

YAESU

Radio for Professionals

C4FM/FM 144/430MHz
DUAL BAND DIGITAL TRANSCEIVER

FTM-310DR

FTM-310DE

Instruction Manual
(APRS Edition)

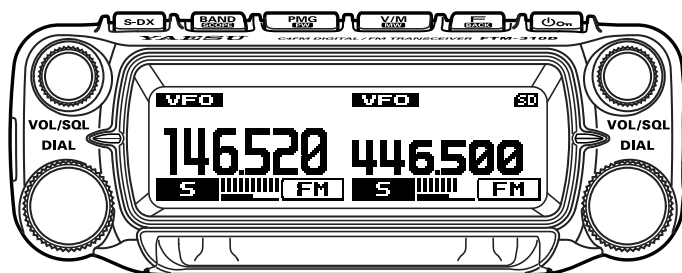


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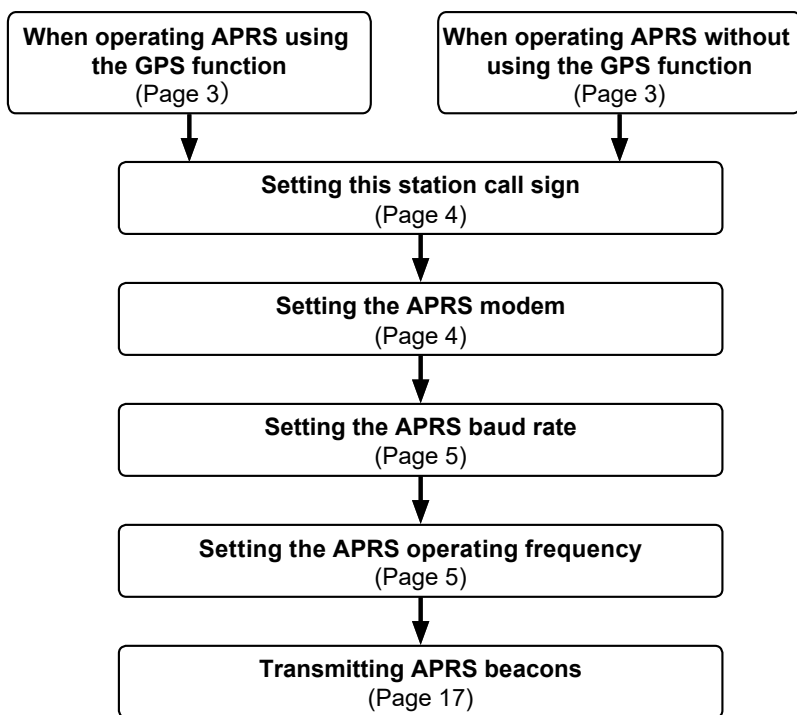
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APRS® initial settings

APRS (Automatic Packet Reporting System) is a communication system to exchange GPS location data and packet messages; it was developed and is supported by Bob Bruninga (WB4APR). Position data may be entered manually in advance or automatically from the built-in GPS satellite receiver.

When an APRS signal is received from a partner station, the direction, distance, speed etc. of the partner station as seen from your own station will be shown on the display of your transceiver.

Initial setting process for APRS operations



When operating APRS using the GPS function

In order to use the GPS satellite data for the station position information, press and hold the  key → [97 MY POSITION SET] → press the Right DIAL knob → rotate the Right DIAL knob to select [GPS].

Factory setting value: GPS

Then proceed to “Setting this station callsign” (Page 4).

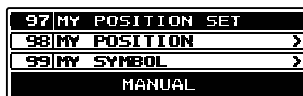
When operating APRS without using the GPS function

When operating APRS without using the GPS function, follow the procedure below to manually set the clock and position information.

• Setting the position information

Enter the station position information manually.

- 1 Press and hold the  key → [97 MY POSITION SET].



- 2 Press the Right DIAL knob.

- 3 Rotate the Right DIAL knob to select [MANUAL] and then press the  key.
Factory setting value: GPS

- 4 Rotate the Right DIAL knob to select [98 MY POSITION] and then press the Right DIAL knob.



- 5 Press the Right DIAL knob.

- 6 Rotate the Right DIAL knob to select “N (North Latitude)” or “S (South Latitude)” press the Right DIAL knob.

- 7 Enter the latitude using the Right DIAL knob.

- 8 After entering the latitude, press and hold the Right DIAL knob.

- 9 Rotate the Right DIAL knob to select “LONGITUDE” and press the Right DIAL knob.

- 10 Rotate the Right DIAL knob to select “E (East Longitude)” or “W (West Longitude)” and press the Right DIAL knob.

- 11 Enter the longitude using the Right DIAL knob.

- 12 After entering the longitude, press and hold the Right DIAL knob.

- 13 Press any key or DIAL knob, other than the  or  key, to save the settings and return to normal operation.

Setting this station callsign

Register this station callsign in order to send and receive messages and to transmit beacons in APRS. Enter the callsign like “W6DXC-9”. The “-9” in the callsign indicates the SSID (Secondary Station Identifier) of which there are 16 types, including one with no SSID. Generally, the SSIDs shown in the table below are used in APRS.

SSID	Description	SSID	Description
(NIL)	Fixed stations that can exchange messages	-8	Marine mobile stations, land mobile stations
-1	1200 bps narrow-to-middle band digipeater	-9	Using the FTM-310DR/DE etc. for mobile applications
-2	9600 bps digipeater	-10	I-Gate station, Internet connection station
-3	1200 bps broadband digipeater	-11	Balloons, aircraft, spacecraft, etc.
-4	Digipeater, mobile station, meteorological station, etc.	-12	1-way tracker station (messages cannot be exchanged)
-5	Operation station using mobile devices (smartphones etc.)	-13	Meteorological station (weather station)
-6	Operation station for satellite communications, events, etc.	-14	Tracking mobile stations
-7	Use of FT5D etc. in handy terminals	-15	Digipeater, mobile station, meteorological station, etc.

- 1 Press and hold the  key → [94 CALLSIGN (APRS)] → press the Right **DIAL** knob.

The text input screen will be displayed.

- 2 Input the callsign and the SSID in the character input screen.
Refer to “Text input screen” (FTM-310DR/DE Operating Manual).
- 3 After entering the callsign, press and hold the Right **DIAL** knob.
- 4 Press any key or **DIAL** knob, other than the  or  key, to save the settings and return to normal operation.

Setting the APRS modem

Turn on the APRS modem to activate the APRS function.

- 1 Press and hold the  key → [77 APRS MODEM].
- 2 Press the Right **DIAL** knob.
- 3 Rotate the Right **DIAL** knob to set to select [ON].
- 4 Press any key or **DIAL** knob, other than the  or  key, to save the settings and return to normal operation.

The display will show “12” (for 1200 bps) or “96” (for 9600 bps) on the display.

• Stop APRS operation

- 1 Set it to [OFF] in step 3 above.

Setting the APRS baud rate

This sets the APRS baud rate.

- 1 Press and hold the  key → [72 DATA SPEED].
- 2 Press the Right **DIAL** knob.
- 3 Rotate the Right **DIAL** knob to select the “**APRS**” and then press the Right **DIAL** knob.
- 4 Rotate the Right **DIAL** knob to select the APRS baud rate.
1200bps: APRS operations using AFSK 1200bps packets
9600bps: APRS operations using GMSK 9600bps packets
- 5 Press any key or **DIAL** knob, other than the  or  key, to save the settings and return to normal operation.

Setting the APRS operating frequency

The customary APRS operating frequency differs depending on the region and country. In the USA, the usual operating frequency is 144.39MHz. Therefore, to begin APRS operations set the frequency to 144.39MHz.

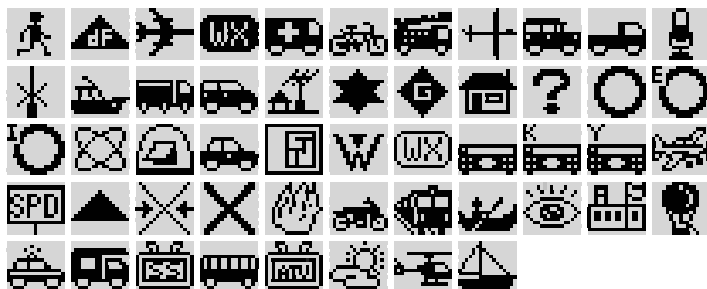
- 1 Setting the APRS operating frequency.
Check that 12 (1200bps) or 96 (9600bps) is displayed on the right-hand side of the frequency.

Other initial settings

Changing the station symbol

This sets the station APRS transmit symbol.

The default setting when shipped from the factory is “ ICON 1 [/>] Car”.



1 Press and hold the  key → [99 MY SYMBOL].

2 Press the Right **DIAL** knob.

3 Rotate the Right **DIAL** knob to select the symbol.

The following four symbol types can be selected as your own symbol: “ICON 1”, “ICON 2”, “ICON 3” and “USER”.

If “USER” is selected, symbol characters can be input directly. * See the following page on how to enter the characters.

4 To use the currently set symbol as is, press any key or DIAL knob, other than the  or  key, to save the settings and return to normal operation.

5 Press the Right **DIAL** knob to change the symbol.

The cursor will move to the “Code” area of the table below.

6 Rotate the Right **DIAL** knob to select “**Code**” and set the symbol to use.

The default value of each symbol is as follows.

MY SYMBOL	Code	Symbol
ICON 1	/>	 Car
ICON 2	/R	 REC.Vehicle
ICON 3	/-	 House QTH (VHF)
USER	YY	 Yaesu Radios

7 Press any key or **DIAL** knob, other than the  or  key, to save the settings and return to normal operation.

• Entering a symbol character directly

You can enter a symbol character directly if the symbol that you want is not available.

1 Press and hold the  key → [99 MY SYMBOL].

2 Press the Right **DIAL** knob.

- 3 Rotate the Right **DIAL** knob to select “USER”, and then press the Right **DIAL** knob.
The cursor will move to the “Code” area.
- 4 Rotate the Right **DIAL** knob to select the Symbol Table ID (character on the left side of the code) and then press the Right **DIAL** knob.
- 5 Rotate the Right **DIAL** knob to select the Symbol Code (character on the right side of “Code”).
- 6 Press any key or **DIAL** knob, other than the  or  key, to save the settings and return to normal operation.

