

MARINE VHF RADIOTELEPHONE

DR-MA1

Operator's Manual

Safety Instructions for the Operator

WARNING



- **Do not open the equipment.**

Hazardous voltage which can cause electrical shock, burn or serious injury exists inside the equipment. Only qualified personnel should work inside the equipment.

- **Do not disassemble or modify the equipment.**

Fire, electrical shock or serious injury can result.

- **Turn off the power immediately if water leaks into the equipment or the equipment is emitting smoke or fire.**

Continued use of the equipment can cause fire or electrical shock.

- **Do not place liquid-filled containers on the top of the equipment.**

Fire or electrical shock can result if a liquid spills into the equipment.

- **Do not operate the equipment with wet hands.**

Electrical shock can result.

- **Keep heater away from equipment.**

Heat can alter equipment shape and melt the power cord, which can cause fire or electrical shock.

- **Any repair work must be done by a licensed radio technician.**

Improper repair work can cause electrical shock or fire.

CAUTION

- **Do not touch any part of the antenna when the equipment is transmitting.**

Electrical shock can result.

- **Use the proper fuse.**

Use of a wrong fuse can result in fire or permanent equipment damage.

- **Do not place objects on the top of the equipment.**

The equipment can overheat or personal injury can result if the object falls.

Safety Instructions for the Installer

WARNING



- **Do not work inside the equipment unless you are totally familiar with electrical circuits.**

Hazardous voltage which can shock, burn or cause serious injury exists inside the equipment.

- **Turn off the power to the mains switchboard before beginning the installation. Post a sign near the switch to indicate it should not be turned on while the equipment is being installed.**

Fire, electrical shock or serious injury can result if the power is left on or is applied while the equipment is being installed.

CAUTION



- **Ground the equipment to prevent electrical shock and mutual interference.**

- **Confirm that the power supply voltage is compatible with the voltage rating of the equipment.**

Connection to the wrong power supply can cause fire or equipment damage. The voltage rating appears on the label at the rear of the unit.

- **Use the correct fuse.**

Use of a wrong fuse can cause fire or equipment damage.

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1 Introduction

Thank you for choosing the ALINCO DR-MA1 VHF Marine Radiotelephone. ALINCO radios and other products are ranked as some of the finest in the world.

Your equipment is designed and produced not only to provide commercial grade performance and reliability but also to be affordable for pleasure craft owners.

Please read carefully this manual and follow the recommended procedure for installation, operation, and maintenance. With appropriate care, your equipment ought to provide years of enjoyable and dependable communications.

1.1 Features

The DR-MA1 transceiver provides the following features:

- 25 W RF output from a compact cabinet:
May be mounted in any small space.
- Water-resistant structure (CFR-46 FCC Regulation Specification)
- 54-channel transmit and 86-channel receive capabilities including International, USA, and Weather channels.
- With the **9/ALL** key, you can program a most-frequently-used channel in.
- Easy channel selection by the push button keys (▲, ▼).
- The Dual Watch function switches between CH16 and a selected channel. When a weather alert signal is received, the mode changes from dual watch to weather alert.
- Advanced commercial grade design and components.



1.2 Specifications

General specifications

Radio compliance	USA FCC Part 80, Canada Cat, V
Number of channels	54 channels TX and 86 channels RX capability. All US, International, and 10 weather channels.
Power supply voltage	13.8 VDC nominal $\pm 15\%$ (11.5~15.6 VDC)
Modulation type	Frequency modulated 16KF3 (G3E)
Operating temperature	-20°C to +50°C (-4°F to 122°F)
Water resistance	CFR 46 parts 110, 111
Dimensions	60 mm (H) \times 150 mm (W) \times 118 mm (D) without projections
Weight	Approximately 1.1 kg
Antenna	SO-239 connector
Power and external speaker connection	A two-meter, four-wire power/speaker cable with a fuse.

Receiver specifications

Frequency range	156.025 to 163.275 MHz in 25 kHz increment*
AF output	3W at 4 ohms load (less than 10% THD at 1 kHz)
Current drain	Less than 250mA
AF response	6 dB/oct. de-emphasis $\pm 1/-3$ dB from 300 to 3000 Hz
Intermodulation	Larger than 68 dB
Sensitivity	0.3 μ V (-117.5 dBm) for 12 SINAD
Squelch sensitivity threshold	0.2 μ V (-121 dBm) or larger
Tight squelch sensitivity	0.8 μ V (-109 dBm)
Adjacent channel selectivity	Larger than 70 dB
Spurious image rejection	Larger than 68 dB
Conducted receiver spurious emission	Less than 2000 pw (-57 dBm)
FM hum and noise	Less than -40 dB

Transmitter specifications

Frequency range	156.025 to 157.425 MHz*
Channel spacing	25 kHz
RF output power	25 W (high) and 1 W (low) switchable
Input current	TX less than 6.0 A max. at 25 watts less than 1.5 A Max at 1 watt
Frequency stability	± 10 ppm
Frequency deviation	± 5 kHz max.
Modulation AF response	Within the limit of +1 or -3dB at 6dB/oct. frequency curve (300 to 3000 Hz) reference (1000 Hz)
Time-out timer	5 minutes $\pm 10\%$
Hum and noise level	Less than -40 dB below audio (less than 10% at 1 kHz for ± 3 kHz)
Spurious and harmonic emission	Attenuated at least 43 + 10 log power (below rated radiated carrier power)

*Some frequencies are skipped. See Appendix 1, "Channel List."

