CLIPPER 28
VHF-FM Radiotelephone

Instruction Manual

PURPOSE

THIS MANUAL CONTAINS IMPORTANT INFORMATION ON THE INSTALLATION, OPERATION AND MAINTENANCE OF YOUR EQUIPMENT.

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TABLE OF CONTENTS

TABLE OF CONTENTS (cont'd)

LIST OF ILLUSTRATIONS

LIST OF TABLES

SECTION 1

INTRODUCTION

1.1 GENERAL

This CLIPPER 28 VHF-FM marine radiotelephone provides reliable simplex and one half duplex (two frequency simplex) mode communications between ships and from ships at sea to public or private shore stations. The one half duplex mode is referred to as duplex mode in this instruction manual. The CLIPPER 28 provides two-way communications on 28 US channels, including the international calling and safety channel 16 and reception on the four separate weather channels. Installation requires attaching the mounting yoke and the microphone bracket and connection to a 13.6VDC power source and an approved antenna.

This manual describes the physical and functional characteristics of the radiotelephone. Complete operational data, installation, theory of operation, and maintenance sections are provided including schematics, parts location drawings, and replaceable parts lists.

1.2 EQUIPMENT FEATURES

The CLIPPER 28 is designed and manufactured to provide ease of installation and operation with excellent reliability. The important built-in features of the equipment are listed below:

- All solid state circuitry for low current drain, minimum heat dissipation, and maximum reliability.
- A high-performance receiver with greater selectivity for operation in "noisy" or "busy" areas.
- 28 channel transmit and 32 channel receive capability within the assigned VHF/FM maritime band.
- Quick select pushbutton for channel 16.
- 4 watts received audio output power to an external speaker provides adequate volume even in a noisy environment.
- Exclusive circuit automatically monitors channel 16.
- Phase locked loop frequency synthesizer used to generate the channel frequencies to eliminate the need for conventional crystals on each channel.
- Full 25 watts output power to the antenna with protective circuitry to prevent damage when operating into faulty antenna systems.
- Capable of receiving all three US weather channels and one Canadian weather channel.

1.3 EQUIPMENT SUPPLIED

Figure 1-1 shows the CLIPPER 28 VHF-FM Radiotelephone with microphone and mounting yoke attached. Table 1-1 provides a complete list of the equipment supplied, the part numbers, and the quantity of equipment supplied.

Figure 1-1 CLIPPER 28 VHF-FM Radiotelephone

Table 1-1
Equipment Supplied

Equipment Name	Part No.	Quantity
Radiotelephone	M56459	1
Microphone	1032564-9	1
Microphone Bracket w/ Attaching Hdwe.	217-7180P1	1
Power Connector and Cord	981409-1	1
Mounting Yoke	1032698-49	1
Spare Bulb(s) & Fuse(s) Kit		1
Manual	1035360	1
FCC Data Sheet	982162	1
Warranty Certificate	983893	1

1.4 SPECIFICATIONS

Transmitter

Channels	28
Frequency stability	±10 PPM (0.001%) (-20°C to +50°C)
Frequency range	156.300 to 157.425 MHz
Channel Spacing	25 kHz increments
Power output	25 watts switchable to 1 watt into 50 ohms at 13.6 VDC +1dB at 15.6 VDC and functional at 10.5 VDC
Modulation	Frequency modulated 16F3. 4.5 kHz +500 Hz to -0 Hz deviation for 100% modulation at 1000 Hz.
Audio distortion	Less than 4.0% at 1000 Hz for ±3 kHz deviation
Audio Response	+1dB -3dB from 6 dB pre-emphasis from 300 to 2500 Hz at 1000 Hz reference
Audio roll-off filter	Exceeds FCC requirements of 18 dB per octave beyond 3000 Hz
Spurious & harmonic radiated outputs	At least 70 dB below rated carrier power

Receiver

Channels	28 plus 4 weather channels
Frequency range	156.300 to 162.550 MHz 25 kHz increments plus 162.550 MHz (W1) 162.400 MHz (W2) 162.475 MHz (W3) 161.650 MHz (W4)

1.4 SPECIFICATIONS (cont'd)

Frequency stability	±0.001% from -20°C to +50°C
Adjacent channel rejection	-70 dB
IF frequencies	1st IF = 16.9 MHz, 2nd IF = 455 kHz
Sensitivity (20 dB quieting)	0.5 uV.
Usable Sensitivity 12 dB (SINAD)	0.35 uV at 1.0 watt
Audio response	+2, -8 dB of 6 dB/octave de-emphasis characteristics from 300 to 3000 Hz referenced at 1000 Hz.
Modulation acceptance	±7.0 kHz bandwidth
Intermodulation rejection	-60dB
Squelch sensitivity threshold	0.3uV or better
Tight squelch sensitivity	0.5uV to 2.0uV
Audio output	4.0 watts or more at 10% or less distortion into 3.12 ohm resistive load at external terminal. 1.2 watts (min.) available at internal speaker.
Spurious and image rejection	60 dB or more
<u>Operating Power Requirements</u>	
Input voltage	13.6 VDC ±15% (nominal), negative ground only
Operating range	11.6 to 15.6 volts dc
Input current	
Transmit	5.5 amps max at 25 watts
Receiving (squelched)	0.4 amps max
<u>Operating Temperature</u>	
Transmit and receive modes	-20°C to +50°C
<u>Radio Dimensions</u>	
Height	87 mm (including bracket) 3.4 inches
Width	240 mm, 9.4 inches

1.4 SPECIFICATIONS (cont'd)

Depth	295 mm 11.6 inches
Weight	Approximately 3.2 Kg (7 lbs)

NOTE

The Model Clipper 28 VHF-FM Radiotelephone meets all applicable sections of FCC Parts 2, 15 and 83 and DOC RSS182.

1.5 COMMUNICATION RANGE

VHF communication range is dependent on the gain and height of the antenna as well as transmitter power and received signal strength. Refer to Figure 1-2, Range Nomograph, to determine the operating range of the installed system.

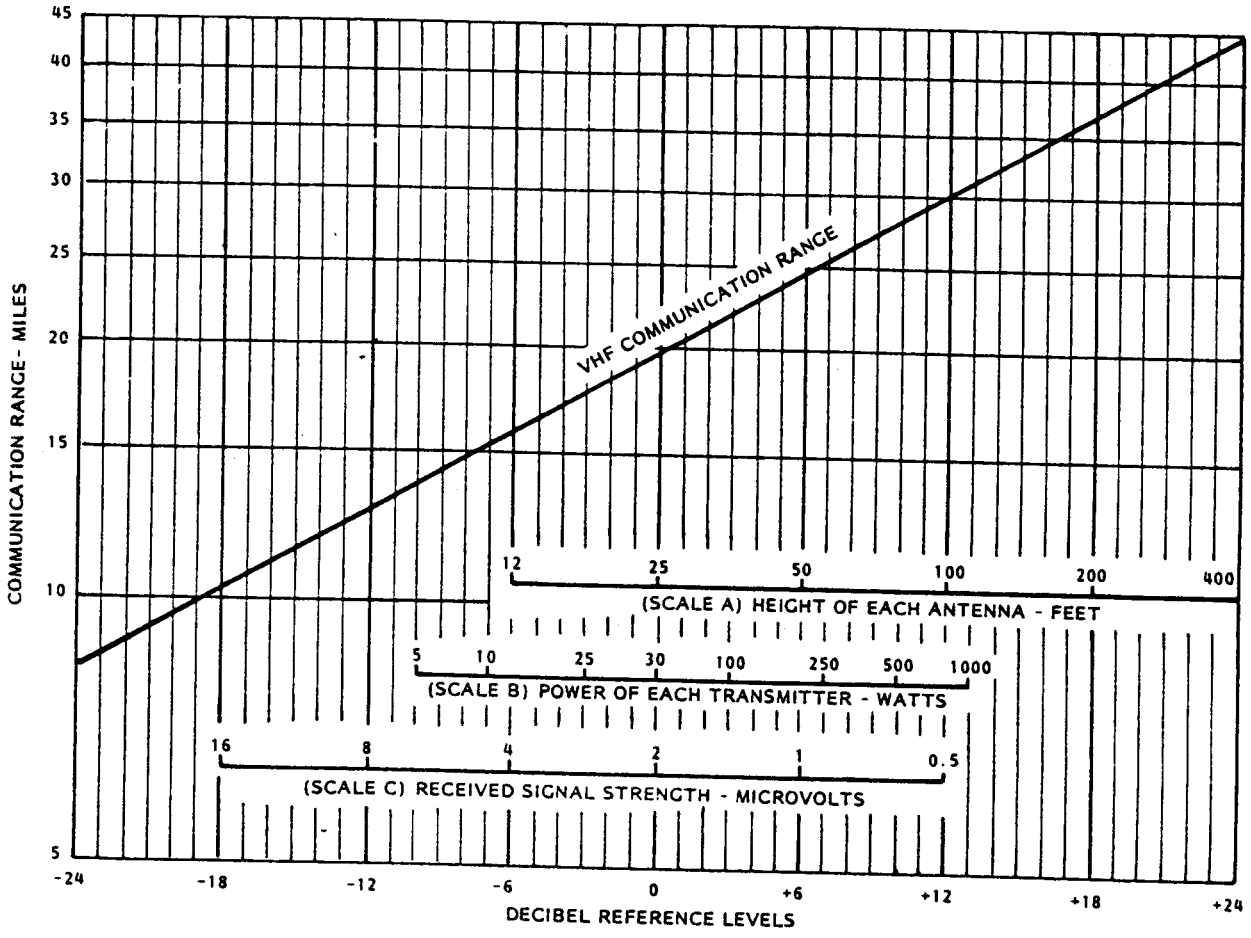


Figure 1-2 Marine VHF Communication Range Nomograph

EXAMPLE

What is the operating range, assuming a minimum required signal strength of 1.0 uV, between a base station using a 50 watt transmitter, a 50 foot tower, with a 6.0 dB antenna and a ship using a 25 watt transmitter with a 3 dB antenna mounted on a 15 foot mast?

