  or Key  to choose the preferable sub-menu to setup value
- 5) After chose the preferable sub-menu completely, press Key  or Key  to setup values
- 6) After setup values for sub-menu completely, press Key  to save. The Display shows the tick sign at the position of setup value for a while with producing Beep sound twice; it means that it saves all setup values completely. User can return to step 4 to choose the next sub-menu.

After setup the values of sub-menu completely but user doesn't press any Key Save, all new setup values are not used; or, if user exits Mode Menu, all setup values return to the old one; or, if user moves to other sub-menus and then returns to the previous one that user recently setup, all new setup values are not updated. In summary, please always press Key Save after setup any sub-menu completely, otherwise it is not updated and it has no any effect on the operation of the Clock.



**NOTE:** When pressing Key  to save value of any sub-menu, it only saves the value of the chosen sub-menu; it does not save all sub-menu of Main Menu. So, please always press Key Save after setup value of each sub-menu completely.

Values that are related to Conf will be saved in EEPROM, it still remains although Power OFF and it will be called when POWER-ON. For value of Time, Date, Alarm that is related to setting Time will be set for RTC DS3231, so it has to provide Battery Backup for RTC in order to run correctly although POWER-OFF.

- 7) When user is in any sub-menu and wants to exit to Main Menu in order to change and go to other Main Menu, please press the Key  to go backwards a step by step until it returns to Main Menu, and then user can start step 2 again.
- 8) Please press the Key  repeatedly to exit Mode Setup until it exits Mode Setup (Display stops at normal mode); or, please press




## 7. HOW TO USE ET-BIG CLOCK BOX

This section describes how to use ET-BIG CLOCK BOX such as a part of setting values connecting more I/O Devices to be used together with ET-BIG CLOCK BOX. If user does not edit or change value of any sub-menu, please press the Key  or Key  to skip the sub-menu to the next instantly.

### 7.1) HOW TO USE ET-BIG CLOCK BOX AS SINGLE TYPE:


When the Clock is used as single type, it uses Time Base from RTC DS3231+Temp internal the box, and it reads data from Sensor device that is connected to Connectors internal the box and then it shows the data according to Mode Display of the pressed Key. Please follow these instructions below;


- 1) Connect Jack 12VDC 1A to the Clock beside the box; this Power Supply is also provided for Connector RJ45.
- 2) The running message shows version of FW on the Display and follow by the message “.RTC.” or “.RXD.” for a while.
  - When it shows the message RTC, it means that user has setup Config value of Md: not K- and Rj:Rx or Tx (**NOTE:** *It should setup the value as Rx because program runs rapidly to transmit data to show on the Display because it doesn't waste time to Print data to Connector RJ45*). In this case, it means that the Clock uses data internal board or from the connective Sensor device to show on the Display when it starts running.
  - When it shows the message RXD, it means that user has setup Config value of Md=K- and Rj=Rx. It means that the Clock waits to receive data from another Clock through Connector RJ45 to show data on the Display when it starts running.
  - (Every time it provides Power Supply or press the Key  to reset the Clock, it always shows the messages above).
- 3) Next, the Clock shows initial data according to Key Mode that is setup in Menu Config of Md:xx.
- 4) It can press Keys on Remote to change display mode as preferred, or it can enter menu to setup values as preferred.

When it is used as single type and user presses Key- on the Remote and sets the Config of Rj=Tx, the Display shows the message “ -Tx- ” to tell user to know that the Clock is setup to send data only but it can't receive any data to show on the Display. If it sets the Confi of Rj=Rx, the Display is turned off; or, it might show the previous data because there is no any transmitting data through Connector RJ45.

### 7.2) HOW TO USE ET-BIG CLOCK BOX AS DOUBLE DEVICES BY USING THE SAME DATA FOR DISPLAY:

This section describes how to use ET-BIG CLOCK BOX as double device. It requires 2 ET-BIG CLOCK BOX; one device must be setup as Config of Rj=Tx (Sender), and another one must be setup as Config of Rj=Rx (Receiver). **NOTE:** It is not allowed to setup both devices as Config of Rj=Tx because the Display may be damaged.