2 Before Installation

This section describes important information you need to know before installing the transceiver.

2.1 Unpacking the Transceiver

Carefully remove the equipment from the shipping box to avoid damaging the contents. It is suggested to keep the box and the packing materials, because if the unit has to be returned to the factory, the original packing materials should be used.

The DR-MA1 package box should contain the articles listed below. If any of them are missing or damaged, contact your authorized dealer.

- DR-MA1 radiotelephone
- MIC hanger with two screws (Part number: KZ0085)
- Power/external speaker cable (Part number: EDC87)
- Mounting bracket with two screws (Part number: EBC15)
- Spare fuse
- Operator's manual (Part number: PS0293)
- Warranty card

2.2 Positioning the Transceiver

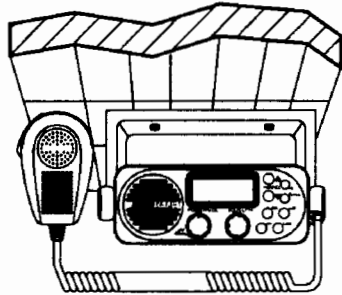
Select the location for mounting the transceiver considering the below:

- Although the equipment is spray-proof, long time exposure to the environment causes shortening of its life. It is suggested to mount the equipment in the cabin or at least in a shaded area.
- The equipment should be placed as near to the power source as possible and have appropriate distance from any devices which may cause interference such as navigation receivers, direction finders, and other onboard electronics.
- After a long transmission, the cabinet of the equipment, especially the rear panel, becomes warm. Therefore, leave some space around the equipment to allow for circulation of cooling air.

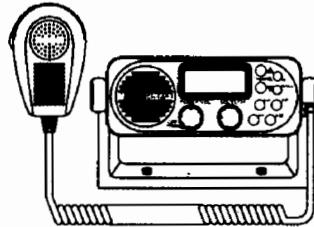
Compass safe distance	
• Standard	: 1.8 m
• Steering	: 0.9 m

2.3 Selecting a Mounting Method

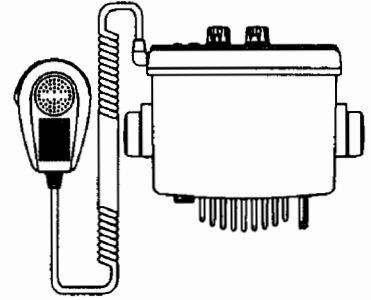
Although the equipment can be mounted on the overhead, a tabletop, or a bulkhead, the mounting place must be able to support the weight of the equipment. If needed, reinforce the mounting place by linking blocks or doubling plates.



**Overhead
(Dashborad)**



Tabletop



Bulkhead

Figure 2-1: Mounting methods

3 Installation

This section describes the instructions for installing the transceiver system.

3.1 Mounting the Transceiver

Before mounting your DR-MA1, find out where the vessel's power supply and ground are located, and also find where the antenna can be mounted. The antenna must be at least three feet away from the equipment and as high as possible.

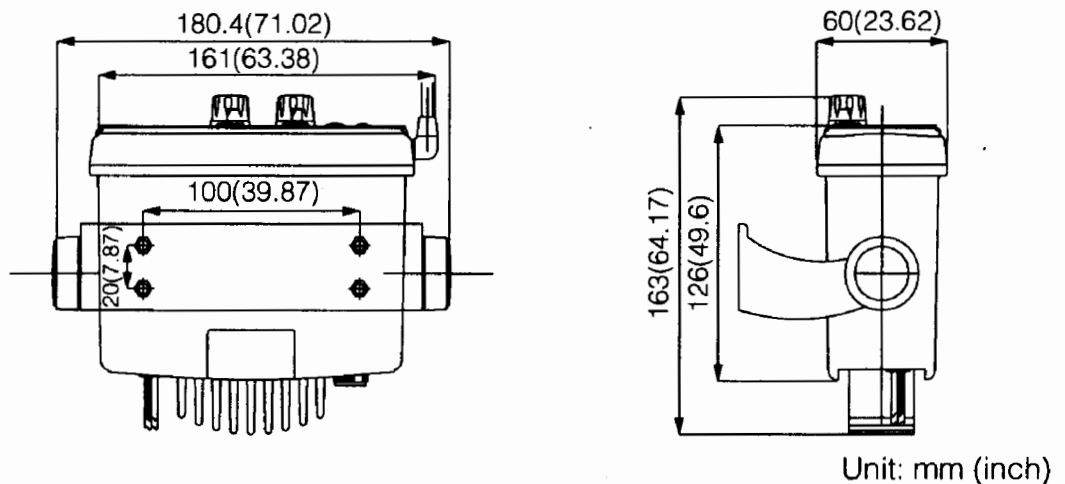


Figure 3-1: Mounting dimensions

To mount the transceiver, use the following procedure:

1. Attaching the bracket

Use four screws to attach the mounting bracket to the surface of the mounting place (these screws are not included in the package).

2. Mounting the transceiver

Place the transceiver body between the bracket arms. Use the included two bracket screws to firmly fix the transceiver.

3.2 Connecting Other Devices

Figure 3-2 shows the electrical connections of the transceiver to the power supply unit, external speaker, and antenna. Following the instructions in this section, properly connect these devices.

