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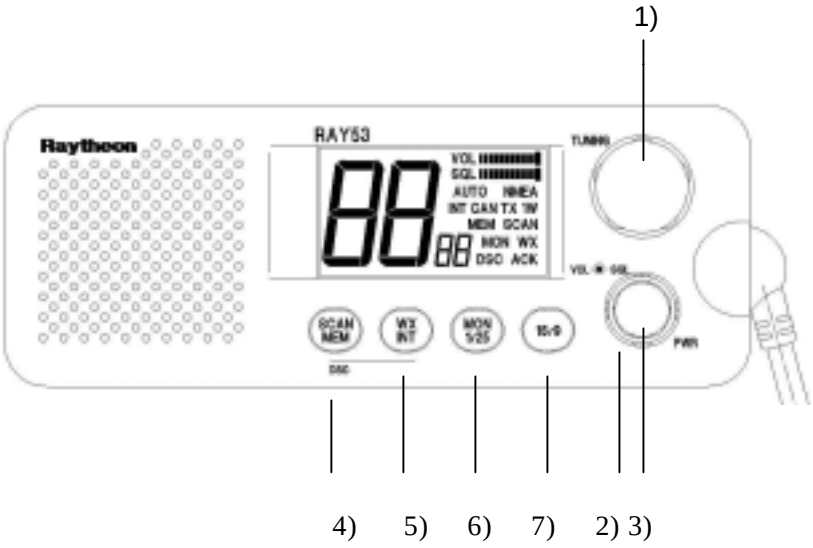
1. OPERATION

1.1 INTRODUCTION

Your RAY53 has the capability to transmit and receive on all available US,International and Canada Marine VHF radiotelephone channels. There are channels that are FCC approved but may only be used by authorized stations for specific purposes, depending on the type of vessel (commercial or noncommercial.) Refer to Table 1-1 . These table list all of the marine VHF channels available in your RAY53 for Canada,International and U.S. radiotelephone use. Full familiarization with this table is essential when selecting your channels. The International frequencies were agreed upon by the attending countries at the 1968 International Telecommunication Union meeting in Geneva and are in active use around the world. The US channels are those channels authorized for use in the U.S.A. by the FCC.

1.2 CONTROLS AND LCD DISPLAY



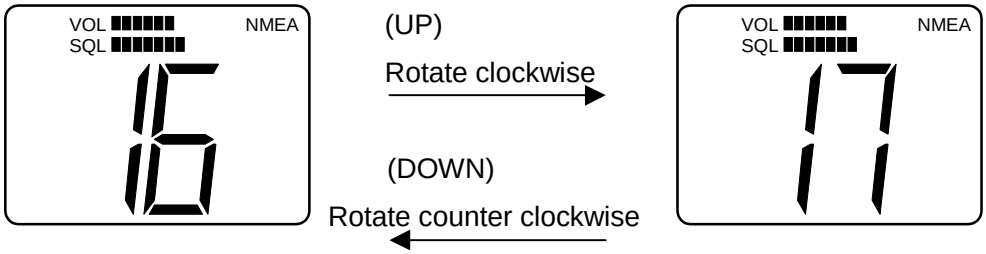
1.2.1 Controls

1) Channel Selection (Knob)

-. Turning to the right can increase the channel number and it can be decreased by turning to the left.

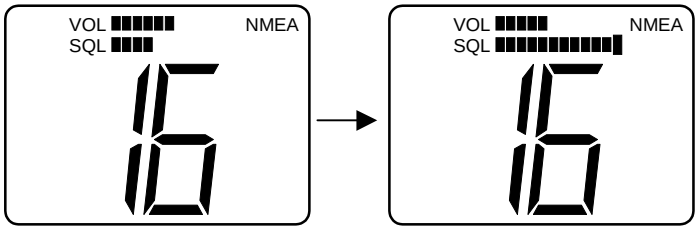
-. When the Channel Selection Knob is rotated to the right at “88CH”, the channel number becomes “01CH”.

-. When the Channel Selection Knob is rotated to the left at “01CH”, the channel number becomes “88CH”.



2) Squelch Knob

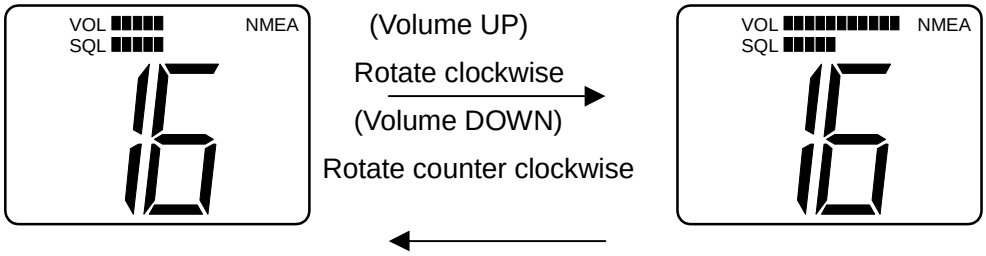
-. When Squelch knob is rotated, the squelch level is adjusted. If the knob is rotated completely clockwise,all bars will illuminate.



Rotate
Clockwise

3) Volume Knob

-. The volume knob controls the audio volume and is also switched to turn power on and off. When the knob is rotated clockwise from the “OFF” position,the power becomes “Turned On”. Being rotated clockwise,the audio volume will be increased. Being rotated counterclockwise,the audio volume will be decreased.



-. When the power is turned on, the receiving mode is in use after the following initial setting.

Initial setting at power on.

Frequency mode--------: the frequency mode at power OFF

Channel --------: 16 CH (Working CH)

Priority CH --------: Priority CH at power OFF

Weather CH --------: Weather CH at power OFF

Transmitter Power---- : 25 Watt

-. When the power is turned on with pushing on SCAN/MEM key,all the memory can be clear.

4) SCAN/MEM key

-. When SCAN/MEM key is pressed and released, Alarm 1 is heard and Scan starts/stop. (To cancel the scan mode, press and release while radio is scanning. To start the scan mode, press and release while radio is not scanning.)

-. If one or more channels are stored in memory, the radio will begin Memory Scan. If no channels are stored in memory,the radio will begin All Scan.

-. To begin All Scan while memory are being stored in,All Scan can be begun by pressing once more during flashing on the LCD.

-. When SCAN/MEM key is continuing to be pressed for more than three seconds, Alarm 1 is heard and Memory of the current channel can be stored/canceled.(When the current channel is stored,the current channel will be canceled. When no other channel is stored, the current channel will be stored.

5) WX/INT key

-. When WX/INT key is pressed and released, Alarm 1 is heard and Working CH /Weather CH are toggled each other.

-. When WX/INT key is continued to be pressed for more than 2 seconds, Alarm 1 is heard and frequency selection mode(US,International or Canadian) can be changed. There are 3 types of frequencies selection modes,US,International and Canadian. The frequencies selection mode is changed like USA--→CAN--→INT.

-. While the monitor operation is in use,Dual monitor and Triple monitor can be changed.

6) MON/ 1/25 Key

-.When MON/ 1/25 is pressed and released, Alarm 1 is heard and Monitor operation start.(Dual Monitor)

-. When MON/ 1/25 continues to be pressed for more than 2 seconds, Alarm 1 is heard and Transmitter power can be changed. When transmitter power is 25W, it can be 1 W. When transmitter power is 1 W, it can be 25 W.

7) 16/9 Key

-. When 16/9 key is pressed and released, Alarm 1 is heard and Channel can be changed as follows.

The current channel is Working CH----------→ Becomes Priority CH

The current channel is Weather CH----------→ Becomes Priority CH

The current channel is Priority CH ----------→ Becomes Working CH

-. When 16/9 key continues to be pressed for more than 2 seconds, Alerm 1 is heard and priority CH can be toggled. When the private channnel is 16CH,it can be changed to 9CH and when the private channel is 9CH,it can be changed to 16CH.

8) PTT Key(Microphone)

-. When pressed,puts the radio into the transmit mode

If the current channel is Weather CH or the channel prohibitted from TX, Alerm 2 is heard and PTT key cannot be used. If the PTT key is pressed continuously for over five minutes,transmission is forcibly inhibited and Alarm 2 is heard until the PTT key is released.

9) UP key(Microphone)

-. The UP key is used to move the channel numbers up(+1).

If the UP key is continuously pressed for over 0.5 seconds,the channel numbers can be continuously up every 100msec.

10)DOWN key(Microphone)

-. The DOWN key is used to move the channel numbers down(+1)

If the DOWN key is continously pressed for over 0.5 seconds,the channel numbers can be continueously down every 100msec.

11) 16/9 key(Microphone)

-. When 16/9 key is pressed and released, Alarm 1 is heard and Channel can be changed as follows.