When user presses Key  to choose mode display of receiver's Display, the receiver's Display shows data that is sent by sender's Display, depending on setting Config of Td of receiver's Display.

User can change format of sender's Display to any Mode Key that is not Key9; the receiver's Display still uses data of sender's Display. But, if user changes format of receiver's Display to any Key that is not Key , data that will be shown on the receiver's Display will be read from its own Board inside and it does not use any data that is sent by sender's Display through Connector RJ45. Now, please follow these instructions.

- 1) Connect Jack DC 12V to the Clock at either side of a Display Box first, don't connect Cable RJ45.



- When the Clock shows data in any Key mode, please press Key **MENU** to enter Menu Conf, choose sub-menu Rj=Rx, and then press Key **▶** to save the value. In this case, it setup Display to be receiver first to prevent the display damaged from connecting Cable RJ45. If both Displays are setup to be Sender, the Display may be damaged.
- Set Mode Display of the received data for the receiver's Display; go to Menu Conf, choose sub-menu Td, and choose display format for receiver's Display, and finally, press Key **▶** to save the value.

Tm(Temp) : Temperature value is shown on the Display

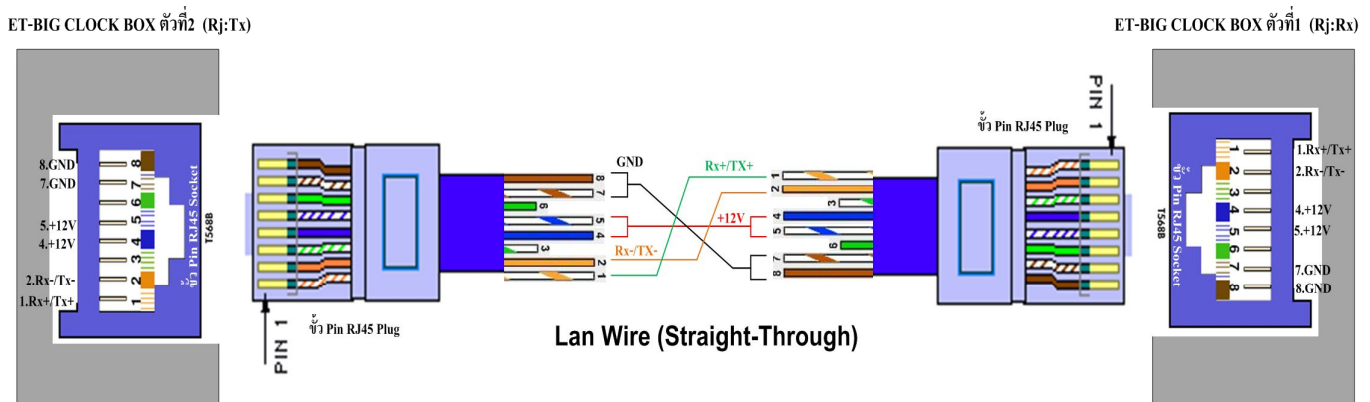
Hu(Humidity) : Humidity value is shown on the Display

Dt(Date/Mount) : Date and Month is shown on the Display

Rt (Rotate) : All 3 values above are alternately shown on the Display and change every 10 seconds

Cp(Copy Display) : Show the same data as Master according to the pressed Key (except Key9)

- Press the Key **MENU** to exit from Menu Setup and return to the normal display screen; next, press Key **⏪** to wait to receive data from another one Display to show on the Display according to the setting values
- Directly connect Cable RJ45 between both of ET-BIG CLOCK BOX as shown in the picture below. In this case, the second Display starts running first because it receives 12V POWER SUPPLY from Cable RJ45.



- Setup values for the second ET-BIG CLOCK BOX to be sender, please press Key **MENU** and enter Menu Conf, choose sub-menu Rj=Tx and then press Key **▶** to save.
- Press Key **MENU** to exit from Menu Setup and return to the normal display screen; next, please press any Key to choose the preferable display format for the second Display (except Key9). Now, the first Display shows data according to the setting values that is set by user; the data that is shown on the first Display is from the second Display.