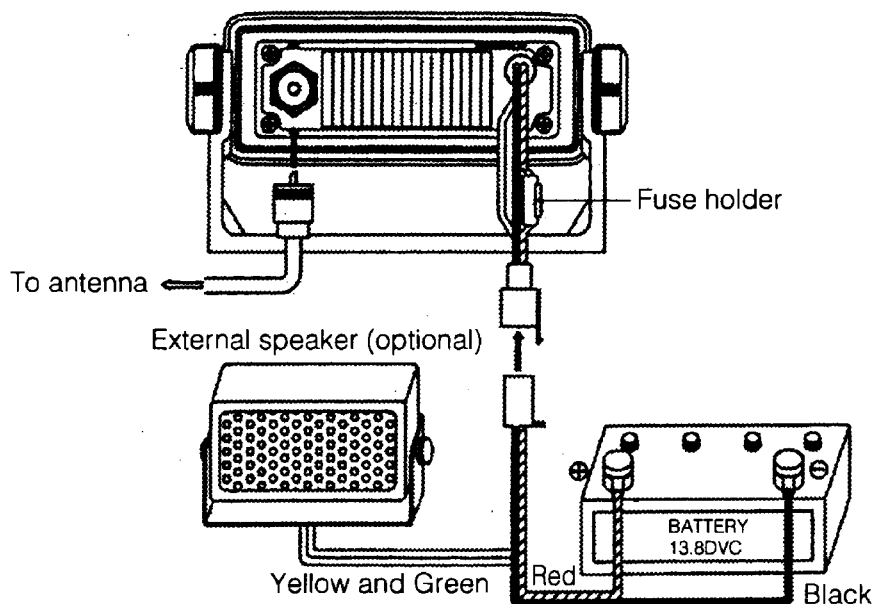


Figure 3-2: Electrical connections

Wiring the Power Supply Unit

Use the included power/external speaker cable to connect the transceiver to the 13.8 VDC power supply unit on your ship.

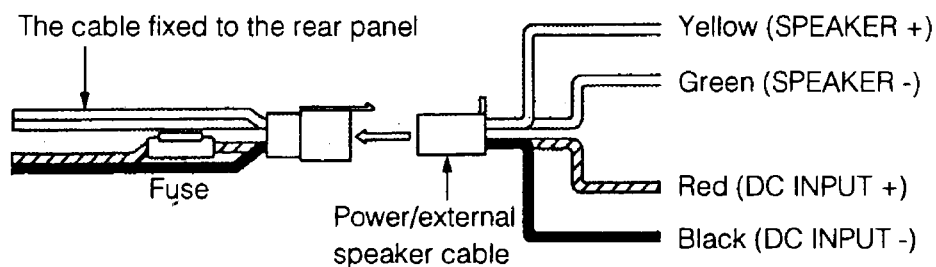


Figure 3-3: Wiring the power supply unit

Plug the male connector at the end of the cable on the rear panel of the transceiver into the female connector of the power/external speaker cable. Attach the red wire of the power/external speaker cable to the DC INPUT+ terminal, and black wire, the DC INPUT- terminal of the power supply unit.

Connecting the External Speaker

The DR-MA1 has a built-in speaker suitable for most applications. However, if the optional external speaker (4W/4 ohms) is desired, use the included power/external speaker cable: attach the yellow wire to the SPEAKER + terminal, and green wire, the SPEAKER - terminal of the speaker. (See figure 3-3.)

Mounting the Antenna

Provide a location as high and clear as possible, free from the influence of nearby antenna, rigging and masts.

The antenna should be a 5/8 wavelength whip (1.2 meter or 4') containing a matching network in its base. However, any good quality antenna, complying with the following requirements may be arranged locally. A high-gain antenna is preferable. If you are not sure, contact your authorized dealer.

- Frequency range: 155 to 164 MHz
- Impedance : 50 ohms
- Polarization : Vertical
- Handling power : 30 W
- Quality : Able to withstand marine environment

Any 50-ohm coaxial cable heavier than 5D-2V (equivalent to RG-212/U) may be used for the connection between the antenna and transceiver. To extend the antenna cable longer than 20 m, use heavier coaxial cable such as 8D-2V or RG-213/U to minimize power loss and signal attenuation through the cable. Be sure to leave some slack in the cable loop behind the transceiver to make service and maintenance easy.

Lay the antenna, and then, solder the PL-259 type connector onto the cable end as shown in figure 3-4. Attach the antenna cable to the antenna connector on the rear panel of the transceiver.

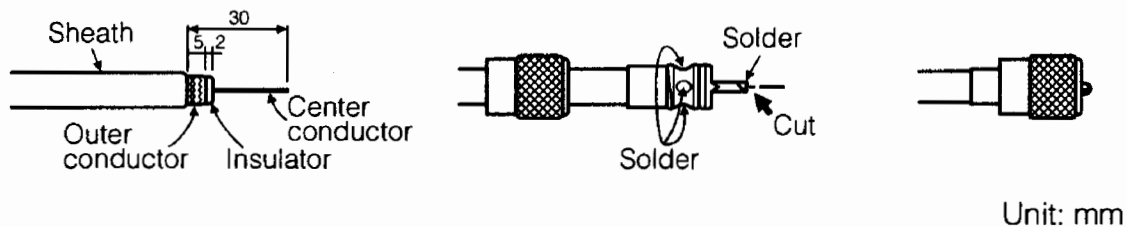


Figure 3-4: Soldering the PL-259 type connector

Grounding

While special grounding is generally not required for VHF radiotelephone, it is a good practice to properly ground all electronic equipment to the ground system on your ship. DR-MA1 can be connected to ground by attaching one end of a wire to one of the screws on the rear panel of the transceiver, and the other end to the nearest ground connection point on the ship.



