

GPS (GLOBAL POSITIONING SYSTEM)

What is GPS?



GPS, standing for Global Positioning System, is becoming common nowadays. Following is a brief introduction.

The American Defense Department developed GPS originally for military operations. The system is available for use by the general public. For example, anybody can use GPS in association with modern vehicle navigation systems. Position precision for public use is approximately 15 m.

Moreover, precision can be improved when a vehicle is used for navigation and aboard ships through use of map matching technology and differential GPS techniques.

A total of 24 or more GPS satellites are at a high-level altitude of approximately 20,000 km on six circular tracks with an orbital radius of approximately 26,000 km. Therefore, there are four or more satellites located in each orbital track. For civilian use, the RF carrier frequency of the satellites is 1575.42 MHz. Spread spectrum (SS) technology is used over a bandwidth of 2.046 MHz to prevent interference among all the satellite signals on a common carrier frequency.

Position Determination Principle

The GPS receiver receives the radio signals transmitted from the GPS satellites. The receiver measures the time duration between when the signal leaves the satellite and when the signal arrives at the GPS receiver. Knowing this time allows calculation of the distance that the signal traveled from that particular satellite. By receiving multiple signals from different satellites and doing this distance calculation multiple times, the intersection of the spherical surfaces that represent the respective radius distances to the various satellites will determine a single point.

The precision of the determination of the intersecting point relies on the satellites and the data collected.

Datum (Geodetic Survey System)

The latitude and longitude information required by the GPS receiver does not allow for accurate representation of the unevenness of the Earth's surface. For use with GPS, the current standard that defines the precise shape of the Earth is called WGS-84. By using this standard in conjunction with mapping standards for each country, accurate position plotting on a map can be done.

GPS and APRS Position Format

Although position can be described in many different formats, such as degrees, degrees and minutes, and degrees, minutes and seconds, the GPS system and APRS have standardized on the degrees and decimal minutes format. Just like it is important to use proper international phonetics when spelling on the air, it is important in APRS as in any communications system to have a default standard for position. All operators should be trained to use the DDD MM.mm format by default in voice communications just like in data formats. Using these standards on the air will prevent communications errors, confusion, repeats, and conversions.

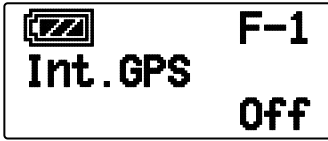
Interval and Total Distance

Geographic Coordinates	Format	Example
Latitude	DD MM.mm (degrees and minutes)	39 49.31N +39 49.31
Longitude	DDD MM.mm (degrees and minutes)	84 15.39W -84 15.39

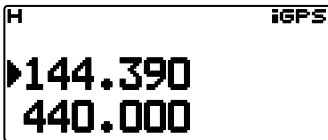
INTERNAL GPS FUNCTION ON/OFF

Turn this function Off when connecting an external GPS receiver to the COM terminal.

Press **[F]**, **[MARK]** to turn the Internal GPS receiver ON or OFF.



- When the Internal GPS receiver is ON, the “iGPS” indicator appears on the display.

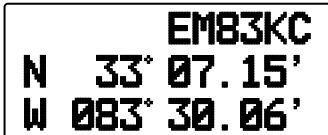


- When the Internal GPS receiver is On, the internal clock is automatically configured with the time data from the internal GPS receiver.
- You must set the time zone beforehand, through Menu No. 196.
- When determining your position for the first time after the power supply is turned On, the clock data is automatically set and is updated once per day thereafter.

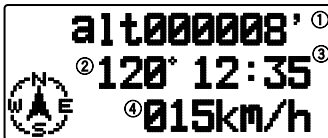
When the Internal GPS receiver is On, pressing **[POS]** will display “Latitude longitude”, then press **[▶OK]** to cycle the display between “Time, Altitude, Travel direction, speed” >> “Target point distance, Travel direction” >> “Log meter” >> “GPS satellite information”.

- Press **[ESC◀]** to return to the previous display.