**NOTE:** If user sets Td:Cp(Copy) for the first Display (Rx), when user presses Key to change mode display of the second Display (Tx), the display of the first Display (Rx) will also be changed according to data of the second Display.

**7.3) HOW TO SETUP TIME:** It has an effect on the operation of Time Base from RTC DS3231. Please follow these instructions;

- Press Key **MENU** to enter Mode Setup.
- Press Key **▶** to enter Main Menu: Time.
- Press Key **+** or **-** Key to setup Hour value (Hr:xx) in a format of 24-hour (00-23).
- Press Key **▶** to save the Hour value.
- Press Key **▶▶** to change a new sub-menu and go to setup Minute value.



- 7) Press Key to save the Minute value.
- 8) Press Key to exit from Mode Setup.

**7.4) HOW TO SETUP DATE:** It has an effect on the operation of Time Base from RTC DS3231. Please follow these instructions;

- 1) Press Key to enter Mode Setup.
- 2) Press Key to choose Main Menu: Date.
- 3) Press Key to enter Main Menu: Date.
- 4) Press Key or Key to setup Days of a week (Dy:Su-Sa) Sunday-Saturday.
- 5) Press Key to save the value of days of a week.
  
- 6) Press Key to change a new sub-menu and go to setup Date value.
- 7) Press Key or Key to setup the Date value (Dt:01-31).
- 8) Press Key to save the Date value.
  
- 9) Press Key to change a new sub-menu and go to setup Month value.
- 10) Press Key or Key to setup the Month value (Mt: 01-12).
- 11) Press Key to save the Month value.
  
- 12) Press Key to change a new sub-menu and go to setup Year value.
- 13) Press Key or Key to choose format of Year value (Yr:TH=B.E.; or EN=A.D.).
- 14) Press Key to save the format of Year and the Display enters mode of setting Year value automatically.
- 15) Press Key or Key to choose and setup the last 2-digit of Year value as follows;  
Buddhist Era (25xx): It should setup the value of xx that is the last 2-digit in a range of 43-99.  
Christian Era (20xx): It should setup the value of xx that is the last 2-digit in a range of 00-56.
- 16) Press Key to save the Year value, especially the last 2-digit.
- 17) Press Key to exit from Mode Setup.

**7.5) HOW TO SETUP CONFIGURATION:** It setup values for the Clock, please follow these instructions;

- 1) Press Key to enter Mode Setup.
- 2) Press Key repeatedly until it found Main Menu: Conf.
- 3) Press Key to enter Menu: Conf.
- 4) Press Key or Key to choose and setup format of display (Md:K0-K9, KC, KT, KL, KR, K+, K-).
- 5) Press Key to save the format of display; this format always be called after Power-ON or Reset.
- 6) Press Key to change a new sub-menu and go to setup brightness of Display.
- 7) Press Key or Key to setup the brightness of Display (Br:00-15) when 00=Min, 15=Max.
- 8) Press Key to save the brightness value of Display.
  
- 9) Press Key to change a new sub-menu and go to setup Time Zone; it will be valid when using Time Base from GPS.
- 10) Press Key or Key to setup Time Zone (Tz: -9 to +9). Time Zone of Thailand is +7 (referred to GMT).
- 11) Press Key to save the Time Zone value.



- 12) Press Key to change a new sub-menu and go to setup executing value for Connector RJ45.
- 13) Press Key or Key to choose the executing value for Connector RJ45 (Rj:Tx-Rx). Normally, it is setup as Rx.
- 14) Press Key to save the executing value of Connector RJ45.
  
- 15) Press Key to change a new sub-menu and go to setup data type of Display(Td) that has an effect on transmitting data through RJ45.
- 16) Press Key or Key to setup the data type that is received through Connector RJ45 (Td:Tm,Hu,Dt,Rt,Cp).
- 17) Press Key to save the data type to show on the Display.

