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Raytheon

RAY 410 Loudhailer



INSTRUCTION MANUAL

GENERAL INFORMATION
INTRODUCTION

PURPOSE

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

ELECTRICAL FEATURES

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WARRANTY

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SECTION 1

GENERAL INFORMATION

1.1 INTRODUCTION

1.1.1 Purpose of Manual

This manual presents instructions for the installation, operation and maintenance of the RAY 410 Loudhailer. Figure 1-1 shows the RAY 410 Loudhailer with microphone and mounting yoke attached.



Figure 1-1 RAY 410 Loudhailer

1.1.2 Features of the RAY 410

The RAY 410 Loudhailer is a multipurpose device that may be used as a ship-to-shore hailer, ship-to-ship hailer, foghorn, audio amplifier, intercom, and alarm system. As a Loudhailer, the RAY 410 amplifies audio signals to a 25 watt level, and when listening for replies, amplifies incoming sounds. If an additional (optional) horn is added to the system, the loudhailer output can be switched to either or both of the hailing horn positions by front panel control. The Loudhailer horn(s) are used as sound dispersal points when the RAY 410 is used as a foghorn so that the full 25 watt output of the unit can be employed. In the foghorn mode any of six (FOG HORN 1, 2, 1+2, 1+3, ANCH, AGND) sound patterns can be automatically generated. The audio amplifier of the unit can be used to distribute the output of Radiotelephones or other entertainment Receivers to the hailer stations.

1.2 ELECTRICAL FEATURES

The RAY 410 Loudhailer incorporates state-of-the-art electronics which provides advantages in both function and performance with high reliability.

- (1) All operations are controlled by a single chip CPU.
- (2) The audio output stage consists of a power IC (BTL configuration) which provides output power with minimum distortion and loss.
- (3) A Muting Circuitry is used to prevent click sounds from being audible when the station keys or microphone key is switched.

1.3 EQUIPMENT SUPPLIED

The RAY 410 is normally supplied with the items listed in Table 1-1. When unpacking the unit carton, check that all items are included. If items are missing, please notify your Raytheon dealer immediately.

**Table 1-1
Equipment Supplied**

Equipment Name	Part No.	Qty.
RAY 410 Loudhailer Unit	M95114	1
Deck Speaker	M95435	1
Microphone	G263100-2	1
Microphone Mounting Bracket	G263116-2	1
Mounting Yoke	MPBX14912	1
Bridge Card	G263092-3	1
Instruction Manual	G263092-2	1
Mini Telephone Plug	PJ-2240-P	1

1.4 SPECIFICATIONS

Specifications for the RAY 410 are listed in Table 1-2.

Table 1-2 Specifications

Dimensions (including mounting Yoke):	
Height	165 mm
Width	240 mm
Depth	120 mm
Weight	2.5 Kg
Input Voltage	13.6 Vdc nominal ($\pm 15\%$)
Input Current	5 amps (in HAIL)
Polarity	Negative Ground
Audio Output	25 Watts
Hail Impedance	8 ohms
Hail Impedance (Both)	4 ohms
Hail Impedance (All)	1 ohm
Intercom Impedance	1 ohm
Distortion	5 %
Listen Sensitivity (at 1 KHz)	6 mV for 5 Watt output
<p>Audio Input Impedance and Input Level</p> <p>a. MIC Impedance - 600 ohm. MIC Sensitivity (at 1 KHz) - less than -40dBm.</p> <p>b. AUX Impedance - 10 Kohm. AUX Sensitivity (at 1 KHz) - less than -10dB.</p> <p>c. SP/MIC Impedance - 100 ohm. SP/MIC Sensitivity (at 1 KHz) - 6mVrms.</p> <p>Frequency Response, Distortion Factor and Signal-to-Noise Ratio.</p> <p>a. At HAIL (25W) 100 Hz - 8 KHz ± 5 dB. less than 10 % (at 1KHz). more than 65 dB.</p> <p>b. At LISTEN (5W) 100 Hz - 8 KHz ± 5 dB. less than 5 % (at 1KHz). more than 60 dB.</p> <p>c. At AUX (25W) 100 Hz - 20 KHz ± 5 dB. less than 10 % (at 1KHz). more than 70 dB.</p>	