4 Operation

This section describes controls and indications on the transceiver, and instructions for receiving and transmitting.

4.1 Controls and Indications

Controls

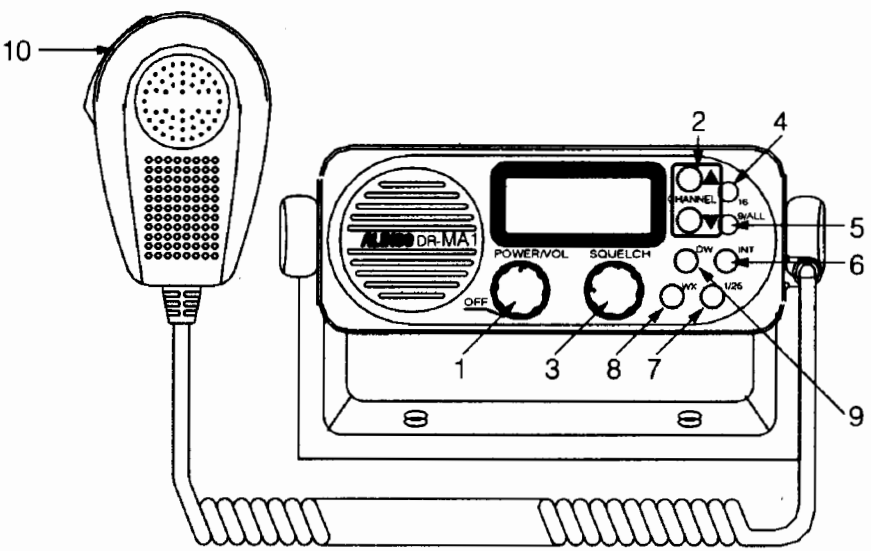


Figure 4-1: Controls

- 1. **POWER/VOL** control : Turns the radio on and off, and adjusts volume of the speaker.
- 2. **CHANNEL** keys : Selects a channel.
- 3. **SQUELCH** control : Adjusts the squelch. Rotate the control counterclockwise until noise is heard, then rotate it clockwise slowly until noise just fades out.
- 4. **16** key : Immediately selects CH16. Pressing this key again returns to the previously-selected channel.
- 5. **9/ALL** key : Instantly selects CH09, or the preset channel if configured as such. To program the preset channel, select the desired channel number with the **CHANNEL** keys, and hold the **9/ALL** key down for more than 3 seconds until you hear a beep, (CH16 cannot be the preset channel).
- 6. **INT** key : Alternately changes international and USA channel mode. "INT" or "USA" appears with each pressing.

- 7. **1/25** key : Alternately changes the transmitter output power between 1 watt ("LOW" appears) and 25 watts ("LOW" disappears).
- 8. **WX** key : Selects the Weather Channel mode. "WX" appears along with the weather channel number. WX channel may be selected with the **CHANNEL** keys, but the radio always starts on WX09 at power-on. While the radio is in this mode, the transmitter is always disabled. To return to the normal receiving mode, press any of the following keys: **WX**, **16**, or **9/ALL**.
- 9. **DW** key : Selects the Dual Watch mode. "DW," "16," and the selected working channel are displayed. The radio automatically monitors CH16 (priority), the selected working channel, and currently set weather channel. To return to the receiving mode, press any key except **INT** and **1/25**.
- 10. **PTT** switch (Push-to-Talk) : Hold this switch down to transmit, and release it to listen. "TX" appears during transmission.

Indications

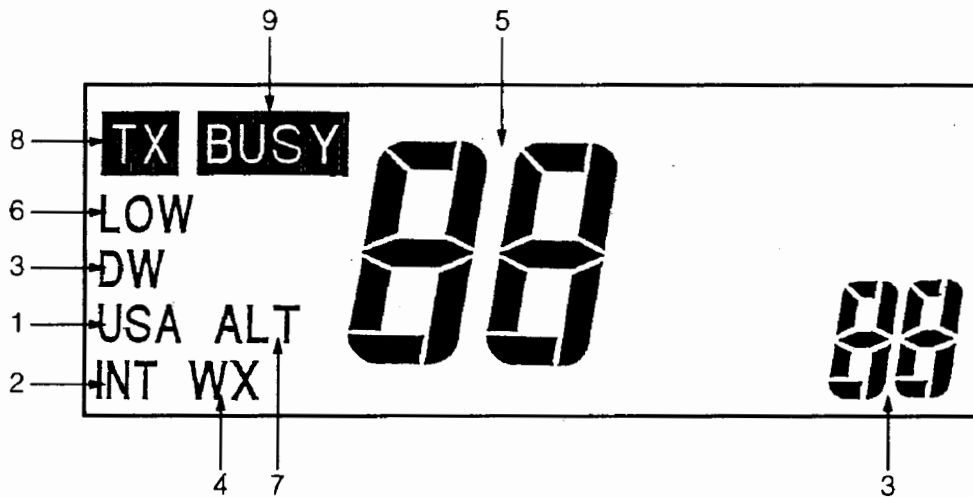


Figure 4-2: Indications

- 1. USA : Appears when the USA mode is selected with the **INT** key.
- 2. INT : Appears when the International mode is selected with the **INT** key.
- 3. DW : Appears when the Dual Watch mode is activated with the **DW** key.