Base station power (50 watts)	0 dB
Ship station power (25 watts)	-3 dB
Base station antenna height (50 feet)	+6 dB
Ship antenna height (15 feet)	-4.5 dB
Base station antenna gain	+6 dB
Ship station antenna gain	+3 dB
Signal strength required (1.0 uV)	+6 dB
Base station coax cable loss (RG-8/U)	-6 dB
Ship station coax cable loss (RG-58C/U)	-3 dB
TOTAL	+4.5 dB

Range equals 23 miles for +4.5 dB reference level.

Note: Coax cable loss
RG-58C/U = 6 dB/100 feet
RG-8C/U = 3 dB/100 feet

SECTION 2

INSTALLATION

2.1 GENERAL

Select the most appropriate mounting location to eliminate the possibility of damage from spray or rain. The mounting location for the radiotelephone and the antenna is determined by the size of the vessel, available space, operator convenience, and proximity to the power source and grounding point. The exterior of the radio is treated with several coats of epoxy paint, but must not be installed where it will be exposed to direct spray or sunlight.

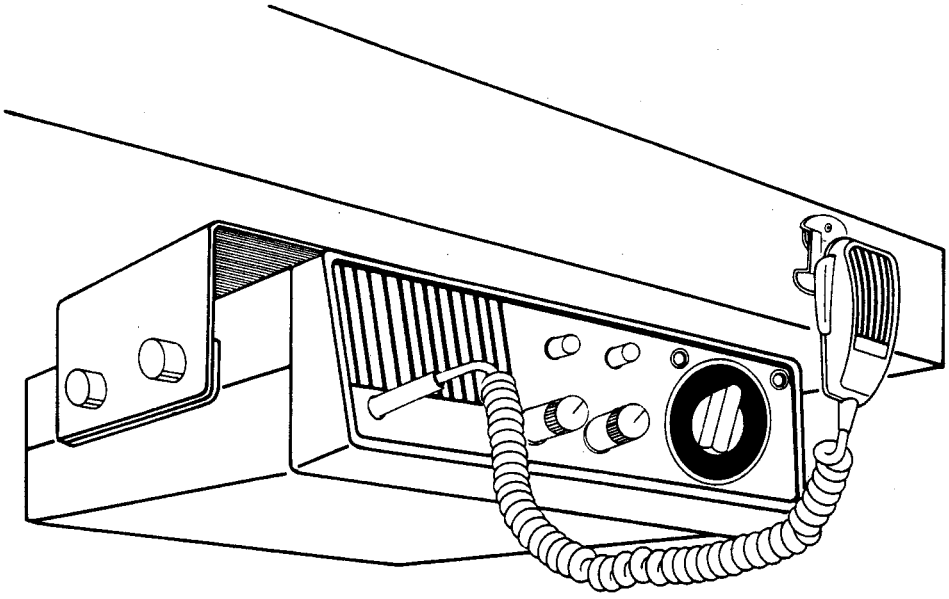
2.2 MOUNTING THE RADIO

This radio is designed so that the mounting bracket can be secured to a horizontal shelf, the overhead or to a bulkhead as shown in Figure 2-1. Install the radio by positioning it in the mounting bracket and securing the two plastic clamps. Either the top or the bottom of the radio will fit into the bracket if the clamp blocks on the sides of the radio are inverted.

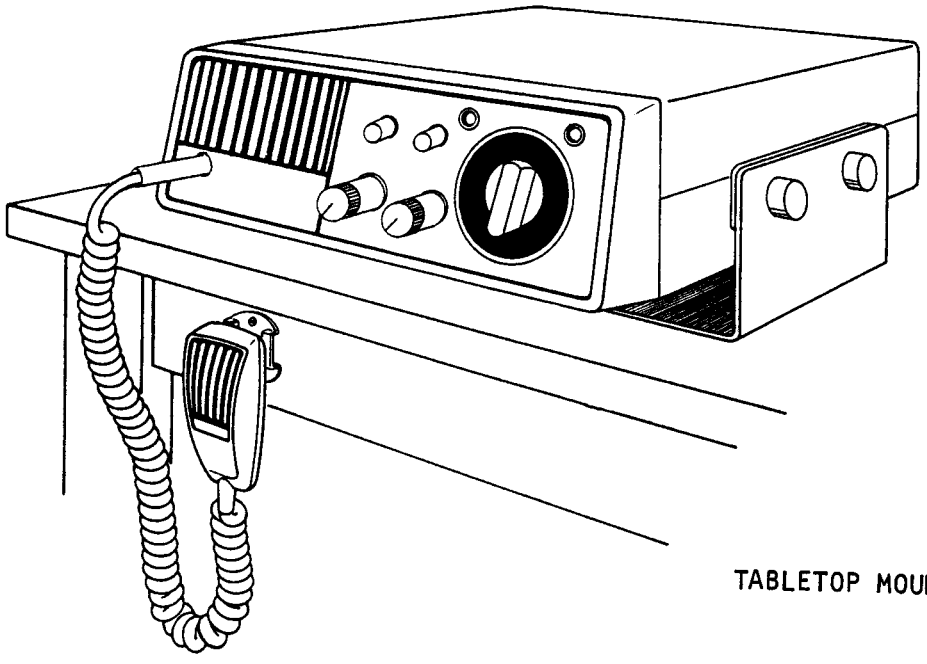
Remove the radio from the mounting bracket when access to the chassis is desired. The cover may be detached by removing the four screws from the rear.

2.3 ANTENNAS

Contact your local authorized Apelco Marine Dealer for professional guidance on the selection of antenna type and installation procedures.



OVERHEAD MOUNT



TABLETOP MOUNT

Figure 2-1 Typical Installations

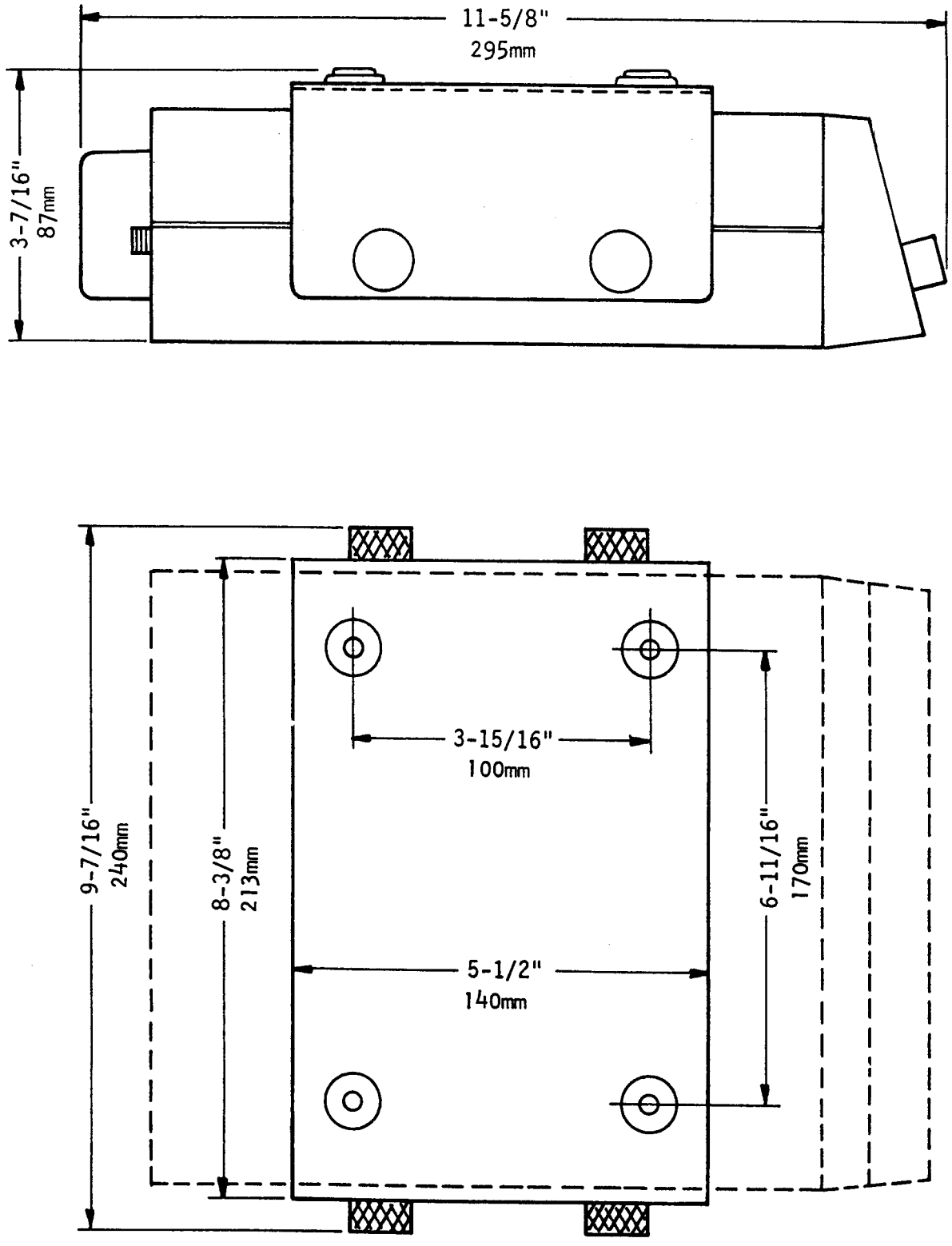


Figure 2-2 Outline and Mounting Dimensions

2.4 BONDING OF METALWORK

All unbonded metalwork in the vicinity of the antenna, such as handrails, steering cable, permanent halyards, windshield frame, or plumbing, may affect the performance of the radio. it is good practice to bond these together and ground to the engine with a copper strap and suitable clamps. In some cases this bonding will be essential, since any unbonded metalwork may act as a parasitic absorber or re-radiator of the antenna transmit signal. These parasitic elements may severely distort an otherwise excellent antenna pattern. BOND ALL METALWORK.