1.5 OPTIONAL COMPONENTS AND ACCESSORIES

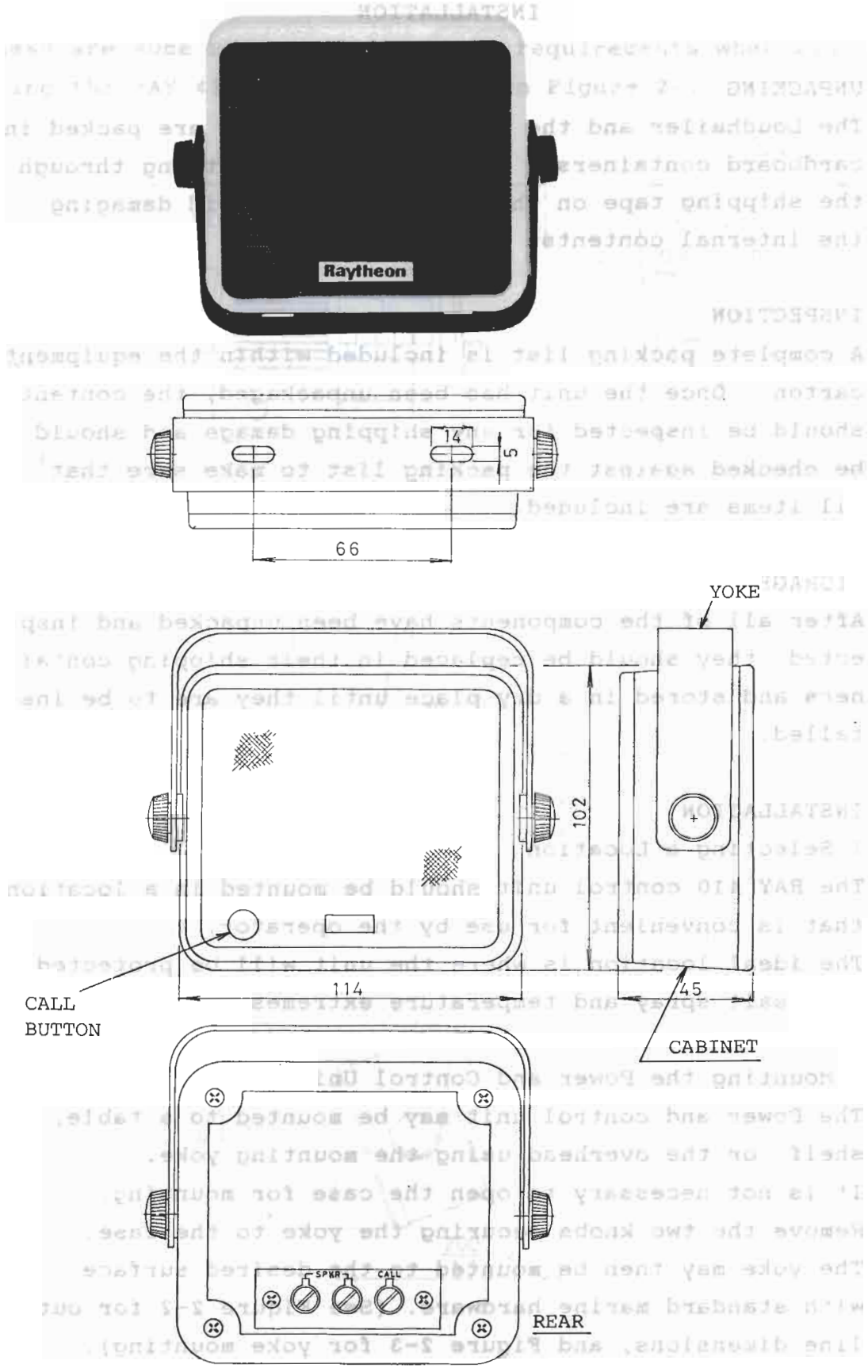


Figure 1-2 M95307 INTERCOM SPEAKER (OPTIONAL)

SECTION 2 OPTIONAL COMPONENTS AND
INSTALLATION

2.1 UNPACKING

The Loudhailer and the horn of the RAY 410 are packed in cardboard containers. Use caution when cutting through the shipping tape on the containers to avoid damaging the internal contents.

2.2 INSPECTION

A complete packing list is included within the equipment carton. Once the unit has been unpackaged, the contents should be inspected for any shipping damage and should be checked against the packing list to make sure that all items are included.

2.3 STORAGE

After all of the components have been unpacked and inspected, they should be replaced in their shipping containers and stored in a dry place until they are to be installed.

2.4 INSTALLATION

2.4.1 Selecting a Location

The RAY 410 control unit should be mounted in a location that is convenient for use by the operator.

The ideal location is where the unit will be protected from salt spray and temperature extremes.

2.4.2 Mounting the Power and Control Unit

The Power and control unit may be mounted to a table, shelf, or the overhead using the mounting yoke.

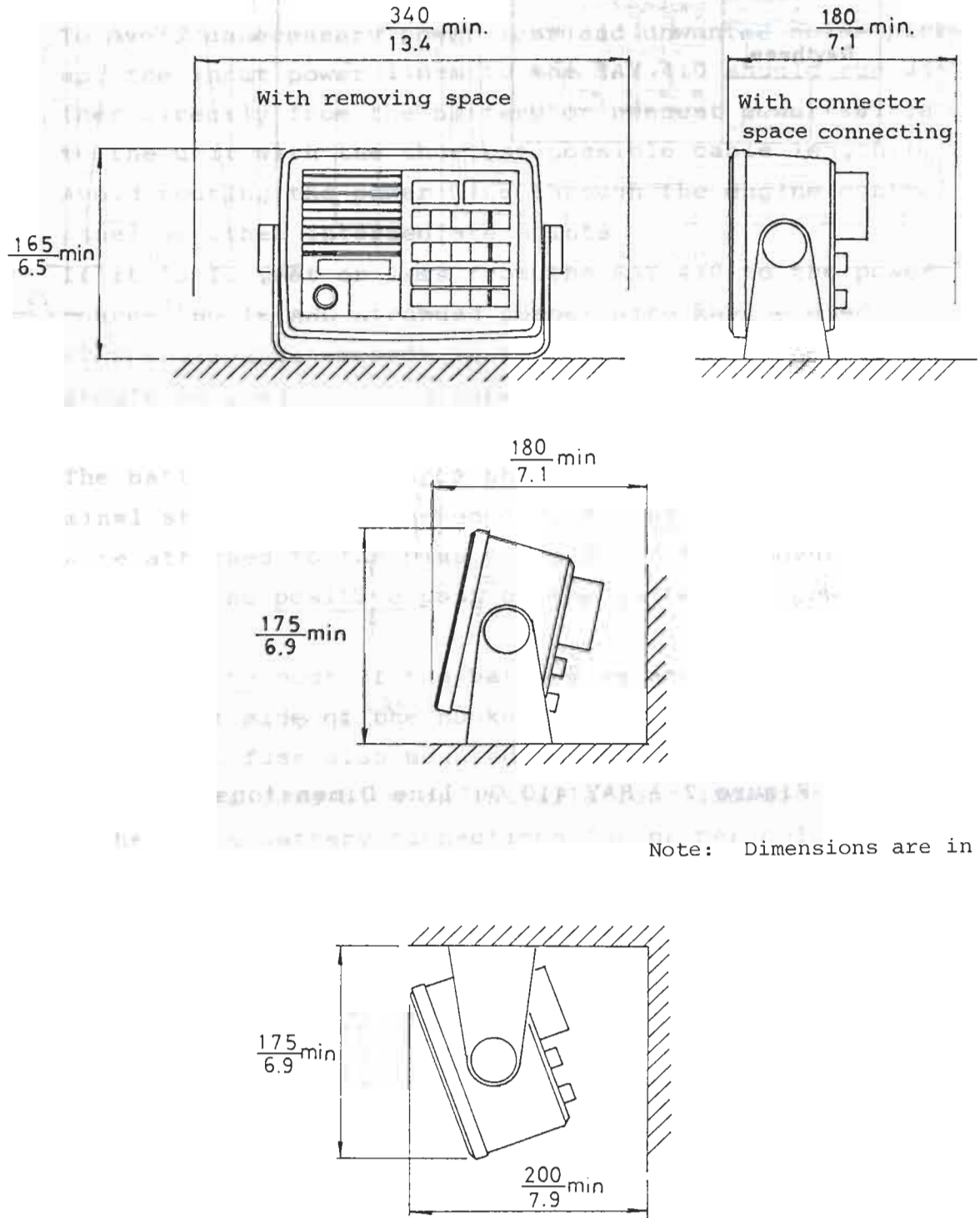
It is not necessary to open the case for mounting.