The current channel is Working CH----------→ Becomes Priority CH

The current channel is Weather CH----------→ Becomes Priority CH

The current channel is Priority CH ----------→ Becomes Working CH

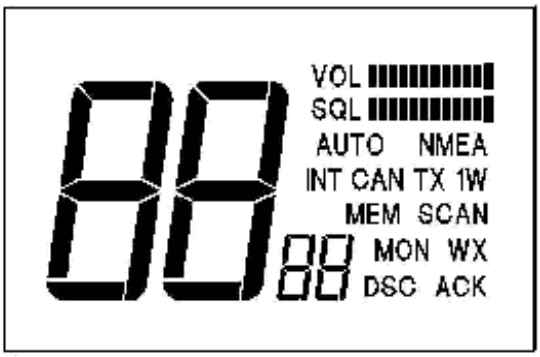
-. When 16/9 key continues to be pressed for more than 2 seconds in Priority CH mode, Alerm 1 is heard and priority CH can be toggled. When the private channnel is 16CH,it can be changed to 9CH and when the private channel is 9CH,it can be changed to 16CH.

12) DISTRESS key

-. DISTRESS key is used to send a DSC Distress Call when pressed and held for 4 seconds.

1.2.2 LCD Display

The items of LCD display on the Front panel are described as follows



1) DSC display: Will be displayed when DSC mode is entered.

2) WX display : Will be displayed when Weather CH is entered.
Will be displayed when Tri monitor mode is entered.

3) INT display : Will be displayed when International channels are programmed for use. “INT” is not displayed when US or Canadian channels are programmed for use.

4) CAN display: Will be displayed when Canadian channels are programmed for use. “CAN” is not displayed when US or International channels are programmed for use.

5) MEM display: Will be displayed when displayed CH is memory-registered.
Will blink at Scan Stand-by and be displayed at Memory Scan.

6) SCAN display: Will be displayed at Scan mode
Will blink at Scan at Scan mode and be displayed with “MEM” at Memory Scan.

7) ACK display : Will be displayed at DSC mode when the response to individual calls are received after DSC call is transmitted.

8) MON display: Will be displayed at Monitor mode
(Dual monitor or Triple monitor)

9) TX display : Will be displayed when transmitter power is detected at transmitter mode.

10) 1 W display: Will be displayed when the transmitter circuits are providing 1 Watt of power to the antenna. When the transmitter is supplying 25 Watt to the antenna, “1 W” will be extinguished.

11)VOL, Bar Graph display: The Vol. bar graph shows the level of volume of the audio output to the speaker.
The volume means to be larger when the dot of the bar graph become increased to the right.

12) SQL,AUTO Bar graph display : The Squelch bar graph shows the depth of squelch.
“AUTO” will be displayed when Auto-Squelch is activate.
The number of dot of SQL Bar graph will be increased when SQL knob is turned to the right to make Squelch deeper.
(When SQL knob is furthermore turned to right from the maximum squelch, the squelch becomes AUTO Squelch and “AUTO” will be displayed.

13) NMEA display: will be displayed at all of the modes while valid NMEA data is being received.
When NMEA data is invalid or is not received,”NMEA” is extinguished.
Applicable data: GLL,GGA,RMA,RMC,APA,APB

14) Channel display: (Large) Will display channel number in use.
When Own Ship’s MMSI ID is entered,etc,Channel display(Large) shows its situation.

15) Channel display (Small): Will display Priority CH number in use.
When Own Ship’s MMSI ID is entered,etc, Channel display(Small) shows its situation.

1.3 OPERATING PROCEDURES

1.3.1 Turning the Power On

1) Rotate the VOLUME knob clockwise to turn the radio on.

1.3.2 Setting the Volume

1) Rotate the VOLUME knob for the disired volume level.

1.3.3. Setting the Power Output

1) Simply press the “MON 1/25” key for two seconds to toggle between 1 Watt output and 25 Watt output. When “1 WATT” is displayed,the output power is 1 Watt. If “1 WATT” is extinguished, 25watts is being output. The choice of power output is dependent upon the distance of transmission and transmitting conditions. In certain US harbors and on certain channels, the FCC requires the power to be limited to 1 Watt. On these “required “ channels,the radio automatically selects 1 Watt power output when the channel is selected.

1.3.4 Selecting the Channel

1) To select the appropriate channel, rotate CHANNEL SELECTION Knob clockwise / counterclockwise or also press UP/DOWN key of the microphone.
2) The channels which are not set on the frequency mode are skipped .
3) When UP/DOWN key is continuously pressed for over 0.5 seconds,the channel is continuously changed(+1 or – 1) every 100msec during pressing UP/DOWN key.

1.3.5 To select the frequency mode

1) The frequency mode(group) can be selected from US mode, International mode and Canadian Mode.

   The frequency mode can be shown on the LCD as follows.

   USA frequency mode----------→ “INT” and “CAN” are eliminated

   CANADIAN frequency mode----------→ “CAN” is displayed and “INT” is eliminated.

   INTERNATIONAL frequency mode----------→ “INT” is displayed and “CAN” is eliminated.

When WX/INT key is pressed and held for over 2 seconds, one frequency mode can be changed to the other frequency mode and Alerm 1 is heard.:

For example:

When USA mode is in use,it can be changed to CANADIAN mode by doing above operation.

When Canadian mode, it can bew changed to International mode. When International mode,it can be changed to USA mode. The last changed frequency mode can be memorized.

When the power is turned on,the last memorized frequency mode can be used.(Channel number is16CH at that time.)

1.3.6 To Transmit

1) Press the Push-To-Talk switch(PTT switch) and speak into the microphone using a clear normal voice.
2) If the current channel is Weather CH or the Tx prohibited channel, PTT switch cannot be used and Audible beep sound 2 is heard.
3) RAY53 is designed to meet the new FCC Rules Part 80.203, which states,if the PTT switch is pressed continuously for over five minutes,transmission is forcibly inhibited. If this occurs,audible beep sound 2 will be heard until the PTT switch is released.

1.3.7 To select a Weather Channel

1) Simply press the WX/INT,then use Channel Selection Knob or UP/DOWN key to select the desired Weather Channel from 0 to 9. When this mode is selected,the transmitter is always inhibited.
2) When the Weather CH is finished by pressing WX/INT key,the last used Weather CH number is memorized
3) When the power is re-turned on,the memorized Weather CH number can be activate on the Weather CH mode.

1.3.8 Priority Channel

1)When 16/9 is pressed and released, Alarm 1 is heard and Priority Channel is in use then Channel Display(Small) shows “P” on the LCD.(“P” display means “Priority CH”.)

2) When 16/9 key is pressed and released again during “P” is diplayed, Alerm 1 is heard and the channel will be returned to the privious Working CH. When the channel is changed by UP/DOWN key during Priority CH is displayed, “P” display will be eliminated and Workimg CH will be in use.

3) When 16/9 is continueously pressed for over 2 seconds, Alerm 1 is heard and Priority channel can be changed either 16CH or 9CH.(When Priority CH is 16CH, it can be changed to 9CH and when Priority CH is 9CH,it can be changed to 16CH.)

1.3.8 Channel Memory

1) The RAY53 has the capability of memorizing all US,International and Canadian Channels. The channels memorized will be scanned in the Memory Scan mode.

2) Channel Memory: When SCAN/MEM key is pressed and held for over 3 seconds,the audible beep sound 1 is heard and the selected current channel can be put into memory.
When the displayed channel on the LCD is memorized, “MEM” is displayed on the LCD.

Memory Clear : To press and hold for 3 seconds when the memory channel is stored, the audible beep sound 1 is heard and the channel can be cleared
When the displayed channel is not memorized,”MEM” is not displayed on the LCD.

1.3.9 Scan Modes

The RAY53 is equipped with two types of scan options, All-scan and Memory Scan. How these options are accessed is dependent upon whether there are any channels stored in memory.

1) All-Scan mode
If no channels are stored in memory,when the SCAN/MEM key is pressed and released, the audible beep sound 1 is heard and ”SCAN” will begin to flash on the LCD for three seconds. If no other keys are pressed in these three seconds,the radio will begin scanning all channels(except weather channels) as long as no signal is received. If a signal is received,the scan will stop on the receiving channel. If the signal is lost for five seconds, the

radio will resume scanning. While the radio is scanning ALL-Scan,"SCAN" is displayed on the LCD.

To cancel the scan mode,press the SCAN/MEM key while the radio is scanning.

2) Memory Scan mode

If one or more channels are stored in memory,when the SCAN/MEM key is pressed and released, the audible beep sound 1 is heard and "SCAN" and "MEM" will begin to flash simultaneously on the LCD for 3 seconds. If no other key is pressed in these three seconds, the radio will begin scanning all channels currently in memory.(Begin Memory scanning) As with All-Scan, If a signal is received,the scan will stop on the receiving channel until the signal is lost for five seconds, the radio will resume scanning.

While the radio is scanning Memory Scan, "SCAN" and "MEM" are displayed on the LCD.

To cancel memory scan,press the SCAN/MEM key while the radio is scanning.

When SCAN/MEM key is pressed again during "MEM" flashing within these three seconds, the audible beep sound 1 is heard and "SCAN" will flash on the LCD and the radio will begin ALL Scan mode. "MEM" will disaprear from the LCD leaving only "SCAN" flashing.