4. **WX** : Appears when the Weather Channel mode is activated with the **WX** key.
5. **BB** : Shows the channel number in use. Select a channel with the **CHANNEL** keys.
6. **LOW** : Appears when the transmitter output power has been set to low power (1 watt) with the **1/25** key, or when a low power channel has been selected with the **CHANNEL** keys.
7. **ALT** : Blinks when a weather alert signal has been received.
8. **TX** : Appears when the **PTT** switch on the microphone is pressed and held. Transmitter output power is provided to the antenna.
9. **BUSY** : Appears when a signal is being received and the squelch is open.

4.2 Receiving

To receive a signal, use the following procedure:

1. Turning the power on

Turn the **POWER/VOL** control clockwise to turn the radio on. The equipment starts up with CH16. The transceiver will automatically enter the Dual Watch mode when it was last turned off in that mode. To switch off the power, turn the control fully counterclockwise.

2. Selecting the USA or International mode

"USA" for the USA mode or "INT" for the international mode appears for channel assignment. To switch to the other mode, press the **INT** key.

3. Selecting a channel

Use the **CHANNEL** keys to choose the desired channel number. (Some channels are skipped. See Appendix 1, "Channel List" for details.)

4. Adjusting the squelch level

Rotate the **SQUELCH** control counterclockwise until you hear noise from the speaker. Then, rotate the control clockwise until the receiver noise just fades out.

5. Adjusting the volume

Turn the **POWER/VOL** control to adjust the volume of the speaker.

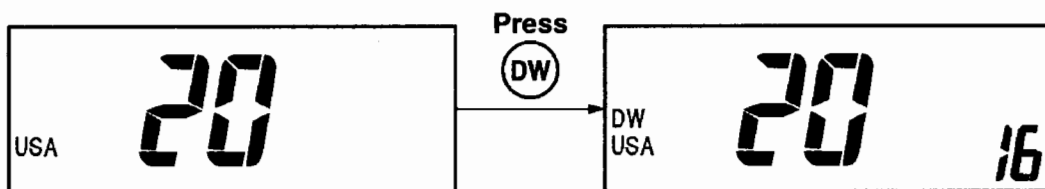
Audible Alarm

Audible alarms are generated in the following conditions:

- One short beep : Valid key operation
- Three short beeps : Invalid key operation
- Five long beeps : Weather alert

Dual Watch Mode

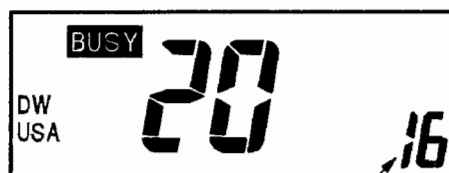
The Dual Watch mode allows you to monitor three channels at once: the selected working channel, currently set weather channel, and CH16. Once the squelch is properly set, select a working channel to show on the LCD, then press the **DW** key. "DW", "16", and the selected working channel number appear on the LCD, and scanning begins.



If a signal is present on CH16, the receiver locks on CH16 and ignores other channels. After the signal has gone, the receiver stays on CH16 for five seconds, then returns to the Dual Watch mode.

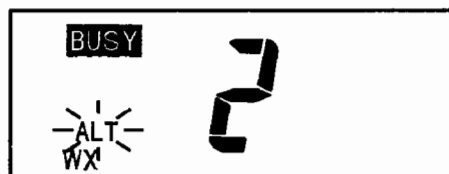


In case a signal is present on the selected working channel, CH16 is monitored momentarily (150 msec.) once in five seconds. After the signal has gone, the receiver stays on that channel for five seconds, and returns to the Dual Watch mode.



"16 " is displayed momentarily once in 5 seconds.

If a weather alert signal is detected on the weather channel, "ALT" blinks on the LCD, the equipment beeps five times, and the receiver locks on the weather channel. The transceiver exits the Dual Watch mode and enters the Weather mode.



To quit the Dual Watch mode, simply press any key except **INT** and **1/25**.

4.3 Transmitting

To transmit, use the following procedure:

1. Selecting the USA or International mode

Select the USA or International mode by pressing the **INT** key. Each time the **INT** key is pressed, the mode changes to the USA or International. "USA" or "INT" appears accordingly at the lower left corner of the LCD.

2. Selecting a channel

Select the desired channel using the **CHANNEL** keys.
(Some channels are skipped. See Appendix 1, "Channel List" for details.)

3. Select the output power level

Set the transmitter to high or low power by pressing the **1/25** key. This alternately changes the transmitter output power between 1 watt ("LOW" appears) and 25 watts ("LOW" disappears).

For short range communications or in harbor areas, transmit at low power to minimize interference to others.

NOTE: *The following channels are set to low power (1 watt) by default:*

*Channels 13**, 17, 67**, 77 in the USA mode*

***:* *Channels 13 and 67 can be transmitted at high power (25 watt) by holding down the **1/25** key while transmitting with the **PTT** Switch.*

Transmitting is prohibited on USA channel 15.

4. Transmitting

Pick up the microphone, press and hold the **PTT** switch to talk, and release it to listen for the response. Hold the microphone fairly close to your mouth and speak clearly.

If the **PTT** switch is being held for more than 5 minutes, the transmit function is disabled, a beep sounds and "to" (time out) blinks instead of the channel display. This condition continues until the **PTT** switch is released.