### 7.6) HOW TO ON/OFF DISPLAY:

It only presses Key ; if the Key is pressed for the first time, it is OFF Display; but, if the Key is pressed for the second time, it is ON Display instead. When using this Key, the Display must be run in the normal mode display according to Key. While being Display OFF, the systems internal the Clock still runs as usual but user can't press any Key, except Key to ON/OFF Display only. State of ON/OFF is not saved when Power-OFF. While being Display OFF, there is no any Alarm notification through Buzzer or related Connector.

### 7.7) HOW TO CHOOSE MODE DISPLAY WHILE POWER-ON

It can choose and setup format of display that will be always shown after Power-ON or Reset, please go to Menu Conf --> Md:xx and choose the preferable Key, and then press Key to Save the setting Key.

### 7.8) HOW TO USE COUNTER MODE:

It receives Signal Trig Active Logic 0 (TTL) through Pin I-Str of Connector Stop Watch to count. Speed of the received Signal Count should not be higher than 10Hz when setting Config Rj:Rx and it should not be higher than 1.25Hz when setting Config Rj:Tx. The display value can be setup in a range of 0-9999 (4-Digit, No Sign). Please follow these instructions below;

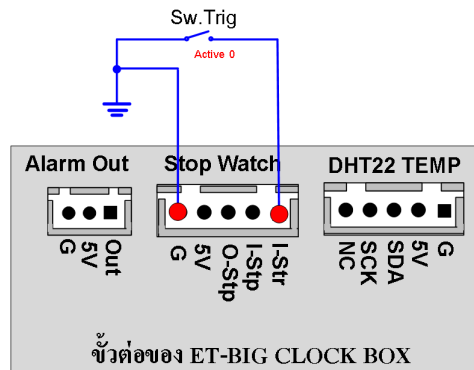
- 1) Press Key to enter Mode Setup
- 2) Press Key repeatedly until it found Main Menu: Cunt
- 3) Press Key to enter Main Menu: Cunt and it found Sub-menu Th:xx
- 4) Press Key or Key to setup the first 2-digit of Target value (Th:00-99)
- 5) Press Key to save the first 2-digit of the Target value
  
- 6) Press Key to change a new sub-menu and go to setup the last 2-digit of Target value
- 7) Press Key or Key to setup the last 2-digit of the Target value (Tl:00-99)
- 8) Press Key to save the last 2-digit of the Target value
  
- 9) Press Key to change a new sub-menu and go to setup Alarm sound when the Count reaches the setting Target value
- 10) Press Key or Key to enable/disable Beep sound (Bp:ON/OF)
- 11) Press Key to save Enable/Disable Beep sound
- 12) Press Key to exit from Mode Setup
- 13) Next, press Key to enter Mode Counter and user will see the setting Target value shown on the Display; user can press this Key continuously to change the preferable value and data is arranged in order as follows;

T: Target --> A: Actual Counting --> R: Remain (T-A=R)





- 14) Please input Signal Trig Logic 0(TTL) through Pin I-Str of Connector Stop Watch as shown in the picture below. Normally, Pin I-Str is set as Pull-Up inside.

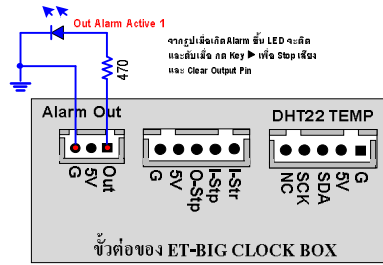


- 15) Please press Key to clear the Counting value (A:, R:) to restart counting.

**7.9) HOW TO USE ALARM (SETTING ALARM CLOCK):**

When Alarm reaches the setting value, Buzzer of the Clock produces a Beep sound; moreover, the Clock also sends state of Alarm as Logic 1 (5V-TTL) to Pin Out of Connector Alarm Out while Alarm happening. So, this Signal can be used to control external devices as required. Please follow these instructions for using Alarm;