<Latitude longitude>

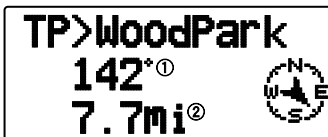


<Time, Altitude, Travel direction, speed>



- ① Altitude ② Travel direction ③ Time ④ Travel Speed

<Target point distance, Travel direction>



- ① Travel direction ② Target point distance

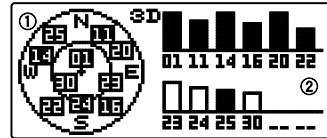
- When pressing **[F]** while the target point distance/ traveling direction is displayed, the North Up display (displays North as the top) changes to the Heading Up display (displays the current travel direction as the top) or vice-versa. In the Heading Up display, a “+” or “-” is used to help indicate the traveling direction.



<Log meter>



<GPS satellite information>



- ① Sky view ② Satellite signal-strength bars

The sky view shows the satellites you are receiving. The satellite signal-strength bars indicate the strength of each satellite you are receiving. A solid bar indicates that the GPS satellite is ready for use.

- When only the frame of the signal-strength bar is displayed, the satellite has not yet been captured.

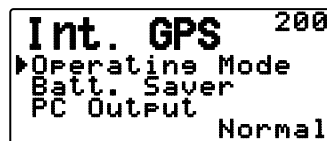
Note:

- ◆ When GPS cannot be received, turn the power ON in a clear environment (Open Sky).
- ◆ While the above screen is displayed (the GPS satellite information screen is positioning) press **[MARK]** (1s) to register a Mark Waypoint.
- ◆ While the above screen is displayed, pressing **[PTT]** will change to the frequency display and transmission will begin. Once transmission is complete, the transceiver returns to the original display.
- ◆ You may experience interference on the internal GPS receiver when using in or around 147.0, 443.8 MHz (Band A) and/or 438.9 MHz (Band B). To eliminate the interference, swap Band A/ Band B or change the frequency.

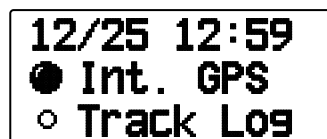
INTERNAL GPS SETUP

■ Internal GPS operation mode

Enter Menu mode and access Menu 200.



GPS Only: The display shows only GPS information; The transceiver transmit and receive capabilities are turned OFF; only GPS operation is available.



- The “●” icon appears when the function is turned ON, the “○” icon appears when the function is turned OFF.
- The “INT. GPS” “●” icon icon blinks while determining the position.

Normal: The display continues to show your frequency, You can use it as a normal transceiver.

When set to “GPS Only”, you can operate only the following key functions.

Key Name	[KEY]	[F], [KEY]	[KEY] (1s)	[KEY] + Power ON
[LAMP]	Lamp	Continuous Lamp On	Lamp	–
[▲] [▼] [▶ OK] [ESC ◀]	–	Function/ Menu select	–	–
[MENU]	Menu mode	RF power select	–	–
[A/B]	–	–	–	–
[1]	MARK	–	Register mode of Mark Waypoint	–
[2]	–	Starting the LOG function	–	–
[3]	POS	–	–	–
[F]	Function mode	–	–	Reset mode

■ Battery Saver (GPS Save)

This function will turn the GPS power source Off after the programmed timer expires if position data is not determined during the maximum catching time (approximately 5 minutes). To prevent unnecessary battery consumption, when there are many reception satellites, the GPS is stabilized and position data can be determined, the GPS power source repeatedly turns On and Off.

- 1 Enter Menu mode and access Menu 201.

```

Int. GPS 201
Operating Mode
▶ Batt. Saver
PC Output
Auto
  
```

- 2 Set GPS Off time to “Off”, 1, 2, 4, 8, or “Auto”.

Auto: When set to Auto, the GPS Off time starts at 1 minute for the first time, then progresses to 2 minutes, 4 minutes and 8 minutes each additional time. The GPS Off time remains at 8 minutes thereafter. However, after having determined your position for the duration, if the GPS cannot pinpoint your location, the GPS Off time will restart at 1 minute.