Setting the APRS operating band

Sets the APRS operating band.

It is usually recommended to use the APRS factory default settings.

- 1 Press and hold the  key → [71 DATA BAND].
- 2 Press the Right **DIAL** knob.
- 3 Rotate the Right **DIAL** knob to select “APRS” and then press the Right **DIAL** knob.
- 4 Rotate the Right **DIAL** knob to select the Band to be used for APRS operation:
MAIN BAND: Always operate on the Main Band.
SUB BAND: Always operate on the Sub Band.
A BAND FIX: Send and receive using the operating band at that point.
B BAND FIX: Send and receive using the Sub Band at that point.
 Default: SUB BAND
- 5 Press any key or **DIAL** knob, other than the  or  key, to save the settings and return to normal operation.

Displaying shortcut keys on the screen

Press and hold the **DIAL** knob to display shortcut keys for the following four functions at the bottom of the screen.

Press and hold the **DIAL** knob again to return to the normal screen.



- SLIST → Displays the station list screen. (see page 9)
- MLIST → Displays the message list screen. (see page 22)
- BCN → Switch the beacon transmission method.
☐ or ☐ appears (Auto), ☒ or ☐ disappears (Manual)
- B-TX → Sends out a beacon only once.

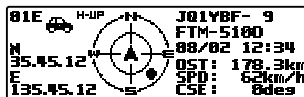
Receiving APRS® beacons

Receiving beacons

• Displaying beacons in the APRS pop-up screen

A alarm will sound when a beacon is received, and the APRS pop-up screen will be displayed.

The contents displayed in the “APRS POP-UP SCREEN” and the “APRS STATION LIST DETAIL SCREEN” to be explained next are basically the same.



Tips

- When receiving a beacon from a station with the same APRS call sign. From the second time onward, the pop-up screen will not be displayed if the status text contained in the beacon is not changed.
- Press and hold the  key → [7 COMPASS] to switch the direction of the compass screen to “HEADING UP” (where the direction of advance of your own station is always displayed on top) or “NORTH UP” (where north is always displayed on top).

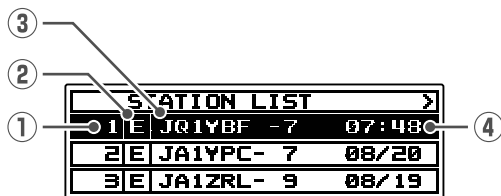
• Displaying beacons in the APRS STATION LIST detail screen

- 1 Press and hold the  key → [104 STATION LIST] → press the Right **DIAL** knob. The APRS STATION LIST screen will be displayed.
- 2 Rotate the Right **DIAL** knob to select the beacon whose details you want to review.
- 3 Press the Right **DIAL** knob to display the details screen. Rotate the Right **DIAL** knob to scroll the screen.
- 4 Press the  key.
Returns the screen to the APRS STATION LIST screen.

Tips

- When [75 APRS FILTER] is set to on, a received beacon matching the filter setting will be stored and shown on the display.
- The receive audio (beacon or voice etc.) of B band when APRS is operating may be muted by setting [78 APRS MUTE] in the setup menu.
- The reception of an APRS beacon is notified by a ringing sound set in [80 APRS RINGER] in the setup menu. If “OFF” is selected, no audio alarm will sound upon receiving a beacon.

Description of the APRS STATION LIST screen and operations



- ① **Number:** Received beacons (up to a maximum of 100) will be displayed, starting with the most recent one received.
- ② **Character:** The station list characters will be displayed.
Refer to the following page for details.
- ③ **Station name:** The callsign or object name / item name of the received beacon will be displayed.
- ④ **Time or date:** Time (HH:MM) or date (MM/DD) will be displayed. The time display will change the date display on the following day.

• Operation

Scroll the screen	Rotate the Right DIAL knob.
Move to the "APRS STATION LIST" detail screen (page 12)	Rotate the Right DIAL knob to select the beacon whose details you want to see and press the Right DIAL knob.
Move to the top of the APRS STATION LIST	Press the Left DIAL knob → [TOP]
Replying messages (page 28)	Press the Left DIAL knob → [RPLY]
Manual transmission of a beacon (page 18)	Press the Left DIAL knob → [B-TX]
Move to the APRS MESSAGE LIST screen (page 22)	Press the Left DIAL knob → [MLIST]
Displays the setup menu "102 SORT FILTER"	Press the Left DIAL knob → [FLTR]
Sorts the APRS Station List	Press the Left DIAL knob → [SORT]
Switch ON / OFF of automatic beacon transmission	Press the Left DIAL knob → [BCN]
Displays the GPS Information display	Press the Left DIAL knob → [GPS]
Delete a selected beacon station from the display (page 11)	Press the Left DIAL knob → [DEL]
Display QUERY (Command: ?APRSP) message	Press the Left DIAL knob → [QUERY]
Sets the frequency of the opposite band of the APRS operating band according to the frequency information included in the beacon.	Press the Left DIAL knob → [QSY]

• Description of Station List Character

Examples of 15 types of station list characters are described here. Refer to the description page listed on the table for the detail screen.

STATION LIST			
1	E	JQ1YBF -7	07:48
2	E	JA1YPC- 7	08/20
3	E	JA1ZRL- 9	08/19

Display	Description
E	Mic-E: Displayed when a beacon of a Mic-E station is received
P	Position: Displayed when the beacon from a fixed station (FIXED) or a mobile station (MOVING) is received
p	Position: Displayed when the beacon of a fixed station (FIXED) or a mobile station (MOVING) is received (compression type)
W	Weather report: Displayed when the beacon of a meteorological station is received
w	Weather report: Displayed when the beacon of a meteorological station is received (compression type)
O	Object: Displayed when the beacon of an object station is received
o	Object: Displayed when the beacon of an object station is received (compression type)
I	Item: Displayed when the beacon of an item station is received
i	Item: Displayed when the beacon of an item station is received (compression type)
K	Killed Object/Item: Displayed when a deleted object station or item station is received
k	Killed Object/Item: Displayed when a deleted object station or item station is received (compression type)
S	Status: Displayed when the beacon of a status station is received
G	Raw NMEA: Displayed when Raw NMEA data (GGA / GGL / RMC) is received
?	Other: Displayed when a beacon that cannot be interpreted is received
Emg	Displayed when an emergency signal from a Mic-E station is received

Tips

- When the transceiver is turned ON, if the detail screen is displayed before the GPS satellites are acquired, the position arrow and distance will not be displayed.
- If GPS satellite information is no longer available due to obstructions such as buildings, tunnels, etc., the most recently acquired coordinates (position arrow, latitude / longitude, distance) will be displayed. The accurate position information will be displayed again when you move to a position that can be located.

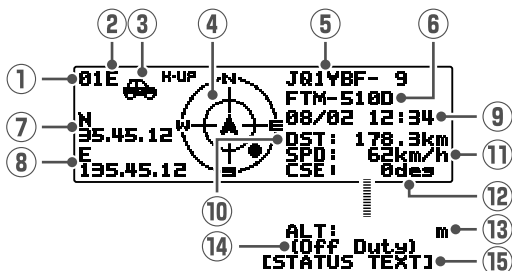
Deleting a beacon station from the list

A beacon station which is no longer required can be deleted from the list by selecting it on the APRS STATION LIST screen.

- 1** Press and hold the  key → [104 STATION LIST] → press the Right **DIAL** knob.
The APRS STATION LIST screen will be displayed.
- 2** Rotate the Right **DIAL** knob to select the beacon.
- 3** Press the Left **DIAL** knob.
- 4** Rotate the Left **DIAL** knob to select [DEL], then press the Left **DIAL** knob.
A confirmation message “DELETE?” will appear in the display.
- 5** Rotate the Left **DIAL** knob to select [OK], then press the Left **DIAL** knob.
The callsign will be deleted from the list.

• Explanation of the detail screen display in an E (Mic-E) APRS STATION LIST and description of operations

Rotate the Right **DIAL** knob in the APRS STATION LIST screen to select the “E” station and press the Right **DIAL** knob to display the E (Mic-E) detailed screen.



- ① **Number:** The number of received beacon (up to a maximum of 100).
- ② **Character:** The station list characters will be displayed.
- ③ **Symbol:** The symbol of the radio station will be displayed.
- ④ **Compass:** The direction of the partner station as seen from your own station will be displayed.
- ⑤ **Callsign:** The received station callsign will be displayed.
- ⑥ **Type code:** The type code used by the partner station will be displayed (Mic-E, McE-Trk, McE-Msg and model name of the radio, etc.)
- ⑦ **Latitude:** The N (north latitude) or S (south latitude) of the current position will be displayed (DDMM.MM or DDMMSS).
- ⑧ **Longitude:** The E (east longitude) or W (west longitude) of the current position will be displayed (DDMM.MM or DDMMSS).
- ⑨ **Date/Time:** The date the beacon was received (MM/DD) will be displayed.
The time the beacon was received (HH:MM) will be displayed.
- ⑩ **Distance:** Distance to the received station will be displayed.
- ⑪ **Speed:** The moving speed of the partner station will be displayed.
- ⑫ **Direction:** The direction of movement of the partner station will be displayed.
- ⑬ **Altitude:** The altitude of the partner station will be displayed.
- ⑭ **Position comment:**
The position comments of the partner station will be displayed.
When an emergency message is received, the message (Emergency!) is displayed and a sound will be repeated 12 times.
- ⑮ **STATUS TEXT:** The comments information will be displayed.

• Operation

Scroll the screen	Rotate the Right DIAL knob.
Select the beacon to display	Press the Right DIAL knob to display  then rotate the Right DIAL knob.
Move to the top of the detail screen display	Press the Left DIAL knob → [TOP]
Send a message to a beacon station	Press the Left DIAL knob → [RPLY]
Display the packet data (raw data)	Press the Left DIAL knob → [RAW]
Manual transmission of a beacon (page 18)	Press the Left DIAL knob → [B-TX]
Delete a selected beacon station from the display (page 11)	Press the Left DIAL knob → [DEL]
Sets the frequency of the opposite band of the APRS operating band according to the frequency information included in the beacon.	Press the Left DIAL knob → [QSY]

APRS reception pop-up setting

This sets the display time of the pop-up that appears when an APRS beacon and message is received.

