

### **Federal Communications Commission (FCC) Statement**

You are cautioned that changes or modifications not expressly approved by the part responsible for compliance could void the user's authority to operate the equipment

### **FCC- Class B**

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a communications. However, there is no guarantee that interference will not occur in particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

### **RF Exposure Statement**

To maintain compliance with FCC's RF exposure guidelines, this equipment should be installed and operated with minimum distance between 20cm the radiator and your body: Use only the supplied antenna.

## **Transmitter Display**

The Transmitter has a front display that shows important information.

### **Time**

Displays the precise time received from the GPS Receiver. If AM or PM is on the display, then the 12-hour option is selected. If neither AM nor PM is on the display, then the 24-hour option is selected.

### **Daylight Saving Time**

The letters "DST+"(Daylight Saving Time) will be displayed when adjustment for Daylight Saving Time is active. If the letters "DST " will be displayed when adjustment for Daylight Saving Time is inactive.

If neither "DST+" nor "DST " is on the display, Daylight Saving time is not applied.

## **GPS Communication**

The GPS Communication indicator (see Figure A) will appear when the Transmitter is communicating with the GPS Receiver. The characters indicate the time signal is being received as follows.

The letters ". ." is displayed, There is no communication with GPS Receiver.

The letters ".o " is displayed, There is communication with GPS Receiver. However, time is not valid.

The letters ".oO" is displayed, There is communication with GPS Receiver. Time is valid.

## **Day/Date**

Display the day and date received from the GPS satellite.

## **Channel Number**

Displays the channel number(00-09) that the Transmitter is set to. However, this channel number does not mean actual transmitting frequency. This is a number for only controlling a repeater.

## **Power LED**

The Power LED(Light Emitting Diode) is located on the leftmost of the front panel of the transmitter.

The Power LED turns on the light when the MCU is running.

## **GPS LED**

The GPS LED is located from the leftmost the 2nd of the front panel of the transmitter. The GPS LED turns on the light when the time information from GPS satellite is valid. If the GPS LED turns off the light, the time information from GPS satellite is not valid.

# **Setup of the Transmitter**

- 1) Carefully screw the Transmitter antenna onto the Transmitter.
- 2) Plug the GPS cable into the GPS socket located in the back of the Transmitter(see Figure B)
- 3) Plug the supplied 10 Volt 2.4 Amp DC power supply(transmitter) into the Transmitter.
- 4) Plug the power supply(transmitter) into a 120 VAC outlet.
- 5) Transmitter setup is complete, See Transmitter Operation for details of operation.

# Transmitter Operation

When the power supply is put into the transmitter at the very first, the transmitter will be in program mode. See Program Mode and set up.

When power is first applied to the Transmitter, the front display will show important information. The POWER LED turns on the light.

The display will note software version. Then the Transmitter checks parameters of program mode. The display will initially show the time which calculated time difference to 12:00:00. The Transmitter then waits for time information from the GPS Receiver.

The GPS LED turns on the light when the time information from GPS satellite is valid.

The GPS Communication indicator will appear like this ".oO" when the Transmitter is receiving a signal from the satellite through the GPS Receiver.

The internal time on the display will increment once each second until the GPS Receiver sends the transmitter a valid time.

Note : The transmitter transmit the time data which the display shows internal time.

Once the Transmitter receives the GPS Receiver time signal, the Transmitter sets its internal clock to that time and will display the correct time and date. The transmission signal is a maximum 500mW FM signal at approximately 915MHz. The Transmitter continually monitors the GPS Receiver and the Transmitter updates its internal clock with the time data it receives. The Transmitter transmits the time signal to per minute as following.

The number of the middle of the lower line of the display is the channel number to which the Transmitter will be transmitting the time signal.

The GPS outlet is to connect the GPS to update the time and date.

The USB outlet is to connect the computer to update the time and date.

# Program Mode

For entering to the program mode from the condition which shows time(Time/Day/Date), push the Mode Button 3 seconds or more.

After entering to the program mode, whenever push the Mode Button, the program mode is changed as follows.

UTC OFFSET -> FORMAT -> DST -> TIME[Time/Day/Date]

## UTC OFFSET

There are 24 available time zone as follows.

"-05 : EASTERN"  
"-04 : CARACAS"  
"-03 : RIO DE JANEIRO"  
"-02 : ---"  
"-01 : ---"  
" 0 : LONDON"  
"+01 : CENTRAL EUROP"  
"+02 : ATHENS"  
"+03 : MOSCOW"  
"+04 : DUBAI"  
"+05 : KARACHI"  
"+06 : COLOMBO"  
"+07 : BANGKOK"  
"+08 : BEIJING"  
"+09 : TOKYO"  
"+10 : SYDNEY"  
"+11 : ---"  
"+12 : ANADYR"  
"-11 : ---"  
"-10 : HONOLULU"  
"-09 : ANCHORAGE"  
"-08 : PACIFIC"  
"-07 : MOUNTAIN"  
"-06 : CENTRAL"

Display will be as follows. The time zone can be changed whenever push the Set Button.