Note:

- ◆ Position precision may be improved by setting the Batter Saver (GPS Save) function to “Off”.
- ◆ You cannot set the SBAS function to “On” when the Batter Saver (GPS Save) function is 1, 2, 4, 8, or Auto. Set the Battery Saver (GPS Save) function to “Off”.

■ GPS Data PC Output

Turn this function on when you want to send the Internal GPS receiver data (NMEA) from the PC terminal using.

- 1 Enter Menu mode and access Menu 202.

```

Int. GPS 202
Operating Mode
Batt. Saver
▶ PC Output
Off
  
```

- 2 Set PC Output to “Off” or “On”.

GPS DATA SETUP

■ Land Survey System Datum

When using the Internal GPS receiver, set up the necessary land surveying system.

For APRS, select “WGS-84” (world land surveying system).

- 1 Enter Menu mode and access Menu 210.

```

Setup 210
▶ Datum
Sentence
SBAS
WGS-84
  
```

- 2 Set Datum to “WGS-84”.

- This function does not work when using an external GPS receiver.

■ Sentence

Adds an NMEA sentence to the Internal GPS receiver data output from the PC.

- 1 Enter Menu mode and access Menu 211.

```

Setup 211
Datum
▶ Sentence
SBAS
*$GPGGA
  
```

- 2 Set Sentence to “\$GPGGA”, “\$GPGLL”, “\$GPGSA”, “\$GPGSV”, “\$GPRMC”, “\$GPVTG”, or “\$GPZDA”.

- With BEACON transmission, the “\$GPGGA” “\$GPRMC” check (✚) cannot be removed in necessary information and satellite image information.
- You cannot output an NMEA sentence from an external GPS receiver to a PC.

■ SBAS

Through the SBAS (Satellite Based Augmentation System) geostationary satellite, when using the system which offers the information of wide scope reinforcement, set this function to "On".

- 1 Enter Menu mode and access Menu 212.



```
Setup 212
Datum
Sentence
▶SBAS Off
```

- 2 Set SBAS to "Off" or "On".

Note: When the Battery Saver (GPS Save) setting is 1, 2, 4, 8, or Auto, you cannot the SBAS setting is "On".

TRACK LOG

All movement is saved in the GPS LOGGER. Saved information includes latitude, longitude, altitude, travel direction, speed, time, and date. The log can retain up to 5000 points of data.

Press [F], [TNC] to turn the Track Log function On or Off.



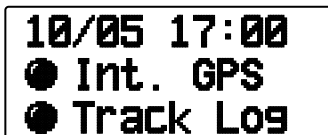
```
Track Log F-2
Off
```

When turning the Track Log function On, "Log Start" appears for approximately 5 seconds, followed by the "iLOG" icon.



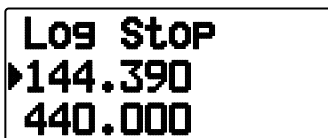
```
H iLOG
▶144.390
440.000
```

- When setting Menu 200 to "GPS Only" and the Track Log function is turned On, the "●" icon appears.



```
10/05 17:00
● Int. GPS
● Track Log
```

- When turning the Track Log function Off, "Log Stop" appears on the display for approximately 5 seconds.



```
Log Stop
▶144.390
440.000
```

- With the Track Log function On, even if the power source is turned Off during Log acquisition, the log is backed up so that when the power is turned back on, the log acquisition resumes.
- You can verify the Log activity ratio in the GPS pinpointing screen.



```
Log Memory
Logging...
Used 75%
```

Note:

- ◆ When the Track Log is turned On while the GPS is Off, the GPS will also turn On.
- ◆ When the GPS is not pinpointing, data is not saved to the log.
- ◆ Using the MCP-4A, you can read the Track Log.
- ◆ If the Track Log overwriting configuration is turned Off (see below), "Log Full" appears when the log memory is full.
- ◆ When the APRS is On, Log operation will begin only when the APRS menu COM terminal input is Off.

