RFCT-10 manual

Transmitter for wireless clock system

Contents

FCC CONCERNS

FCC Compliance Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.
This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a 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:

The antenna(s) used for this device must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

Do not

Any changes or modifications to the equipment not expressly approved by the party responsible for compliance could void user's authority to operate the equipment.

1 Description

Figure 1.1

The RFCT-10 receives a time from a GPS (global positioning system) receiver or from a NTP (network time protocol) server via ethernet port. Then the RFCT-10(time transmitter) broadcasts the time to remote wireless clocks (time receiver of our company). As a result, all the wireless clocks are synchronized to the exact time. This time synchronization system is ideal for schools, universities, hospitals, and other applications in synchronizing time.

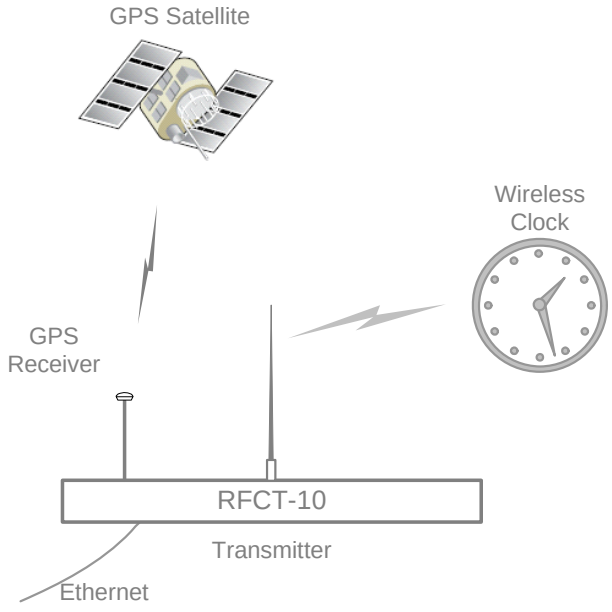


Figure 1.2

Input, output and in-out ports are described as follows.

- Input port
  - ➢ DC Power (9VDC)

- GPS Antenna port
- Key pad(4x4 array)

- Output port
  - RF Antenna port

- Input and output port
  - RJ-45 RS232 PC Interface port
  - Ethernet port

- Display output
  - LED(REF, Alarm, Fault, PWR)
  - LCD

- Accessory
  - AC-DC Adaptor (input:100-240VAC, output:9VDC/1.5A)
  - GPS Antenna(GPS18LVC)

Figure 1.3 shows the input, output and in-output connection.