IMPORTANT: *CH16 is used in all USA coastal areas to call the Coast Guard and for general vessel calling. In certain high traffic areas, CH09 is also used as the Hailing Frequency. Please check with your local authority.*

5 General Notes on Operating Marine VHF

5.1 Rules and Manners

The DR-MA1 fully complies with the requirements for international maritime VHF radio service. It is intended to be used by a person holding a valid radio operator's license and station callsign.

Followings are some important rules, regulations, and manners for operating the equipment.

- Whenever the radio is turned on, keep watching on CH16 for distress or calling message.
- Distress communications have absolute priority. If you hear MAYDAY, talk only if you can help, and be prepared to offer assistance or relay the distress message.
- Listen before transmitting to avoid interfering with other communications.
- The ship Radiotelephone Station Licensee is responsible for recording in a communication log contacts made over the telephone and watch period on CH16. All distress, emergency, and safety messages must be recorded in detail. Entries must show boat's name, call sign, watch start/stop times, and operator's signature. Use 24-hour notation to record time.
- Radio waves are public property. Keep all communications as brief and clear as possible.
- Declare ID or callsign at the beginning and end of each communication.
- Use appropriate channels.
- Do not divulge contents of communications nor use them for private benefit without permission. (This does not apply to distress communication.)
- Be aware that many people are listening. Do not use indecent or profane language.

5.2 Communication Distance

The DR-MA1 operates on the VHF band assigned for maritime mobile stations (156.5 to 163.275 MHz). The VHF radio wave, unlike LF or HF, propagates like a light ray. Thus communication is only available with another VHF antenna which is above the horizon. This is called line-of-sight.

Even if a clear line-of-sight condition exists, the radio wave is attenuated along the signal path. The communication distance is also limited by transmitter power, antenna efficiency, and receiver sensitivity.

The average communication range, using 25 W marine VHF, is:

- 10 to 15 nm for ship-to-ship
- 20 to 30 nm for ship-to-shore

NOTE: *An obstruction in the signal path, such as a large ship, crane, building or mountain, can destroy VHF communications even for a short distance.*

6 Maintenance

The DR-MA1 is designed to provide years of trouble-free operation; however, it is suggested to inspect and maintain the following points to minimize the possibility of equipment failure and assure optimum performance. Be sure to disconnect the power cable at the fuse holder before performing any maintenance work.

6.1 Cleaning the Transceiver

Cabinet and LCD

Keep the unit clean and dry at all times. Dust or loose dirt accumulated on the front panel and knobs should be wiped off with a soft, dry cloth. For stubborn dirt, use mild detergent and water on a cotton tipped swab or soft cloth. Never use plastic solvents, such as thinner or acetone for cleaning; they may dissolve paint coating and marking on the front panel and cabinet case.

Connectors

Check all connectors for foreign material and corrosion. If corroded, clean the contact and re-tighten it securely.

6.2 Checking the Antenna System

Since the antenna is exposed directly to sunlight and salt water spray, it is subjected to corrosion or salt water immersion at the antenna base. If physical damage, such as a crack or water immersion is found, contact Alinco dealer for servicing.

6.3 Checking the Battery

The DR-MA1 operates normally at any voltage between 11.5 and 15.6 VDC. If the battery voltage is out of ranges, check the battery liquid and the charging system of your boat. Check also rust or corrosion at the battery terminals and the ship's mains switch-board for poor contact.

6.4 Replacing the Fuse

To protect the transceiver from serious damage, a 10A fuse is provided in the snap-in fuse holder on the power cable. The fuse protects against over-current and reverse polarity of the ship's mains or internal fault of the equipment. If the fuse has blown, first find the cause of the problem before replacing it.

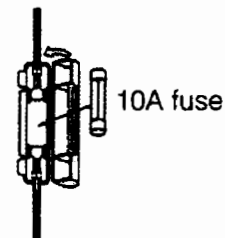


Figure 6-1: Replacing the Fuse



CAUTION

- Use the correct fuse. Use of the wrong fuse can cause fire or equipment damage.

7 Troubleshooting

Most of VHF troubles are caused not by the transceiver itself but by the ANT/feeder or power supply system. The list below provides simple troubleshooting that can be done by the operator.



CAUTION

- Do not attempt to check inside the transceiver. Careless handling may cause permanent damage to the transceiver.

Symptom	Possible cause	Remedy
Volume control turned clockwise but power does not come on.	<ol style="list-style-type: none"> Power is off at mains switchboard. Power lead is loose or disconnected. Mains battery is flat. Fuse has blown. 	<ol style="list-style-type: none"> Turn mains switch on. Secure connector firmly and check connections to battery. Check battery liquid, charging system, etc. Check mains voltage and polarity and then replace the fuse (10A).
LCD looks normal but no sound is heard.	<ol style="list-style-type: none"> The squelch setting is too high. (Turned too far clockwise.) The volume setting is too low. 	<ol style="list-style-type: none"> 1, 2. To confirm audio output, turn the SQUELCH control fully counterclockwise and turn the POWER/VOL control slowly clockwise.
Noise is heard but no or poor signal is received.	<ol style="list-style-type: none"> The antenna connector (on the rear panel) is loose or disconnected. The antenna has separated. The antenna cable is damaged or immersed with water. Any radio barrier (large vessel, crane, mountain, etc.) exists in the signal path. Transmitter is too far away or transmitting is in low power. 	<ol style="list-style-type: none"> 1. Fasten antenna connector tightly. 2. Install new antenna vertically. 3. Lay new cable (50-ohm coaxial cable). 4, 5. Line-of-sight is a rule for VHF communications.
"TX" appears but output power is off or low.	<ol style="list-style-type: none"> Refer to items 1 through 4 above. The output power setting is low. The channel is to be operated in lower power ("LOW" appears). 	<ol style="list-style-type: none"> 1. Refer to items 1 through 4 above. 2. Set the output power to "high." 3. International and USA channels 13, 17, 67, and 77 are low power channels.
"TX" does not come on when the PTT switch is pressed.	<ol style="list-style-type: none"> Attempting transmission on a channel assigned only for reception: USA: 2,15,70,75, 76 INT: 70, 75, 76 WX0 - WX9, etc. 	<ol style="list-style-type: none"> 1. Refer to Appendix 1 "Channel List."
Does not scan normally in the Dual Watch mode (locked on a channel).	<ol style="list-style-type: none"> The squelch setting is too low, causing noise. 	<ol style="list-style-type: none"> 1. Adjust the squelch so that noise just fades out.
Turned suddenly to CH16.	<ol style="list-style-type: none"> Had momentary power failure. 	<ol style="list-style-type: none"> 1. Select the desired channel and function again. Check power line connection.