2.5 ELECTRICAL CONNECTIONS

2.5.1. DC Power Connection

A two pin connector is furnished for connecting the 13.6 vdc power to the radio. The power cable from the 13.6 volt power source to the radio should be number 14 stranded wire for a run of less than 10 feet. Longer cable runs require an even larger wire size to minimize the voltage drop (Figure 2-3). Connections should be made directly to the battery. Check that all connections are clean and bright. The (+) battery wire must be connected to pin 2 of the connector and the (-) battery wire (ground) to pin 1 of the connector.

Should the power connections be inadvertently reversed, protective fuse F1 (7A), located in the input power cable, will blow. Check the input power leads for correct polarity with a VOM. Reconnect the leads observing correct polarity and replace the fuse.

NOTE

Do not install this radio on any vessel with a positive ground battery system.

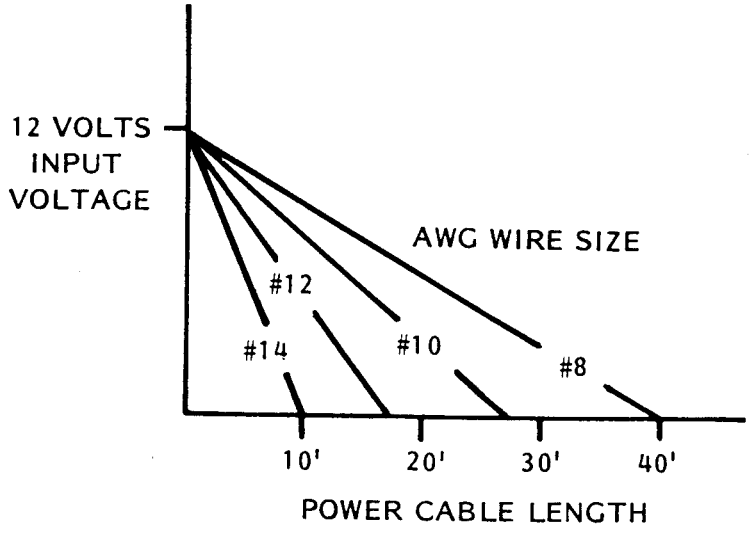


Figure 2-3 Power Cable Size versus Length

2.5.2 External Speaker Connection

The CLIPPER 28 radiotelephone has an external speaker jack (EXT-SP J104) mounted on the rear panel. This jack provides the user with the option of connecting an external 3.1 to 4.0 ohm speaker to the radiotelephone. The external speaker is not provided with the radiotelephone package and must be obtained separately. When an external 3.1 to 4.0 ohm speaker is plugged into J104 it automatically disconnects the radiotelephone's 8 ohm internal speaker.

2.6 GROUNDING

No special grounding is necessary for the radiotelephone installation. However, when the radiotelephone is mounted on a non-grounded surface a ground wire should be attached to the mounting yoke.

SECTION 3

OPERATION

3.1 AVAILABLE CHANNELS

The Clipper 28 transmits on 28 and receives on 32 Marine VHF radiotelephone channels. These channels are FCC approved but some channels may only be used by authorized stations for specific purposes, depending on the type of vessel (commercial or non-commercial). Because of this, caution is urged. Table 3-1 lists all of the marine VHF frequency channel designations for International and U.S. radiotelephone use; those channels with asterisks are available in this radio. Full familiarization with this table is essential.

3.2 CONTROLS AND INDICATORS

Refer to Figure 3-1 for familiarization with the following controls and indicators.

1) CH-16 MON Pushbutton Switch
Selects channel 16 (calling and safety) to be monitored. Also it disables channel selector switch S1-2.

2) 1W/25W Pushbutton Switch
Selects one watt transmitter output power to the antenna when depressed. When released, provides 25 watts transmitter output power to the antenna.

3) Channel No. Indicator
The channel numbers selected by channel selector switch S1-2 dial.

4) CH-16 Indicator - Lights when CH-16 MON is activated.

5) Channel Selector Switch S1-2
Positioning of the CHANNEL SELECTOR SWITCH S1-2 (32 position switch) allows the operator to select the desired channel for transmitting or receiving. This switch is disabled when the CH-16 MON pushbutton is depressed.

6) TX Indicator
This indicator (red) indicates the transmitter is keyed and RF is present at the antenna jack.

7) SQUELCH Control
Provides an adjustable quieting level to eliminate general background noise from the speaker in the absence of received signals.

8) OFF/VOLUME Control
Provides DC power to the unit and controls the level of the audio input to the speaker.

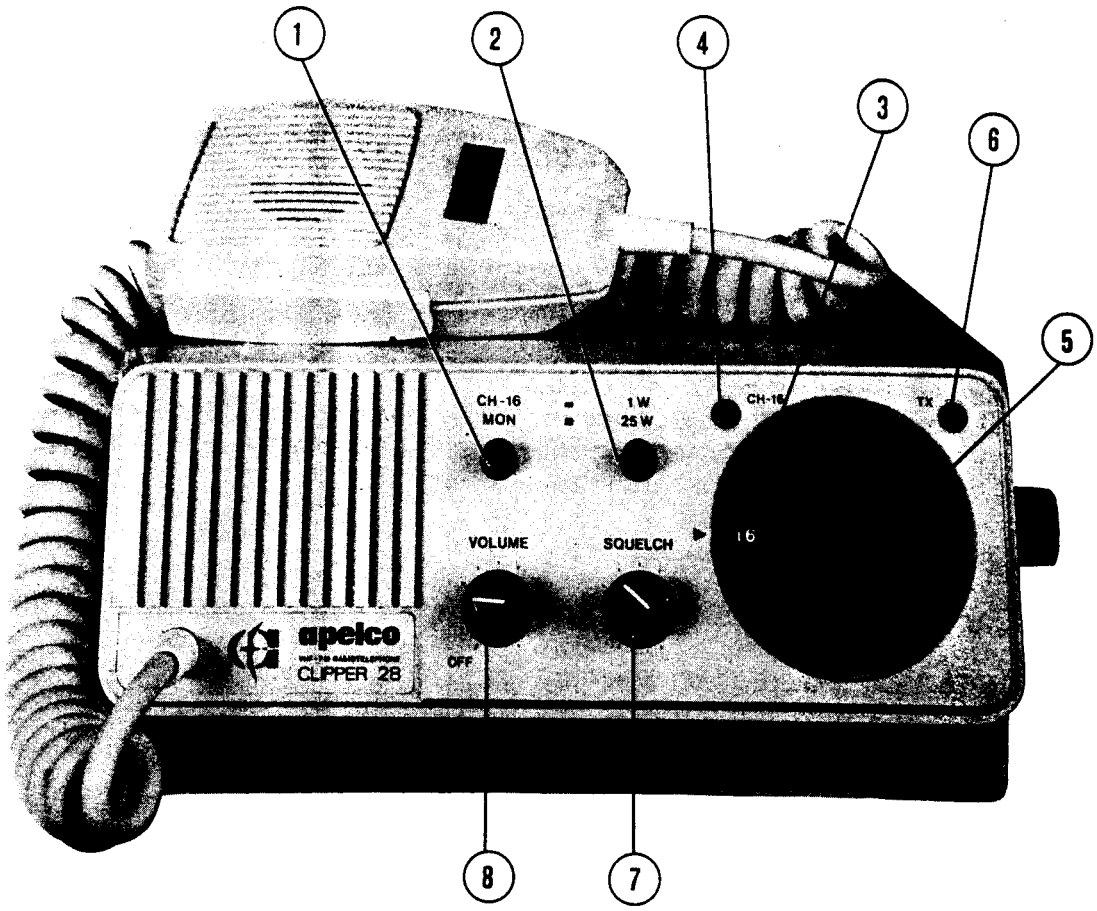


Figure 3-1 CLIPPER 28 Controls and Indicators

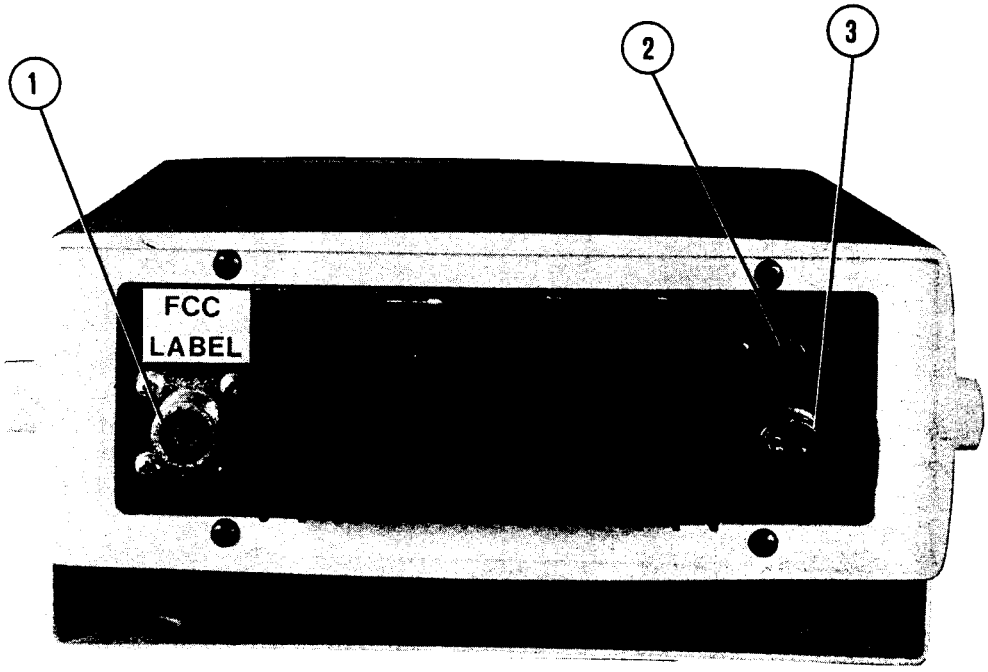


Figure 3-2 CLIPPER 28 Rear Panel Connectors

3.3 REAR PANEL CONNECTORS

See Figure 3-2 for the location of the unit rear panel connectors.