■ Track Log All Clear

- 1 Enter Menu mode and access Menu 220.



```
Track Log 220
▶Clear All Data
Wrap When Full
No
```

- 2 Select "Yes" or "No".

Selecting "Yes" will clear the entire Track Log.

■ Overwriting the Track Log

When the Track Log becomes full, new data will begin overwriting the oldest Track Log data

- 1 Enter Menu mode and access Menu 221.



```
Track Log 221
Clear All Data
▶Wrap When Full
Off
```

- 2 Select "On" or "Off".

Selecting "On" will allow old data to be overwritten with new data.

LOG SETUP

■ Track Log Acquisition Type

You can set the conditions for saving portable Track information as GPS Logger.

You can change the settings for travel speed, etc.

- 1 Enter Menu mode and access Menu 230.

```

Log Setup 230
▶Record Method
Interval
Distance
Time
    
```

- 2 Select "Time", "Distance", or "Beacon" for the Record Method.

- 3 Access Menu 231.

```

Log Setup 231
Record Method
▶Interval
Distance
10 sec
    
```

- 4 Select an Interval time from 2 ~ 1800 seconds (in steps of 1 second).

- The Interval setting is available only if the Record Method has been set to "Time".

- 5 Access Menu 232.

```

Log Setup 232
Record Method
Interval
▶Distance
0.01 mi
    
```

- 6 Select a Distance from 0.01 ~ 9.99 (in steps of 0.01).

- The Distance setting is available only if the Record Method has been set to "Distance".
- The units used for Distance can be set to miles (mi), kilometers (km) or nautical miles (nm).

Interval and Log Total Time:

Point Q'ty	Interval time (second)					
	2	5	10	15	30	2800
5000	166.7	416.7	833.3	1250	2500	150000 (min)
	2.8	6.9	13.9	20.8	41.7	2500 (hour)

Interval and Total Distance:

Point Q'ty	Interval distance (km)					
	0.01	2.00	4.00	6.00	8.00	9.99
5000	50	10000	20000	30000	40000	49950 (km)

TARGET POINT

You can register positional information for a target point.

- 1 Enter Menu mode and access Menu 240.

```

Target Pt. 240
▶*1 JJ00AA
Name:
N 00°00.00'
W 000°00.00'
    
```

- 2 Select a Target Point (from 1 ~ 5).

- 3 Press [MHz]. The "in use" target point mark (*#) appears to the left of the channel number.

- 4 Access Menu 241.

```

Target Pt. 241
1 JJ00AA
▶Name: ▶Oconeel_1
N 00°00.00'
W 000°00.00'
    
```

- 5 Enter a Target Point name (up to 8 characters).

- 6 Access Menu 242.

```

Target Pt. 242
*1 JM03AC
Name: Oconeel
▶N 33°07.15'
W 000°00.00'
    
```

<Menu No. 3W0: "dd°mm.mm" >

```

Target Pt. 242
*1 JM03AC
Name: Oconeel
▶N 33°07.15"
E 000°00.00"
    
```

<Menu 3W0: "dd°mm'ss.s" >

- 7 Enter the north/ south latitude.

- 8 Access Menu 243.

```

Target Pt. 243
*1 EM83KC
Name: Oconeel
▶N 33°07.15'
W 083°30.06'
    
```

<Menu No. 3W0: "dd°mm.mm" >

```

Target Pt. 243
*1 EM83KC
Name: Oconeel
▶N 33°07.15"
W 083°30.06"
    
```

<Menu 3W0: "dd°mm'ss.s" >

- 9 Enter the east/ west longitude.

MARK WAY POINT

You can register up to 100 points with the location's latitude, longitude, altitude, time, name, and icon. Names and icons can be manually edited.