- 1) Press Key to enter Mode Setup
  - 2) Press Key repeatedly until it found Main Menu: Alarm
  - 3) Press Key to enter Main Menu: Alarm
  - 4) Press Key or Key to choose and setup Hour value of Alarm (Ah: 00-23)
  - 5) Press Key to save the Hour value of Alarm
  - 6) Press Key to change a new sub-menu and go to setup Minute value of Alarm
  - 7) Press Key or Key to choose and setup the Minute value of Alarm (Am :00-59)
  - 8) Press Key to save the Minute value of Alarm
  - 9) Press Key to change a new sub-menu and go to setup operating state of Alarm Clock
  - 10) Press Key or Key to setup the operating state of Alarm Clock (Ae:ON-OFF), please choose ON to activate the Alarm
  - 11) Press Key to save the operating state of Alarm Clock
  - 12) Press Key to exit from Mode Setup
- 13) After exited from Mode Setup completely, the Clock must be in Display Mode of Key1 only and user can hear Beep sound while Alarm is happening; but, if the Clock is in other Modes, user can't hear any sound while Alarm is happening until it returns to Display Mode of Key1. Moreover, while Alarm is happening, the Clock also sends the state of Alarm as Logic '1' (5V-TTL) to Pin Out of Connector Alarm Out; so, this signal can be used to control according to user's requirements; please look at the example below;



- 14) Press Key to stop Alarm sound and it also clears the state of Alarm at Pin Out of Connector Alarm Out to become Logic '0' instead.

**NOTE:** When setting Alarm, especially in a part of Time, it will be set the RTC DS3231; so, it has to provide Battery Backup for the Clock because the setting values still remain although Power-OFF.

### 7.10) HOW TO USE TEMP SENSOR DHT22 (ET-SENSOR AM2302):

This Model Temp DHT22 is connected to measure Temperature and percentage of Humidity from external device and the Clock will read the value to show on Display. Please follow these instructions below;

- 1) Connect Temp Sensor DHT22 at Connector Con-DHT22 Temp that is Box 5 Pin type as shown below;



- 2) Connect 12V Power Supply to the Clock.
- 3) When the Clock enters normal display mode, please press Key to see the Temperature value and press Key to see the percentage of Humidity value;, or user may press Key to see both values alternately.

If it is not connected to any Temp DHT22, the display, especially in the part of percentage of Humidity, will show the value as 0.0%. However, the Display still shows the value of Temperature as normal because the Clock reads the Temperature value of Temp Sensor from internal RTC DS3231 instead.

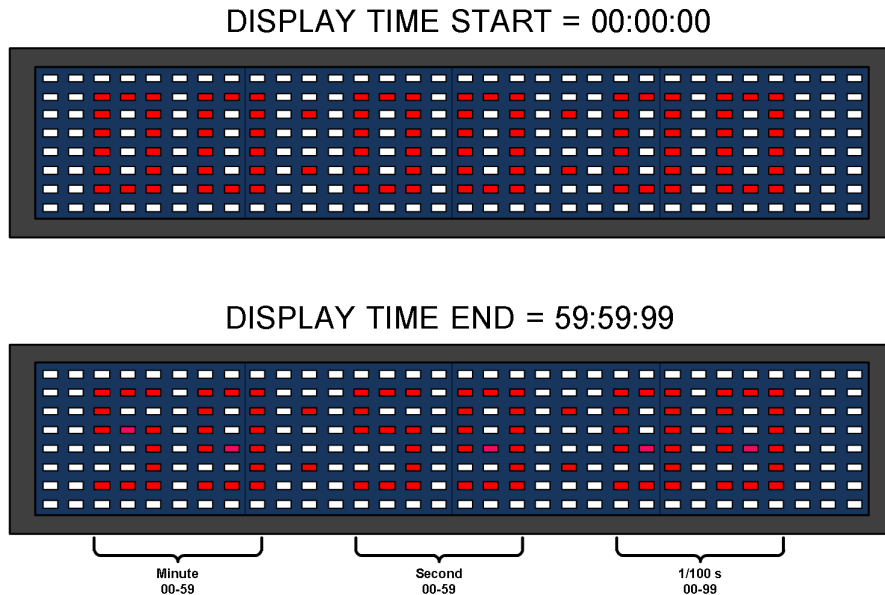
**NOTE:** While the Clock is running and user connects or removes any Temp Sensor, user always resets the Clock to check if the connection with Temp Sensor and all values are read to be shown on the Display are correct.