1.3.10 Monitor operations

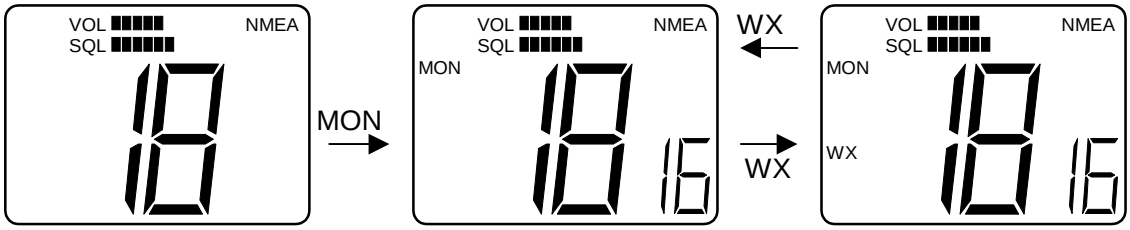
1) The RAY53 is equiped with 2 types of monitor operations, Dual Watch opeartion and Tri Watch operation.

Working CH and Priority CH can be monitored alternately in Dual Watch operation.

Working CH, Priority CH and Weather CH can be monitored by turns in Tri Watch operation.

2)Dual Watch and Tri Watch can be changed each other by using WX/INT key.

When WX/INT key is pressed and released in the monitor mode, Alerm 1 is heard and Dual Watch and Tri Watch can be changed each other alternately.



Dual Monitor Tri Monitor

Dual Watch operation

-. “MON” is displayed on the LCD.

-. Working CH number is displayed at Channel Display(Large) on the LCD.

-. Priority CH(16CH or 9CH) number is displayed at Channel Display(Small) on the LCD.

. If the signal of Working CH is detected, the Channel Display(Small) will be extinguished and the monitor will stop temporarily. Then the Receiver will be done for 7 seconds.(Even if there is no carrier for these 7 seconds, the monitor will stop for 7 seconds.) After 7 seconds is passed,the radio will monitor Priority CH.

-. If the carrier of Private CH is detected , the Priority CH number is displayed at the Channel Display(Large) and the Channel Display(Small) will be extinguished and the monitor will stop temporarily.

Tri Watch operation

-. “MON” is displayed on the LCD.

-. Working CH number is displayed at Channel Display(Large) on the LCD.

-. Priority CH(16CH or 9CH) number is displayed at Channel Display(Small) on the LCD.

-. “WX” is displayed on the LCD

-. If the carrier of Working CH is detected, the Channel Display(Small) will be

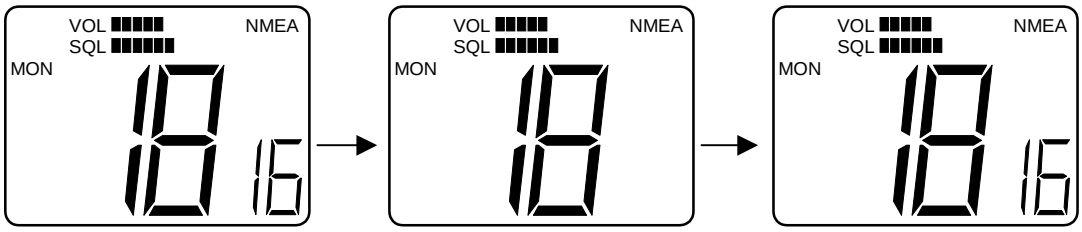
extinguished and the monitor will stop temporarily. Then the Receiver will be done for 7 seconds.(Even if there is no carrier for thse 7 seconds, the monitor will stop for 7 seconds.) After 7 seconds is passed,the radio will monitor Priority CH.

-. If the carrier of Private CH is detected, the Priority CH number is displayed at the Channel Display(Large) and the Channel Display(Small) will be extinguished and the monitor will stop temporarily.
7 seconds has been passed after the carrier is eliminated, the radio will monitor Weather CH.

-. If the carrier or the alert of Weather CH is detected, the monitor operation will stop and Weather CH will become in use with “WX” flashing every 0.5 sec and Alerm 3 is heard for 5 seconds.

The Variation by carrier detection during Monitor operation

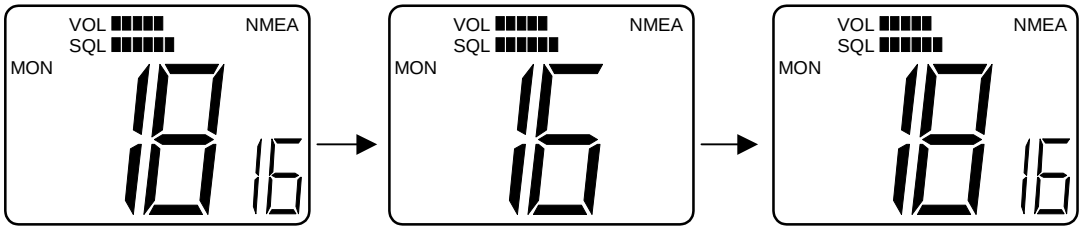
Carrier Detection at Working CH



Carrier is detected at Working CH

7 seconds is passed after the carrier is OFF

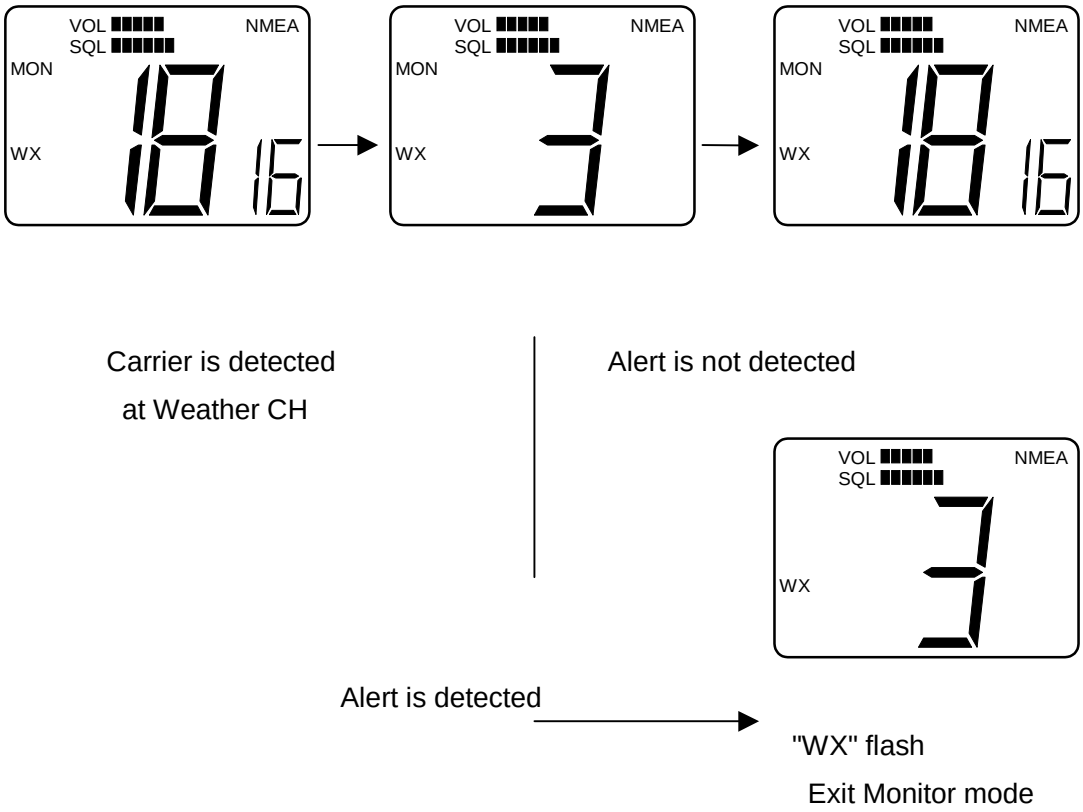
Carrier Detection at Priority CH



Carrier is detected at Priority CH

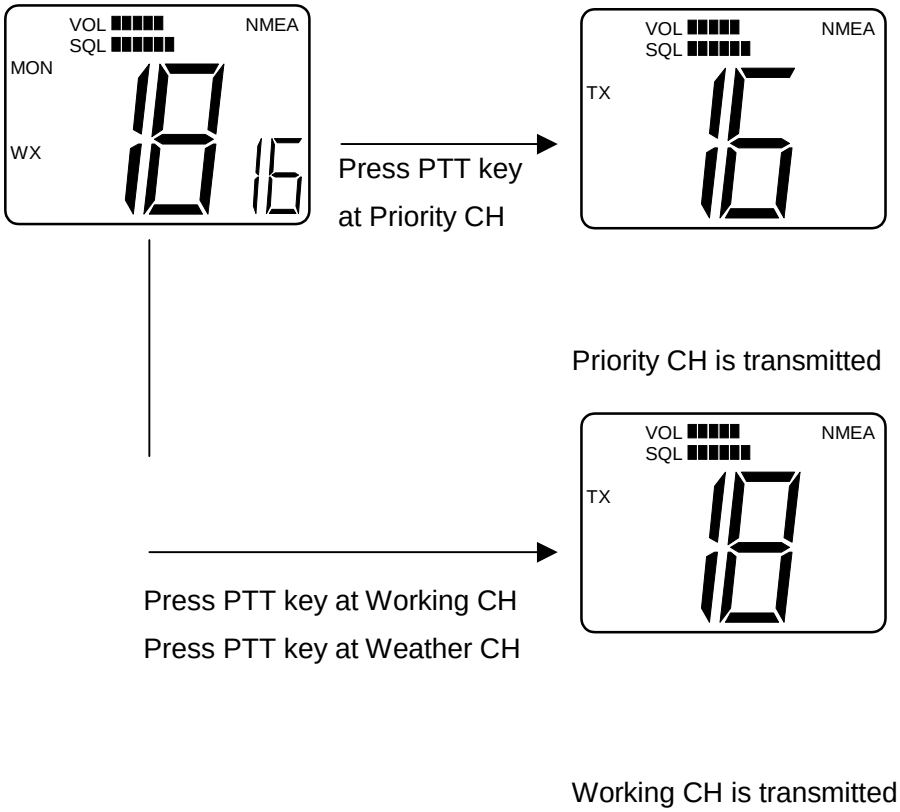
7 seconds is passed after the carrier is OFF