1) ANTENNA Connector J101
Provides the input coaxial connection for the antenna cable.

2) EXT-SP Connector J104
Provides the connection for an external 4Ω speaker which can be remotely located from the unit. Connecting an external speaker automatically disconnects the unit's internal speaker. Do not attempt to operate this radio with both internal and external speakers operating. Damage to the radio may result and void the warranty. The external speaker is not provided as part of the CLIPPER 28 VHF-FM Radiotelephone.

3) POWER DC 13.6V Connector J103
A keyed two pin male connector used to connect the 13.6 VDC input battery connector. The plus (+) terminal of the battery is connected to pin 2 and the minus terminal is connected to pin 1.

4) 7A FUSE With Power Cable
A 7 Amp protective fuse connected in the power cable between unit and battery.

3.4 OPERATING PROCEDURES

Specific operating procedures are presented below. General information on radiotelephone usage may be found in the appendices. For frequencies available in this model refer to Table 3-1.

3.4.1 Transmit/Receive

1. Connect antenna to ANTENNA Jack J101 (1, Fig. 3-2) and DC power cable to POWER DC 13.6V Jack J103 (3, Fig. 3-2).

2. Turn OFF/VOLUME control (8, Fig. 3-1) clockwise to turn radio on. Adjust OFF/VOLUME control in a clockwise direction for a comfortable listening level.

3. Rotate SQUELCH control (7, Fig. 3-1) until speaker noise just ceases.

NOTE

Do not turn SQUELCH control past this point as it is possible to cut out weak signals that would otherwise be audible. Advancing the SQUELCH Control will eliminate the weak signals, if desired.

4. Set transmitter power switch 1W/25W (2, Fig. 3-1) to either the 1W or 25W position depending on the distance the message is to be transmitted and transmitting conditions.

NOTE

FCC rules require that no more than 1.0 watt transmitting power be used in harbors.

NOTE

Initial communication contacts are usually made over channel 16 as all ships and shore stations continuously monitor this channel.

5. To transmit and receive on channel 16, depress pushbutton switch CH-16 MON.

6. To transmit and receive on channels other than 16, select the appropriate channel, with channel selector S1-2, insure that pushbutton switch CH-16 MON is released, and transmit using the microphone push-to-talk switch.

7. To receive weather information, select WX1, WX2, WX3 or WX4 as appropriate for your area.

8. To transmit distress calls ("MAYDAY, MAYDAY, MAYDAY"):

   a. Select channel 16.

   b. Speaking slowly transmit the phrase "MAYDAY, MAYDAY, MAYDAY," followed by the name and call sign of the calling vessel repeated three times. Continue with the distress message as follows, speaking slowly and distinctly:

1. The name of calling vessel.

2. Last known position.

3. The nature of the emergency.

4. A description of the calling vessel (type, color, length, number of persons aboard, etc.).

5. Indicate end of message by saying, "Over."

NOTE

Because the primary purpose of the distress frequency is to summon help, it is likely that an immediate response will be received. If there is no reply after several transmissions, transmit on any other available frequency until contact is made.

3.5 STATION LOG BOOK PROCEDURE

A station log must be maintained during the hours of service of ship stations using the radiotelephone. Pages of the log shall be numbered in sequence, and each page shall include the name of the vessel and the radio call sign of the station. All entries which show transmitter operation shall be made and signed by the LICENSED operator. Watch entries, and signature of each person keeping the required watch, shall be so related that they constitute a certification by each such person of when the watch began and ended.

The date and time of each occurrence or incident required to be in the log while engaged in international voyages, should be UTC (Universal Time, Coordinated; formerly GMT) opposite the entry. Vessels operating on the Great Lakes are subject to the Great Lakes agreement and use eastern standard time (EST): other stations may use UTC or local standard time. The log book should show the appropriate symbol as the head of the column in which the time is entered. Symbols are UTC, EST, CST, PST, etc.

Table 3-1

Marine VHF Radiotelephone Channels

CHANNEL DESIGNATION	SIMPLEX DUPLEX	SHIP-SHIP	SHIP TO SHORE	TYPE OF OPERATION
1	D	no	yes	International
1A	S	yes	yes	Port Operations
2	D	no	yes	International
2A	S			Not Authorized
3	D	no	yes	International
3A	S			Not Authorized
4	D	no	yes	International
4A	S			Not Authorized
5	D	no	yes	International
5A	S	yes	yes	Port Operations
* 6	S	yes	no	Safety
7	D	no	yes	International
* 7A	S	yes	yes	Commercial
* 8	S	yes	no	Commercial
* 9	S	yes	yes	Commercial/non-Commercial
* 10	S	yes	yes	Commercial
* 11	S	yes	yes	Commercial
* 12	S	yes	yes	Port Operation
* 13	S	yes	yes	Bridge to Bridge, Nav.(1W)
* 14	S	yes	yes	Port Operation
15	S	Rcv	Rcv	Rcv only-Environmental
* 16	S	yes	yes	Calling and Safety
17	S	State Agencies Only		State Government
18	D	no	yes	International
* 18A	S	yes	yes	Commercial
19	D	no	yes	International
19A	S	yes	yes	Commercial
20	D	no	yes	Port Operation, Internatl.
21	D	no	yes	International
21B	S	USCG Only		USCG
22	D	no	yes	International
* 22A	S	yes	yes	USCG Liason-Notice to Marin.
23	D	no	yes	International
23B	S	USCG Only		USCG
* 24	D	no	yes	Public Correspondence
* 25	D	no	yes	Public Correspondence
* 26	D	no	yes	Public Correspondence
* 27	D	no	yes	Public Correspondence
* 28	D	no	yes	Public Correspondence
60	D	no	yes	International
61	D	no	yes	International
62	D	no	yes	International
63	D	no	yes	International
63A	S	yes	no	Port Operation
64	D	no	yes	International

MARINE VHF RADIOTELEPHONE CHANNELS

CHANNEL DESIGNATION	SIMPLEX DUPLEX	SHIP-SHIP	SHIP TO SHORE	TYPE OF OPERATION
65	D	no	yes	International
65A	S	yes	yes	Port Operation
66	D	no	yes	International
66A	S	yes	yes	Port Operation
67	S	yes	yes	Navigation
* 68	S	yes	yes	Non-Commercial
* 69	S	yes	yes	Non-Commercial
* 70	S	yes	no	Non-Commercial
* 71	S	yes	no	Non-Commercial
* 72	S	yes	no	Non-Commercial
73	S	yes	yes	Port Operation
74	S	yes	yes	Port Operation
75	-	--	--	Guard Band-156.775-Rcv Only
77	S	yes	no	Intership Commercial
78	D	no	yes	International
* 78A	S	yes	yes	Non-Commercial
79	D	no	yes	International
* 79A	S	yes	yes	Commercial
80	D	no	yes	International
* 80A	S	yes	yes	Commercial
81	D	no	yes	International
* 81A	S	USCG Only		USCG
82	D	no	yes	International
82A	S	USCG Only		USCG
83	D	no	yes	International
83B	S	USCG Only		USCG
* 84	D	no	yes	Public Correspondence
85	D	no	yes	Public Correspondence
86	D	no	yes	Public Correspondence
87	D	no	yes	Public Correspondence
88	D	no	yes	Public Correspondence
* 88A	S	yes	no	Commercial
* W1		Rcv	Rcv	NOAA Weather-162.55MHz
* W2		Rcv	Rcv	NOAA Weather-162.40MHz
* W3		Rcv	Rcv	NOAA Weather-162.475MHz
* W4		Rcv	Rcv	Canada Weather-161.65MHz

* = Installed Channels

SECTION 4

THEORY OF OPERATION

4.1 GENERAL

The CLIPPER 28 VHF-FM Radiotelephone consists of four functional sections: the channel selection (control) section, the phase locked loop section, the transmitter section and the receiver section. These sections are discussed individually in the following paragraphs. Figure 4-1 contains the functional block diagram of the radiotelephone and Figure 4-2 contains a detailed functional block diagram of the phase locked loop (PLL) circuitry. Figures 6-1 and 6-2, are schematic diagrams of the CLIPPER 28 VHF-FM Radiotelephone and are included in Section 6. These schematics are used in conjunction with the block diagrams in this section to aid qualified technicians during repair or adjustment of the radiotelephone.

4.2 CHANNEL SELECTION AND CONTROL

Channel selection is accomplished by use of the the 32 position Channel Selector rotary switch S1-2. The wiring of this switch and the associated logic circuitry (Fig. 6-2) provide the encoded channel signals (Table 4-1). The design of the circuitry makes it impossible to produce any unauthorized frequencies. The channel selector rotary switch is coded to prohibit transmissions between channel selections. In the event the PLL circuitry (Fig. 4-2) malfunctions or unlocks, transmission is inhibited by diode D15 and transistor Q14. Calling and safety Channel 16 can be selected by its individual pushbutton switch. The channel 16 pushbutton switch is wired to disable channel selector rotary switch S1-2. The pushbutton switch automatically gates the correct PLL code from Channel Selector switch S1-2 logic circuitry to the PLL circuit. When the OFF/ VOLUME control VR101 is turned on the 13.6VDC supply is stabilized by Q17 and IC-5 to provide the crystal oscillator circuits with constant voltage.