- 1 Press and hold the  key → [79 APRS POPUP] → Press the Right **DIAL** knob.
- 2 Rotate the Right **DIAL** knob to select [BEACON] or [MESSAGE], then press the Right **DIAL** knob.
- 3 Rotate the Right **DIAL** knob to select the pop-up time when a beacon or message is received, then press the  key.

Factory default value: 10 sec

OFF	The display will not change even if a beacon or message is received.
3 sec, 5 sec, 10 sec	Select the pop-up screen (compass screen or message screen) time.
HOLD	The pop-up screen (compass screen or message screen) will continue to be displayed until you perform a key press.
CALL 3sec, CALL 5sec, CALL 10sec	Select the display time for the call sign screen. Pop-up screens (compass screen and message screen) will not be displayed.
CALL HOLD	The call sign screen will continue to be displayed until you perform a key press. Pop-up screens (compass screen and message screen) will not be displayed.

- 6 Rotate the Right **DIAL** knob to select [MY PACKET], then press the Right **DIAL** knob.
- 7 Rotate the Right **DIAL** knob to select the pop-up ON/OFF of your own station's transmission beacon (relayed signal).

Factory default value: OFF

- 8 Press any key or **DIAL** knob, other than the  or  key, to save the settings and return to normal operation.

Display to notify reception of the same beacon or message

When receiving the same beacon or message from the same partner station, the following screen is displayed. The display time is according to the setting in “79 APRS POPUP” of the setup menu in the previous section.



The first two alphabetical characters displayed in front of the callsign of the partner station contain the following meaning.

First digit

- N** = New: New signal
- D** = Duplicate: Received signal
- A** = ACK: Message ACK signal (page 29)
- R** = Reject: Message REJ signal (page 24)
- O** = Other: Message to other stations

Second digit

- E** = Mic-E: Beacon of a mike encoder station
- P** = Position: Beacon of a fixed station (FIXED) / mobile station (MOVING)
- p** = Position: Beacon of a fixed station (fixed) / mobile station (moving) (compression type)
- W** = Weather report: Beacon of a meteorological station
- w** = Weather report: Beacon of a meteorological station (compression type)
- O** = Object: Beacon of an object station
- o** = Object: Beacon of an object station (compression type)
- I** = Item: Beacon of an item station
- i** = Item: Beacon of an item station (compression type)
- K** = Killed Object/Item: Deleted object station / item station
- k** = Killed Object/Item: Deleted object station / item station (compression type)
- S** = Status: Beacon of a status station
- M** = Message
- G** = Raw NMEA: Beacon of a Raw NMEA
- ?** = Other: Beacon that could not be interpreted

Audio notification of a beacon or message received APRS RINGER function

An audio notification can be set to sound when an APRS beacon arrives from a partner station.

- 1** Press and hold the  key → **[80 APRS RINGER]** → Press the Right **DIAL** knob.
- 2** Rotate the Right **DIAL** knob to select the item to be set, and then press the Right **DIAL** knob.

Please refer to the list of setup menu actions (page 35) for the details of each item.

TX BEACON: OFF / ON

TX MESSAGE: OFF / ON

RX BEACON: OFF / ON

RX MESSAGE: OFF / ON

MY PACKET: OFF / ON

CALL RINGER: OFF / ON

RANGE RINGER: OFF / 1km - 100km

MSG VOICE: OFF / ON

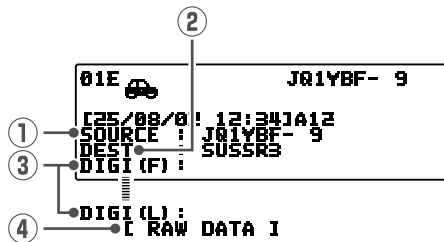
- 3** Rotate the Right **DIAL** knob to select "ON" or "OFF", then press the  key.
- 4** Repeat step 2 and 3 to set the remaining items.
- 5** Press any key or **DIAL** knob, other than the  or  key, to save the settings and return to normal operation.

Displaying RAW packet data

Display the packet data (raw data) of the partner station from the APRS STATION LIST detail screen.

- 1 Press and hold the  key → [104 STATION LIST] → press the Right **DIAL** knob.
The APRS STATION LIST screen will be displayed.
- 2 Rotate the Right **DIAL** knob to select the beacon, then press the Right **DIAL** knob.
A detail screen of the APRS STATION LIST will appear in the display.
- 3 Press the Left **DIAL** knob.
- 4 Rotate the Left **DIAL** knob to select the [RAW], then press the Left **DIAL** knob.
The RAW packet data will appear in the display.
Rotate the Right **DIAL** knob to scroll the screen display.
- 5 Press the  key to return to the detail screen.

Details of RAW packet data display screen



- ① SOURCE information: View the source address information of AX.25.
- ② Destination information: View the destination address information of AX.25.
- ③ Digipeater information: View the relay station (digipeater) information.
- ④ RAW TEXT: View the text of raw data.

Tips

- For transmit messages, information on DIGI (First) and DIG (Last) will not be displayed ("-") will be displayed) as the digipeater information is not saved.
- When a 3rd Party Header Beacon (beacon from I-Gate and others) is received, the route information included in the text of the 3rd Party Header Beacon will be displayed instead of the information obtained from the AX.25 packet signal.

Transmitting APRS® beacons

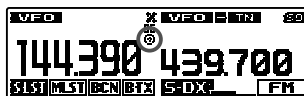
Transmitting an APRS beacon automatically

An APRS beacon can be sent automatically at a fixed interval.

- 1 Press and hold the  key → [86 BEACON TX SET] → Press the Right **DIAL** knob.
- 2 Rotate the Right **DIAL** knob to select the [AUTO], then press the Right **DIAL** knob.
- 3 Rotate the Right **DIAL** knob to select the “ON” or “SMART”, then press the Right **DIAL** knob.
- 4 Rotate the Right **DIAL** knob to select the [INTERVAL], then press the Right **DIAL** knob.
- 5 Rotate the Right **DIAL** knob to select the transmission interval can be selected from the following times.
30sec / 1min / 2min / 3min / 5min / 10min / 15min / 20min / 30min / 60min
Factory default value: 5 min
- 6 Press any key or **DIAL** knob, other than the  or  key, to save the settings and return to normal operation.

The beacon transmission setting on the APRS Station List screen is displayed with the following icon:

- No display (OFF):** Only when select the [107 BEACON TX], then press the Right **DIAL** knob will the APRS beacon of your station be transmitted (with the default settings).
- ☒ **appears (AUTO):** Automatically transmit the APRS beacon of your own station at a 5-minute interval.
- ☐ **appears (SMART):** Transmit automatically with the SmartBeaconing™ function*



*(Refer to “Setting the SmartBeaconing™” (Page 18) on the details of the SmartBeaconing™ function.)

Tip

- If Setup Menu [101 SmartBeaconing] is set to TYPE1, TYPE2 or TYPE3, the setting of the BEACON INTERVAL will be ignored.
- If the squelch is open when the specified time has passed to transmit a beacon, the beacon transmission is delayed. The beacon will be sent when the squelch is closed.

Setting the SmartBeaconing™

SmartBeaconing™ is a function that efficiently transmits an APRS beacon including your own station position, speed and direction of travel. The information is based on data from a GPS satellite receiver unit.

This device supports automatic beacon transmission using SmartBeaconing™. Three SmartBeaconing™ settings (TYPE1, TYPE2 and TYPE3) are available.

If different timing settings are needed, the TYPE1 - TYPE3 parameters can also be changed. In order to ensure that beacons can be transmitted in an appropriate manner, adjust the parameters and DIGI PATH settings of the SmartBeaconing™ function for efficient operation and reduced signal congestion.

1 Press and hold the  key → **[101 SmartBeaconing]** → Press the Right **DIAL** knob.

2 Press the Right **DIAL** knob, then rotate the Right **DIAL** knob to select TYPE.

OFF: Turn the SmartBeaconing™ function OFF.

TYPE1 / TYPE2 / TYPE3: Turn the SmartBeaconing™ function ON.

Factory default value:

STATUS: OFF

STATUS	TYPE1	TYPE2	TYPE3
LOW SPEED	5	5	5
HIGH SPEED	70	70	70
SLOW RATE	30min	30min	30min
FAST RATE	120sec	120sec	120sec
TURN ANGLE	28°	28°	28°
TURN SLOPE	26	26	26
TURN TIME	30sec	30sec	30sec

3 Press any key or **DIAL** knob, other than the  or  key, to save the settings and return to normal operation.

Tip

Set STATUS to TYPE1, TYPE2 or TYPE3; set **[97 MY POSITION SET]** to "GPS"; and set the "AUTO" in the **[86 BEACON TX SET]** to "SMART" to activate the SmartBeaconing™ function.

*SmartBeaconing™ is a function provided by HamHUD Nichetronix.

Transmitting an APRS beacon manually

1 Press and hold the  key → **[86 BEACON TX SET]** → Press the Right **DIAL** knob.
The APRS beacon will be transmitted.

On the APRS STATION LIST screen or the APRS STATION LIST details screen, a beacon may be sent manually by pressing the Left **DIAL** knob → **[B-TX]** → then press the Left **DIAL** knob.

Tip

When using the GPS function in APRS operations, be sure to check that **[97 MY POSITION SET]** is set to "GPS". A beacon cannot be transmitted if GPS data cannot be captured.

Registering status text

A maximum of up to 60 characters can be registered for 5 types of status comment.
The following characters can be entered.