Carrier Detection at Weather CH (Alert is received)

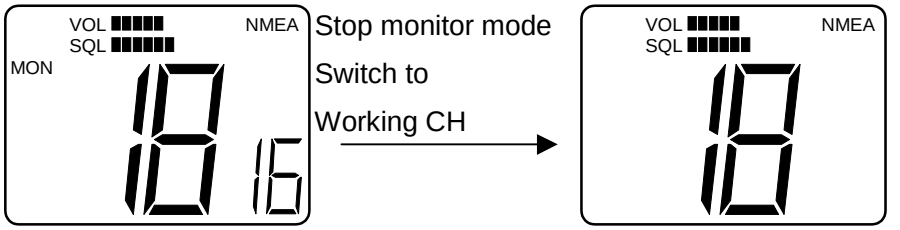


1.3.11 The key opeartion during the monitor operation.

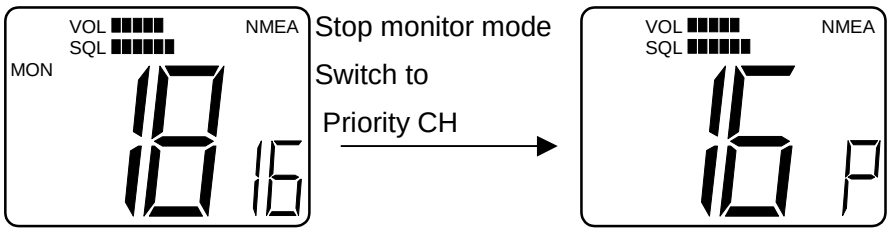
-. When PTT key is pressed,the monitor will stop and the transmission will be done at the stopped channel. While detecting the carrier of Weather CH or detecting Weather Alert, the transmission will be done at Workimg CH.



-. When SCAN/MEM key , MON/1/25 key or UP/DOWN key is pressed, Alerm 1 is heard and the monitor will stop and then Workimg CH will be in use.



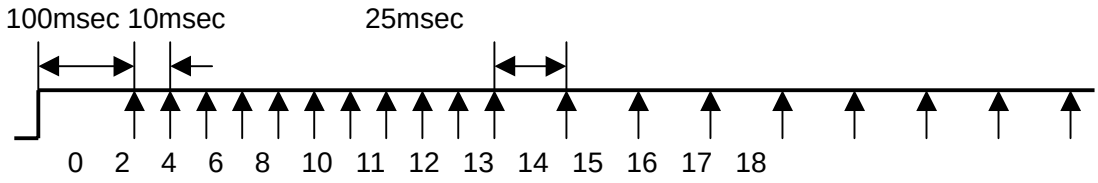
-. When 16/9 key is pressed, Alerm 1 is heard and Scan operation will stop and then Priority CH will be in use.



-. Even if the Channel Selection knob is operated,there is no change.

1.3.12 The operation for Weather Alert detection(Alert Tone : 1050 Hz)

Alert detection checks the output power from Alert detection IC as following timing.

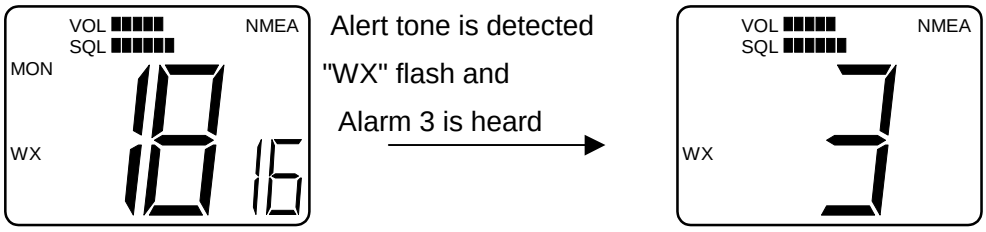


-. When the alert is ready to be detected(when the carrier is detected), the detection will start to be checked after 100msec.

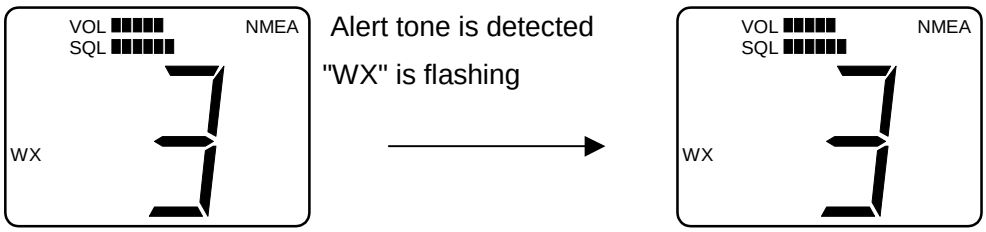
-. The detection is checked 11 times per every 10msec and then the detection is checked 8 times per every 25msec. If the alert is detected at all the checking points, it means that Weather Alert can be detected.
The detection are checked with timing changed during total 300msec.

-. If none of detection is detected between 0 and 18 with the above timing, re-start at first 100msec.

-. If the alerts are not detected at some of the above timing between 0 and 18,the following scanning will be done.
When alert tone is detected at Tri Watch monitor, “WX” display flashes every sec and Alarm 3 is heard for 5 seconds.



2. When alert tone is detected at Weather CH, “WX” display flashes every 0.5sec.
(Alarm 3 is not heard)



The operation by any keys after alert detection.

-. When either PTT key,SCAN/MEM key or MON/1/25 key is pressed, Alarm 2 is heard to prohibit keys from using.

-. When WX/INT key, 16/9 key or UP/DOWN key is pressed, “WX” display will be eliminated and the key operation will be in use.

-. Even if the Channel Selection knob is operated,there are no changes.

1.3.13 DSC (Digital Selective Calling)

The DSC mode enables you to contact or be contacted by another vessel digitally,without voice communications. DSC can be used to replace the normal routine of verbally contacting another vessel on CH16,then proceeding to a working channel for further communications. Your radio must be set to CH70 to transmit or receive DSC calls. The three DSC call modes are described in the following section.

1) Own Ship's ID Entry(Own Ship's MMSI Entry)

To operate the RAY53 in the DSC mode,Own Ship's ID must be registered in advance. The registration procedure is as follows.

1. * If the former ID has been entered, Own Ship's ID cannot be entered and Alarm 2 is heard. There should be no MMSI number in the unit when shipped.
   It is necessary for re-enter Own ship's ID to delete the former ID by Own Ship's ID Clear.
   *If there is no former ID, Alarm 1 is heard and Own Ship's ID can be entered.

2. To enter DSC setting mode, press and hold the SCAN/MEM and WX/INT keys simultaneously for 2 seconds.
   ----→ "DSC" is displayed, which means the unit is in DSC mode.
   ----→ "MEM" is displayed, which means OwnShip's MMSI can be entered in DSC mode.

3. MMSI number can be put by the following operation

-. "0" is displayed at Channel Display(Large) on the LCD and "1" is displayed at Channel Display(Small) on the LCD.
   Channel Display(Large) is representative the MMSI number itself and Channel Display(Small) is representative of the position in the 9 digit.

-. When the Channel Selection knob is rotated, Channel Display(Large) shows the MMSI number is increased/decreased as "0" base.(0 to 9 can be selected)

-. MMSI number is selected by knob being rotated. When DSC key is pressed, the audible beep sound 1 is heard and the selected number can be memorized.("2" is displayed at Channel Display(Small) on the LCD which means that 2nd(second) digit is ready to be input. And the rest of the digits are entered in the same manner.

-. Once all of the digits have been entered, the unit will redisplay ID numbers every 1 second.

-. If the number was entered incorrectly, the customer perform the entry again by pressing and releasing DSC key. At that time "0" is displayed at Channel Display(Large) and "1" is displayed at Channel Display(Small).

-. If the number is entered correctly, the entered number becomes Own Ship's MMSI by pressing DSC key for 2 seconds and the audible beep sound 1 is heard,then the DSC mode is exited and returned to Working CH.

4. Entry of number is done by Channel Selection knob. The number cannot be input by UP/DOWN key on the Microphone.
The stored data can be memorized only by DSC key
The stored data cannot be memorized by the other key operations and cannot be done when the power is turned off on the way.

5. The way to CLEAR Own ship's ID No.
To turn the unit on with pressing and holding SCAN/MEM + 16/9 key simultaneously.
The audible beep sound 1 is heard and "CL" is displayed at Channel Display(Large).