Remove the two knobs securing the yoke to the case.

The yoke may then be mounted to the desired surface with standard marine hardware. (See Figure 2-2 for outline dimensions, and Figure 2-3 for yoke mounting).

After the yoke is in place, reinstall the unit by

aligning the case with the yoke and secure the two yoke knobs. These are some recommended spacing requirements when mounting the RAY 410. They are shown in Figure 2-1.



Note: Dimensions are in $\frac{\text{mm}}{\text{in}}$

Figure 2-1 Recommended Clearance

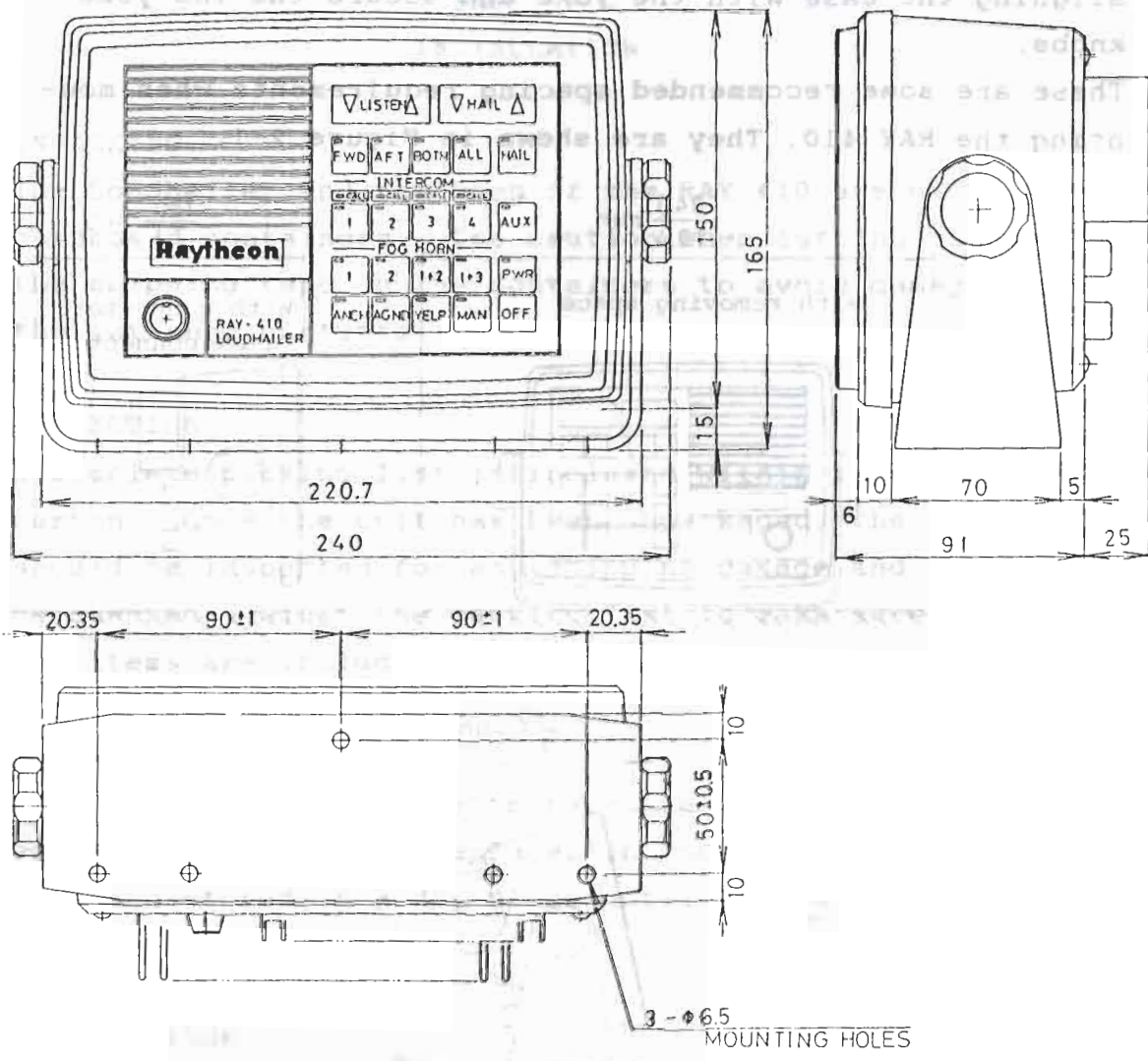


Figure 2-2 RAY 410 Outline Dimensions

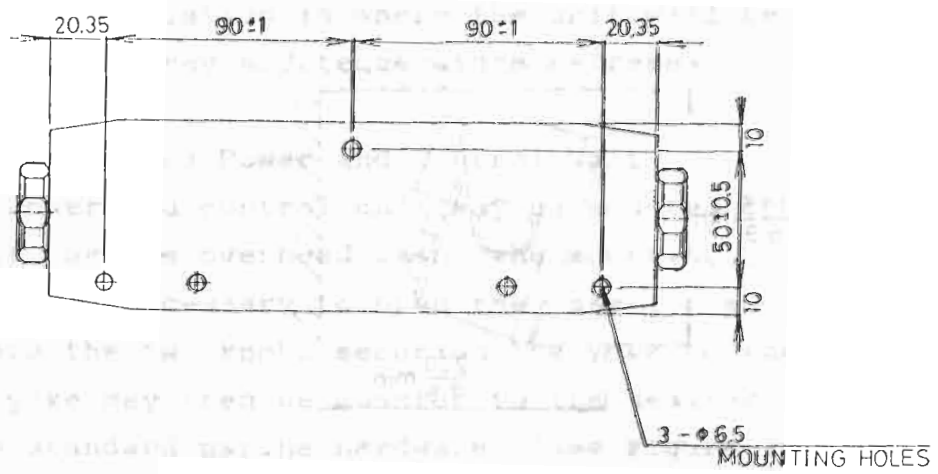


Figure 2-3 Yoke Mounting Dimensions

2.4.3 Electrical Connections

Connections to the RAY 410 are made to the terminal strip on the rear of the unit, as depicted in Figure 2-4, Page 13.

To avoid unnecessary power loss and unwanted noise pick-up, the input power lines to the RAY 410 should run either directly from the battery or nearest power source to the unit with the shortest possible cable length. Avoid routing the power line through the engine control panel or other intermediate points. If it is 10 feet or less from the RAY 410 to the power source, NO.16 AWG stranded copper wire may be used. If the distance exceeds 10 feet, NO.14 or larger wire should be used to avoid excessive voltage drops.

The battery or 12V source should be attached to the terminal strip section marked 12V IN. BE CERTAIN that the wire attached to the plus (+) side of the hookup is connected to the positive post of the battery or power source.

The negative post of the battery is attached to the negative (-) side of the hookup. The unit is protected by a 6 amp fuse also mounted on the rear panel.

Should this fuse blow on installation, immediately recheck the battery connections for proper polarity.

2.4.3.1 Intercom Stations

Up to four intercom station speakers (optional) can be connected to the intercom speaker (INTC SPKR) terminals on the terminal block. The speakers are 8 (ohm) and include "CALL" switches. Stations 1, 2, 3, and/or 4, should be connected to the proper numeric point on the terminal block so that they will correspond to the desired station key positions. Connect one of the speaker lines to terminal 2, the other line to the GND terminals (on the right side of the terminal block). The "call" line should be connected to terminal 1.