- 1 Press and hold the  key → **[85 BEACON STATUS TEXT]** → Press the Right **DIAL** knob.
- 2 Press the Right **DIAL** knob, then rotate the Right **DIAL** knob to select “**TEXT 1**” to “**TEXT 5**”.
- 4 Press the  key.
- 5 Rotate the Right **DIAL** knob to select “**TX RATE**” and press the Right **DIAL** knob.
- 6 Rotate the Right **DIAL** knob to select the TX RATE.
Select the rate from 1/1 (every time) to 1/8 (once in 8 times).
When select to 1/2(FREQ) to 1/8(FREQ), the status text is sent once every set number of times and the frequency information is sent each time.
- 7 Press the  key.
- 8 Rotate the Right **DIAL** knob to select “**TEXT 1**” to “**TEXT 5**”, then press the Right **DIAL** knob.
The screen for selecting the embedded information in the status text will be displayed.
NONE: No data will be embedded in the status text.
FREQUENCY: The frequency on the band opposite from the APRS operating band will be automatically embedded in the status text.
FREQ & SQL & SHIFT: The band frequency on the band opposite from the APRS operating band and information such as the tone (squelch), shift, etc. will be automatically embedded in the status text.
- 9 Press the Right **DIAL** knob, then rotate the Right **DIAL** knob to select **[NONE]**, **[FREQUENCY]** or **[FREQ & SQL & SHIFT]**, then press the Right **DIAL** knob.
The screen for editing text will be displayed.
The text contents will be displayed if text was already entered.
- 10 Enter the text.
Refer to “Text input screen” (FTM-310DR/DE Operating Manual) on how to enter text.
- 11 Press and hold the Right **DIAL** knob.
- 12 Press any key or **DIAL** knob, other than the  or  key, to save the settings and return to normal operation.

When entering status text, a colon symbol (:) will appear in the 21st, 29th and 43rd characters. When entering a long text that exceeds the position of this colon, the text may not be displayed in certain models. Enter a text that is shorter than the colon position as much as possible.

Selecting a position comment

This selects the position comment (standard message) to be incorporated into your own station beacon.

- 1 Press and hold the  key → **[100 POSITION COMMENT]** → Press the Right **DIAL** knob.
- 2 Rotate the Right **DIAL** knob to select the position comment.
Select the position comment from the following list.
Off Duty / En Route / In Service / Returning / Committed / Special / Priority / Custom 0 - Custom 6 / EMERGENCY!
Factory setting value: Off Duty
- 3 Press any key or **DIAL** knob, other than the  or  key, to save the settings and return to normal operation.

Caution

Never select "Emergency!" unless emergency aid is required e.g. accidents and disasters etc.
In the event an emergency message is sent out by mistake, select a position comment other than "Emergency!" and send another packet. Do not turn the radio OFF.

Setting the digipeater route

A digipeater is a station that relays packets such as beacons. The following 8 types of digipeater routes can be selected for use in the device.

Route	Number of relay steps	Address	Format
OFF	0	—	—
WIDE 1-1	1	Configured (settings cannot be changed)	New-Paradigm format*
WIDE 1-1, WIDE 2-1	2	Configured (settings cannot be changed)	New-Paradigm format*
PATH 1	Maximum 2	Any	Any
PATH 2	Maximum 2	Any	Any
PATH 3	Maximum 2	Any	Any
PATH 4	Maximum 2	Any	Any
FULL 1	Maximum 8	Any	Any
FULL 2	Maximum 8	Any	Any

When "WIDE 1-1, WIDE 2-1" is selected, the beacon is initially relayed to the digipeater station at the first location as specified in WIDE 1-1, and then it is relayed to the digipeater at the second location as specified in WIDE 2-1.

As of 2013, digipeater stations used in APRS are recommended to operate in the New-Paradigm format*. As the number of supporting digipeater stations is the largest, the default setting of this radio is therefore set to "WIDE 1-1, WIDE 2-1" when shipped from the factory on the assumption of a digipeater station operating in the New-Paradigm method. It is recommended that you operate the transceiver without changing the setting. When using other relay methods, select either PATH 1 to PATH 4, FULL 1 or FULL 2, and enter the address of the digipeater used for that route.

*Refer to the following website for details on the New-N Paradigm method.
<http://aprs.org/fix14439.html>.

Caution

When too many relay steps are set, the beacons transmitted from the same station are repeatedly relayed, resulting in signal congestion on the APRS channel. Use the default settings as far as possible.

- 1 Press and hold the  key → **[87 DIGI PATH]** → Press the Right **DIAL** knob.
- 2 Rotate the Right **DIAL** knob to select the DIGI PATH.
Select the DIGI PATH from OFF / WIDE1-1 / WIDE1-1,WIDE2-1 / PATH 1 / PATH 2 / PATH 3 / PATH 4 / FULL 1 / FULL 2
WIDE1-1 and WIDE1-1,WIDE2-1 are fixed values.
The relay method etc. can be entered for PATH 1 - PATH 4 / FULL 1 / FULL 2.
- 3 Press any key or **DIAL** knob, other than the  or  key, to save the settings and return to normal operation.

Setting the address of the digipeater route

After selecting PATH 1 - PATH 4 / FULL 1 / FULL 2 under **[87 DIGI PATH]** in the set-up menu, enter the specific address information (callsign and ALIAS).

A maximum of 2 addresses for PATH 1 - PATH 4, and a maximum of 8 addresses for FULL 1 - FULL 2 can be registered.

Example: Enter the address information of PATH 1

- 1 Press and hold the  key → **[88 DIGI PATH 1]** → Press the Right **DIAL** knob.
Switch to the address selection screen.
- 2 Rotate the Right **DIAL** knob to select the **[ADDRESS 1]**, then press the Right **DIAL** knob.
The address input screen will be displayed.
- 3 Enter the address.
Refer to "Text input screen" (FTM-310DR/DE Operating Manual) on how to enter text.
- 4 Press and hold the Right **DIAL** knob.
The entered callsign will be displayed in the setting field under **[ADDRESS 1]**.
- 5 Rotate the Right **DIAL** knob to select the **[ADDRESS 2]**, then press the Right **DIAL** knob.
- 6 Enter the address.
- 7 Press and hold the Right **DIAL** knob.
The entered callsign will be displayed in the setting field under **[ADDRESS 2]**.
- 8 Press any key or **DIAL** knob, other than the  or  key, to save the settings and return to normal operation.

APRS® message screen and operating instructions

Description of the APRS MESSAGE LIST screen and operations

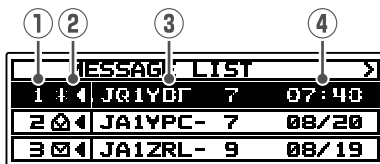
Text messages can be sent and received separately from beacons in APRS.

Replies can be sent in response to messages received, and standard messages saved in the memory can also be selected to be sent as replies.

A maximum of up to 100 sent and received messages can be saved in a common list in the memory.

Checking messages

- 1 Press and hold the  key → [105 MESSAGE LIST] → Press the Right **DIAL** knob.
The MESSAGE LIST screen will be displayed.
- 2 Rotate the Right **DIAL** knob to select the message to be displayed.
- 3 Press the Right **DIAL** knob.
The selected message will be displayed.
- 4 Press the  key.
Returns to the MESSAGE LIST screen.



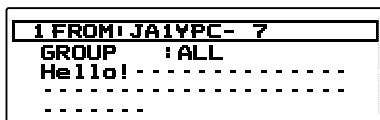
- ① **Number:** The number of the message received or transmitted will be displayed.
- ② **Receive/Transmit:** One of the following icons is displayed during message reception and transmission.
-  Messages received (unread)
 -  Messages received (read)
 -  Messages transmitted (ACK received)
 -  Messages transmitted (ACK not received)
 -  Transmission message (transmission not complete)*
*(The figure is the remaining transmission count)
- ③ **Callsign:** The received or transmitted callsign will be displayed.
- ④ **Time or date:** The message receive or transmit time (HH:MM) or date (MM/DD) will be displayed.

•Operation

Scroll the screen.	Rotate the Right DIAL knob
Move to the top of the list.	Press the Left DIAL knob → [TOP]
Display the screen for editing the reply message.	Press the Left DIAL knob → [RPLY]
The message will be transmitted by force.	Press the Left DIAL knob → [SEND]
Move to the STATION LIST screen.	Press the Left DIAL knob → [SLST]
The message will be read out loud. (Required the optional FVS-2.)	Press the Left DIAL knob → [VOIC]
Display the message input screen.	Press the Left DIAL knob → [EDIT]

Receiving messages

When a message is received, a pop-up screen appears, together with a audio alarm, followed by the screen below.



When the message screen is displayed, touching the screen will take you to the reply message editing screen for the received message, allowing you to reply easily. For instructions on how to enter messages, see “Creating and sending messages” (page 27).

Tips

- An alarm will sound when a message ACK is received and the “AM>(callsign)” will be displayed on the screen.
- An alarm will sound when a message REJ (reject) is received and the “RM>(callsign)” will be displayed on the screen.

Filter setting for messages received

The group filter for receiving messages and bulletin messages from specific groups (ALL, CQ, QST, YAESU etc.) can be set.

- 1 Press and hold the  key → [95 MESSAGE GROUP] → Press the Right **DIAL** knob.
- 2 Rotate the Right **DIAL** knob to select the group filter, then press the Right **DIAL** knob.
 - GROUP 1: ALL*****
 - GROUP 2: CQ*****
 - GROUP 3: QST*****
 - GROUP 4: YAESU****
 - GROUP 5: -----
 - GROUP 6: -----
 - BULLETIN 1: BLN?*****
 - BULLETIN 2: BLN?
 - BULLETIN 3: BLN?

“GROUP 1: ALL”, “GROUP 2: CQ”, “GROUP 3: QST”, “GROUP 4: YAESU”, “GROUP 5 (any)” and “GROUP 6 (any)” can be selected for the group code. For bulletin, “BULLETIN 1” to “BULLETIN 3” can be selected.

- 3 Enter the text.

Refer to “Text input screen” (FTM-310DR/DE Operating Manual) on how to enter text. A maximum of up to 9 characters can be entered.
- 4 Press and hold Right **DIAL** knob.
- 5 Press any key or **DIAL** knob, other than the  or  key, to save the settings and return to normal operation.