2) Individual Ship' Call"

1. **"**Individual Ship's Call" specifies other Ship's Number and the channel number.
Unless Own Ship's MMSI ID is entered, Individual Ship's Call cannot be used.

2. When SCAN/MEM key and WX/INT key are simultaneously pressed and released, Individual Ship's Call will be in use.
---→ "DSC" is displayed on the LCD which means the unit is in DSC mode.
---→ Channel 70 is displayed at Channel Display(Large)
(Programming for PLL data of 70CH.)
---→ "In" is displayed at Channel Display(Small) which means the unit is in Individual Ship's Call mode.

3. When SCAN/MEM key ("DSC" key) is pressed and released, the audible beep sound 1 is heard and the other ship's Number can be set.
-. "0" is displayed at Channel Display(Large) on the LCD and "1" is displayed at Channel Display(Small) on the LCD.

Channel Display(Large) is representative of the MMSI number itself and Channel Display(Small) is representative of the position in the 9 digit.

-. When the Channel Selection knob is rotated, Channel Display(Large) shows the MMSI number is increased/decreased as “0” base.(0 to 9 can be selected)

-. MMSI number is selected by knob being rotated. When SCAN/MEM key(DSC key) is pressed, the audible beep sound 1 is heard and the selected number can be memorized.(“2” is displayed at Channel Display on the LCD, which means that 2nd (second) digit, is ready to be input. And the rest of the digits are entered in the same manner.

-. Once all of the digits have been entered, the unit will redisplay ID numbers every 1 second.

-. If the number was entered incorrectly, the customer can perform the entry again by pressing and releasing SCAN/MEM key(DSC key). At that time “0” is displayed at Channel Display(Large) and “1” is displayed at Channel Display(Small).

4. Entry of number is done by Channel Selection knob. UP/DOWN key on the Microphone does not enter the number.

5. If the number is entered correctly, the entered number becomes “Other Ship’s Number” by pressing SCAN/MEM key(DSC key) for 2 seconds and the audible beep sound 1 is heard.
The stored data can be memorized only by SCAN/MEM key(DSC key).
The stored data cannot be memorized by the other key operations and cannot be done when the power is turned off on the way.

6. After entry of “Other Ship’s number”, Other Ship’s Channel Number is ready to be entered.
---→ ”--- ---“ is displayed at Channel Display(Large) which means Channel number is ready to be entered.
---→ “W” is displayed at Channel Display(Small) which means the working channel is to be selected.

6’ If the operator would like to resistor Other ship’s MMSI No.only without attempt of transmission, the last used(before registration of MMSI) CH will be displayed by pressing 16/9 key at this stage.

7. -. Working Channel can be selected by rotating Channel Selection knob.
   -. When SCAN/MEM key(“DSC” key) is pressed and released, the audible beep sound is heard and the selected number can be memorized as Working Channel number.

8. If the operator would like to resistor Other ship’s MMSI No.only without attempt of transmission, the last used(before registration of MMSI) CH will be displayed by pressing 16/9 key at

9. After entry of “Channel number”, “Individual Ship’s Call” is ready to transmit.
   ----→ “TX” is flashing on the display(Instruction to be ready to transmit)
   ----→ Channel 70 is displayed at Channel Display(Large)
   (Programming for PLL data of 70CH.)
   ----→ “In” is displayed at Channel Display(Small) (Instruction for Individual Ship’s Call)
   -. While “TX” is flashing,Individual Ship’s Call can transmit at 70CH by pressing PTT key.
   -. After transmission, when an acknowledgement from the target ship is received, the audible beep sound is heard and “ACK” is displayed on the LCD.
   -. When 2 seconds is passed after receipt of acknowledge, the unit will switch to selected Channel number and “DSC” mode will be exited.
   When DSC mode is exited,”DSC” and “ACK” will be eliminated.
   Channel Display(Large) displays the selected Channel number.
   Channel Display(Small) is eliminated.
   -. If an acknowledge from the target ship is not received, “Individual Ship’s Call” at 70CH is still remaining in use.
   (“Individual Ship’s Call” can transmit again by pressing PTT key)

10. The way to CLEAR Other ship's MMSI No.

There are two ways to clear Other Ship's MMSI No.

1) To turn the unit on with pressing and holding SCAN/MEM key simultaneously. Alarm 1 is heard and "CL" is displayed at Channel Display(Large).

Or

2) To turn the radio on with pressing and holding SCAN/MEM key and 16/9 key Simultaneously. Alarm 1 is heard and "CL" is displayed at Channel Display(Large). (Own Ship's ID No. is also CLEAR by doing this operation.)

3) Other ship's MMSI previously entered.

When the other ship MMSI number has been entered,the operator does not have to register the other ship's MMSI number by doing the following procedure.

1. Press SCAN/MEM key and WX/INT key simultaneously

2. Then "MEM", "DSC", "70" (Large channel display), "In"(Small channel display) are displayed on LCD.

-"MEM" means that the other ship's MMSI number has been registered.

-."DSC" means that the unit is in DSC mode.

-."In" means that the unit is in DSC mode.

3. Press and release DSC key.

4. "MEM","DSC" "0"(Large channel display) and "1"(Small channel display) are displayed on the LCD.

5. Press and release MON key if you would like to check the MMSI number.

6. The MMSI number of each digit is displayed every 1 sec from 1st digit to 9th digit.

MMSI number itself is displayed on the Large Channel Display.

The number of digit is displayed on the Small Channel Display.

7. After all MMSI number(total 9 digits) are displayed, to press DSC key for 2 second, the LCD displays "DSC", " --- ---",(Large Channel Display) and "w"(Small Channel Display) which means the unit is ready and waiting for input of Calling CH .

5’ Press and release WX/INT key if you do not have to check the MMSI number again ,

6’ the LCD displays “DSC”, “ --- ---“,(Large Channel Display) and “w”(Small Channel Display) which means the unit is ready and waiting for input of Calling CH .

8. (If you would like to enter the different Other Ship’s MMSI number manually),

1. To rotate channel selection knob from the stage of the above 4(“MEM”,”DSC”,”0” and “1”) ,then the different other ship’s MMSI number can be set. The LCD displays “DSC” , “3”(Large Channel display) and “1” (Small Channel display) which means that the number of 1st digit is 3.
2. To press and release DSC key for confirmation,Alerm 1 is heard and the MMSI number of 2nd digit will be ready to be input. “MEM”, “DSC”,”0”(Large Channel Display) and “2”(Small Channel display) are displayed on the LCD. To rotate Channel Selection Knob,the MMSI number of 2nd digit is selected.
3. The rest of the digits are entered in the same manner.
4. Once all of the digits have been entered,the unit re-display MMSI Number every 1 sec from 1st digit to 9th digit. When the operator confirmed MMSI number, “DSC” “--- ---“ and “w” are displayed on the LCD by pressing and holding DSC key for 2 seconds.

   If the operator would like to double check the MMSI number again or to change the MMSI number, the LCD displays “MEM”,”DSC”,”0” and “1” by pressing and releasing DSC key.

4) Receiving Individual Ship’s Call Response

1. The receivable Channel is only 70CH. It can be done even in working CH, Monitor mode and Scan mode.

2. When the unit receive the signal, the unit will become automatically “DSC” mode.
   If the received signal is for the unit itself,the unit will respond the signal.
   If the received signal is not for the unit itself, the unit will not respond and Monitor Mode or Scan mode will continue to be in use.

3. The operation when the received signal is for the unit itself.
   When the unit receives “Individual Ship’s Call” at 70CH, Alarm tone will sound.
   ----→ “DSC” is displayed which means the unit is in DSC mode.

----→ Channel Display(Large) displays 70CH.

----→ “In” is flashing at Channel Display(Small) which means the unit is ready to receive Individual Ship’s Call.

----→ “TX” is flashing, which means the unit is ready to receive Individual Ship’s Call.

4. To transmit the response by pressing PTT key.
   After transmission,the unit will switch to instructed Channel number and DSC mode will be exited.
   ----→When DSC mode is exited, “DSC” is eliminated.
   ----→Channel Display(Large) display the selected Channel number.
   ----→Channel Display(Small) is eliminated.

5. The transmitter/receiver can be done at the selected channel number.

5) “All Ship’s Call”

1. “All Ship’s Call” does not specify the other ship.
   “All Ship’s Call is general call to any ship to initiate contact on channel 16.
   Unless “Own Ship’s ID” is entered,”All Ship’s Call” cannot be done.

2. When SCAN/MEM key and WX/INT key are simultaneously pressed and released, “All Ship’s Call” will be in use.
   ----→ “DSC” is displayed on the LCD which means the unit is in DSC mode.
   ----→ Channel 70 is displayed at Channel Display(Large)
   (Programming for PLL data of 70CH.)
   ----→ “In” is displayed at Channel Display(Small) which means the unit is in Individual Ship’s Call mode.
3. “All Ship’s Call” can be selected by rotating Channel Selection Knob.
   Channel Display(Small) displays “AS”.

   Whether “Individual Ship’s Call” or “All Ship’s Call” can be selected by Channel Selection Knob.

When “Individual Ship’s Call” is selected, Channel Display(Small) displays “In”.
When “All Ship’s Call” is selected, Channel Display(Small) displays “AS”.