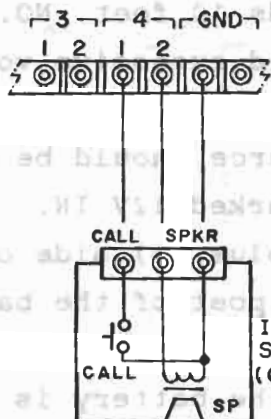


Figure 2-4-1

2.4.3.2 Deck Horn(s)

The outside deck speakers should be mounted to the desired location using the universal swivel mount.

Connection to each horn(s) should be made with No.18 or larger, stranded, twisted pair copper wire. The two-conductor cable chosen should be suitable for external all-weather use.

Electrical connections from the deck horn(s) are made on the terminal strip at either the FWD or AFT point on the strip, depending on the location of the deck on the boat.

For connection to FWD, connect the deck horn to terminals "FWD" 1 and 2. For connection to AFT, connect the deck horn to terminals "AFT" 1 and 2.

2.4.3.3 Alarm

The RAY 410 is also equipped to operate with an external alarm sensor to deter burglary or vandalism. The sensors required should be of the type that closes the circuit when activated.

The burglar alarm can be activated in the following manner:

By closing the alarm key line (RAY 410 left in "ON" condition) with alarm sensor.

2.4.3.4 Connection of Alarm Key Alone

Connect the "ALM" key (which closes the circuit when activated) to terminals "ALM" 1 and 3 on the terminal block. Before activating the alarm, the RAY 410 power must be turned "ON".

The function key should be set to the "YELP" position, and the speaker station key to the "ALL" position.

If, in the above condition, the sensor key is closed while you are off the boat, "YELP" will sound with high volume through the RAY 410 deck horn.

The sound will continue until either the sensor stops operating, the function key is set to another mode, or the power switch is turned off. (See Figure 2-4-3).

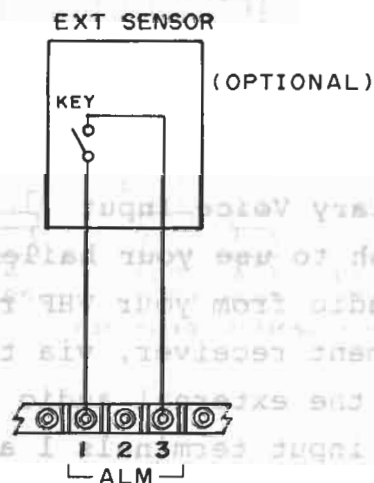
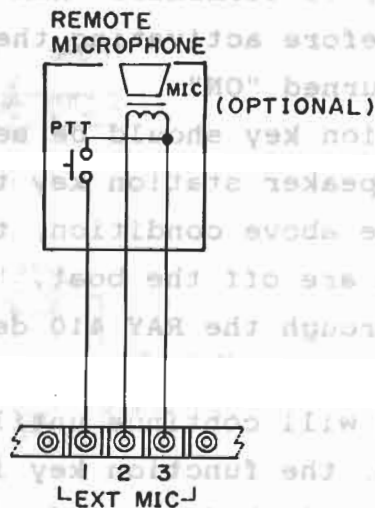


Figure 2-4-3

2.4.3.5 Remote Microphone

On occasion, a second hailing microphone at a second station might be useful. A set of terminals are available to complete the second microphone connection. Figure 2-4-2 illustrates the proper connection points.

Figure 2-4-2



2.4.3.6 Auxillary Voice Input

If you wish to use your hailer speaker systems for patching the audio from your VHF radiotelephone or from an entertainment receiver, via the intercom or deck speaker stations, the external audio can be connected at the auxillary input terminals 1 and 2.