4.3 PHASE LOCKED LOOP (PLL) CIRCUIT

The PLL circuitry is controlled by the Channel Selector 32 position rotary switch S1-2 and pushbutton switch CH-16 MON, (S7) shown in Fig. 6-2. The wiring of S1-2 and the associated logic circuitry generate the encoded PLL logic signals (Table 4-1) which control the PLL circuitry. The CH-16 MON pushbutton switch provides for quick selection of the PLL code generated by Switch S1-2 and the associated logic circuitry for generation of the channel frequency. Also, switch S1-2 inhibits the generation of unauthorized frequencies and transmissions between channel selections.

In the event the PLL circuit malfunctions or unlocks, an inhibit signal is generated by the phase detector circuit and applied via D15, Q14, and Q11 to inhibit the output of mixer Q3. The channel PLL codes are applied to the programmable divider circuit to program the division of the VCO output frequency. This VCO output frequency was divided previously by five (IC-7) and mixed with 25.6 MHz (IC-8). The difference frequency is passed to the program divider via low pass filter L17, C83 and C84), limiter amplifier IC-8 and inverter amplifier IC-6. A 10.24 MHz tuned crystal oscillator X-3 external to IC-6 provides the control frequency for the crystal control oscillator in IC-6.

Table 4-1
PLL Output Codes

POS.	CH.	PLL CODE RX	TX
1	06	1 1 1 0 0 1 0 0 0	1 1 1 0 0 1 0 0 0
2	07	1 1 1 0 0 1 0 1 0	1 1 1 0 0 1 0 1 0
3	08	1 1 1 0 0 1 1 0 0	1 1 1 0 0 1 1 0 0
4	09	1 1 1 0 0 1 1 1 0	1 1 1 0 0 1 1 1 0
5	10	1 1 1 0 1 0 0 0 0	1 1 1 0 1 0 0 0 0
6	11	1 1 1 0 1 0 0 1 0	1 1 1 0 1 0 0 1 0
7	12	1 1 1 0 1 0 1 0 0	1 1 1 0 1 0 1 0 0
8	13	1 1 1 0 1 0 1 1 0	1 1 1 0 1 0 1 1 0
9	14	1 1 1 0 1 1 0 0 0	1 1 1 0 1 1 0 0 0
10	16	1 1 1 0 1 1 1 0 0	1 1 1 0 1 1 1 0 0
11	18	1 1 1 1 0 0 0 0 0	1 1 1 1 0 0 0 0 0
12	22	1 1 1 1 0 1 0 0 0	1 1 1 1 0 1 0 0 0
13	24	0 1 0 1 0 0 1 0 0	1 1 1 1 0 1 1 0 0
14	25	0 1 0 1 0 0 1 1 0	1 1 1 1 0 1 1 1 0
15	26	0 1 0 1 0 1 0 0 0	1 1 1 1 1 0 0 0 0
16	27	0 1 0 1 0 1 0 1 0	1 1 1 1 1 0 0 1 0
17	28	0 1 0 1 0 1 1 0 0	1 1 1 1 1 0 1 0 0
18	68	1 1 1 0 0 1 1 0 1	1 1 1 0 0 1 1 0 1
19	69	1 1 1 0 0 1 1 1 1	1 1 1 0 0 1 1 1 1
20	70	1 1 1 0 1 0 0 0 1	1 1 1 0 1 0 0 0 1
21	71	1 1 1 0 1 0 0 1 1	1 1 1 0 1 0 0 1 1
22	72	1 1 1 0 1 0 1 0 1	1 1 1 0 1 0 1 0 1
23	78	1 1 1 1 0 0 0 0 1	1 1 1 1 0 0 0 0 1
24	79	1 1 1 1 0 0 0 1 1	1 1 1 1 0 0 0 1 1
25	80	1 1 1 1 0 0 1 0 1	1 1 1 1 0 0 1 0 1
26	81	1 1 1 1 0 0 1 1 1	1 1 1 1 0 0 1 1 1
27	84	0 1 0 1 0 0 1 0 1	1 1 1 1 0 1 1 0 1
28	88	1 1 1 1 1 0 1 0 1	1 1 1 1 1 0 1 0 1
29	WX1	0 1 1 0 0 0 0 1 0	1 1 1 1 1 1 1 1 1
30	WX2	0 1 0 1 1 1 1 0 0	1 1 1 1 1 1 1 1 1
31	WX3	0 1 0 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1
32	WX4	0 1 0 0 1 1 1 1 0	1 1 1 1 1 1 1 1 1

The 10.24 MHz output of the crystal controlled oscillator is divided into 5 KHz and 5.12 MHz output signals. The 5.12 MHz signal is multiplied by five (Q22) and applied to mixer IC-8 (25.6 MHz). The 5 KHz signal is applied to the phase detector contained in IC-6. The phase detector compares the output frequency of the programmable divider with the 5 KHz reference signal from the oscillator frequency divider. The differential output voltage of the phase detector circuit is coupled through low pass filter (R59, R60, C74 and C75) to VCO Q13. When this differential output voltage stabilizes at the correct level for the selected frequency, the VCO output frequency is locked to the selected frequency (139.40 to 145.65 MHz). The output frequency of the VCO Q13 is buffered by Q12 and applied to both the transmitter mixer Q3 and the receiver mixer Q25.

The phase detector continuously monitors the frequency output of the VCO by comparing it with the output of programmable divider to cause the circuit to operate as a phase locked loop. When the channel selector rotary switch S1-6 is changed to a new position, the PLL code output increases or decreases the frequency of the input signal to the phase detector circuit. The change in the frequency of this input signal to the phase detector is compared to the 5.0 KHz reference signal and the increase or decrease in the output is coupled by low pass filter (R59, R60, C74 and C75) to the junction of back-to-back variable capacitance diode D13. An increase in voltage applied to D13 decreases its capacitance and increases the oscillation frequency of VCO Q13. Again the PLL operation continues until the output of the phase detector is a steady D.C. level causing the VCO to lock to the frequency represented by the PLL code.

4.4 TRANSMITTER SECTION

When the microphone push-to-talk (PTT) switch is pressed, regulated B+ is applied to the transmitter section and audio frequency (voice) signals are coupled via a 750 usec pre-emphasis network to modulation limiter amplifiers IC-3 and IC-2. Audio output signals from IC-2 are coupled via low pass filter (C42, L12 and C43) to VR-1 control. The 16.9 MHz crystal oscillation circuit is temperature compensated by capacitor C35. The output of crystal modulator X-1 is buffer/amplified by Q4 and applied via low pass filter (C25, L8, and C24) to mixer FET Q3. Mixer Q3 mixes the modulated 16.9 MHz signal with the output signal (139.40 to 145.65 MHz) from the VCO, Q13. In the event the PLL unlocks or malfunctions, a transmitter inhibit signal is generated by the PLL and coupled via D15, Q14 and Q11 to inhibit transmissions at modulator Q5. The output of mixer Q3 is then coupled via L7 and L6 (M type coupling bandpass filter) to preamplifiers Q2 and Q1.

The output of preamplifier Q1 is coupled via L4 and C12 to the input of RF power amplifier IC-1. The output of IC-1 is coupled via a double Pi type network to antenna jack J101. A portion of the RF output at the junction of L1 and C2 is coupled by capacitor C3, full wave rectified by diodes D5 and D6 and applied to Q8. Transistor Q8 is turned on when the PTT is pressed to illuminate the TX lamp.

The rectified RF is also coupled via 1.0 watt control VR-3 and 25 watt control VR-4 to the input of operational amplifier IC-4. This input voltage to IC-4 is compared to a reference voltage and its differential output voltage is applied to DC amplifiers Q9 and Q10. The output from Q10 is applied as a control voltage

back to RF power amplifier IC-1 to maintain its output at 25 watts or less. During transmission, the diode switched (D10 and Q23) tuned circuit L14 and C96, acts as a quarter-wave transmission line to prevent power from being coupled to the receiver section.

4.5 RECEIVER SECTION

When the microphone PTT switch is released, B+ is disconnected from the transmitter section and connected to the receiver section. RF signals received by the antenna are coupled by Pi filter network (C1, L1 and C2) to the junction of C4 and D1. Diode D1 operates as an open switch during receiver operation. The amplitude of the RF input signal coupled by L14 is clamped above ground by diodes D11 and D12 and applied to the gate of RF amplifier FET Q24. The RF output of Q24 is coupled by a bandpass filter (L20, C102, L21, C103, L21, C103, L22 and C104) to the gate of mixer FET Q25. The VCO signal (139.40 to 145.65 MHz) is also applied to mixer Q25.

The difference output of mixer Q25 (single-tuned by T1) is a 16.9 MHz IF signal which is coupled via double 16.9 MHz crystal filters XF-1 and XF-2 to the input of 1st IF amplifier Q26. The 16.9 MHz output of Q26 is applied to a mixer circuit contained in IC-9. Crystal X-4 (17.355 MHz) provides the control element for the oscillator contained in IC-9. The 17.355 MHz output of this oscillator is mixed with the 16.9 MHz 1st IF signal to provide the 455 KHz 2nd IF frequency. The 455 KHz 2nd IF frequency is filtered by two 455 KHz ceramic filters CF-1 and CF-2 and applied to a limiter amplifier contained in IC-9. The 455 KHz output of the limiter amplifier is demodulated and the detected audio frequency output is amplified and applied to VOLUME control VR101, SQUELCH control VR-102, noise filter circuit Q27 and noise detector circuit D17. The AF signal from VOLUME control VR101 is applied to the 750 usec de-emphasis circuit Q28 and then to low pass filter circuit Q29. The output of low pass filter Q29 (operating as an emitter follower) is applied to power amplifier IC-10 along with the output of noise detector D19 which is switched into IC-10 by transistor switch Q30. This action provides the squelch level to power amplifier IC-10.

SECTION 5

MAINTENANCE

5.1 GENERAL

The purpose of this section is to provide servicing instructions to the service engineer. The equipment is designed to provide long periods of trouble-free operation. However, it is recognized that environmental and other factors will result in a need for occasional service.