5. After selection of All Ship’s Call”,when SCAN/MEM key(“DSC” key) is pressed, the audible beep sound 1 is heard and the unit is ready to transmit “All Ship’s Call”
   ----→ “TX” is flashing on the LCD which means that Transmission is ready.
   ----→ Channel 70 is displayed at Channel Display(Large).
   ----→ “AS” is displayed at Channel Display(Small) which means that the unit is in All ship’s Call mode.

6. While “TX” is flashing, All Ship’s Call can transmit at 70CH by pressing and releasing PTT key. Transmitter output power is limited to 1W.

7. After transmission,the unit will switch to 16CH of Working CH and DSC mode will be exited.
   When DSC mode is exited, ”DSC” will be eliminated.
   Channel Display(Large) displays 16CH of Working CH..
   Channel Display(Small) is eliminated.
   (“Individual Ship’s Call” can transmit again by pressing PTT key)

5) Receiving All Ship’s Call

The receivable Channel is only 70CH. It can be done even in working CH, Monitor mode and Scan mode.
When the unit receive the signal, the unit will become automatically “DSC” mode

1. When the unit receives “All Ship’s Call” at 70CH, Alarm tone will sound.
   ----→ “DSC” is displayed which means the unit is in DSC mode.
   ----→ Channel Display(Large) displays 70CH.

----→ “As” is flashing at Channel Display(Small) which means the unit is ready to receive All Ship’s Call.

2. After the unit received “All Ship’s Call”, when SCAN/MEM key(“DSC” key) is pressed, the audible beep sound 1 is heard and the unit will switch to the 16CH of Working CH and then “DSC” mode will be exited.

----→ When “DSC” mode is exited, “DSC” is eliminated from the LCD.

----→ Channel display(Large) displays 16CH of Working CH.

----→ Channel Display(Small) is eliminated.

6) “ Distress Call”

The “Distress Call” is to be initiated by pressing and holding the “DISTRESS” key on the rear of the microphone for 4 seconds.The Distress call has highest priority of all the operations.

Unless Own Ship’s MMSI ID is entered, Distress Call is not available.

1. When Distress key is continuously pressed, “Distress Call” can start to operate.

----→ “DSC” is displayed which means the unit is in DSC mode.

----→ Channel Display(Large) displays Counts down time(4,3,2,1).

Counts down will be shown every 1 second on Channel Display(Large)

----→ “d” is displayed at Channel Display(Small)

2. “Distress” key has to be pressed continuously for over 4 seconds.

While Distress key is being pressed, Channel Display(Large) is showing Count down times like 4→3→2→1.

If “Distress” key is released on the way before 4 seconds, “Distress Call” operation will be cancelled.

3. After Count down is finished,”Distress Call” can start to be transmitted.

----→ Channel Display(Large) displays 70CH.

----→ “d ” is displayed at Channel Display(Small) which means the unit is in Distress Call mode.

----→ Distress signal can be automatically transmitted.(“TX” is displayed on the LCD during transmitting.)

4. After transmitting Distress signal,the unit will wait for an acknowledgement from the other ship.
   ----→ Channel Display(Large) displays 70CH.
   ----→ Channel Display(Small) displays “16” which means the channel after receipt of an acknowledgement will be 16CH.
   ----→ “TX” will be eliminated.

5. If the unit does not receive any acknowledgement from the other ships for Distress Call even after Distress Call was transmitted, Distress signal can be transmitted automatically randomly every 3.5 – 4 sec until receiving acknowledgement from the others.
   When the acknowledgement is received,the automatic transmission will not be necessary.

6. Once an acknowledgement is received from the other ship, Alerm tone will sound and “Distress Call” mode will be exited and the unit automatically select 16CH.
   ----→”ACK” is displayed by receiving acknowledgement. (“ACK” will be eliminated after 16CH is selected.)
   ----→”DSC” is eliminated.
   ----→ Channel Display(Large) displays 16CH of Working CH.
   ----→ Channel Display(Small) is eliminated.

7) Receiving “Distress Call”

The receivable Channel is only 70CH. It can be done even in working CH, Monitor mode and Scan mode.
When the unit receive the signal, the unit will become automatically “DSC” mode

(1)When the unit receives “Distress Call” at 70CH.
----→ “DSC” is displayed which means the unit is in DSC mode.
----→ Channel Display(Large) displays 70CH.

----→ “d ” is flashing at Channel Display(Small) which means the unit is ready to receive Distress Call.

After the unit received “Distress Call”, when “DSC” key is pressed and released, Alarm 1 is heard and the unit will switch to the 16CH of Working CH and then “DSC” mode will be exited.

---→ When “DSC” mode is exited, “DSC” is eliminated from the LCD.

---→ Channel Display(Small) is eliminated3. DSC Watch mode can be activate by doing following operat.

8) DSC WATCH Mode/ON OFF operation

1. DSC WATCH operation is defined that the radio is searching for CH70(DSC Channel) in Receiving Working Channel , Scan Operation mode, and Monitor Operation mode.
2. DSC Watch operation can be selected with ON/OFF by panel operation. DSC WATCH should be OFF when the unit is ex-factoried.

1) Press and hold SCAN/MEM key and WX/INT key simultaneously for 2 seconds.

2) “DSC” , “70” (Large CH display) and ‘In”(Small CH display) are displayed on the LCD. The unit is in the selection mode for Individual Ship’s Call.

3) Rotate Channel Selection Knob to the right.
4) “DSC” , “70”(Large CH display) and “As”(Small CH display) are displayed on the LCD. The unit is in the selection mode for All Ship’s Call.

5) Rotate Channel Selection Knob to the right.
6) “DSC”, “70”(Large CH display) , and “0F”(Small CH display) are displayed on the LCD. At this stage, DSC Watch mode can be selected. “0F” on the Small CH display means that DSC Watch is OFF.
Further to rotate CH selection Knob to the right,the unit repeat to be displayed from the above 2) . The display will be done as 6)→ 2) → 4) → 6).

To rotate Channel Selection Knob to the left, the unit will be displayed back to the Above 4). The display will be done as 6) → 4) → 2) → 6).

7) By pressing SCAN/MEM key, DSC Watch mode can be selected either ON or OFF.

8) To press SCAN/MEM key and WX/INT key simultanously, the unit return to the last Used display before the above 1) display.

9) When Power is re-activate on, the unit will start in the mode last used.(On or OFF).

2. SPECIFICATIONS

Transmitter

Channels	All available US,International and Canada VHF Marine band
Frequency Stability	+/- 10PPM(+/- 0.001%) (-20° C to +50° C)
Frequency Range	156.025 to 157.425MHz
Channel Spacing	25 kHz Increments
Power Output	25 Watts switchable to 1 Watt into 50 Ohms at 13.6 VDC
Modulation	Frequency modulated 16F3 (+/-4.5kHz at 1000Hz)
Modulation Audio Response	Shall not vary +1/-3 dB from true 6 dB pre-emphasis from 300 to 2500Hz, reference 1000Hz. Audio frequencies 3-20 kHz shall be attenuated(at 1 kHz by 60 log f/3 dB. Above 20kHz by 50dB)
FM Hum & Noise level	Less than –40dB below audio
Audio Distortion	Less than 10% at 1kHz for 3kHz deviation
Spurious & Homonic Emissions	Attenuated at least 43+10log Po(below ratd radiated carrier power) per FCC Rules Part 2 & 80
Antenna Impedance	50 Ohm
Transmitter Protection	Shall survive open or short circuit of anttena system without damage(10 min.test)

Receiver

Channels	All available US,International,Canada VHF Marine Band
Frequency Range	156.025 to 163.275 MHz in 25 kHz increments
Frequency Stability	+/- 10 PPM(+/- 0.001%) from -20° C to +50° C
Usable Sensitivity	0.3µV for 12dB(SINAD)
Squelch Sensitivity	0.2µV or better
Threshold	1.0µ full squelch
Adjacent CH Rejection	70dB
Spurious Image Rejection	70dB
Intermodulation Rejection	70dB
Audio Output	2 Watt or more at 10% or less distortion into 8 Ohm load(INTERNAL)
Hum & Noise in Audio	Less than –40dB

Operating Requirement

Input Voltage	13.6 VDC +/- 15%(11.6 to 15.6 VDC)
Current Required	Less than 5.8 amp at 25 Watts
Transmit	Less than 1.5 amp at 1 Watt
Operating Temperature	-20 °C to +50°C

Duty Cycle	Continuous, 80% receive, 20% transmit (max 10 min, @25° C)
Humidity	100% at 50°C for 8 hours

Radio Dimensions

Height	55 mm(2.17 inches)
Width	145mm(5.7 inches)
Depth	160mm(6.3 inches)
Weight	Approx. 868g

3. TECHNICAL DESCRIPTION

10.1 General

The RAY53 can be considered as consisting of two major sections.

-. The control section(consisting of the front panel controls ,LCD display,and CPU

-. The transmitter/Receiver/PLL section.

10.2 The Control Section

. The heart of the control section is the CPU,which is IC201 located on the CNTL PCB. The CPU controls all of the following items:

-. Controls the Squelch circuit by detecting a busy signal from the 2nd IF circuit IC3 on the RF PCB.