Appendix 1 Channel List

VHF Marine Channel Frequencies

International version

CH	Ship Tx	Ship Rx	Type of Operation	CH	Ship Tx	Ship Rx	Type of Operation
01	156.050	160.650	-	61+	156.075	160.675	-
02	156.100	160.700	-	62+	156.125	160.725	-
03	156.150	160.750	-	63	156.175	160.775	Com'l
04	156.200	160.800	-	64+	156.225	160.825	-
05	156.250	160.850	Port operations	65	156.275	160.875	Port operations
06	156.300	156.300	Intership safety	66	156.325	160.925	Port operations
07	156.350	160.950	Com'l	67	156.375	156.375	Com'l
08	156.400	156.400	Com'l	68	156.425	156.425	Non com'l
09	156.450	156.450	Call & ship/sip	69	156.475	156.475	Non com'l
10	156.500	156.500	Com'l & ship/ship	-	-	-	-
11	156.550	156.550	Com'l & ship/ship	71	156.575	156.575	Non com'l
12	156.600	156.600	Port operations	72	156.625	156.625	Non com'l
13	156.650	156.650	Nav. ship/bridge	73	156.675	156.675	Port operations
14	156.700	156.700	Port operations	74	156.725	156.725	Port operations
15	156.750	156.750	Environmental	-	-	-	-
16	156.800	156.800	Emerg/calling	-	-	-	-
17	156.850	156.850	State controlled	77	156.875	156.875	Port operations
18	156.900	161.500	Com'l	78	156.925	161.525	Non com'l
19	156.950	161.550	Com'l	79	156.975	161.575	Com'l
20	157.000	161.600	Port operations	80	157.052	161.625	Com'l
21	157.050	161.650	Coast guard	81	157.075	161.675	Coast guard
22	157.100	161.700	Coast guard	82	157.125	161.725	Coast guard
23	157.150	161.750	Coast guard	83	157.175	161.775	Coast guard
24	157.200	161.800	Public corresp.	84	157.225	161.825	Public corresp.
25	157.250	161.850	Public corresp.	85	157.275	161.875	Public corresp.
26	157.300	161.900	Public corresp.	86	157.325	161.925	Public corresp.
27	157.350	161.950	Public corresp.	87	157.375	161.975	Public corresp.
28	157.400	162.000	Public corresp.	88	157.425	162.025	Com'l
60+	156.025	160.625	-				

+ : Assigned by Canadian Government, proper authorization must be ensured prior to use.

USA version

CH	Ship Tx	Ship Rx	Type of Operation
01	156.050	156.050	Port operations and com'l
-	-	-	-
03 ^{*4}	156.150	156.150	-
-	-	-	-
05	156.250	156.250	Port operations
06	156.300	156.300	Intership safety
07	156.350	156.350	Com'l
08	156.400	156.400	Com'l
09	156.450	156.450	Boater calling
10	156.500	156.500	Com'l
11	156.550	156.550	Com'l
12	156.600	156.600	Port operations
13 ^{*3}	156.650	156.650	Intership nav, safety
14	156.700	156.700	Port operations
15 ^{*1}	-	156.750	Environmental
16	156.800	156.800	Distress, safety/calling
17 ^{*2}	156.850	156.850	State controlled
18	156.900	156.900	Com'l
19	156.950	156.950	Com'l
20	157.000	157.000	Port operations
21 ^{*4}	157.050	157.050	-
22	157.100	157.100	Coast guard
23 ^{*4}	157.150	157.150	-
24	157.200	161.800	Public corresp.
25	157.250	161.850	Public corresp.
26	157.300	161.900	Public corresp.
27	157.350	161.950	Public corresp.
28	157.400	162.000	Public corresp.