5.2 PERIODIC MAINTENANCE

The procedures listed below should be performed at monthly intervals to minimize the possibility of an equipment failure and assure optimum performance.

1. Inspect the antenna system. Pay particular attention to the cleanliness of the antenna insulator(s), condition of soldered connections, etc.

2. Fuse ferrules are subject to corrosion which increases circuit resistance. Fuses should be removed from their holders, inspected, and cleaned of any accumulation of dirt or corrosion.

3. Plastic surfaces should be cleaned with lens tissue or a soft nonabrasive cloth. Care should be exercised when cleaning any plastic surface to prevent scratching. Mild soap and water may be used in stubborn cases.

CAUTION

Do not use solvents.

5.3 POST-INSTALLATION SERVICE

This radiotelephone is completely aligned at the factory and should not require any adjustments at installation. However, it is considered good practice to verify that none of the adjustments have changed or been disturbed before or during installation. The test equipment listed below (5.3.1) is used for the test setup shown in Figure 5-1.

5.3.1 Test Equipment

1.	DC power supply (13.6 VDC)	20V	10A	
2.	RF power meter	50 ohms	40W	150 MHz

3. Signal Generator 50 ohms 150 MHz
(Measurements Corp 900 or equivalent)

4. FM linear detector (FMLD) 150 MHz
(Measurements Corp 902 or equivalent)

5. Frequency counter 150 MHz
(HP 5245L or equivalent)

6. Digital Voltmeter

7. Oscilloscope
(any oscilloscope accurate for audio signal tracing)

8. SINADDER (Trademark of Helper Instrument Co.)

9. Distortion Meter

10. Toggle Switch (for use as a PTT switch)

11. Toggle Switch with RG-58C/U and 2 BNC connectors for TX/RX switching.

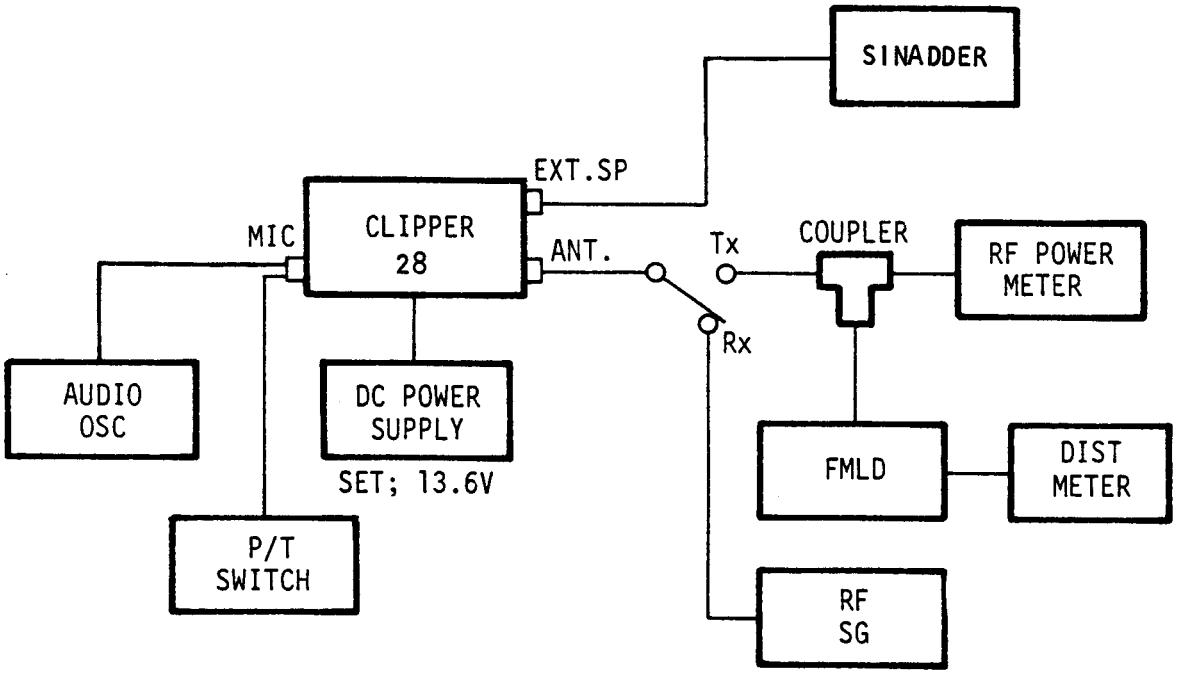


Figure 5-1 Test Equipment Interconnection

5.3.2 Crystal Frequency Adjustments

1) 10.24 MHz frequency adjustment

a. Connect the frequency counter to TP-2 (pin 6 of IC-6).
b. Turn OFF/VOLUME control CW to apply 13.6 Vdc to the radiotelephone.
c. Adjust trimmer capacitor TC-1 for a reading of 10.24 MHz on the frequency counter.

2) 16.9 MHz frequency adjustment

a. Connect frequency counter to the collector of Q4.
b. Rotate channel selector switch S1-2 for an indication of 16 on channel indicator.
c. Set PTT toggle switch to TX (do not apply any modulation from the audio oscillator) and adjust L10 for an indication of 16.9 MHz on the frequency counter.

3) 17.355 MHz (RX second local freq.) adjustment

a. Rotate channel selector switch S1-2 for an indication of 18A on channel indicator.
b. Set PTT toggle switch to RX position.
c. Connect the high gain frequency counter through a series 5pF capacitor to pin 2 of IC-9.
d. Adjust trimmer capacitor TC-2 for an indication 17.355 MHz on the frequency counter.

5.3.3 PLL Adjustments

NOTE

Do not perform this procedure until the 10.24 MHz frequency adjustment has been completed.

1) 25.6 MHz frequency adjustment

a. Connect the frequency counter to pin 1 of IC-8.
b. Adjust L18 for an indication of 25.6 MHz on the frequency counter.

2) PLL lock and maximum output adjustments

a. Connect the high input impedance voltmeter to the plus (+) side of capacitor C74.
b. Rotate channel selector switch S1-2 for an indication of 06 on channel indicator.
c. Adjust L16 for approximately 5 volts on the high input impedance voltmeter.
d. Rotate W1 channel selector switch S1-2 and observe tnat the voltage indicated on the high input impedance voltmeter is approximately 7 volts.
e. After the PLL has locked, adjust L15 for a maximum output on the high input impedance voltmeter.

5.3.4 TX Bandpass Filter Adjustment

1) Rotate channel selector switch S1-2 for an indication of 18A (center channel) on channel indicator dial.

2) Connect the RF voltmeter to Pin 1 of IC-1.

3) Adjust L4, L5, L6 and L7 to obtain a maximum reading on the RF voltmeter.

4) Connect the RF power meter to the ANTENNA Jack J101 and re-adjust L4, L5, L6 and L7 for maximum RF output power.

5) Rotate channel selector switch S1-2 first for an indication of 06 and then 88 on channel indicator while fine tuning L4, L5, L6 and L7 for approximately the same RF power output for both extreme channels (06 and 88).

5.3.5 Modulation Limiting

1) Connect the FM Linear Detector (FMLD) to the ANTENNA Jack J101 and tune to 156.800 MHz.

2) Rotate channel selector switch S1-2 for an indication of 16 on channel indicator dial.

3) Connect audio oscillator and PTT toggle switch to microphone.

4) Set audio oscillator to 2.5 kHz and 50% modulation +16 dB.

5) Adjust VR-1 control to fall in the range of 4.5 to 5 kHz deviation.

5.3.6 RF Output Power Control Adjustment

1) Depress 1W/25W pushbutton switch S10 (1W position) and adjust VR-3 for an indication of just under 1 watt on the RF power meter.

2) Release 1W/25W pushbutton switch S10 (25W position) and adjust VR-4 for an indication of just under 25 watts on the RF power meter.

5.3.7 RX Sensitivity Adjustment

1) Connect the SINADDER to the EXT-SP Jack J104.

2) Rotate channel selector switch S1-2 for an indication of 18A on channel indicator dial.

3) Adjust L19, 20, 21, 22 and T1 for maximum sensitivity (dip) on the SINADDER at the center of channel 19.

4) Adjust T2 for optimum SINAD on the SINADDER.

5) Check the sensitivity at the highest frequency channel W1 and the lowest frequency channel 06 on the SINADDER.

6) If necessary, fine tune L20, 21 and 22 to obtain the same sensitivity on high frequency channel W1 as on low frequency channel 06.

5.4 TROUBLE ISOLATION

Table 5-1 provides a general trouble isolation chart for use by a technician to isolate troubles to functional areas.

Table 5-1
Trouble Isolation

Step No.	Symptom	Probable Cause
1.	CLIPPER 28 does not turn on.	a. 7A Fuse blown. b. 13.6VDC power connector not properly connected to J103. c. Defective OFF/VOLUME switch VR101. d. Noise filter L24 open. e. Varistor V1 shorted. f. Diode D24 shorted. g. Capacitor C142 shorted. h. Capacitor C140 shorted. i. Defective regulator IC-5. j. Capacitor C98 shorted.
2.	No sound with AF signal connected to pin 4 of IC-10	a. Defective IC-10 b. Squelch level set too high c. Defective switch transistor Q30. d. Defective noise filter Q27. e. Defective IC-10 output component C144, C145, C146 or L26.
3.	No sound with AF signal applied to volume control VR101.	a. Check volume control, VR101. b. Check 750usec de-emphasis circuit Q28. c. Check low pass filter Q29.
4.	No RX	a. Check for 13.6VDC at input to IC-5. b. Check Q17, Q18, Q19, Q20 and IC-5. c. Check X-4 output for 17.355 MHz signal. d. Check IC-9 bias voltage. e. Check 16.9MHz output of first mixer Q25. f. Check 16.9MHz output of crystal filters XF-1 and XF-2. g. Check 16.9MHz output of first IF amplifier Q26.