-. Generates a beep tone when a key is activated on the keyboard.

-. Mutes the transmitter modulation circuit when receiving.

-. Controls the output power of the transmitter High/Low.

-. Controls the dividing ratio N of the PLL circuit.

-. Switches On/Off the transmitter power.

-. Mutes AF audio.

-. Detects a weather alert signal(when in Monitor Mode)

-. Controls the LCD display.

3. 3 The transmitter/Receiver/PLL Sections

In reading through the following circuit descriptions, it may be helpful to refer to Block Diagram of the TX/RX/PLL circuits.

10.3 1. PLL(Phase Lock Loop) Circuit

PLL circuit of this radio is PLL IC(IC2) and is composed of VCO circuit which is for Transmitter and for Receiver independently. PLL IC(IC2) **generates** the setting frequency based on the control data of CPU(IC201).

The reference oscillating frequency of the PLL circuit is 21.25MHz and is consisting of crystal resonator X1 and IC2. This oscillating frequency 21.25MHz is divided into 1/850 to

make 25KHz-reference frequency.

Transmit frequency is generated on the Inductor and Capacitor circuit with connected to IC2 pin 4,5.

The frequency control voltage, which is output from IC2 pin 7, will be input into Variable Capacitance Diode(D6) on Inductor and Capacitor circuit.

The receiver local frequency is generated on the Inductor and Capacitance circuit with connected to IC2 pin 20, 21.

The frequency control voltage, which is output from IC2 pin 18, will be input into Variable Capacitance Diode(D5) composed on

The oscillating frequency 21.25MHz which is output from IC2 pin 11 will be used for the second local frequency of Receiver and it will be input into IF IC(IC2) pin 1.

10.4 Transmitting Circuit Operation

3.4.1 Microphone Amplifier Circuit:

Voice signal from the mocrophone goes through pre-emphasis circuit consisting of C147 ,R104 and is amplified in MIC AMP IC8(A).

Pre-emphasis can be output by Diode(D10). The level of the signal is limited by D7 and adjusted in the VR4.

Limiter output is amplified by IC8(B),then it goes through the active 4-stage LPF consisting of IC8(C) and IC8(D). 4-stage LPF output goes into Variable Capacitance Diode(D7) and then it makes Frequency modulation.

3.4.2 Transmit Frequency Power Amplifier Circuit

RF signal from the PLL IC(IC2) pin 1 goes through the 10dB attenuator consisting of R37,R38,R39 and will be amplified by Q11. Output from Q11 will amplify drive power necessary for the Q4 and Q3. power module(IC5) will be amplified and the RF signal will be output to the antenna switching circuit. 4-stage LPF consisting of L21 and L1-L3 is used to improve the level of Transmission Spurious Emission. RF output from the power module(IC5) can be changed by changing the voltage of IC5 pin2.

3.4.3 APC Circuit

Diode D4 is monitoring a part of the power module's(IC5) output. The monitoring signal will be output to IC5 via switching transistor Q8 and display the "TX ON" and the LCD.

The output voltage from IC5 controls the RF power to keep the RF output at a constant level.

3.4.4 DSC Signal Treatment

In DSC mode at CH70,a sequence signal from CPU is input to MODEM IC(IC11) and converted to an analog signal. As a MODEM TX signal,this signal switches the analog switch(Q20) from microphone input position to DSC position. Then DSC signal is sent out to the transmitter microphone amplifier.

If NMEA information are input to P501 connector through GPS or other devices connected to it,these information are taken into CPU through photo-coupler of Q22 and can be transmitted with DSC to provide information such as position and time.

3.5 RECEIVER CIRCUIT

3.5.1 Antenna Switching Circuit

A signal received at the antenna connector J501 goes to high frequency amplifier circuit via 4-stage low pass filter consisting of coils L1-L3 and L21.

3.5.2 High Frequency Amplifier Circuit

RF signal goes to the 1st mixer circuit through 2-stage BPF(consisting of coil L5,6) and will be high frequency amplified by Q1 and then 3-stage BPF(consisting of L8,L10,and T3) . The 1st image spurious frequency will be rejected to the adequate level in the 5-stage BPF inside the high frequency amplifier circuit.

3.5.3 1st Intermediate Frequency Amplifier Circuit.

A double balanced mixer(DBM) of IC1 is used for 1st mixer of Receiver.

RF signal from RF Amplifier circuit input to IC1 pin 6. Receiver local frequency input from PLL IC(IC2) pin 20 to IC1 pin3 and then converts the frequency.

The converted 1st IF signal(the frequency of 1st IF is 21.7MHz) goes through 1-stage crystal filter(F1) and is amplified in transistor(Q2)

3.5.4 2nd Intermediate Frequency Circuit

The 1st IF signal is added to IC3 and converted to 2nd IF signal. The 2nd IF signal goes through F2 and amplified in the IC3 and then through discriminator CD1 and the demodulated AF signal is output from IC3.

3.5.5 Low Frequency Circuit

The AF signal demodulated in the IC3 goes through the de-emphasis circuit consisting of operational amplifier IC4(A) and R127 and C45. A 3 stage active HPF consisting of IC4(B) ,C48,C49 C50,R23,R24 and R25 is used to reject AF signal below 300Hz. The AF signal from the 3-stage HPF goes through AF Volume VR301 and is input to the speaker amplifier circuit IC9.

3.5.6 Audio Muting Circuit

The Q18 to mute the audio is controlled by input of squelch's BUSY signal and the mute output of the CPU(IC201).

3.5.7 WX Alert Detection

The tone selector IC10 detects the 1050Hz alert tine if it is contained in the re-modulated AF and WX alert tone will be output from the speaker.

3.5.8 DSC Signal Treatment

If the re-modulated signal arriving is a DSC signal, it is input to MODEM IC(IC11) as an RX MODEM signal, and converted to digital signal. Undergoing the treatment in the CPU circuit, this digital signal changes the operation state to DSC mode.

4. ALIGNMENT for RAY53

4.1 PLL Adjustment(Receiver)

1.1 Connect the power supply(13.6V, 10) to the power line.

1.2 Set the radio on CH16(156.800MHz) and set it to Receiver mode.

1.3 Connect the reed terminal of a digital voltmeter or high impedance tester to Test point(TP2) on RF PCB and set it to DC voltage range.

1.4 Adjust variable coil (T1) in the RF PCB(in the VCO shield case) and set the DC voltage to 1.3V+/-0.1V.

4.2 PLL Adjustment(Transmitter)

Connect the power supply (13.6V,10A) to the power line.

Connect RF Power Meter(40W 50 ohm, 150-200MHz) to antenna connector.

Set the radio on CH16(156.800MHz) and set it to Transmitter mode.

Connect the reed terminal of a digital voltmeter or high impedance tester to Test point(TP3) on RF PCB and set it to DC voltage range.

Adjust variable coil (T2) in the RF PCB(in the VCO shield case) and set the DC voltage to 2.0V+/-0.1V.

4.3. Frequency Adjustment(Transmitter)

4.3.1 Connect the power supply (13.6V,10A) to the power line.

4.3.2 Connect RF Power Meter(40W 50 ohm, 150-200MHz) to antenna connector. Use Coupler in order to divide the transmitter output power and then connect to frequency counter.

4.3.3 Set the radio on CH16(156.800MHz) and set it to Transmitter mode.

4.3.4 Adjust Trimmer Capacitor(TC1) in the RF PCB(in the VCO shield case) and set the Frequency Counter to 156800.000Hz+/-100Hz.

4.4 Modulation Adjustment(Transmitter)

4.4.1 Connect the power supply (13.6V,10A) to the power line.

4.4.2 Connect RF Power Meter(40W 50 ohm, 150-200MHz) to antenna connector. Use Coupler in order to divide the transmitter output power and then connects to FM

linear detector.

4.3.3 Connect the audio oscillator and PTT test Assy to Connector (J203) No.1 pin in CNTL PCB. Set the audio oscillator to –18dBm and set the frequency to 1KHz And then set it to transmitter mode.

4.4.4 Adjust Variable Resistor(VR4) in the RF PCB to set the deviation displayed on FM linear detector to 4.2kHz+/-0.1kHz.

4.4.5 Set the audio oscillator to –38dBm and set the frequency to 1kHz. Confirm that the deviation on FM linear detector should be 3.0kHz+/-0.5kHz.

4.5 Output Power Adjustment(Transmitter)

4.5.1 Connect the power supply (13.6V 10A) to the power line.and connect Power Meter(40W, 50 ohm, 150-200MHz) to antenna connector.

4.5.2 Set the radio on CH 16(156.800MHz) and to be transmitter mode at Low power mode.

4.5.3 Adjust the output power to 1.0W+/-0.1W by Variable Resistor (VR2) on the RF PCB.

4.5.4 Change the transmitter output selector Switch into Hi Power mode.

4.5.5 Adjust the output power to 2.5W +/-1W by Variable Resistor(VR3) on the RF PCB.

4.6 RF Sensitivity Adjustment(Receiver)

4.6.1 Connect a RF signal generator to the antenna connector and a SINAD meter to the External speaker line.

4.6.2 Select the Weather Channel .

4.6.3 Set RF generator as follows:

Frequency : 163.275 MHz.