### 7.11) HOW TO USE STOP WATCH:

The display format of Stop Watch is arranged in a order of Minute (00-59): Second (00-59): 1/100 Second (00-99), respectively, with Resolution of 10mS. The maximum timing of Stop Watch is 60 minutes. When Key-9 is pressed, it enters Mode Stopwatch and the display screen shows the Start Time as 00:00:00. It can show the maximum timing as 59:59:99; when the Clock



reaches this maximum timing, it stops timing automatically and it remains at the time value. Moreover, when it stop timing, the Clock also sends Signal Logic '1' or 5V to Connector Stop Watch (Connector Block 5Pin) Pin O-Stp; user can use this signal to control devices as preferred. Signal Logic at this Pin will be cleared to be Logic '0' when user clears the stopped time value.



There are 2 types for using Stop Watch as described below; user can choose any type as preferred.

➤ **HOW TO USE STOP WATCH BY REMOTE KEY-9**

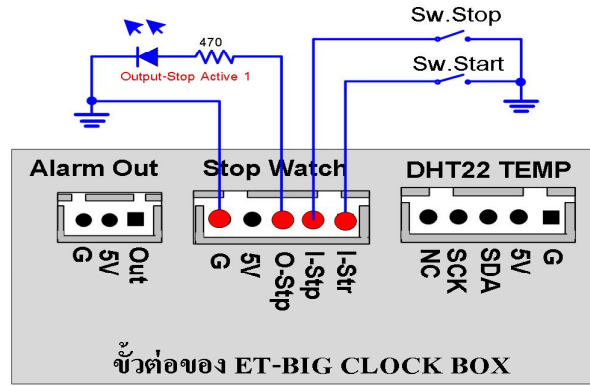
- 1) While it is in any display mode, please press Key-9 to enter Stop Watch; the display screen shows the initial value as 00:00:00 and Output at Pin O-Stp will be set as Logic '0' (Default value).
- 2) Press Key-9 to start timing and Time starts running.
- 3) Press Key-9 again to stop timing and the Output at Pin O-Stp will be set as Logic '1' instead.
- 4) Press Key-9 again to clear all values to be 00:00:00 and Output at Pin O-Stp is also cleared to be Logic '0'. Next, press Key-9 again to restart timing. The operation of Stop Watch will be looped as mentioned above.

Referred to descriptions above, when user presses Key-9, especially from step No.2, it has to press the Key while it is used in Stop Watch Mode; this Key-9 has an effect on the operation of Stop Watch as mentioned above. While it is timing or it stops timing, other Keys can be used go to other display mode as normal and it only presses Key-9 again to return this Stop Watch Mode. In this case, the operation of timing is still running, or the result of Stop Watch is still remains until user presses Key-9 to change the display in the Stop Watch Mode.

➤ **HOW TO USE STOP WATCH BY REMOTE KEY-9 TOGETHER WITH SWITCH OR EXTERNAL SENSOR**

Function of Remote Key-9 in the second type is still the same as the first type above; but, it is more special because Key-9 is used to enter Stop Watch Mode and clear timing only. For Start and Stop timing, it uses SW or external Sensor instead. So, user can apply this operation to other work as preferred. Please follow these instructions below;

- 1) Connect SW. or Sensor (O/P Active Logic 0 TTL) to Connector Stop Watch at Pin I-Str (Input-Start) and I-Stp (Input-Stop) as shown in the picture below;