When a group or bulletin message is received, screens like the following are displayed:

Tips

- The receive audio (beacon or voice etc.) of RX Band when the APRS is operating, in can be muted by setting [78 APRS MUTE] is set to ON in the setup menu.
- The display method and time when an APRS beacon is received can be set by the [79 APRS POPUP] setting in the setup menu.
- If the RX MESSAGE in [80 APRS RINGER] is set to ON in the setup menu, an audio notification will be given when a message / group message / bulletin message etc. addressed to your APRS station is received. If RX MESSAGE is set to OFF, the message will appear in the display without any audio alarm.
- Messages that differ only in the SSID that are addressed to your own station callsign can also be received. However, a reply to the acknowledgment receipt will only be sent if all the characters including the SSID are the same.

Deleting a message from the list

Unwanted messages on the APRS MESSAGE screen can also be deleted.

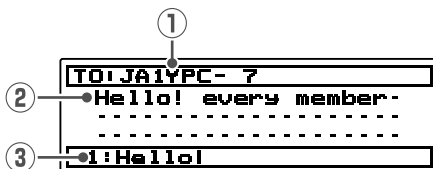
- 1 Press and hold the  key → [105 MESSAGE LIST] → Press the Right **DIAL** knob.
The APRS MESSAGE LIST screen will be displayed.
- 2 Rotate the Right **DIAL** knob to select the message to delete.
- 3 Press the Left **DIAL** knob.
- 4 Rotate the Left **DIAL** knob to select [DEL], then press the Left **DIAL** knob.
A confirmation message “DELETE?” will appear in the display.
- 5 Rotate the Left **DIAL** knob to select [OK], then press the Left **DIAL** knob.
The message will be deleted.

Transmitting APRS® messages

Message edit screen and description of operations

To display the Message Edit screen. Press the Left **DIAL** knob → **[EDIT]** on the APRS MESSAGE detail screen → Press the Left **DIAL** knob.

The transmitted or received message can be edited and transmitted in the Message Edit screen.



- ① **Callsign:** The callsign of the destination will be displayed.
- ② **Message:** A maximum of up to 67 characters can be entered in a transmission message.
- ③ **Standard Message:** Rotate the Left **DIAL** knob to select the standard message and press and hold the Left **DIAL** knob to paste the standard message at the cursor position.

•Operation

Display the screen for entering the message text.	Press the Left DIAL knob → [TEXT]
Insert a space at the cursor position.	Press the Left DIAL knob → [INS]
Delete the character to the left of the cursor.	Press the Left DIAL knob → [X]
Deleting all texts	Press the Left DIAL knob → [CALL]
Manually send the message.	Press the Left DIAL knob → [M-TX]
Enter the callsign of the destination will	Press the Left DIAL knob → [CALL]

Text containing a maximum of 67 characters can be sent as an APRS message in this device.

Creating and sending messages

- 1** Press and hold the  key → **[105 MESSAGE LIST]** → Press the Right **DIAL** knob.
The APRS MESSAGE LIST screen will be displayed.
- 2** Press the Left **DIAL** knob.
- 3** Rotate the Left **DIAL** knob to select the **[EDIT]**, then press the Left **DIAL** knob.
The display will change to the APRS MESSAGE EDIT screen.
- 4** Press the Left **DIAL** knob.
 - Rotate the Left **DIAL** knob to select the **[CALL]**, then press the Left **DIAL** knob.
 - The display will change to the callsign input screen.
- 5** Input the callsign of the destination station.
Refer to “Text input screen” (FTM-310DR/DE Operating Manual) on how to enter the callsign.
- 6** Press and hold the Right **DIAL** knob.
Return to the APRS MESSAGE EDIT screen.
- 7** Press the Left **DIAL** knob → rotate the Left **DIAL** knob to select the **[TEXT]** → press the Left **DIAL** knob.
The screen for editing text will be displayed.
- 8** Enter the text.
 - Refer to “Text input screen” (FTM-310DR/DE Operating Manual) on how to enter text.
 - A maximum of up to 67 characters can be entered.
- 9** Press and hold the Right **DIAL** knob.
Return to the APRS MESSAGE EDIT screen.
- 10** Press the Left **DIAL** knob.
- 11** Rotate the Left **DIAL** knob to select the **[M-TX]**, then press the Left **DIAL** knob.
The message will be sent and the display will return to the frequency screen.

Tip

The data transmission delay time can be changed using the **[82 APRS TX DELAY]** setting in the setup menu.

- **Use fixed text to write a message**

A character string registered in advance can be appended to a message text.
Refer to “Registering a standard message” for the registration method.

- 1 Follow Steps 1 - 6 in “**Creating and sending messages**” (page 27).
- 2 Rotate the Left **DIAL** knob to select a standard message, then press and hold the Left **DIAL** knob to insert the standard message.
- 3 Press the Left **DIAL** knob.
- 4 Rotate the Left **DIAL** knob to select the **[M-TX]**, then press the Left **DIAL** knob.
The message will be sent and the display will return to the frequency screen.

- **Registering a standard message**

8 standard messages containing a maximum of 16 characters each can be registered in this device.

- 1 Press and hold the  key → **[76 APRS MSG TEXT]** → Press the Right **DIAL** knob.
- 2 Rotate the Right **DIAL** knob to select the message number to register and press the Right **DIAL** knob.
A screen for editing the fixed text message will be displayed.
- 3 Entering a fixed text message.
Refer to “Text input screen” (FTM-310DR/DE Operating Manual) on how to enter a fixed text message.
A maximum of up to 16 characters can be entered.
- 4 Press and hold the Right **DIAL** knob.
The fixed text message will be registered.
- 5 Press any key or **DIAL** knob, other than the  or  key, to save the settings and return to normal operation.

Using the reply function

You can also reply to a station that has sent an APRS message.

- 1 Rotate the Right **DIAL** knob to select the partner station, then press the Right **DIAL** knob.
Select the partner station to reply to in the APRS MESSAGE LIST screen.
- 2 Press the Left **DIAL** knob.
- 3 Rotate the Left **DIAL** knob to select the **[RPLY]**, then press the Left **DIAL** knob.
The display will change to the APRS MESSAGE EDIT screen.
- 6 Enter the characters
Enter the message according to the procedure in “**Creating and sending messages**” (page 27) and “**Use fixed text to write a message**” (page 28).
- 7 Press the Left **DIAL** knob.
- 8 Rotate the Left **DIAL** knob to select the **[M-TX]**, then press the Left **DIAL** knob.
The message will be sent and the display will return to the frequency screen.

• Message receipt acknowledgment (ACK)

When a message is sent to a specific partner station, an ACK packet (receipt acknowledgment) will be returned to acknowledge receipt of the message by the partner station. The transmission process ends with an audio alarm to acknowledge receipt when an ACK packet is returned by the partner station. When an ACK packet is not returned by the partner station for one minute, the same message will be resent. The status will change to TX OUT if an ACK packet is not returned by the partner station even after resending the message 4 times. The remaining transmission count of the acknowledgment receipt will appear in the APRS MESSAGE LIST screen as shown below. The remaining transmission count can also be checked by pressing the **DIAL** knob to change to the transmit detail screen.

Remaining count display example

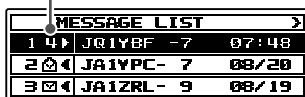
Show "*" when ACK is received



MESSAGE LIST			
1	4	JQ1YBF -7	07:48
2	4	JA1YPC- 7	08/20
3	4	JA1ZRL- 9	08/19

APRS MESSAGE LIST Screen
(display when an acknowledgment is received)

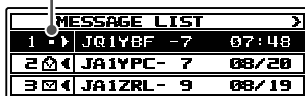
Show the number of remaining transmissions



MESSAGE LIST			
1	4	JQ1YBF -7	07:48
2	4	JA1YPC- 7	08/20
3	4	JA1ZRL- 9	08/19

APRS MESSAGE LIST Screen
(when the number of transmissions remaining is four)

Show "•" during TX OUT



MESSAGE LIST			
1	•	JQ1YBF -7	07:48
2	4	JA1YPC- 7	08/20
3	4	JA1ZRL- 9	08/19

APRS MESSAGE LIST Screen
(display during TX OUT)

Tip

A maximum of 100 messages can be displayed in the APRS screen, with the oldest messages being deleted automatically if the number exceeds 100. As a result, when a new message is received, messages that were not resent 5 times may be deleted.

APRS Setup menu List

Menu Number / Item	Description	Selectable options (Options in bold are the default settings)
74 APRS DESTINATION	Model code display Non-editable.	APY310 (FIX)
75 APRS FILTER	Filter function settings.	Mic-E: ON / OFF POSITION: ON / OFF WEATHER: ON / OFF OBJECT: ON / OFF ITEM: ON / OFF STATUS: ON / OFF OTHER: ON / OFF RANGE LIMIT: OFF / 1 / 10 / 100 / 1000 / 3000 (km / mi) ALTNET: ON / OFF
76 APRS MESSAGE TEXT	Standard message text input.	1 to 8 channels
77 APRS MODEM	Set APRS function ON/OFF.	OFF / ON
78 APRS MUTE	Set audio mute for APRS band.	OFF / ON
79 APRS POPUP	Beacons and messages Pop-up display time setting.	BEACON: OFF / 3sec / 5sec / 10sec / HOLD CALL 3sec / CALL 5sec CALL 10sec / CALL HOLD MESSAGE: OFF / 3sec / 5sec / 10sec / HOLD CALL 3sec / CALL 5sec CALL 10sec / CALL HOLD MYPACKET: OFF / ON
80 APRS RINGER	Set bell sound when beacons are received.	TX BEACON: ON / OFF TX MESSAGE: ON / OFF RX BEACON: ON / OFF RX MESSAGE: ON / OFF MY PACKET: ON / OFF CALL RINGER: ON / OFF RANGE RINGER: OFF / 1 / 5 / 10 / 50 / 100 (km / mi) MSG VOICE: ON / OFF
81 APRS RINGER (CS)	Call sign setting for CALL RINGER.	1 - 8 stations
82 APRS TX DELAY	Data transmit delay time setting.	100ms / 150ms / 200ms / 250ms / 300ms / 400ms / 500ms / 750ms / 1000ms
83 APRS UNITS	APRS display unit settings.	POSITION: dd°mm.mm' / dd°mm'ss" DISTANCE: km* / mile* SPEED: km/h* / mph* / knot* ALTITUDE: m* / ft* BARO: hPa* / mb* / mmHg* / inHg* TEMP: °C* / °F* RAIN: mm* / inch* WIND: m/s* / mph* / knot* *(Depends on the transceiver version)
84 BEACON INFORMATION	Transmit beacon information settings.	AMBIGUITY: OFF / 1 digit / 2 digits / 3 digits / 4 digits SPEED/COURSE: ON / OFF ALTITUDE: ON / OFF