CH	Ship Tx	Ship Rx	Type of Operation
61 ^{*4}	156.075	156.075	-
63	156.175	156.175	Port operations&com'l
64 ^{*4}	156.225	156.225	-
65	156.275	156.275	Port operations
66	156.325	156.325	Port operations
67 ^{*3}	156.375	156.375	Com'l
68	156.425	156.425	Non com'l
69	156.475	156.475	Non com'l
-	-	-	-
71	156.575	156.575	Non com'l
72	156.625	156.625	Non com'l
73	156.675	156.675	Port operations
74	156.725	156.725	Port operations
-	-	-	-
-	-	-	-
77 ^{*2}	156.875	156.875	Port operations
78	156.925	156.925	Non com'l
79	156.975	156.975	Com'l
80	157.025	157.025	Com'l
81 ^{*4}	157.075	157.075	-
82 ^{*4}	157.125	157.125	-
83 ^{*4}	157.175	157.175	-
84	157.225	161.825	Public corresp.
85	157.275	161.875	Public corresp.
86	157.325	161.925	Public corresp.
87	157.375	161.975	Public corresp.
88	157.425	157.425	Com'l

*1: Transmitting is disabled.

*2: 1W only

*3: 1 watt initially. Can be switched to high power (25W) by holding down the **1/25** key while transmitting with the **PTT** switch.

*4: These channels are not for use by the general public in U.S. waters.

VHF Weather Channel Frequencies

USA version: Transmitting is disabled when WX0~WX9 is displayed.

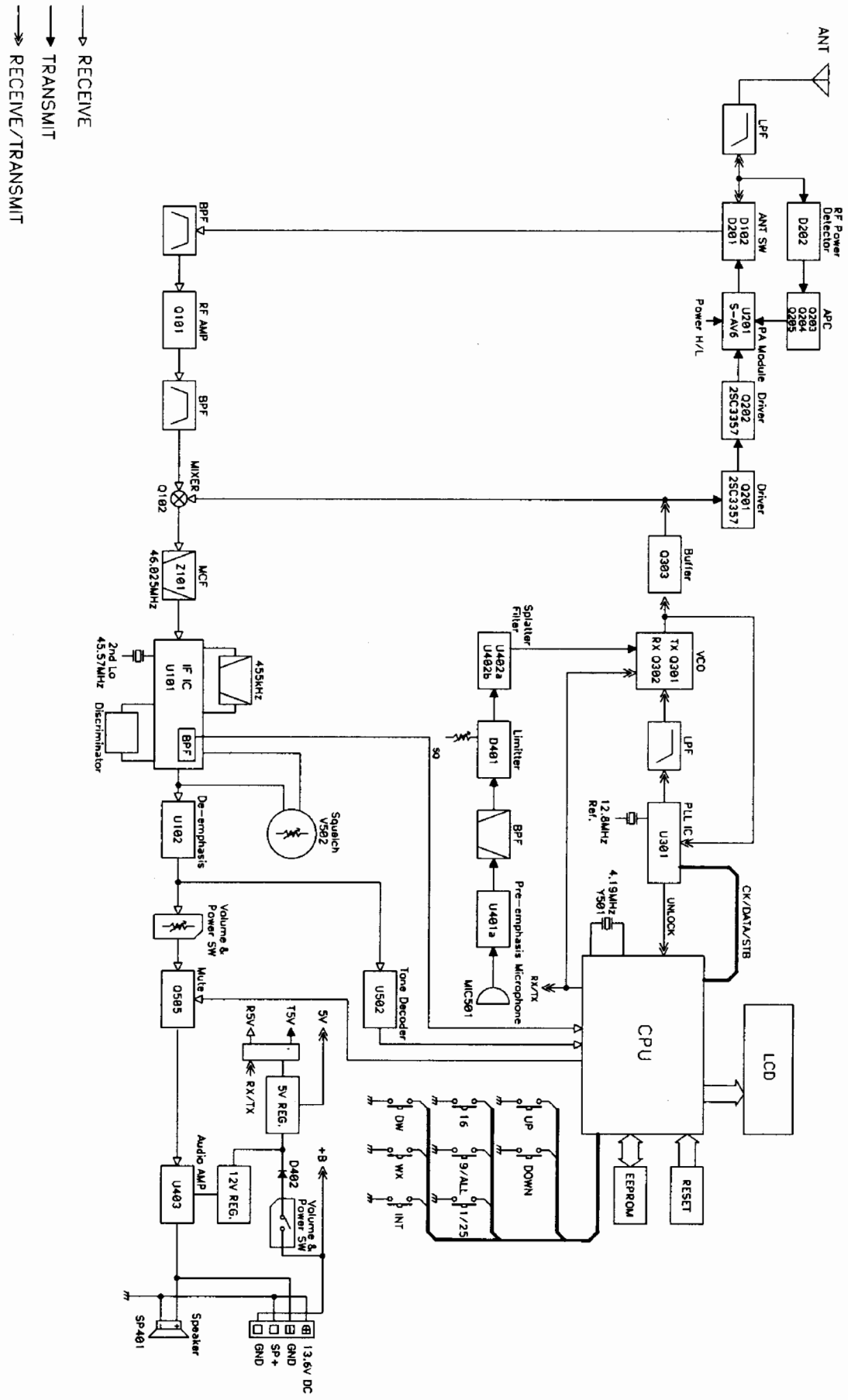
CH	Receive Frq.	Service	CH	Receive Frq.	Service
WX0	163.275	NOAA weather	WX5	162.450	NOAA weather
WX1	162.550	NOAA weather	WX6	162.500	NOAA weather
WX2	162.400	NOAA weather	WX7	162.525	NOAA weather
WX3	162.475	NOAA weather	WX8	161.650	Canadian weather
WX4	162.425	NOAA weather	WX9	161.775	Canadian weather



CAUTION

- Operation on channels not designated for use by your classification of craft or on International Channels within US territorial waters is a violation of FCC Rules and Regulations and may result in severe penalties.

Appendix 2 Block Diagram



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