Modulation: 1.0 kHz

Deviation : 3.0kHz

4.6.4 Adjust T3 on RF board and make the best of SINAD sensitivity

5. ELECTRICAL CONNECTIONS

5.1 DC Power, External Speaker Connections and NMEA Input

The 6 feet long power cable assembly consists of the DC power cable and the external speaker cable. The DC power cable is composed of RED(+) and BLACK(-) wires, and the external speaker cable has YELLOW(+) and GREEN THICK(-) wires and NMEA Input has BLUE(+) and PURPLE(-). The RED(+) wire with an in-line fuse(10 amps.) and the BLACK(-) wire of the 6 pin connector cable are used for connecting the RAY53 to the ship's 13.6 VDC power system.

In most cases this length should be adequate enough to reach the DC power source.
If additional wire length is required,the cable can be extended by adding more cable as necessary. However,for power cable runs longer than 15 feet,larger wire diameter size should be used to prevent voltage line loss.

Your RAY53 radio should be connected to the nearest primary source of ship's DC power. A typical source may be a circuit breaker on the power panel or a fuse block near the unit. When connecting to either of these sources, the circuit breaker or other in-line fuse should be rated at 10 amps.

It is recommended that lugs be used to connect the power cable to the DC supply and the lug connections should be both crimped and soldered. This is very important in order to insure adequate currect draw to the equipment. intermittent operation may result if an insufficient connection is made to the power source. the connection terminal should be clean, with no sigh of corrosion.

The RED(+) wire is connected to the positive terminal of the power source or battery. The BLACK(-) wire is connected to the negative(ground) of the power source or battery. Should the power connections be inadvertently reversed,the

10 amp.in-line fuse located in the RED(+) wire will open. Check the input power leads for correct polarity with a VOM(volt/ohm meter),reconnect the leads observing correct polarity,and replace the fuse. Use the same rate and type fuse.

-The RAY53 accepts NMEA 0183 data from a GPS or Loran navigator to provide Lat/Lon position information that is transmit during DSC Distress Call mode. The NMEA sentences that could provide positional data,by order of priority are: GGA.RMC,RMA,and GLL.

5.2 Antenna Connections

The coaxial cable to your VHF antenna is intended to be connected to the antenna jack on the rear panel using a PL259 VHF type connector. The antenna cable may be cut to the required length at installation. If a longer cable length is required, RG-58 50 ohm coaxial cable or equivalent cable may be used for runs up to a maximum of 50 feet. If the distance required is even greater,then we recommend using low loss RG-213 or equivalent cable for the entire run in order to avoid excessive losses in power output.

If the antenna RF connector is likely to be exposed to the marine environment, a protective coating of grease(similar to Dow Corning DC-4) can be applied to the connetor before connecting it to the radio. Any other extensions or adapters in the cable run should also be protected by silicon grease and then wrapped with a waterproofing tape.

5.3 Antenna Mouting Suggestions

The best radio in the world is useless without a good antenna location. Mounting the VHF antenna properly is very important because it will directly affect the performance of your VHF radio. A standard VHF antenna which is designed to use aboard boats should be used.

-. Since VHF transmission are essentially Line-of-Sight,mount the antenna at the highest possible location on the vessel and free of obstruction in order to

obtain maximum range.

- Use an antenna with highest possible gain characteristics.
- If you must extend the length of the coaxial cable between the antenna and the Radio, use a coaxial cable designed for the least amount of power loss over the entire cable length.
- Keep the coaxial cable between the radio and antenna as short as possible.

5.4 Grounding

While special grounding is not generally required for VHF radiotelephone installations, it is good marine practice to properly ground all electronic equipment to the ship's ground system. The RAY53 can be connected to ground by attaching a wire to one of the screws on the unit's rear panel and then to the nearest ship's ground connection point. The recommended wire to be used or such grounding is #10 AWG.

RAY53's cabinet was specially designed and die-cast from aluminum to insure maximum noise rejection from external sources

USA Frequency DATA

CH	TX Frequency	RX Frequency	PWR	CH	TX Frequency	RX Frequency	PWR
1	156.050	156.050		73	156.675	156.675	
2				74	156.725	156.725	
3	156.150	156.150		75		156.775	1
4				76		156.825	1
5	156.250	156.250		77	156.875	156.875	3
6	156.300	156.300		78	156.925	156.925	
7	156.350	156.350		79	156.975	156.975	
8	156.400	156.400		80	157.025	157.025	
9	156.450	156.450		81	157.075	157.075	
10	156.500	156.500		82	157.125	157.125	
11	156.550	156.550		83	157.175	157.175	
12	156.600	156.600		84	157.225	161.825	
13	156.650	156.650	2	85	157.275	161.875	
14	156.700	156.700		86	157.325	161.925	
15		156.750	1	87	157.375	161.975	
16	156.800	156.800		88	157.425	157.425	
17	156.850	156.850	3				
18	156.900	156.900					
19	156.950	156.950					
20	157.000	157.000					
21	157.050	157.050					
22	157.100	157.100					
23	157.150	157.150					
24	157.200	161.800					
25	157.250	161.850					
26	157.300	161.900					
27	157.350	161.950					
28	157.400	162.000					
60							
61	156.075	156.075					
62							
63	156.175	156.175					
64	156.225	156.225					
65	156.275	156.275					
66	156.325	156.325					
67	156.375	156.375	2				
68	156.425	156.425					
69	156.475	156.475					
70	156.525	156.525	4				
71	156.575	156.575					

WX Frequency DATA

CH	RX Frequency
0	163.275
1	162.550
2	162.400
3	162.475
4	162.425
5	162.450
6	162.500
7	162.525
8	161.650
9	161.775

72	156.625	156.625					

INT Frequency DATA

CH	TX Frequency	RX Frequency	PWR	CH	TX Frequency	RX Frequency	PWR
1	156.050	160.650		73	156.675	156.675	
2	156.100	160.700		74	156.725	156.725	
3	156.150	160.750		75		156.775	1
4	156.200	160.800		76		156.825	1
5	156.250	160.850		77	156.875	156.875	3
6	156.300	156.300		78	156.925	156.875	
7	156.350	160.950		79	156.975	156.875	
8	156.400	156.400		80	157.025	156.875	
9	156.450	156.450		81	157.075	156.875	
10	156.500	156.500		82	157.125	156.875	
11	156.550	156.550		83	157.175	156.875	
12	156.600	156.600		84	157.225	156.875	
13	156.650	156.650	2	85	157.275	156.875	
14	156.700	156.700		86	157.325	156.875	
15		156.750	1	87	157.375	156.875	
16	156.800	156.800		88	157.425	156.875	
17	156.850	156.850	3				
18	156.900	161.500					
19	156.950	161.550					
20	157.000	161.600					
21	157.050	161.650					
22	157.100	161.700					
23	157.150	161.750					
24	157.200	161.800					
25	157.250	161.850					
26	157.300	161.900					
27	157.350	161.950					
28	157.400	162.000					
60	156.025	160.625					
61	156.075	160.675					
62	156.125	160.725					
63	156.175	160.775					
64	156.225	160.825					
65	156.275	160.875					
66	156.325	160.925					
67	156.375	156.375	2				
68	156.425	156.425					
69	156.475	156.475					

70	156.525	156.525	4				
71	156.575	156.575					
72	156.625	156.625					
CAN Frequency DATA							
CH	TX Frequency	RX Frequency	PWR	CH	TX Frequency	RX Frequency	PWR
1	156.050	156.050		73	156.675	156.675	
2	156.100	156.100		74	156.725	156.725	
3	156.150	156.150		75		156.775	1
4	156.200	156.200		76		156.825	1
5	156.250	156.250		77	156.875	156.875	3
6	156.300	156.300		78	156.925	156.925	
7	156.350	156.350		79	156.975	156.975	
8	156.400	156.400		80	157.025	157.025	
9	156.450	156.450		81	157.075	157.075	
10	156.500	156.500		82	157.125	157.125	
11	156.550	156.550		83	157.175	157.175	
12	156.600	156.600		84	157.225	161.825	
13	156.650	156.650	2	85	157.275	161.875	
14	156.700	156.700		86	157.325	161.925	
15		156.750	1	87	157.375	161.975	
16	156.800	156.800		88	157.425	157.425	
17	156.850	156.850	3				
18	156.900	156.900					
19	156.950	156.950					
20	157.000	157.000					
21	157.050	157.050					
22	157.100	157.100					
23	157.150	157.150					
24	157.200	161.800					
25	157.250	161.850					
26	157.300	161.900					
27	157.350	161.950					
28	157.400	162.000					
60	156.025	156.025					
61	156.075	156.075					
62	156.125	156.125					
63	156.175	156.175					
64	156.225	156.225					
65	156.275	156.275					
66	156.325	156.325					

67	156.375	156.375	2				
68	156.425	156.425					
69	156.475	156.475					
70	156.525	156.525	4				
71	156.575	156.575					
72	156.625	156.625					

NOTE:

1. Transmitter is automatically disable on channel 15,75 and 76 in all modes.
2. 1 Watt initially. User can override to 25Watts via front panel controls.
3. 1 Watt Only
4. Channel 70 is now used for Digital Selective Calling only.