"SET MODE \*UTC OFFSET"

"-05 : EASTERN"

## FORMAT

Display will be as follows. The display time format can be changed whenever push the Set Button.

"SET MODE \*FORMAT"

"12 HOUR DISPLAY"

or

"SET MODE \*FORMAT"

"24 HOUR DISPLAY"

## DST

Transmitter is pre-programed to automatically make adjustment for Daylight Saving Time. The letters "DST+"(Daylight Saving Time) will be displayed when adjustment for Daylight Saving Time is active. If the letters "DST " will be displayed when adjustment for Daylight Saving Time is inactive. If neither "DST+" nor "DST " is on the display, Daylight Saving time is not applied.

The adjustment to Daylight Saving Time and back to Standard Time take place 12:00 AM on the day of change.

Note : The GPS signal does not encode information about Daylight Saving Time. In the spring when the Transmitter changes to Daylight Saving Time, the system clock will adjust by advancing faster than their normal speed to make the adjustment and then return to normal operation. In the fall when the Transmitter returns to Standard Time, the system clock will make the time adjustment and then return to normal operation.

Display will be as follows. The daylight saving time selection can be changed whenever push the Set Button.

"SET MODE \*DST"

"YES"

or

"SET MODE \*DST"

"NO"

## TIME

Display will be as follows.

"SET MODE \*TIME"

"NO"

If you want to set up time manually, choose "YES" on the display by pushing the Set Button.

"SET MODE \*TIME"

"YES"

After that, push Mode button to enter the changing mode of year.

Display will be as follows.

"SET MODE \*TIME"

" YEAR : 2009"

The year can be changed whenever push the Set Button.

The range of adjustment is 2000-2255.

After that, push Mode button to enter the changing mode of month.

Display will be as follows.

"SET MODE \*TIME"

" MONTH : Jun. "

The month can be changed whenever push the Set Button.

After that, push Mode button to enter the changing mode of day.

Display will be as follows.

"SET MODE \*TIME"

"DAY : 25"

The day can be changed whenever push the Set Button.

After that, push Mode button to enter the changing mode of time.

Display will be as follows.

"SET MODE \*TIME"  
"HOUR : 11:25 AM"

The hour can be changed whenever push the Set Button.

After that, push Mode button to enter the changing mode of minute.

Display will be as follows.

"SET MODE \*TIME"  
" MINUTE : 02:25 PM"

The minute can be changed whenever push the Set Button.

After that, push Mode button to exit the changing mode of minute.

RF OUTPUT POWER: 500mW(MAX)

MODULATION TYPE OF FHSS SIGNAL: FSK

FREQUENCY RANGE: 920.15-924.791MHZ

NUMBER OF CHANNELS: 52

NOTES:

- a. The transmission and receiver is the same for the 20 dB bandwidth.
- b. The transmission of each channel of the transmitter is to send sync code. The receiver will recognize the sync code, confirm the channel and analyze the data.
- c. Part 2.1-definition of Frequency Hopping System: A spread spectrum system in which the carrier is modulated with the coded information in a conventional manner causing a conventional spreading of the RF energy about the frequency carrier. The frequency of the carrier is not fixed but changes at fixed intervals under the direction of a coded sequence.

The wide RF bandwidth needed by such a system is not required by spreading of the RF energy about the carrier but rather to accommodate the range of frequencies to which the carrier frequency can hop. The test of a frequency hopping system is that the near term distribution of hops appears random, the long term distribution appears evenly distributed over the hop set, and sequential hops are randomly distributed in both direction and magnitude of change in the hop set.

The device to comply with these requirements , so the device is FHSS modulation products.

d. The transmission channel is based on the Hop data as below:

Channel to Frequency Table (MHz)

| 0      | 1       | 2       | 3       | 4       | 5       | 6       | 7       |
|--------|---------|---------|---------|---------|---------|---------|---------|
| 920.15 | 920.241 | 920.332 | 920.423 | 920.605 | 920.696 | 920.787 | 920.878 |

| 9       | 10      | 11      | 12      | 13      | 14      | 15      | 16      |
|---------|---------|---------|---------|---------|---------|---------|---------|
| 920.969 | 921.060 | 921.151 | 921.242 | 921.333 | 921.424 | 921.515 | 921.606 |

| 17      | 18      | 19      | 20      | 21      | 22      | 23      | 24      |
|---------|---------|---------|---------|---------|---------|---------|---------|
| 921.697 | 921.788 | 921.879 | 921.970 | 922.061 | 922.152 | 922.243 | 922.334 |

| 25      | 26      | 27      | 28      | 29      | 30      | 31      | 32      |
|---------|---------|---------|---------|---------|---------|---------|---------|
| 922.425 | 922.516 | 922.607 | 922.698 | 922.789 | 922.880 | 922.971 | 923.062 |