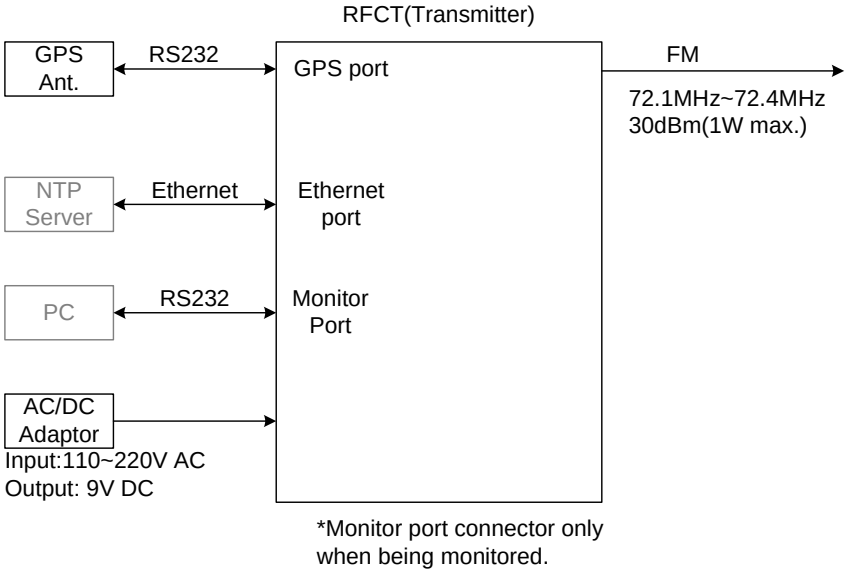


Figure 1.2

Figure 1.4 shows the block diagram of RFCT-10

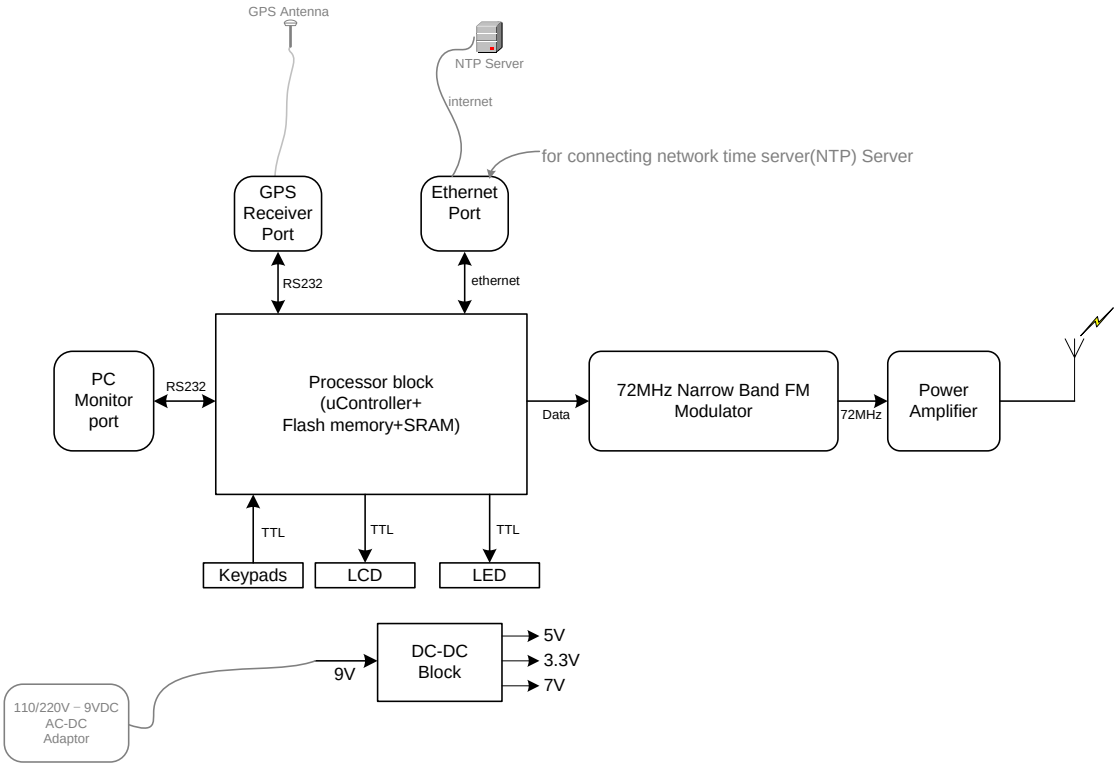


Figure 1.4

2 Initial Setup

2.1 Preparation for setup

- RFCT-10 Set
  - Transmitter (RFCT-10 main body).
  - AC-DC Adaptor power supply
  - RF Transmitter Antenna
  - GPS Antenna
- PC and monitoring cable(refer to 4.Monitoring using PC) : optional

2.2 Setup

2.2.1 Location

The first step in setting up the transmitter is to determine a suitable location for the transmitter and GPS unit. The transmitter's power supply requires 120 Volts AC so proximity within reach of the transformer cord is needed. It is recommended that the transmitter be located a minimum of 2 to 3 feet above the floor and away from large metal objects, such as lockers, filing cabinets, etc. The transmitted signal from the antenna radiates in a circular and 'umbrella ' pattern, therefore the coverage for an area will be better if the transmitter is centrally located. In multistory buildings, locating the transmitter on the top floor will often significantly improve coverage for the lower floors due to the umbrella ' pattern of transmission.

The GPS antenna needs a clear view of the sky to receive the GPS signal. Only the cable permanently attached to the GPS unit may be used outdoors. then additional cable is required the connection must be sealed with Radio Shack coaxial Cable Connector Sealant 278-1645 or high quality silicone sealant to weatherproof the connection. Any cable extensions must be protected from outside elements.

2.2.2 Assembly of the RFCT-10

1. Carefully screw the transmitter antenna onto the transmitter. The antenna must be snug against the case but hand-tighten only.
2. Plug the GPS unit cable into the transmitter.
3. Attach the GPS unit to the inside of a window
4. Plug the supplied 9-volt/1.5 Amp DC power supply into the transmitter.
5. Plug in the supplied 9-volt/1.5 Ampere DC power supply into a 120 VAC outlet.
6. Set all the parameter on the transmitter using key pad.