Step No.	Symptom	Probable Cause
		h. Check 455kHz signal from ceramic filters CF-1 and CF-2. i. Check Channel selector S1-2 for correct output.
5.	Low Sensitivity	a. Check the output of IC-9, Q26, Q25 and Q24. b. Check the ouput of VCO for frequency and amplitude. c. Check D11, D12, Q23, and D1 for shorts. d. Check antenna cable and connector.
6.	Squelch Circuit Inoperative	a. Check VR102 and VR5. b. Check circuitry associated with Q27, D19, Q30 and IC-5.
7.	No Tx	a. Check Q20, Q18, and Q3 for TX B+. b. Check Q14 and Q11 for oscillation circuit B+. c. Check for correct input to mixer Q3. If incorrect check VCO Q13 and PLL IC-6. d. Check output level of 16.9 MHz crystal X-1. e. If good, check output level of Q4 and input level to Q3 (junction of L8 and C24). f. If incorrect output from Q4 check Q5, Q6, Q7 and associated circuitry. g. Check bias level voltage for Q1 and Q2. h. Check output of Q2, Q1 and IC-1. i. Check TX inhibit circuit for malfunction.
8.	Low RF Power Output	a. Check RF power output from IC-1. b. If good, check double Pi type network components (C6, L2, C5, C4, C2, L1 and C1) and antenna switch D1. c. If not good, check voltage level outputs of preamplifiers Q1 and Q2 and associated circuitry.

Step No.	Symptom	Probable Cause
9.	Poor or No Modulation	a. Check microphone operation. b. Check the outputs of Q4, Q5, Q6, IC-2, IC-3 and their associated circuitry.
10.	Deviation of TX Frequency	a. Check VCO output frequency, PLL phase detector output and their associated circuitry. b. Check 16.9MHz crystal (X-1,) frequency output and its associated circuitry. Also, check the adjustment of VR-1 and L10. c. Check channel selector switch S1-2.
11.	PLL output frequency or level incorrect	a. Check frequency of 10.24 MHz crystal oscillator. b. Check check output of phase detector circuit. c. Check frequency output of oscillator divider circuit. d. Check frequency output of programmable divider. e. If incorrect, check channel selector switch S1-6, 5.12MHz x 5 multiplier Q22, 1/5 divider IC-7, mixer IC-8, low pass filter (L17, C83 and C84) and limiter amplifier IC-8.
12.	PLL output code incorrect	a. Check channel selector switch S1-2. b. Check D201-D207 of push-button switch S11.

SECTION 6

PARTS LIST & DRAWINGS

Table 6-1 Parts List Clipper 28 Radiotelephone

Description	Qty		Symbol	Part No.
Main PCB Assembly	1			1035434-1
Channel Switch PCB Assembly	1			1035434-2 or 1035434-32
Volume Control with Power Switch, 50k ohms (A)	1		VR101	1035434-3
Squelch Control, 50K ohms (C)	1		VR102	1035434-4
Ant. Jack	1			1035434-5
Power 13.6 Vdc Jack	1			1032698-180
Ext. Spkr. Jack	1		J104	1032698-181
Speaker	1			1035434-6
Microphone	1		G243130-9 -	~~1032564-9~~
Mic. Hanger	1			217-7180P1
DC Cable with Inline Fuse	1	Kit		1035434-7
Fuse, 7A	3			226-7176P72
Cabinet Assembly	1	Pair		1032698-47
Front Bezel Assembly	1			1035434-8
Yoke Assembly	1			1032698-49
Knobs, Function Switch, (Black)	2			1035434-9
Knobs, Control (Vol, Sq)	2			1035434-10
Knob, Channel Selector	1			1035434-11
Gasket, Function Switch	1			1035434-12
Gasket, Heat Sink	1			1035434-13
Gasket, Speaker	1			1035434-14
Thumbscrews	4			1032698-59
Thumbscrew Washers	4			1032698-60
XTAL X3				1032698-70

See Clipper 82 or 62 Book

APPENDIX A

RADIOTELEPHONE SERVICES

A.1 BASIC RADIOTELEPHONE SERVICE

Radiotelephone communication capability provides important benefits of safety and convenience. It is possible to call, or be called by, the Coast Guard or other vessels within range.

With the addition of channels for Maritime Radiotelephone Service, a far greater range of communication is possible. Range is no longer limited to the relatively short range of the transmitter. The ability to contact the Marine operator provides communication with virtually any other telephone anywhere in the world, on land or sea.

A.2 GETTING ON THE AIR

Before a vessel can lawfully transmit any message, with or without the assistance of a marine telephone operator, the FCC requires that the following be on board:

1. A valid ship's radiotelephone station license.
2. A licensed radiotelephone operator.
3. A radiotelephone station log book.

FCC regulations prohibit the use of profane language, and establish other reasonable controls. All persons aboard a vessel who will be using its communications equipment should be familiar with these and with approved operating procedures. Frequencies are shared with other boatmen. Contacts should be kept brief so that all may have an equal opportunity to transmit and receive messages.

A.3 TECHNICAL REQUIREMENTS

The Telephone Company (or independent common carrier) operates the shore-based radio stations. It does not rent, lease or sell radio telephone equipment for use aboard ship. Such equipment is owned and maintained by the boat owner or, in some cases, by a maritime radio operating company. The selection, installation, and maintenance of a shipboard radio station is highly technical and should be entrusted only to a licensed, reliable marine radio service concern.

The owner's service requirements aboard ship and the operating area will determine the type of marine telephone service and the specific installation needed. Transmitters must meet the requirements set forth in the International Regulations applicable in the country in which the ship is registered. Vessels of United States registry must conform to the regulations of the FCC.

A.4 REGISTER WITH THE COAST STATION

If regular use of Public Marine Radiotelephone Service is planned, it is important to register with the owner of the coast station serving the primary area of operation. Registration with Bell System stations is free. It provides the coast station with billing information for calls, and saves the air time necessary to transmit this information on each call. Ship stations equipped for selective signaling must

register in order to obtain assignment of a radiotelephone or ringer number. In areas serviced by the Bell System the operator may register by calling any of the contact numbers "collect."

There is no monthly charge for maintaining an account. Billing is made for each marine call and for any long distance or overseas charges when they apply. Information on these charges is available in advance from the Marine Operator.

On all three Bell System marine services, messages between the U.S. and any boat may be placed prepaid, collect, or as credit card calls.

NOTE
Keep the Telephone Company informed of any changes that affect your registration.

A.5 MARINE RADIOTELEPHONE

The Bell System and numerous independent Common Carriers maintain a network of marine radio stations strategically located along the coastal waters and major inland waterways of the 48 contiguous states of the U.S. Stations are generally operated 24 hours a day.

A.5.1. VHF Service

1. Public Class III-B Coast Stations

   This Service offers reliable operation with good transmission quality over distances of 20 to 50 miles, using FM with channels in the 156-162 MHz range. Antenna height and equipment quality are the primary factors that determine communication distance.

   NOTE
   Under FCC rules now in effect, a licensed VHF radiotelephone must be aboard before medium frequency (MF) equipment can be licensed. VHF must be used in preference to MF when within range of a VHF shore station.

2. VHF Channels

   The non-commercial VHF channels available in the United States are grouped into categories for specific uses so that maximum utilization with minimum interference can be attained. A listing by category may be found in Table 3-1.

3. How to Place Calls on VHF/Ship to Shore

   a. Listen to verify channel to desired station is not busy.

   b. When channel is clear, put transmitter on air for 15 to 20 seconds - repeat if no answer.

c. When the Marine Operator answers, say: "This is (Ship Call Signal) the telephone billing number is...." If there is no telephone billing number, state caller's name, ship's name and address in city of registry.

d. Finish with the city and telephone number being called. Proceed thereafter as directed.

e. At the end of the conversation, repeat ship's name and call sign and sign off with "clear" or "out."

4. Shore-to-Ship

a. Call the local telephone operator and ask for the Marine Operator.

b. Give the Marine Operator the name of the ship being called, its call sign, location, and selective signaling code number (if known). Proceed thereafter as directed.

5. Receiving Shore-to-Ship Calls

To receive public coast station calls, a receiver must be in operation on the proper channel.

When calling on VHF, Bell System coast stations will call on channel 16 (156.8 MHz) when requested to do so by the calling party.

Since it is mandatory for commercial operators to maintain a watch on channel 16 (156.8 MHz), many commercial operators carry an additional receiver tuned to a working frequency of their area coast station. This enables them to receive a high percentage of calls on the first attempt. Selective ringing requires a second receiver. When you hear your boat called, answer as follows: "(Name of coast station that called) This is (Name of your vessel and call sign), Over." Proceed thereafter as directed.

6. Ship-to-Ship Direct

To directly contact another vessel, compatible equipment must be available. (If the other vessel is out of range, make contact through the Marine Operator.)

Most direct ship-to-ship contacts are originated on the distress calling and safety frequency - Channel 16 (156.8 MHz).

a. On a non-busy channel give the name of the vessel being called, and the name and call sign of the calling vessel.

b. When the called vessel answers, it should suggest an intership frequency on which to complete the conversation. Calls must be limited to 3 minutes except in emergencies.

c. When the call is complete, sign off with vessel name and call sign. You may not call the same boat again for at least 10 minutes.

A.6 DISTRESS, URGENCY AND SAFETY MESSAGES

If the radio is turned on and not in use, it should be used as a channel 16 monitor. This channel is the calling and safety frequency and is monitored 24 hours-a-day by the Coast Guard and most commercial shore stations. If help is needed, it can be on its way in moments from the Coast Guard and other vessels in the area.

Distress, urgency and safety messages are identified by the use of a code word at the beginning of each message. This word indicates the priority of the message.