Menu Number / Item	Description	Selectable options (Options in bold are the default settings)
85 BEACON STATUS TEXT	Status text input settings.	SELECT: OFF / TEXT 1 - 5 TX RATE: 1/1 - 1/8 / 1/2(FREQ)- 1/8(FREQ) TEXT 1 - 5: NONE / FREQUENCY / FREQ & SQL & SHIFT
86 BEACON TX SET	Beacon automatic transmit / Manual transmit switch.	AUTO: OFF / ON / (SmartBeaconing)* INTERVAL: 30sec / 1min / 2min / 3min / 5min / 10min / 15min / 20min / 30min / 60min PROPORTIONAL: ON / OFF DECAY: ON / OFF LOW SPEED: 1 - 3 - 99 (km/h / mph / knot) RATE LIMIT: 5sec - 30sec - 180sec * The option in the parentheses is available when the "101 SmartBeaconing" is TYPE1, TYPE 2 or TYPE 3, and the "97 MY POSITION SET" is GPS.
87 DIGI PATH	Digital repeater route setting.	OFF / WIDE1-1 / WIDE1-1, WIDE2-1 / PATH 1 / PATH 2 / PATH 3 / PATH 4 / FULL 1 / FULL 2
88 DIGI PATH 1	Digital repeater route address setting.	ADDRESS 1: - ADDRESS 2: -
89 DIGI PATH 2		
90 DIGI PATH 3		ADDRESS 1: - to ADDRESS 8: -
91 DIGI PATH 4		
92 DIGI PATH FULL 1		
93 DIGI PATH FULL 2		
94 CALLSIGN (APRS)	My call sign setting.	***** - **
95 MESSAGE GROUP	Group filter setting for received messages.	GROUP 1: ALL ***** GROUP 2: CQ***** GROUP 3: QST***** GROUP 4: YAESU**** GROUP 5: ----- GROUP 6: ----- BULLETIN 1: BLN?***** BULLETIN 2: BLN?----- BULLETIN 3: BLN?-----
96 MESSAGE REPLY	Set automatic response to received messages.	REPLY: OFF / ON CALLSIGN: *****_ REPLY TEXT: -
97 MY POSITION SET	My position setting.	GPS / MANUAL
98 MY POSITION	My position manual setting.	LATITUDE: N 0°00. 00' (° 00") LONGITUDE: E 0°00. 00' (° 00")
99 MY SYSBOL	My symbol setting.	ICON 1: [>] Car ICON 2: [R] REC.Vehicle ICON 3: [-] House QTH (VHF) USER: [YY] Yaesu Radios
100 POSITION COMMENT	Set position comment.	Off Duty / En Route / In Service / Returning / Committed / Special / Priority / Custom 0 to Custom 6 / EMERGENCY!

Menu Number / Item	Description	Selectable options (Options in bold are the default settings)
101 SmartBeaconing	Smart beaconing settings.	STATUS: OFF / TYPE1 / TYPE2 / TYPE3 * For details on the following setting items for each type, refer to the APRS Instruction Manual. LOW SPEED, HIGH SPEED, SLOW RATE, FAST RATE, TURN ANGLE, TURN SLOPE, TURN TIME
102 SORT FILTER	Sort function / Filter function settings.	SORT: TIME / CALLSIGN / DISTANCE FILTER: ALL / MOBILE / FREQUENCY/ OBJECT/ITEM / DIGIPEATER/ VoIP / WEATHER / YAESU/ OTHER PACKET / CALL RINGER / RANGE RINGER / 1200 bps / 9600 bps
103 VOICE ALERT	Voice alert function settings.	VOICE ALERT: NORMAL / TONE SQL / DCS / RX-TSQL / RX-DCS TONE SQL: 67.0Hz - 254.1Hz (100.0Hz) DCS: 023 - 754
104 STATION LIST	Displays the APRS Station list screen.	—
105 MESSAGE LIST	Displays the APRS Message list screen.	—
106 BEACON TX SELECT	Beacon automatic transmit / Manual transmit switch.	MANUAL / AUTO / (SmartBeaconing)* * The option in the parentheses is available when the "101 SmartBeaconing" is TYPE1, TYPE 2 or TYPE 3, and the "97 MY POSITION SET" is GPS.
107 BEACON TX	Manual beacon transmission (one time)	—

APRS Setup menu function list

74 APRS DESTINATION

Model Code Display

Setting Item: [APY310]

Default: [APY310]

Explanation: Displays the model code. This setting cannot be changed.

75 APRS FILTER

Filter function setting

Setting Item: Mic-E / POSITION / WEATHER / OBJECT / ITEM / STATUS / OTHER /
RANGE LIMIT / ALTNET

Default: Mic-E: ON
POSITION: ON
WEATHER: ON
OBJECT: ON
ITEM: ON
STATUS: ON
OTHER: OFF
RANGE LIMIT: OFF
ALTNET: OFF

Explanation: For setting FILTER for obtaining various beacon types.

ON: Obtains beacons
OFF: Does not obtain beacons

Mic-E: Displays the obtained MIC-Encoder beacons
POSITION: Displays the obtained Position of beacons
WEATHER: Displays the obtained Weather beacons
OBJECT: Displays the obtained Object of beacons
ITEM: Displays the obtained item of beacons
STATUS: Displays the obtained Status of beacons
OTHER: Displays the obtained packets other than those used in APRS.
RANGE LIMIT: Displays beacons from stations within the setting distance.
ALTNET: Displays the obtained packets specified by Destination Address in Alternate Nets.

76 APRS MESSAGE TEXT

Entering fixed text characters.

Explanation: 8 types of up to 16 character fixed text can be created, and copied to messages on the message edit screen.

77 APRS MODEM

APRS modem ON/OFF setting.

Setting Item: OFF / ON

Default: OFF

Explanation:

OFF: Turn APRS function [OFF].

ON: Turn APRS function [ON].

78 APRS MUTE

AF mute ON / OFF setting for APRS reception band when APRS function is on.

Setting Item: ON / OFF

Default: OFF

Explanation: When the APRS function is on, all received sounds in the band set as the APRS receive band is muted.

79 APRS POPUP

APRS reception pop-up setting

Setting item: BEACON: OFF / 3 sec / 5 sec / 10 sec / HOLD
CALL 3sec / CALL 5sec / CALL 10sec / CALL HOLD
MESSAGE: OFF / 3 sec / 5 sec / 10 sec / HOLD
CALL 3sec / CALL 5sec / CALL 10sec / CALL HOLD
MY PACKET: OFF / ON

Default: BEACON: 10 sec
MESSAGE: 10 sec
MY PACKET: OFF

Explanation:

When an APRS BEACON or Message is received, the content is shown in a POPUP.

BEACON: Setting for the time a POPUP is displayed when a beacon is received.

MESSAGE: Setting for the time a POPUP is displayed when a new message is received.

MY PACKET: Setting for the time a POPUP is displayed when a self transmitted beacon (relay wave) is received.

OFF	The display will not change even if a beacon or message is received.
3 sec, 5 sec, 10 sec	Select the pop-up screen (compass screen or message screen) time.
HOLD	The pop-up screen (compass screen or message screen) will continue to be displayed until you perform a key press.
CALL 3sec, CALL 5sec, CALL 10sec	Select the display time for the call sign screen. Pop-up screens (compass screen and message screen) will not be displayed.
CALL HOLD	The call sign screen will continue to be displayed until you perform a key press. Pop-up screens (compass screen and message screen) will not be displayed.

80 APRS RINGER

Setting the bell sound when a message or beacon is transmitted/received.

Setting item: TX BEACON: ON / OFF
TX MESSAGE: ON / OFF
RX BEACON: ON / OFF
RX MESSAGE: ON / OFF
MY PACKET: ON / OFF
CALL RINGER: ON / OFF
RANGE RINGER: 1mi - 100mi (1km - 100km) / OFF
MSG VOICE: ON / OFF

Default: TX BEACON: ON
TX MESSAGE: ON
RX BEACON: ON
RX MESSAGE: ON
MY PACKET: ON
CALL RINGER: OFF
RANGE RINGER: OFF
MSG VOICE: OFF

Explanation:

Set the bell sound for transmit/receive of APRS beacons and messages and the conditions for when it rings.

- **TX BEACON:** This sets the bell ring when your own station is sending a beacon. When set to ON, a bell will ring prior to the transmission.
- **TX MESSAGE:** This sets the bell ring when your own station is sending a message. When set to ON, a bell will ring prior to the transmission.
- **RX BEACON:** This sets the bell ring when a beacon is received from another station. When set to ON, a bell will ring when a beacon is received.
- **RX MESSAGE:** This sets the bell ring when a message is received from another station. When set to ON, a bell will ring when a message is received.
- **MY PACKET:** This sets the bell ring when your own station transmit beacon (relayed signal) is received.
- **CALL RINGER:** A bell will ring when a beacon from a station whose callsign is set using **[81 APRS RINGER (CS)]** in the set-up menu is received.
- **RANGE RINGER:** A special bell will ring when a beacon located close to your own station is received. When distance is selected, a special bell will ring when a beacon from a station closer than the distance set is received. When OFF is selected, the distance will not be determined.
- **MSG VOICE:** Read out the message content. When set to ON, the message contents (callsign and main text) are read out when a message is received (the optional voice guide unit FVS-2 is required).

81 APRS RINGER (CS)

Callsign setting for CALL RINGER

Setting Items:

*****-NN

*: Callsign (a maximum of 6 characters)

NN: SSID (a number between one and 15 or nil)

Explanation:

Turn “**CALL RINGER**” under [**80 APRS RINGER**] in the set-up menu to ON to set the callsign of the station which will ring the special bell. A maximum of up to 8 callsigns can be set.