7. RFCT-10 setup is complete

3 Operation

When Power is first applied to the transmitter the time is set to 00:00:00. Then the transmitter reads configuration parameters, user adjustable via key pad, from the internal flash memory. The transmitter then sends information to the GPS unit and waits for time information from the GPS unit. Depending on the location, weather conditions, time of day, etc. this can require up to several minutes for the initial time verification. Once the transmitter has received the GPS unit signal for time, the transmitter sets its internal clock to that time. The transmitter then starts to transmit its internal time once every second. The transmission signal are depends on one-watt FM signal at approximately 72.2 MHz. The transmitter continually monitors the GPS unit and the transmitter's internal clock is updated every time the transmitter received data from the GPS unit.

3.1 Operation details

3.1.1 Start up

After initial power up, LEDs (REF, Alarm, and Fault) will go off, and LCD will display as below. The simplest way to be sure transmitter is running properly is to see if the time on LCD increases per second.

```
1.Status, GPS:N/A, Channel:#0
2006,Jan-01,00:00:00,Sun, DLS:OFF
```

3.1.2 Reference setup

Change the reference type from the default "GPS" to desired reference. Move, first, to the screen "3.Reference." followed by pushing "Enter" button. Then, keep pushing the "Menu" button until you see "3-5. Reference Source" screen.

```
3-5.Reference Source <GPS:1 SNTP:2>
[GPS]
```

① Key in "1" for NTP, and "2" for SNTP followed by pushing "Enter" button.

3.1.3 Local time setup

By default, system time is set to UTC, and the offset from UTC is set to 0. To get the correct local time, appropriate local time offset needs to be set. Move, first, to the screen “2.Time.”

```
2.Time, 2006,Oct-26,02:39:12, Thu
Local Offset: 0hr. 0min. DLS:ON
```

① Push “Enter” button.

```
2-1.Local Hour <Sing:* Backspace:#>
[Hour: 0] 9
```

② Type in local hour offset followed by pushing “Enter” button.

③ Push “Menu” button.

```
2-2.Local Min <Sing:* Backspace:#>
[Min: 0]
```

④ Type in local minute offset followed by pushing “Enter” button.

3.1.4 Daylight Saving Setup

Move, first, to the screen “2.Time.” followed by pushing “Enter” button. Then, keep pushing the “Menu” button until you see “2-3.Daylight saving” screen.

```
2-3.Daylight Saving <Dot:* Backspace:#>
[Start(m.d.h): 4.2.2]
```

① Type in start date of Daylight Saving followed by pushing “Enter” button.

② Push “Menu” button.

```
2-4.Daylight Saving <Dot:* Backspace:#>
[End(m.d.h): 10.29.2]
```

③ Type in end date of Daylight Saving followed by pushing “Enter” button.

3.1.5 RF Channel Setup

Setup the desired RF channel out of 16 channels. Move, first, to the "4.Radio Frequency" screen. Then push the "Enter" button.

```
4.Radio Frequency, ON
Channel:#0, Attenuator:#0
```

① Push "Enter" button.

```
4-1.Channel <Backspace:# Range:0->15>
[Channel: 0]
```

② Type in desired channel followed by pushing "Enter" button.

3.1.6 RF Attenuator Setup

Move, first, to the "4.Radio Frequency" screen followed by pushing "Enter" button. Then, keep pushing the "Menu" button until you see "4-2.Attenuator" screen.

```
4-2.Attenuator <Backspace:# Range:0->31>
[Attenuator: 0]
```