- 1 When the frequency or position is displayed, press **[MARK] (1s)** to enter Mark Waypoint registration mode.
 - When registering a Mark Waypoint, the following display appears for approximately 10 seconds.

```
Marked !!
Edit > [OK]
```

- 2 Press **[▶OK]** to enter Mark Waypoint editing Mode.

```
1: MARK-1
▶Name
Icon
```

- 3 Selecting "Name" will enter the Name editing screen. You can enter up to 9 characters.

```
1: MARK-1
▶Name
▶Mark-1_ _ _ _ ◀
```

- 4 Selecting "Icon" will enter the Icon selection screen. Refer to the APRS explanation regarding the available icons.

```
1: MARK-1
▶ICON
▶Symbol : K W
Table : \ W
```

Note:

- ◆ Even when the Log function is OFF, you can register a Mark Waypoint.
 - ◆ The MCP-4A can read Mark Way points.
-

■ Copying the Mark Way Point to the Target Point

You can copy the displayed Mark Way Point to the Target Point.

- 1 Select "Copy to TP" to display the Target Point list.

```
1: MARK-1
▶COPY TO TP
```

- 2 Select the Target Point (1 ~ 5) that you want to copy.

```
<COPY TO TP>
▶Target Pt 1
Target Pt 2
```

■ Mark Way Point List

The information registered with the Mark Waypoint is confirmed.

Press **[MARK]** to display the Mark Waypoint list.

- The list of Mark way point appears.

```
▶ 1: KENWOOD
2: HOME
3: HAM store
```

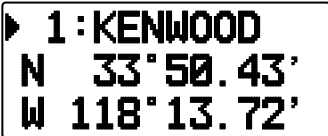
- When there is no data registered in the Mark Waypoint, "No Mark" is displayed.
- Rotate the **Tuning** control: Selects the station data.
- Press **[▲]**: To move the cursor "▶" up the display, to the previous list number.
- Press **[▼]**: To move the cursor "▶" down the display, to the next list number.
- Press **[▶OK]**: Displays the details of the selected Mark Waypoint.
- Press **[A/B]**: Deletes the selected Mark Waypoint.
 - "Clear?" appears then press **[▶OK]** to clear.
- Press **[A/B] (1s)**: Deletes all Mark Waypoints.
 - "Clear All?" appears. Press **[▶OK]**, "Sure?" appears then press **[▶OK]** to clear all.
- Press **[MENU]**: Enters Mark Waypoint Edit mode.
- Press **[MARK]** or **[ESC ◀]**: Returns to the frequency display.

Note: When the Mark way point is no data registered, "No Mark" is displayed.

■ Detailed Display of a Mark Waypoint

The details of a Mark Waypoint are spread across 3 screen pages.


Page 1:



▶ 1:KENWOOD
N 33°50.43'
W 118°13.72'

- Rotate the **Tuning** control: Changes to the previous/next detailed display.
- Press [**ESC** ◀]: Returns to the Mark Waypoint list display.
- Press ▶**OK**]: Continues to the next page.
- Press [**A/B**]: Deletes the Mark Waypoint currently being displayed.
- Press [**MENU**]: Enters Mark Waypoint Edit mode.
- Press [**LIST**]: Returns to the frequency display.

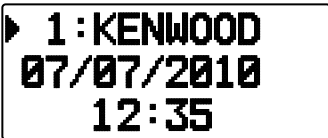
Page 2:



▶ 1:KENWOOD
alt 000008'
W

- Rotate the **Tuning** control: Changes to the previous/next detailed display.
- Press [**ESC** ◀]: Returns to the previous page.
- Press ▶**OK**]: Continues to the next page.
- Press [**A/B**]: Deletes the Mark Waypoint currently being displayed.
- Press [**MENU**]: Enters Mark Waypoint Edit mode.
- Press [**LIST**]: Returns to the frequency display.

Page 3:



▶ 1:KENWOOD
07/07/2010
12:35

- Rotate the **Tuning** control: Changes to the previous/next detailed display.
- Press [**ESC** ◀]: Returns to the previous page.
- Press [**A/B**]: Deletes the Mark Waypoint currently being displayed.
- Press [**MENU**]: Enters Mark Waypoint Edit mode.
- Press [**LIST**]: Returns to the frequency display.