82 APRS TX DELAY

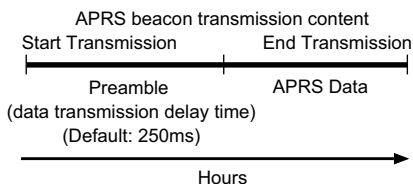
Set the data sending delay time.

Setting item: 100 ms / 150 ms / 200 ms / 250 ms / 300 ms / 400 ms / 500 ms / 750 ms / 1000ms

Default: 250 ms

Explanation:

The preamble (data transmission delay time), shown right, for when transmitting APRS data can be set.



83 APRS UNITS

Unit setting for APRS display.

Setting item: POSITION: dd°MM.MM' / dd°MM'SS"

DISTANCE: km / mile

SPEED: km/h / mph / knot

ALTITUDE: m / ft

BARO: hPa / mb / mmHg / inHg

TEMP: °C / °F

RAIN: mm / inch

WIND: m/s / mph / knot

Default: Depends on the transceiver version.

Explanation:

Set the measurement unit for Latitude/Longitude (POSITION), DISTANCE, SPEED, ALTITUDE, Barometric pressure (BARO), Temperature (TEMP), Precipitation (RAIN), and Wind Speed (WIND).

POSITION: Unit display of minute of Longitude/Latitude (dd°mm'ss" can be changed. mm' is displayed in 1/100 minute and ss" in seconds.

DISTANCE: Unit can be set to [km] or [mile].

SPEED: Unit can be set to [km/h], [mile/h] or [knot].

ALTITUDE: Unit can be set to [m] or [feet].

BARO: Unit can be set to [hPa], [mb], [mmHg], [hPa] or [inHg].

TEMP: Unit can be set to [°C] or [°F].

RAIN: Unit can be set to [mm] or [inch].

WIND: Unit can be set to [m/s], [mile/h] or [knot].

84 BEACON INFORMATION

Setting the transmit beacon information.

Setting item: AMBIGUITY: OFF / 1 digit / 2 digits / 3 digits / 4 digits

SPEED/COURSE: ON / OFF

ALTITUDE: ON / OFF

Default: AMBIGUITY: OFF

SPEED/COURSE: ON

ALTITUDE: ON

Explanation:

AMBIGUITY: This function is for masking lower denominations of the station position (longitude, latitude) to ambiguate the station position. Setting this function to [OFF] disables ambiguation and transmits the precise station position information.

OFF	1 digit	2 digits	3 digits	4 digits
35°38.17'	35°38.1□	35°38.□□	35°3□.□□	35°□□.□□
139°42.33'	139°42.3□	139°42.□□	139°4□.□□	139°□□.□□

SPEED/COURSE: If function is set to [ON], speed and directional information is transmitted. If this function is set to [OFF], speed and directional information is not be transmitted.

ALTITUDE: If this function is set to [ON], altitude information is transmitted.
If this function is set to [OFF], altitude information is not transmitted.

85 BEACON STATUS TEXT

Entering status text.

Setting Item: SELECT: OFF / TEXT 1 to TEXT 5

TX RATE: 1/1 to 1/8 / 1/2(FREQ) to 1/8(FREQ)

TEXT 1: (Not entered)

TEXT 2: (Not entered)

TEXT 3: (Not entered)

TEXT 4: (Not entered)

TEXT 5: (Not entered)

* Up to 60 characters can be entered for status text into TEXT 1 to TEXT 5.

Default: SELECT: OFF

TX RATE: 1/1

Explanation:

SELECT: Select the status text to send when transmitting a beacon.

Selecting OFF transmits the beacon without a status text.

TX RATE: Set how frequent a status text is sent with a APRS beacon. Select from 1/1: every time, 1/2: 2 once every 2 transmissions, to up to 1/8: once every 8 transmissions, a status text is sent with a beacon. When set to 1/2(FREQ) to 1/8(FREQ), the status text is sent once every set number of times and the frequency information is sent each time.

86 BEACON TX SET

Beacon transmission setting.

Setting Item: AUTO : OFF / ON / SMART
INTERVAL: 30sec - 60min
PROPORTIONAL: OFF / ON
DECAY: OFF / ON
LOW SPEED: 1 - 99
RATE LIMIT: 5sec - 180sec

Default: AUTO : OFF
INTERVAL: 5min
PROPORTIONAL: ON
DECAY: ON
LOW SPEED: 5
RATE LIMIT: 30sec

Explanation:

Set the method the APRS BEACON is automatically transmitted.

AUTO: OFF: The station beacon will not be sent automatically.
ON: The station beacon will be sent automatically at a transmission interval set using "INTERVAL". However, when "DECAY" is set to ON, the transmission interval will be gradually increased to a maximum of 30 minutes when the station is not moving (stationary).
SMART: Perform automatic transmission using the SmartBeaconing™ function. This setting can be selected only when the status setting of [101 SmartBeaconing] in the setup menu is set to TYPE 1 - TYPE 3, and [97 MY POSITION SET] is set to GPS.

INTERVAL: Setting the time interval for automatically sending an APRS beacon. If [101 SmartBeaconing] is set to TYPE 1 - TYPE 3 the setting for INTERVAL is ignored.

PROPORTIONAL: OFF: The transmission will be in accordance with the address selected under [87 DIGI PATH] in the set-up menu.
ON: The digipeater address set in [87 DIGI PATH] on the setup menu is automatically changed (thinning out) when sending. When this function is set to ON, packet update will be carried out in detail for close distances while relay steps are spread out to reduce frequency congestion for long distances.
The settings will become void when [87 DIGI PATH] is set to OFF, FULL 1 and FULL 2.

DECAY: OFF: The APRS beacon transmission time interval is not extended.
ON: When DECAY is set to ON and your station enters into the stop mode, the APRS beacon transmission time interval will gradually be extended (to a maximum of 30 minutes).

LOW SPEED:	Set the cut-off value for determining when the station has stopped and "DECAY" is set to ON. When the speed is lower than the value set, the station will be deemed to have stopped.
RATE LIMIT:	Set the timer limiting automatic transmissions from the last beacon transmission to a certain period of time. This prevents the beacon from being sent out twice continuously within a short period of time when "DECAY" is set to ON in the stationary state, and movement is detected immediately after the beacon is automatically transmitted. The beacon will not be automatically transmitted within this period of time. Only when the set time has passed will the beacon be automatically sent out again.

87 DIGI PATH

Setting the digipeater route.

Setting item: OFF / WIDE1-1 / WIDE1-1,WIDE2-1 / PATH 1 / PATH 2 / PATH 3 / PATH 4 / FULL 1 / FULL 2

Default: WIDE1-1

Explanation:

A station that relays packets, such as beacons, is called a digipeater.

Select a CALLSIGN or ALIAS of the digipeater you would like to use.

In this transceiver, [WIDE1-1] (setting for 1 relay station) and [WIDE1-1,WIDE2-1] (setting for 2 relay stations) is the default.

In [WIDE1-1,WIDE2-1], a transmission is relayed to the first digipeater station specified as WIDE1-1, then to the second digipeater station specified as WIDE2-1.

In the USA, digipeater stations used by APRS are customarily operated using *New-Paradigm.

The initial values set to this transceiver are premised for digipeater stations operating with New-Paradigm, because most digipeater stations support this method.

In order to use other relay methods, select one of PATH 1 to PATH 4, FULL 1 or FULL 2, and enter the CALLSIGN or ALIAS.

* For information on the New-Paradigm method, refer to the following website for details.
<http://aprs.org/fix14439.html>

88 DIGI PATH 1

Setting the digipeater route addresses.

Setting item: ADDRESS 1
ADDRESS 2

Default: -----

Explanation: Enter specific address information (callsign and alias) when "PATH 1" is selected in [87 DIGI PATH] in the setup menu.

A maximum of up to 2 addresses can be specified.

89 DIGI PATH 2

Setting the digipeater route addresses.

Setting item: ADDRESS 1
ADDRESS 2

Default: ----- --

Explanation: Enter specific address information (callsign and alias) when "PATH 2" is selected in **[87 DIGI PATH]** in the setup menu.

A maximum of up to 2 addresses can be specified.

90 DIGI PATH 3

Setting the digipeater route addresses.

Setting item: ADDRESS 1
ADDRESS 2

Default: ----- --

Explanation: Enter specific address information (callsign and alias) when "PATH 3" is selected in **[87 DIGI PATH]** in the setup menu.

A maximum of up to 2 addresses can be specified.

91 DIGI PATH 4

Setting the digipeater route addresses.

Setting item: ADDRESS 1
ADDRESS 2

Default: ----- --

Explanation: Enter specific address information (callsign and alias) when "PATH 4" is selected in **[87 DIGI PATH]** in the setup menu.

A maximum of up to 2 addresses can be specified.

92 DIGI PATH FULL 1

Setting the digipeater route addresses.

Setting item: ADDRESS 1 to ADDRESS 8

Default: ----- --

Explanation: Enter specific address information (callsign and alias) when "FULL 1" is selected in **[87 DIGI PATH]** in the setup menu.

A maximum of up to 8 addresses can be specified.

93 DIGI PATH FULL 2

Setting the digipeater route addresses.

Setting item: ADDRESS 1 to ADDRESS 8

Default: ----- --

Explanation: Enter specific address information (callsign and alias) when "FULL 2" is selected in **[87 DIGI PATH]** in the setup menu.

A maximum of up to 8 addresses can be specified.

94 CALLSIGN (APRS)

Specify the CALLSIGN of your station.

Explanation:

Register the station CALLSIGN which is needed for APRS communication. APRS data cannot be transmitted if a CALLSIGN for the station is not entered. Be sure to register a CALLSIGN.

When a CALLSIGN is registered to the station, it is displayed on the LCD when the transceiver power is turned ON.

Register a CALLSIGN as shown below:

***** – NN

*: CALLSIGN (Up to 6 characters)

NN: Number (a number between 1 to 15, or no SSID.)

Entering [-9] after the CALLSIGN is recommended in standard mobile use.

95 MESSAGE GROUP

Group filter setting for APRS MSG GROUP received messages.

Setting Items: A filter can be set for receiving messages with a specified group code (ALL or CQ).