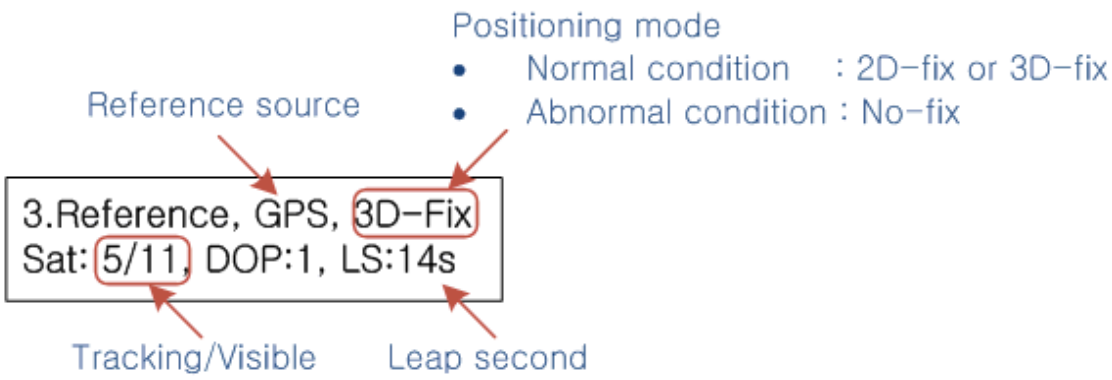
① Type in desired attenuator value followed by pushing "Enter" button.

3.2 GPS Operation

3.2.1 Confirm the GPS Receiver Operation

Current GPS status information including positioning mode, number of satellites in tracking, DOP (Dilution of Precision), and leap second is available on the "3. References" screen. More details available via the Monitor port. REF(green) LED indicates the reference is in good health and transmitter is ready for RF transmission.

```
3.Reference, GPS, 3D-Fix
Sat: 5/11, DOP:1, LS:14s
```



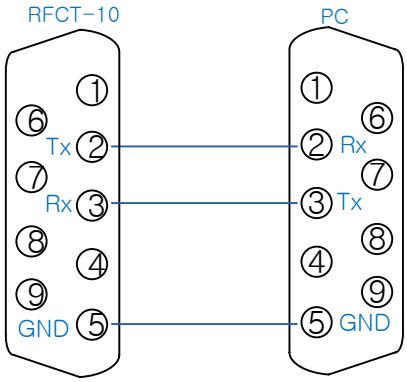
3.3 SNTP Operation

Not available for the time being.

4 Monitoring using PC

4.1 Preparation

4.1.1 Serial Cable



4.1.2 Connection

① Connect the serial cable from the COM port of your computer

② Connect the other end of cable to the “MONITOR PORT” on the rear of the transmitter

③ Start a Hyper terminal session, or any other terminal program in your favor, on COM port with the following settings

Bits per second = 115200

Data bits = 8

Parity = None

Stop bits = 1

Flow control = None

4.2 Command

HELP

- Displays command list and description.

```
[HELP List]=============================================================
HELP          : Help
PS            : Process Status
DATE          : Date and time
ANT           : GPS Antenna signal
GPS           : GPS Status
SNTP          : SNTP Status
PPS           : 1PPS Status
IP            : IP Configurations
NET           : Network Status
RST           : System reset
^C            : Cancel current command
^Z, ^X        : Command history
------------------------------------------------------------------------
```

Example)

Oct-26 23:56:37,1> help

PS

- Displays process status.

```
 Oct-26  2:47: 9   Tasks: 7   Cpu usage: 19%     Running:     3:20:56(1205323)

     Name       Prio  State  Dly  Stack   Free   Used    Max   Starts    Ends
OS Idle          63   Ready    0    512    494     18    148   11fd1c   11fb1c
OS Stat          62   Ready    3    512    484     28    208   11fb1c   11f91c
GPS,SNTP          1       Q   92   3200   3033    167   2128   11d574   11c8f4
Serial            2       Q    0   1024    989     35    436   11d974   11d574
Button            3   Ready    3   1024   1001     23    584   11dd74   11d974
Display           4   Ready    0   1024    946     78    680   11e174   11dd74
Odetic            5    Flag    0   1024    983     41    240   11e574   11e174
```

- **Oct-26 2:47:9**: Local time
- **Tasks**: Current number of tasks running
- **CPU Usage**
- **Running Time**: Running time since the last power-on.

Example)

Oct-26 23:56:37,1> ps

...

Oct-26 23:56:37,1> ^C

DATE

- Displays UTC and Local time.

```
- UTC(GMT) -
  2006 Oct 26   07:23:30   Thu

- Local -
  2006 Oct 26   02:53:30   Thu   -5 hr -30 min   Daylight Saving: 1 hr
```

• **UTC (GMT)**: Universal Time Coordinated

• **Local**: The time the differential factors such as local time offset and daylight saving are applied to UTC.