A.6.1 Distress Signal: MAYDAY

Used if there is an immediate danger of loss of life or property. MAYDAY has priority over all other communications.

1. If a MAYDAY is heard

   Immediately discontinue any transmission. Note the details of the message in the radio log right away. A call to relay information or render assistance may be received. Having the facts may make it possible to help save a vessel or a life.

   Unless assistance is possible, do not make any transmissions on this channel until the MAYDAY condition is lifted by the Coast Guard.

2. To make a MAYDAY call

   a. Switch to channel 16.

   NOTE
   Because the primary purpose of the channel is to summon help, it is likely that an immediate response will be heard. If not, repeat the message. If still no reply, transmit on any other available frequency until contact is made.

   b. Speaking slowly and distinctly, say "MAYDAY, MAYDAY, MAYDAY. This is ....." giving the name of vessel and call sign three times. Then continue with the distress message, as follows, still speaking slowly and distinctly.

   c. The name of calling vessel.

   d. Position.

e. The assistance needed.

f. A description of vessel (type, color, length, number of persons aboard, etc.)

g. Indicate end of message by saying, "Over."

A.6.2 Urgency Signal: PAN

Used when the safety of the vessel or person is in jeopardy. "Man overboard" messages are sent with this urgency signal. PAN has priority over all other communications with the exception of distress traffic.

A.6.3 Safety Signal: SECURITY

Used for messages concerning the safety of navigation or giving important meteorological warnings.

A.7 WEATHER BROADCASTS

Coast Guard stations transmit weather information in many areas. Local frequencies and schedules may be obtained from the nearest U.S.C.G. or NOAA office. The U.S. Weather Bureau broadcasts current weather on channels W1 (162.550 MHz) and W2 (162.400 MHz), W3 (162.475 MHz), and W4 (161.650).

At some shore stations, the Marine Operator broadcasts weather information. The Marine Operator may be consulted for channels used and time schedule of broadcasts. Commercial broadcasting stations generally broadcast weather reports and forecasts as part of their news coverage.

NOTE

No prudent boatman ventures out of port without the best available knowledge of weather conditions and possible changes. Your radiotelephone can help you obtain this important information.

A.8 KEEPING THE LOG BOOK

NOTE

Radio logs must be retained for at least one year, and for three years if they contain entries concerning marine disaster or distress. This period may be longer if an investigation is underway or pending.

The FCC requires the following entries in a radiotelephone log each day underway:

1. Name of vessel.
2. Vessel's call sign.
3. Operator's signature.
4. Date and listening time on 2182 KHz or 156.8 MHz, using the 24 hour clock.

5. All distress (MAYDAY) messages heard or transmitted.
6. All urgency (PAN) and safety (SECURITY) messages transmitted.
7. Distress, urgency, and safety messages should be logged in as much detail as possible, including date, time of day, operating frequencies, vessel's name and position, and nature of the emergency.
8. All installation, service, and maintenance details that affect the operation of the transmitter must be entered by the licensed technician performing such work, including his address and the class, serial number and expiration date of his license.

A.9 PHONETIC ALPHABET

To help make call letters more clearly understood, and to assist in spelling out similar sounding or unfamiliar words, radiotelephone users usually employ the international phonetic alphabet.

PHONETIC ALPHABET

A - ALPHA	J - JULIET	S - SIERRA
B - BRAVO	K - KILO	T - TANGO
C - CHARLIE	L - LIMA	U - UNIFORM
D - DELTA	M - MIKE	V - VICTOR
E - ECHO	N - NOVEMBER	W - WHISKEY
F - FOXTROT	O - OSCAR	X - X-RAY
G - GOLF	P - PAPA	Y - YANKEE
H - HOTEL	Q - QUEBEC	Z - ZULU
I - INDIA	R - ROMEO	

A.10 MARITIME MOBILE RADIOTELEPHONE CONTACTS

For information on any of the three Bell System Marine services, or for registration of your vessel, call the Telephone Company representative in your area.

Atlanta, GA	404-877-3895	Milwaukee, WI	414-350-8870
Baltimore, MD	301-393-1036	Montreal, Canada	514-870-7189
Birmingham, AL	205-321-8509	Newark, NJ	201-649-2014
Boston, MA	617-743-4035	New Orleans, LA	504-581-7337
Charleston, SC	803-722-9011	New York, NY	212-564-0410
Charlotte, NC	704-372-9456		212-393-7394
Chicago, IL	312-727-1574	Norfolk, VA	804-424-9911
Cincinnati, OH	513-397-3431	Omaha, NB	402-422-8656
Cleveland, OH	216-822-4840	Philadelphia, PA	215-466-4648
Detroit, MI	313-354-9550	Portland, OR	503-224-6261
Houston, TX	713-521-6355	San Francisco, CA	415-986-5216
	713-521-7708		415-442-2262
Indianapolis, IN	317-630-1697	Seattle, WA	206-345-2341
Jacksonville, FL	904-353-2315	Washington, DC	202-392-3682
Los Angeles, CA	213-744-1616		202-637-9900
Miami, FL	305-379-0745	Wilmington, NC	919-763-4675
	305-350-8016		

A.11 SUMMARY

1. An accurate, complete radio log is required by FCC regulations.

2. Maintain a watch on the international distress channel (Channel 16 -156.8 MHz) whenever your receiver is operating. Enter the date and listening time in the log.

3. If both VHF and medium frequency (MF) radiotelephones are installed, VHF must be used whenever within VHF range. This is required by FCC regulations.

4. Listen before transmitting on any frequency to avoid interfering with other vessels' communications.

5. Make all messages brief and to the point. The maritime radiotelephone service is a "party line." If a call is unsuccessful at first, wait at least two minutes before trying again.

6. If a MAYDAY call is heard, respond only if in a position to render assistance or relay the distress message.

7. Profanity on the air is unlawful. Violation, under the Communications Act of 1934, carries a maximum fine of $10,000 and imprisonment for up to two years.

8. False distress signals are prohibited. Violators may be prosecuted under FCC regulations, which carry a maximum fine of $10,000 and one year in prison.

9. Keep the radiotelephone equipment in good working order. Have it checked periodically by a qualified, licensed technician. Do not stake the safety of a vessel or passengers on a questionable radiotelephone.

10. Radiotelephone messages, like telephone conversations, are private. It is unlawful to make use of any information intended for others.

APPENDIX B

LICENSING

B.1 GENERAL

All radio stations aboard U.S. flag vessels must be licensed by the FCC under part 83 of the FCC regulations. The licensee is responsible at all times for the lawful and proper operation of his station. Licenses are not granted to aliens except where the radio installation is required by law or treaty. Ship stations are licensed primarily for safety of life and property. Distress and safety communications must, therefore, have absolute priority.

B.2 SHIP STATION LICENSE

Application for a ship radiotelephone and/or radionavigation station (radar) license is made on FCC Form 502, except that FCC Form 501 shall be used for radiotelephone stations required by Title III, Part II of the Communications Act of 1934, as amended, or the Safety of Life at Sea Convention, or where the applicant is also the licensee of radiotelegraph equipment aboard the vessel. FCC Form 501 is used for party boats and commercial vessels which require a radiotelephone installation.

B.3 RENEWAL OF SHIP STATION LICENSE

An application for renewal of a ship radiotelephone and/or ship radionavigation (radar) station license shall be filed on FCC Form 405-B, except that FCC Form 405-A shall be filed for renewal of a ship station license which also authorizes radiotelegraph equipment. Insofar as possible, FCC Form 405-B is mailed to the station licensee 60 days prior to expiration of his license. If it has not been received 30 days prior to expiration, FCC Form 405-B may be obtained upon request from the nearest FCC office. The application for renewal must be received by the Commission prior to the expiration date.

B.4 INTERIM SHIP STATION LICENSE FOR RADIOTELEPHONE

An interim license authorizing the operation of a ship radio station for a 6-month period may be obtained at any Commission field engineering office upon presentation (by the applicant or any person who informs the office that he has been authorized to act in behalf of the applicant in securing an interim ship station license) of a properly completed application and an informal request for an interim license.

In Alaska only, an interim ship station license may be obtained by mailing a properly completed application and a written request for an interim ship station license to the Commission's field engineering office at Anchorage.

The full-term license will be mailed to the licensee prior to the expiration of the interim license.

The interim license procedure does not apply to renewal applications.

B.5 OPERATOR LICENSE

The radiotelephone transmitter in a ship station may be operated only by a licensed radio operator. The licensed operator may permit others to operate the transmitter if he starts, supervises, and ends the operation, makes the necessary log entries, and transmits the necessary identification. The license usually held by radio operators aboard small vessels not required to carry a radio installation for safety purposes is the Restricted Radiotelephone Operator Permit or verification card of a second class or higher radiotelegraph or radiotelephone license. The Restricted Radiotelephone Operator Permit or verification card of a higher class license must be posted or kept on the operator's person (Rule 83.165). For vessels requiring radiotelephone installation, the operator must have a third class radiotelephone operator permit.

B.6 APPLICATION FOR OPERATOR PERMIT

Field offices will accept applications filed on FCC Form 753 for the Restricted Radiotelephone Operator Permit if the applicant makes a satisfactory showing of immediate need for a permit for safety, and if the application is presented in person by the applicant or his agent. However, this lifetime permit is usually obtained by mailing an FCC Form 753 to the FCC at Gettysburg, Pennsylvania 17325. No oral or written examination is required. An application for a Restricted Radiotelephone Operator Permit must be accompanied by a filing fee (see fee schedule below).

B.7 FEES

The appropriate fee must be enclosed with each application for a station license. An additional fee is required for an interim license. DO NOT SEND CASH. Make check or money order payable to the Federal Communications Commission. In general, the fee will not be refunded even if the license is not granted. Also, fee overpayments of $2.00 or less will not be refunded. (No fee is required for an application filed by a Government Agency or for a special temporary authority of brief duration or minor character.)

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