Figure 2-4-2

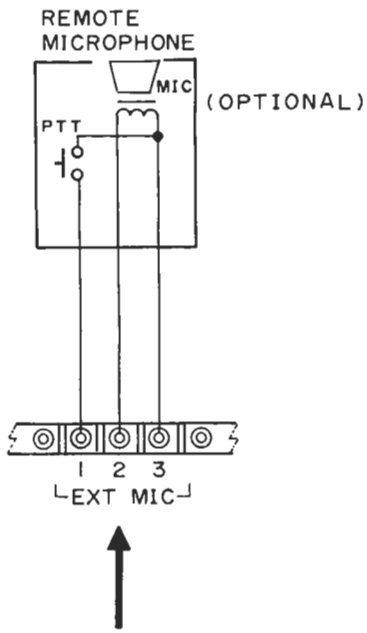


Figure 2-4-3

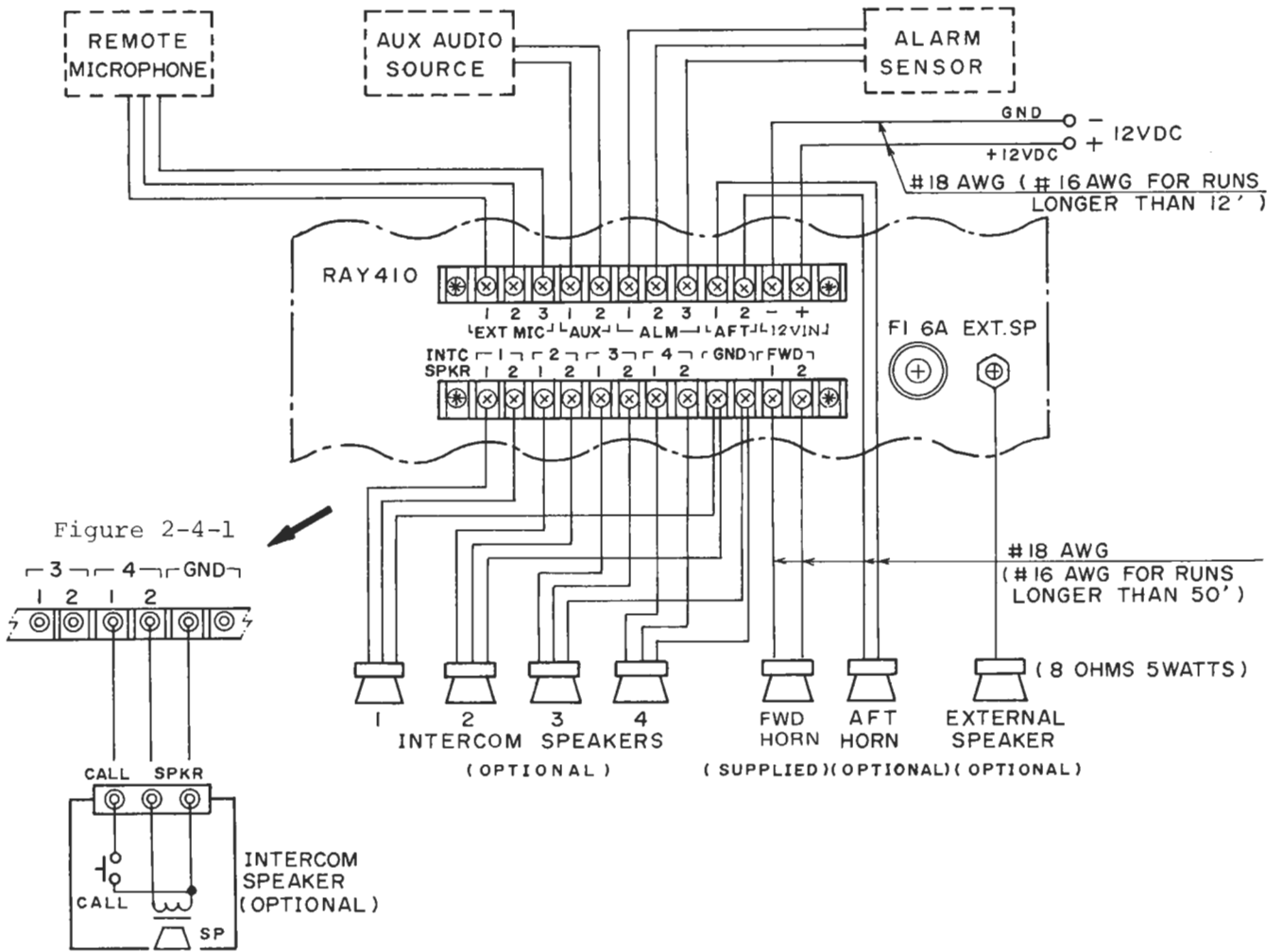
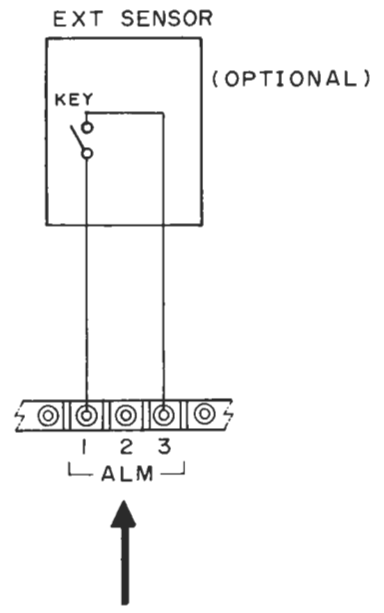


Figure 2-4 RAY 410 Electrical Connections

SECTION 3
OPERATION

3.1 OPERATING CONTROLS

Figure 3-1 illustrates the front panel controls of the RAY 410 description follows in paragraph 3.1.



Figure 3-1 Operating Controls

3.1.1 Loudhailer Controls

- (1) PWR/OFF Touch keys turn on and off RAY 410 power.

For Power on:

Press the "PWR" key. The LED lights, indicating that the power is on.