Example)

Oct-26 23:56:37,1> date

ANT

- Displays NMEA input from GPS Receiver.

```
02:114> $GPRMC,015702,A,3622.9973,N,12721.4394,E,000.0,087.5,271006,007.3,W,A*08
02:150> $GPGGA,015702,3622.9973,N,12721.4394,E,1,04,3.1,129.6,M,19.7,M,,*4A
02:175> $GPGSA,A,2,01,03,,07,14,,,,,,,,3.3,3.1,1.0*30
02:212> $GPGSV,3,1,11,01,64,191,52,03,17,199,49,06,34,054,00,07,56,155,50*7F
02:249> $GPGSV,3,2,11,14,20,159,43,16,56,266,00,20,14,277,00,23,22,318,00*7D
02:278> $GPGSV,3,3,11,25,73,033,00,30,06,058,00,31,67,053,00*47
02:319> $PGRMF,374,439036,271006,015702,14,3622.9973,N,12721.4394,E,A,1,0,88,3,2*29
```

• **02:114>**: Received second, millisecond.

• **NMEA**: NMEA information

Example)

Oct-26 23:56:37,1> ant

...

Oct-26 23:56:37,1> ^C

GPS

- Displays GPS Status

```
- ANTENNA -                          - TIME -

 Model: GPS 18LVC                     2006/10/26  19:56:14
 Temp(c): 30                          Leap Second       14
 Status: P,P,R,R,P,N,R                Daylight Saving    1
 Baudrate: 19200                      DOP                1
 1PPS(20ms): ENABLED
 Ver: 2.80


- SATELLITE -

 Fix: 2D-Fix
 Visible: 11
 PRN:   1   3   6   7  14  16  20  23  25  30  31   0
 E/L:  72  10  38  49  28  51  16  16  71  12  68   0
 A/Z: 199 199  60 161 157 256 283 320  11  55  32   0
 N/R:  48  44   0  54  43  47   0   0   0   0   0   0


- POSITION -

 LAT.   N 3623.0209
 LON.   E 12721.4528
 HEI.   117.8
 DOP.   3
```

- Antenna: GPS Receiver information
  - Model: Model name
  - Temp: Temperature
  - Status: Self-test result (P=Pass, F=Fail, R=Retained, L=Lost, N=Null)
    - ROM checksum test(P,F)
    - Receiver failure discrete(P,F)
    - Stored data lost(R,L)
    - Real time clock lost(R,L)
    - Oscillator drift discrete(P,F)
    - Data collection discrete(C, N)
    - GPS sensor configuration data(R,L)
  - Baudrate
  - 1PPS: 1PPS enable status(pulse width)
  - Ver: software version.

- Time: Local Time Information
  - Time: Year/Month/Day Hour:Minute:Second

- Leap Second
- Daylight saving: +/- Daylight saving offset
- DOP: Dilution of Precision(Time)

• Satellite: Satellite tracking information
- Fix: Current positioning mode
- Visible: Number of satellites in view
- PRN: Satellite ID number
- E/L: Elevation
- A/Z: Azimuth
- N/R: Noise Ratio

• Position: Position information
- Lat: Latitude
- Lon: Longitude
- HEI: Height
- DOP: Dilution of Precision(Position)

Example)

Oct-26 23:56:37,1> gps

...

Oct-26 23:56:37,1> ^C

SNTP

- Displays SNTP status

```
time.nist.gov, Status:0, Version:0, Mode:0, Stratum:0, Polling:2^0
Precision:0.000000E+74, RootDelay:0.000000, RootDispersion:0.000000
ReferenceID:
Waiting...
```

Example)

Oct-26 23:56:37,1> sntp

...

Oct-26 23:56:37,1> ^C

PPS

- Displays 1PPS input

```
@ C: 0  ACC:17  ACV:31243  GRA1:31245  TCNT1:31213
@ C:-1  ACC:18  ACV:31243  GRA1:31244  TCNT1:31185
@ C: 0  ACC:19  ACV:31243  GRA1:31244  TCNT1:31235
@ C: 0  ACC:20  ACV:31243  GRA1:31244  TCNT1:31232
@ C: 0  ACC:21  ACV:31243  GRA1:31244  TCNT1:31231
@ C: 0  ACC:22  ACV:31243  GRA1:31244  TCNT1:31234
@ C: 0  ACC:23  ACV:31243  GRA1:31244  TCNT1:31229
@ C: 0  ACC:24  ACV:31243  GRA1:31244  TCNT1:31232
@ C: 0  ACC:25  ACV:31243  GRA1:31244  TCNT1:31231
@ C: 0  ACC:26  ACV:31243  GRA1:31244  TCNT1:31231
```

Example)

Oct-26 23:56:37,1> pps

...