GROUP 1

GROUP 2

GROUP 3

GROUP 4

GROUP 5

GROUP 6

BULLETIN 1

BULLETIN 2

BULLETIN 3

Default: GROUP 1: ALL*****

GROUP 2: CQ*****

GROUP 3: QST*****

GROUP 4: YAESU****

GROUP 5: -----

GROUP 6: -----

BULLETIN 1: BLN?*****

BULLETIN 2: BLN?

BULLETIN 3: BLN?

Explanation: A filter can be set to receive messages with a specified group code (ALL or CQ)

(ALL, CQ, QST, and YAESU are selected in default settings).

“*”: Acts as a wild card matching any character received.

96 MESSAGE REPLY

Setting Item: REPLY

CALLSIGN

REPLAY TEXT

Default: REPLY : OFF

CALLSIGN: *****-**

REPLAY TEXT: -

Explanation:

A reply message set up beforehand can be automatically sent out upon receiving a message. Enter "CALLSIGN" to automatically reply to a specific station.

REPLY : OFF: A reply message is returned automatically when a message is received.

ON: A reply message is not returned when a message is received.

CALLSIGN: Set only when replying only to a station with a specific APRS callsign.

REPLAY TEXT: Enter the automatic reply message.

97 MY POSITION SET

Setting the station position.

Setting Item: GPS / MANUAL

Default: GPS

Explanation:

Set whether position information for your station is obtained via GPS, or manually entered.

GPS: Acquire the station position automatically via GPS.

MANUAL: Manually set the station position.

98 MY POSITION

Setting the latitude and longitude of your station.

Setting Item: LATITUDE

LONGITUDE

Default: GPS

Explanation:

Enter the station latitude and longitude when "MANUAL" is selected in [97 MY POSITION SET] of the Setup Menu.

99 MY SYMBOL

Set the Station Symbol

Setting Item: Symbol

Default: ICON 1:  [/>] Car

ICON 2:  [/R] REC.Vehicle

ICON 3:  [/~] House QTH (VHF)

ICON 4:  [YY] Yaesu Radios

Explanation: Set the symbol for the station to transmit.

100 POSITION COMMENT

Set up the position comment function.

Setting Item: Off Duty / En Route / In Service / Returning / Committed / Special / Priority/
Custom 0 / Custom 1 / Custom 2 / Custom 3 / Custom 4 / Custom 5 /
Custom 6 / Emergency!

Default: Off Duty

Explanation: Select the position comment (standard message) incorporate into the station beacons.



Unless there is a serious emergency, such as an accident or natural disaster, do not select [EMERGENCY!].

101 SmartBeaconing

Settings for SmartBeaconing™

Setting Item: STATUS: OFF / TYPE1 / TYPE2 / TYPE3

LOW SPEED: 2 to 30

HIGH SPEED: 3 to 90

SLOW RATE: 1min to 100min

FAST RATE: 10sec to 180sec

TURN ANGLE: 5° to 90°

TURN SLOPE: 1 to 255

TURN TIME: 5sec to 180sec

Default: STATUS: OFF

STATUS	TYPE1	TYPE2	TYPE3
LOW SPEED	5	5	5
HIGH SPEED	70	70	70
SLOW RATE	30min	30min	30min
FAST RATE	120sec	120sec	120sec
TURN ANGLE	28°	28°	28°
TURN SLOPE	26	26	26
TURN TIME	30sec	30sec	30sec

Explanation:

SmartBeaconing™ is a function that efficiently transmits an APRS beacon including the station position, speed and direction of travel. The information is based on data from a GPS satellite receiver unit.

Set STATUS to TYPE1, TYPE2 or TYPE3; set **[97 MY POSITION SET]** to “GPS”; and set **“AUTO” [86 BEACON TX SET]** to “SMART” to activate the SmartBeaconing™ function.

STATUS: SmartBeaconing™ only operates when STATUS is set to TYPE1, TYPE2, or TYPE3.

Set STATUS to OFF to deactivate SmartBeacon™. The transceiver's SmartBeaconing™ feature has three identical default settings (TYPE 1 through TYPE 3) that can be change and saved to suit the situation.

- LOW SPEED:** If speed is lower than setting, BEACONS are transmitted in time intervals set in [SLOW RATE].
The units for speed can be set in Setup Menu option **[83 APRS UNITS]**.
- HIGH SPEED:** If speed is higher than setting, BEACONS are transmitted in time intervals set in [FAST RATE].
The units for speed can be set in Setup Menu option **[83 APRS UNITS]**.
- SLOW RATE:** BEACON transmission time interval when speed decreases below the [LOW SPEED] setting.
- FAST RATE:** BEACON transmission time interval when speed increases above the [HIGH SPEED] setting.
- TURN ANGLE:** Set the minimal value of changes in angle when the direction of movement changes.
- TURN SLOPE:** Set the coefficient for automatically altering the angle that judges changes in the direction of movement according to speed.
The higher the coefficient value setting, the greater the judgment angle is when moving at slow speeds.
1 to 255 (X10)°/SPEED
(If the real number for units of rotating tilt is set to 1/10, this is the same as the unit setting used in HamHUD Nichetronix, LLC series transceivers.)
- TURN TIME:** Set the time limit until the next BEACON can be transmitted, after a BEACON is transmitted upon detection of a change in time (Variable Rate Beacons) or direction (Corner Pegging).

Caution

If SmartBeaconing™ is to be operated at different timings, the parameters of settings TYPE1 to TYPE3 can be changed.
When changing parameters, be sure to adjust parameters of SmartBeaconing™ and DIGI PATH settings for appropriate beacon transmission intervals to avoid communications channel congestion.

102 SORT FILTER

Sort function / filter function setting.

Setting Item: SORT: TIME / CALLSIGN / DISTANCE

FILTER: ALL / MOBILE / FREQUENCY / OBJECT/ITEM / DIGIPEATER /
VoIP / WEATHER / YAESU / OTHER PACKET / CALL RINGER /
RANGE RINGER / 1200bps / 9600bps

Default: SORT: TIME

FILTER: ALL

Explanation:

This sets the sorting condition for the display order of the station list and selects the type of beacon to be displayed in the station list.

SORT: Select the sort condition for the display order of the station list.

TIME: Sort the station list starting from the latest one received.

CALLSIGN: Sort the station list in ascending order of the callsign.

DISTANCE: Sort the station list starting from the one closest to your own station.

FILTER: Select the type of beacon to be displayed in the station list.

ALL: All the received beacons will be displayed.

MOBILE: Only the mobile stations will be displayed.

FREQUENCY: Only station with frequency information will be displayed.

OBJECT/ITEM: Only object stations and item stations will be displayed.

DIGIPEATER: Only digipeater stations will be displayed.

VoIP: Only VOIP station such as WIRES will be displayed.

WEATHER: Only meteorological stations will be displayed.

YAESU: Only stations which are using Yaesu wireless transceivers will be displayed.

OTHER PACKET: Only RAW NMEA data stations, status stations and non-APRS packet information that cannot be analyzed are displayed. Set "OTHER" to ON under **[75 APRS FILTER]** in the set-up menu to display non-APRS packets that cannot be analyzed.

CALL RINGER: Only information of callsign ringer stations set under **[81 APRS RINGER (CS)]** in the set-up menu will be displayed.

RANGE RINGER: Only information of stations deemed as nearby stations according to "RANGE RINGER" settings that are set under **[80 APRS RINGER]** in the set-up menu will be displayed.

1200 bps: Only stations received using 1200 bps packets will be displayed.

9600 bps: Only stations received using 9600 bps packets will be displayed.

Tips

- Press the Left **DIAL** knob → **[SORT]** → Press the Left **DIAL** knob in the function menu of the station list to sort the station list.
- When a new beacon is received after sorting, it will be added to the top of the list without being sorted. The sorting order will be restored to the initial setting when the radio is turned OFF.

103 VOICE ALERT

Voice alert function setting.

Setting Item: VOICE ALERT: NORMAL / TONE SQL / DCS / RX-TSQL / RX-DCS

TONE SQL: 88.5Hz to 254.1Hz

DCS: 023 to 754

Default: VOICE ALERT: NORMAL

TONE SQL: 100.0Hz

DCS: 023

Explanation:

This is an audio notification function that will announce the presence of other stations which can communicate via voice communications.

VOICE ALERT: Set the operation of the voice alert function.

NORMAL: The voice alert function will be turned OFF.

TONE SQL: A tone squelch will be used for sending and receiving voice signals. A tone signal will also be appended when sending APRS data.

DCS: DCS will be used in sending and receiving voice signals. The DCS code will also be appended when sending APRS data.

RX-TSQL: Although a tone squelch is used in sending and receiving voice signals, a tone signal is not appended when sending APRS data.

RX-DCS: Although DCS is used in sending and receiving voice signals, the DCS code is not appended when sending APRS data.

TONE SQL: Set the tone frequency used for the voice alert function.

DCS: Set the DCS code used for the voice alert function.

104 STATION LIST

Displaying beacons in the APRS STATION LIST

Rotate the Right **DIAL** knob to select the station to display the details, and press the Right **DIAL** knob.

For details, refer to “Displaying beacons in the APRS STATION LIST detail screen” on page 8.

105 MESSAGE LIST

Displaying messages in the APRS MESSAGE LIST

On the message list screen, rotate the Right **DIAL** knob to select a message and press the Right **DIAL** knob to check the contents of the sent / received message on the details screen or reply.

For details, refer to “Description of the APRS MESSAGE LIST screen and operations” on page 22.

106 BEACON TX SELECT

Beacon transmission method setting

Setting Item: MANUAL / AUTO / SmartBeaconing

Default: MANUAL

Explanation: Set whether to send APRS beacons manually, or automatically on a regular basis.

MANUAL: Manually send the APRS beacon.

AUTO: Automatically sends APRS beacons every 5 minutes (Factory default).

SmartBeaconing: Automatically send APRS beacons using the Smart Beaconing™ feature. See page 18 for details on setting the operation of the SmartBeaconing™ function.

107 BEACON TX

Transmitting an APRS beacon manually.

Press the Right **DIAL** knob to send the APRS beacon only once.

For details, refer to “Transmitting an APRS beacon manually” on page 18.

YAESU

Radio for Professionals

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