To turn Power off:

Press the "PWR" key, and the "OFF" key together. The power will be turned off, and the PWR LED will go out, indicating that the power is off.

- (2) LISTEN "UP/DOWN" touch keys control the listen volume level.

These controls increment in 32 steps. When power is turned on, the volume is automatically preset to the mid-range level. The level is changed by pressing the "UP" or "DOWN" key. As the key is pressed, the buzzer produces an intermittent tone. When the maximum or minimum level is reached, the sound becomes a continuous tone, indicating that further depression of the key will no longer change the level.

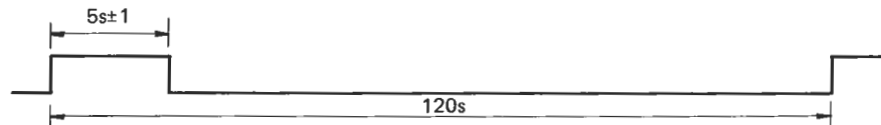
- (3) HAIL "UP/DOWN" touch keys control the hail volume level to external loudspeakers connected to the RAY 410.

The hail volume also has 32 steps of level control. When the power is turned on, the hail volume is automatically set to the intermediate level. The level can be adjusted by pressing the "UP" or "DOWN" key. The operation of the control is identical to the listen volume function.

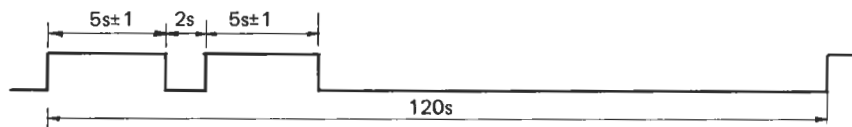
(4) FOGHORN KEYS

A. A 400Hz Foghorn and ringing bell tones are produced by seven of the ten Foghorn key positions. As each key is pressed, the buzzer initiates an intermittent tone and, at the same time, the LED of the key pressed lights indicating selection. The following Foghorn signals can be produced automatically with the RAY 410:

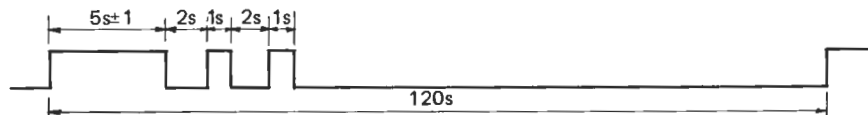
1. FOG HORN 1. Usage: Power Boat "UNDERWAY"
One 5 second blast (± 1 second) at 2 minutes intervals.



2. FOG HORN 2. Usage: Power Boat "STOPPED"
Two 5 second blast (± 1 second), with a 2 second interval, between, repeated every 2 minutes.

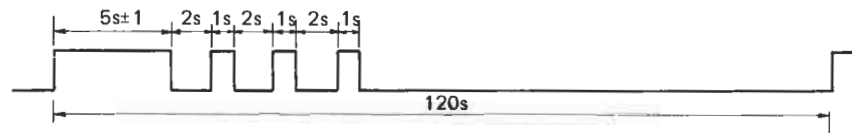


3. FOG HORN 1+2. Usage: Sail Boat, Fish Boat, Tow Boat
One 5 second blast (± 1 second), followed by two 1 second blasts, at 2 second intervals, repeated every 2 minutes.



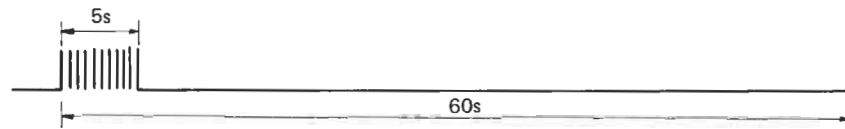
4. FOG HORN 1+3. Usage: Vessel Under Tow

One 5 second blast (± 1 second), followed by three 1 second blasts, at 2 second intervals, repeated every 2 minutes.



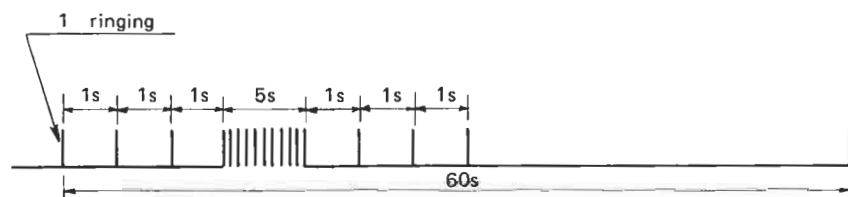
5. ANCH Usage: Any Vessel at Anchor

Rapidly ringing bell for a duration of 5 seconds, with a repetition interval not to exceed 1 minute.



6. AGND Usage: Any Vessel Aground

Three one ringing bells at one second intervals, followed by rapidly ringing bell for a duration of 5 seconds, followed by three one ringing bells at one second intervals, repeated every minute.



7. MAN Usage: Passing Signals, etc.

Length and timing of the blasts are controlled by the operator by depressing the push-to-talk switch on the microphone.

example:



B. YELP Usage: Coast Guard, Patrol Vessels, etc.

When the YELP key is pressed, the buzzer produces an intermittent tone and, at the same time, the LED of the key lights.

It is one of the function keys.

A varying pitch (yelping) tone is generated when the external alarm contacts are closed or when the push-to-talk switch is pressed.



(5). HAIL

Enables voice hailing thru the external horns and/or intercom stations.

When the PTT key is pressed, the voice signals from the hand microphone are amplified and are sent to the external loudspeakers.

When the PTT key is released, the unit returns to the listen function.

(6). AUX

When AUX mode is selected, external audio from the ships radiotelephone or an entertainment receiver may be paged through the loudhailer speaker systems.

(7). STATION KEYS

The selection of these keys determines which of the external speakers will receive the output of the RAY 410 amplifier.

As each station key is pressed, the buzzer produces an intermittent tone and, at the same time, the LED of the key lights.

CAUTION

Damage to the power amplifier may result if the STATION switch is set to a position at which there is no speaker connected and keyed while in hail or foghorn modes.