Oct-26 23:56:37,1> ^C

IP

- Setup and displays IP addresses

```
Syntax: ip [ -local(-l) | -gate(-g) | -dns(-d) | -sntp(-s) ]  [address(es)]
Ex) ip -local 128.0.0.2
    ip -gate 128.0.0.1
    ip -dns 128.0.0.3 128.0.0.4 128.0.0.5
    ip -sntp time.nist.gov tick.usno.navy.mil ntp.ewha.net
```

NET

- Current Network status

```
- Network Configuration -

  Local IP                : 61.101.66.23
  Gateway(Router)         : 61.101.66.1
  DNS Servers             : 210.117.65.2, Current
                            168.126.63.1
                            61.101.66.17

- SNTP Configuration -

  time.nist.gov           : 0.0.0.0, Current
  tick.usno.navy.mil      : 0.0.0.0
  ntp.ewha.net            : 0.0.0.0
```

Example)

Oct-26 23:56:37,1> net

RST

- Reboot system

Example)

Oct-26 23:56:37,1> rst

System Soft Reset……

Oct-26 23:56:37,1> rst -c

System Config Reset……

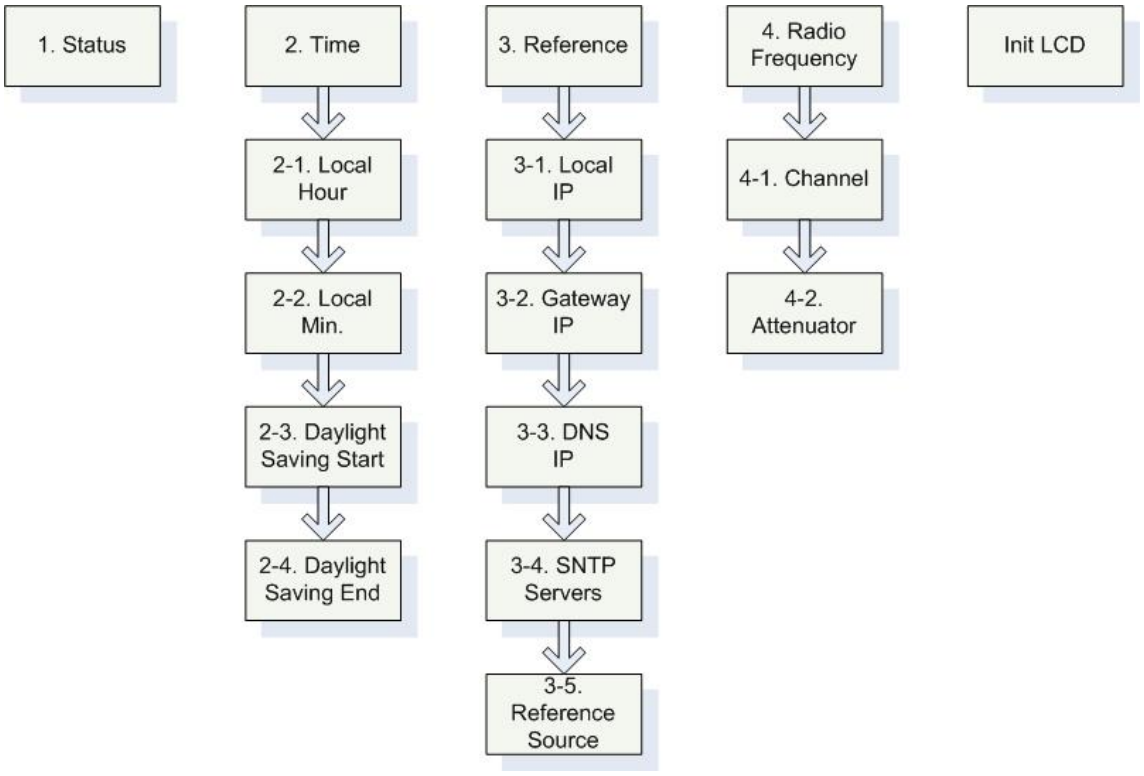
^C

- Abort Current Command

^Z, ^X

- Command History

5 LCD Menu using key pad



5.1 Status

- Displays current status of RFCT-10

1.Status, GPS:3D-Fix, Channel:#0 2006,Oct-26,02:39:12,Thu, DLS:ON

5.2 Time

- Displays time related settings of RFCT-10

2.Time, 2006,Oct-26,02:39:12, Thu Local Offset: -6hr. -45min. DLS:ON

5.2.1 Local Hour

- Displays or sets local hour

```
2-1.Local Hour <Sing:* Backspace:#>
[Hour: -6]
```