| 33      | 34      | 35      | 36      | 37      | 38      | 39      | 40      |
|---------|---------|---------|---------|---------|---------|---------|---------|
| 923.153 | 923.244 | 923.335 | 923.426 | 923.517 | 923.608 | 923.699 | 923.790 |

| 41      | 42      | 43      | 44      | 45      | 46      | 47      | 48      |
|---------|---------|---------|---------|---------|---------|---------|---------|
| 923.881 | 923.972 | 924.063 | 924.154 | 924.245 | 924.336 | 924.427 | 924.518 |

| 49      | 50      | 51      |  |  |  |  |  |
|---------|---------|---------|--|--|--|--|--|
| 924.609 | 924.700 | 924.791 |  |  |  |  |  |

Hop Sequence 0 Channels by Index

|    |   |   |    |    |   |    |    |   |    |    |    |    |    |    |    |    |    |
|----|---|---|----|----|---|----|----|---|----|----|----|----|----|----|----|----|----|
| 0  | 1 | 2 | 3  | 4  | 5 | 6  | 7  | 8 | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 26 | 0 | 2 | 28 | 34 | 5 | 49 | 37 | 7 | 11 | 48 | 32 | 43 | 3  | 45 | 30 | 14 | 44 |

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 |
| 19 | 49 | 29 | 39 | 6  | 42 | 20 | 4  | 21 | 10 | 22 | 9  | 15 | 23 | 18 | 24 | 12 | 25 |

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|--|
| 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |  |  |
| 17 | 27 | 13 | 31 | 16 | 33 | 8  | 3  | 6  | 38 | 40 | 47 | 50 | 1  | 35 | 41 |  |  |

Hop Sequence 1 Channels by Index

|    |   |    |    |   |    |   |    |    |    |    |    |    |    |    |    |    |    |
|----|---|----|----|---|----|---|----|----|----|----|----|----|----|----|----|----|----|
| 0  | 1 | 2  | 3  | 4 | 5  | 6 | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 50 | 0 | 22 | 25 | 3 | 33 | 4 | 45 | 23 | 27 | 6  | 7  | 17 | 38 | 29 | 42 | 19 | 32 |

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 |
| 48 | 26 | 34 | 8  | 40 | 31 | 43 | 9  | 5  | 10 | 36 | 11 | 2  | 12 | 37 | 13 | 15 | 18 |

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|--|
| 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |  |  |
| 20 | 24 | 28 | 30 | 35 | 39 | 16 | 4  | 1  | 14 | 44 | 46 | 1  | 47 | 21 | 49 |  |  |

Hop Sequence 2 Channels by Index

|   |    |   |    |    |   |   |    |    |    |    |    |    |    |    |    |    |    |
|---|----|---|----|----|---|---|----|----|----|----|----|----|----|----|----|----|----|
| 0 | 1  | 2 | 3  | 4  | 5 | 6 | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 3 | 50 | 0 | 22 | 25 | 3 | 4 | 45 | 23 | 27 | 40 | 6  | 28 | 7  | 37 | 17 | 38 | 18 |

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 |
| 39 | 43 | 44 | 30 | 29 | 49 | 46 | 42 | 20 | 19 | 48 | 26 | 34 | 8  | 9  | 5  | 10 | 36 |

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|--|
| 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |  |  |
| 11 | 2  | 12 | 13 | 32 | 15 | 24 | 3  | 5  | 16 | 41 | 14 | 1  | 47 | 21 | 33 |  |  |

Hop Sequence 3 Channels by Index

|    |    |    |    |    |    |    |   |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|---|----|----|----|----|----|----|----|----|----|----|
| 0  | 1  | 2  | 3  | 4  | 5  | 6  | 7 | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 25 | 31 | 35 | 28 | 33 | 50 | 37 | 0 | 22 | 29 | 36 | 3  | 4  | 45 | 38 | 48 | 30 | 26 |

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 |
| 23 | 11 | 49 | 16 | 27 | 8  | 40 | 6  | 7  | 17 | 18 | 39 | 43 | 44 | 46 | 42 | 20 | 19 |

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|--|
| 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |  |  |
| 34 | 9  | 5  | 10 | 2  | 12 | 13 | 3  | 2  | 15 | 24 | 41 | 14 | 1  | 47 | 21 |  |  |

Hop Sequence 4 Channels by Index

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 0  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 21 | 25 | 18 | 31 | 27 | 35 | 28 | 33 | 19 | 12 | 44 | 50 | 48 | 23 | 37 | 0  | 22 | 43 |

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 |
| 10 | 29 | 47 | 1  | 36 | 3  | 41 | 13 | 4  | 45 | 17 | 46 | 40 | 38 | 15 | 30 | 14 | 26 |

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|--|
| 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |  |  |
| 11 | 49 | 16 | 8  | 6  | 7  | 3  | 9  | 42 | 20 | 34 | 9  | 5  | 2  | 32 | 24 |  |  |