A. 1, 2, 3, and 4

Selects one of the Intercom Stations for connection to the loudhailer output/input an LED on each key illuminates when the call button is depressed at each station. The internal buzzer also sounds indicating a "CALL" condition.

B. FWD

Selects the horn speaker which is mounted on the forward part of the vessel for use as a foghorn, hailer or public address system.

C. AFT

Selects the horn speaker which is mounted on the aft of the vessel for use as a foghorn, hailer or public address system.

D. BOTH

Selects the horn speaker which is mounted on the forward part and aft of the vessel for use as a foghorn, hailer or public address system.

E. ALL

Connects the amplifier to all stations for use as a foghorn, hailer or public address system.

3.2 OPERATING PROCEDURES

3.2.1 Loud Hailing

To operate the RAY 410 as a loudhailer, proceed as follows:

1. Set the FUNCTION key to HAIL.
2. Set the STATION key to the FWD, AFT, BOTH or ALL position as required for the particular application.
3. Key the microphone. Speak into the microphone. Adjust HAIL volume as required.

The speaker used for the broadcast service has been automatically set to about 1/3 output(volume level). This level can be adjusted by moving up or down the HAIL VOLUME key.

NOTE

The horn speaker supplied with the system is highly directional and should be pointed, as nearly as possible, in the direction of the vessel or shore facility with which communication is desired.

CAUTION

Setting the STATION switch to a position at which no speaker is connected will cause damage to the power output circuits.

Unkeying the microphone, returns the unit to the "LISTEN" condition. Adjust the listen volume controls as necessary for desired listen volume level.

3.2.2 Automatic Fog Horn Operation

When using the RAY 410 in auto fog horn mode, take the following steps:

1. Select the desired fog horn function.
2. Select the desired speaker/s.
3. The fog horn volume is controlled by the "HAIL" volume keys. Press ▲▼ keys for desired output level.

The 400 Hz fog horn tone or bell tones are automatically broadcasted at proper intervals.

3.2.3 Manual Fog Horn Operation

1. Set the function key at MAN.
2. Set the station key to FWD, AFT, BOTH, or ALL.
3. Pressing the microphone PTT key enables fog tone (400 Hz) to be produced. This sound continues while the PTT key is held down.

The manual fog horn function may be used for sounding the various signals included in the section on sound signals, Coast Guard Manual CB-169. This includes signals to draw bridges, backing down, passing, etc. The sounding of the signals is accomplished by pressing and releasing the PTT switch in the proper time sequence.

3.2.4 Intercom Operation

To speak with a person at a remote speaker location:

A. Operation from the RAY 410 (Master Station)

1. Set the FUNCTION key to HAIL.
2. Set the STATION switch to the desired substation(or hailing speaker).
3. Both the HAIL and LISTEN keys can be adjusted by pressing the appropriate UP or DOWN keys.

4. Depress the PTT button while talking, and release it for listening. When the PTT switch is released, the speaker at the remote location can act as a microphone, with the sounds being heard at the RAY 410 internal speaker.
5. The RAY 410 microphone takes priority over responses from sub-stations. This means that the sub-stations cannot be heard if the PTT key is held down.

3.2.5 Calls from Remote Intercom Stations

As long as RAY 410 power is on, the RAY 410 can be called from the sub-stations through buzzer sound and LED indication.

1. Press the CALL switch on the sub-station speaker.
2. On the RAY 410 side, the LED "CALL" corresponding to the calling sub-station lights and the buzzer sounds (The buzzer and LED will stay on while the CALL switch is held down.)

3.2.6 Audio Amplifier

If the output line from a radiotelephone equipment, cassette deck, or entertainment receiver is connected to the AUX terminals 1 and 2, the output signals of such units can be broadcasted to desired stations after amplification by the RAY 410.

1. Set the FUNCTION key to AUX.
2. Set the STATION key to the desired speaker(s).
3. Adjust HAIL volume for desired level.

3.2.7 Alarm

An external alarm sensor can be connected externally to the RAY 410. For the wiring, see section 2 (2.4.3.3). To activate the alarm, take the following steps:

1. Set the FUNCTION key to YELP.
2. Set the STATION key to ALL.
3. Set the HAIL VOL control to maximum level.

If the alarm area is violated, the RAY 410 will begin emitting a high volume "YELP" until de-activated.

SECTION 4

PRINCIPLE OF OPERATION

4.1 BLOCK DIAGRAM

Figure 4-1 is a block diagram of the RAY 410. The operation of the circuitry is described below based on this block diagram.

4.1.1 Power Supply

Ships power is fed to the +12 V DC IN terminals on the RAY 410. It is filtered via FL1 and FL2 to remove noise pick-up from the power line. Regulators IC302 and IC303 provide +5 and +9 V DC for the electronic circuit except the power amplifier. The PA is supplied with 12 V DC via FL2. IC301 provides a regulated 12 V to supply the relays for station selection. The regulated 12 V is also fed to the AF circuit. A regulated 5 V is fed to the control circuitry.

4.1.2 Key Circuitry

All the operations are performed by entry of the key inputs from the touch panel. The keys are classified into the function selector key group and station selector key. In each group, only one key position is valid. However, the combination of keys of the two groups allows various operations. The entry of the key input is judged by the CPU. For confirmation of the key operation, the LED for the key concerned is lit and the buzzer sounds. If one of the station selector keys is manipulated to select a station, the signal correspondent to one of the relays K8 through K15 in the relay network is given to activate the correspondent relay through the relay driver. To the station selected by the station selector key, the key circuit sends either the AF signal, TONE signal, or BELL signal according to the position of the function selector

key after converting it with the analog multiplexer and amplifying it with the amplifier.

If an intercom station sends a call signal, the circuit CALL 1 - CALL 4 makes the LED for that intercom station light and makes the buzzer sound.

To prevent the influence of external noise, CALL 1-CALL 4, MIC key and ALARM key lines are connected to the CPU through photo couplers.

4.1.3 Audio Amplifier (HAIL Mode)

The low level voice signals from the microphone is amplified in the microphone pre-amplifier. It is then converted by the analog multiplexer, amplified by the power amplifier, and sent to the selected destination by the relay network.