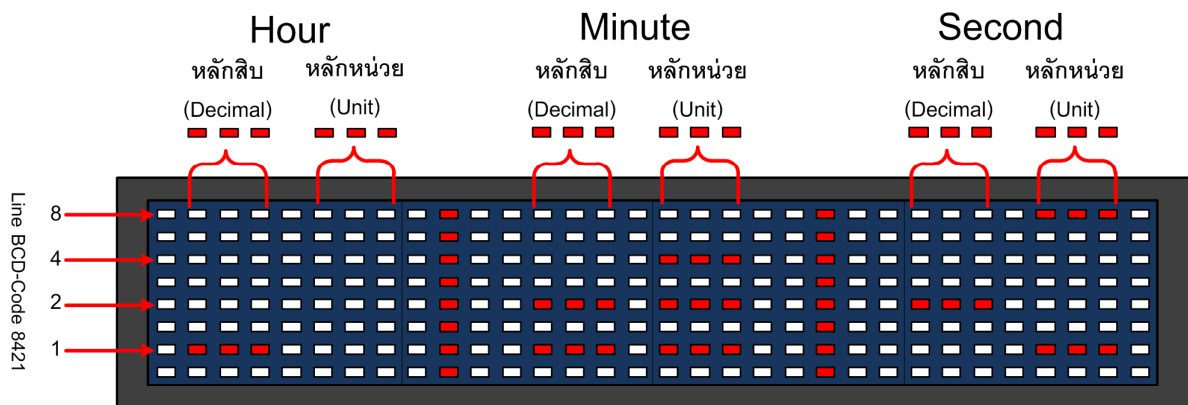


In this case, Input that is connected to Pin I-Str is used as Switch Start Timing; and Input that is connected to Pin I-Stp is used as Switch Stop Timing. Both Inputs are Pull-Up inside at 5V; so, it has to send Logic '0' to control Start or Stop instantly; in this case, format of Signal Logic '0' should be Trig as the same as Push-Button Switch.

- 2) If user needs Signal Logic Output of Stop, please connect the Signal at Pin O-Stp (output-Stop). When it is normal state, this Pin gives Logic '0'; and when it stops timing, this Pin gives Logic '1' for a while; and it becomes Logic '0' again when Remote Key-9 is pressed to clear the timing to 00:00:00.
- 3) After connected I/O devices completely, please press Remote Key-9 to enter Mode Stop Watch and the display screen shows the initial value 00:00:00. The Output at Pin O-Stp is set at Logic '0' (Default value).
- 4) Send Signal Logic '0' to trig Pin I-Str, it starts timing and Time starts running.
- 5) Send Signal Logic '0' to trig Pin I-Stp, it stops timing and Output at Pin O-Stp will be set as Logic '1'.
- 6) Press Remote Key-9 to clear timing to be 00:00:00 and Output at Pin O-Stp is also cleared to be Logic '0'. The Clock waits to receive Signal Trig at Pin I-Str to restart timing.

### 7.12) HOW TO READ CLOCK AS DIGITAL CODE BCD-8421

For Digital Code Display, user has to press Remote Key and the picture below shows the format of reading Time value.



\* LED = = 0

Ex.Time 10:37:29

Read Digital Time Code BCD-8421



Referred to the picture above, it is divided into 3 sections and each section is replaced by unit of Hour, Minute, Second; each unit of the section consists of 2-digit number that is the ten-digit and digit; each digit is divided into 4 lines; and each Line has its own stationed number as shown in the picture below. When number in each digit is displayed, it is replaced with ON/OFF LED 3 Dot that is arranged in a horizontal line (in this case, 1 Line is replaced by ON/OFF LED 3 dot in horizontal line). In summary, a number in each digit can include a maximum of ON LED 4 dot in a specified position of Line as shown in the picture below;

When it reads time value, it has to read digit by digit. If position of any digit has no any LED ON, it assumes that it is zero; on the other hand, if position of any number digit has LED ON, it has to include the stationed number of each Line that is LED ON first and user will get the final number of the required digit. When it can read the numeric value in the ten digit and digit successfully, please arrange numbers in order; and finally, user will get the numeric values in each digit of Hour or Minute or Second as preferred. For example, please look at the digit of Minute in the picture above, there are 2 LED ON in the Line that has its own stationed value = 1 and 2; so, the value in the ten digit is  $1+2=3$ . Next, please look at the digit's place in the picture above, there are 3 LED ON in the Line that has its own stationed value =  $1+2+4=7$ . So, when numbers of both digits are arranged in an order, user will get the Minute value as 37. For digit of Hour and Second, it also uses the same method to read value.

//\*\*\*\*\* **END** \*\*\*\*\*//