5.2.2 Local Min

- Displays or sets local minute

```
2-2.Local Min <Sing:* Backspace:#>
[Min: -45]
```

5.2.3 Daylight Saving Start

- Displays or sets date of daylight saving start

```
2-3.Daylight Saving <Dot:* Backspace:#>
[Start(m.d.h): 4.2.2]
```

5.2.4 Daylight Saving End

- Displays or sets date of daylight saving end

```
2-4.Daylight Saving <Dot:* Backspace:#>
[End(m.d.h): 10.29.2]
```

5.3 Reference

- Displays reference related status of RFCT-10

```
3.Reference, GPS, 3D-Fix
Sat: 6/12, DOP:2, LS:14s
```

5.3.1 Local IP

- Displays or sets local IP address

```
3-1.Local IP <Dot:* Backspace:#>
[192.168.0.3]
```

5.3.2 Gateway IP

- Displays or sets gateway IP address

```
3-2.Gateway IP <Dot:* Backspace:#>
[192.168.0.1]
```

5.3.3 DNS IP

- Displays or sets DNS server IP address

```
3-3.DNS IP <Dot:* Backspace:#>
[192.168.0.2]
```

5.3.4 SNTP Servers

- Displays or sets SNTP server IP address

```
3-4.SNTP Servers <Dot:* Backspace:#>
[time.nist.gov]
```

5.3.5 Reference Source

- Displays or sets reference source

```
3-5.Reference Source <GPS:1 SNTP:2>
[GPS]
```

5.4 Radio Frequency

- Displays RF related settings of RFCT-10

```
4.Radio Frequency, ON
Channel:#0, Attenuator:#0
```

5.4.1 Channel

- Displays or sets RF channel

```
4-1.Channel <Backspace:# Range:0->15>
[Channel: 0]
```

5.4.2 Attenuator

- Displays or sets attenuator value

```
4-2.Attenuator <Backspace:# Range:0->31>
[Attenuator: 0]
```

5.5 Init LCD

- Normalize LCD screen

6 Specification

Item	Description
Output power	1 Watt maximum
Frequency	72.1MHz~72.4MHz
Number of channel	16 selectable channel
Channel bandwidth	20kHz
Key pad	4x4 array
Display	LED: 4, LCD:1
Dimensions	17"L x 1 7/8"W x 12"D
Transmitting antenna	Monopole 46"
Power supply	9VDC/1.5A max.
AC-DC Adaptor	input:100-240VAC output:9VDC/1.5A
Operating temperature range	0℃~70℃
GPS receiver input	DB9, 1PPS(LVTTL),TX(RS232), RX(RS232)
PC monitoring port	DB9, RS232
Ethernet port	RJ45, 10BaseT
Transmission interval	1 per sec

IMPORTANT NOTICE

Information in this document is provided in connection with HanyangNavicom Co., Inc. (“HanyangNavicom”) products. These materials are provided by HanyangNavicom as a service to its customers and may be used for informational purposes only. HanyangNavicom assumes no responsibility for errors or omissions in these materials. HanyangNavicom may make changes to specifications and product descriptions at any time, without notice.

THESE MATERIALS ARE PROVIDED “AS IS” WITHOUT WARRANTY OF ANY KIND, EITHER XPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF NAVICOM PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, CONSEQUENTIAL OR INCIDENTAL DAMAGES, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. HANYANGNAVICOM FURTHER DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS.

HANYANGNAVICOM SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS, WHICH MAY RESULT FROM THE USE OF THESE MATERIALS. HanyangNavicom products are not intended for use in medical, lifesaving or life sustaining applications. HanyangNavicom customers using or selling HanyangNavicom products for use in such applications do so at their own risk and agree to fully indemnify HanyangNavicom for any damages resulting from such improper use or sale.