The power amplifier circuit uses the BTL design. This uses low voltage, large output with low distortion, and low power loss IC's. The output level is adjusted with the HAIL VOL. control.

4.1.4 Audio Amplifier (LISTEN Mode)

In the LISTEN mode, the external horns or intercom speakers are used as the microphone.

The relay network section selects the horn or intercom speaker to connect it to the input circuit. The input signal is sent to the pre-amplifier for LISTEN (SP/MIC PRE AMP).

Its output level is adjusted by the LISTEN VOL. control and sent to the power amplifier. Except for the output from the tap on the output transformer, the power amplifier functions exactly as in the HAIL mode. Then, the signal is sent to the built-in speaker. The speaker has the impedance of 8 ohms and the audio power, handling capability of 3W.

If an external LISTEN speaker is connected to the EXT. SP. jack, the built-in speaker remains connected. The external speaker must have the impedance of 8 ohms and the power handling capability of 5W.

4.1.5 Alarms

The alarm output produces the 400 Hz tone, bell sound, or yelping sound. The output level depends on the hail volume setting. Sound is respectively generated by the 400 Hz tone generator and/or bell sound generator, upon reception of the key input from the key matrix. The CPU controls the tone and bell sound selection.

4.1.6 Hail & Listen Volume Circuit

The volume circuit controls the level of "HAIL" and "LISTEN" via CPU according to the serial data. The volumes change at 2dB steps from 0 to 00dB (-2dB to -66dB). There are 35 steps, and at initial power-up, the CPU sets the level to -6dB.

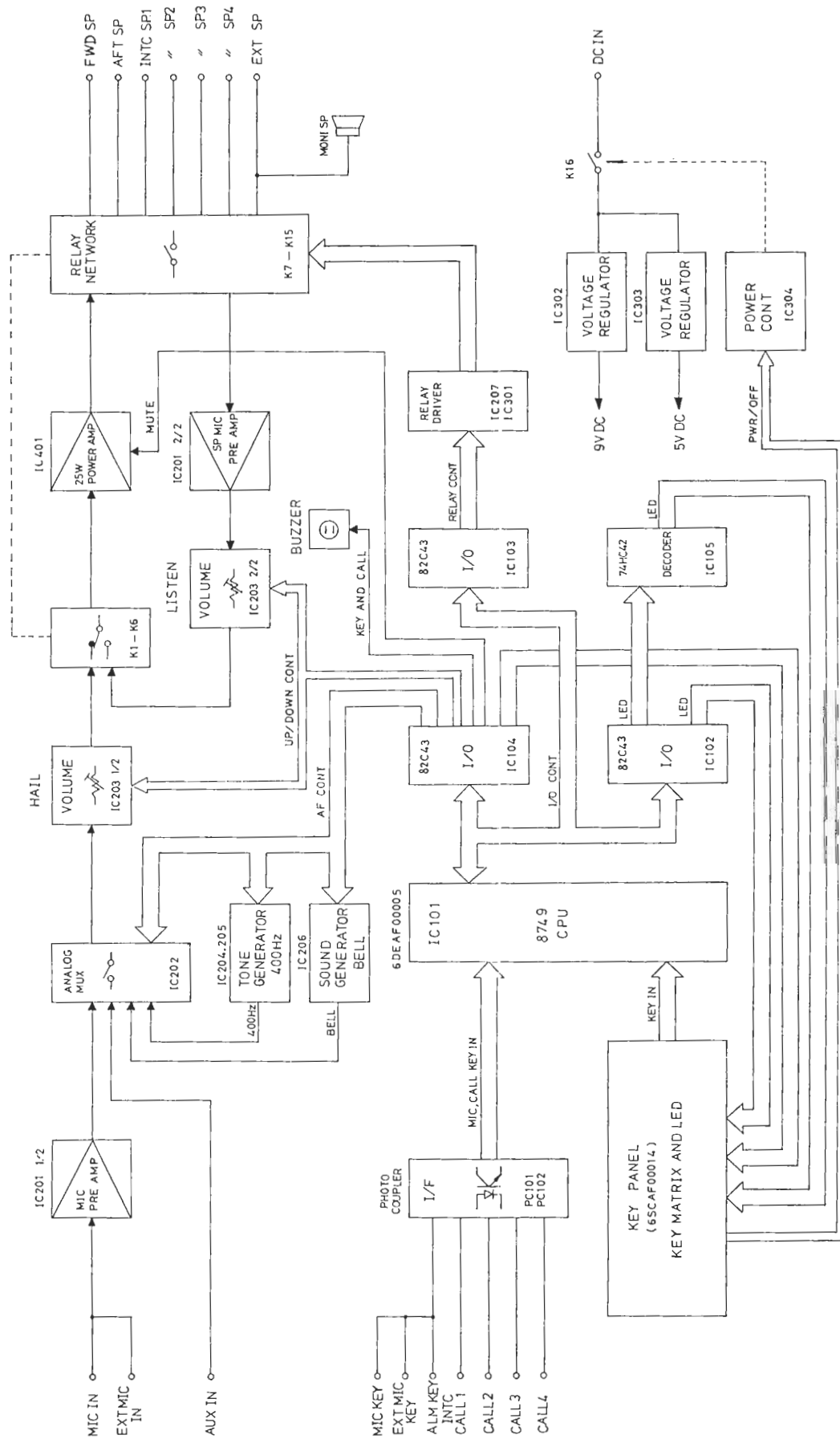


Figure 4-1 RAY 410 Block Diagram

SECTION 5

MAINTENANCE

This section describes the procedures of disassembly for repairs of the RAY 410 Loudhailer

5.1 ASSEMBLY AND REPLACEMENT OF PARTS

Figure 5-1 provides a disassembly diagram which may be useful if service and repair is required on the RAY 410.

The following steps may be taken for disassembly.

1. Remove all the lead wires to the external speaker and from the power source.
2. Remove the two knobs and remove the case from the mounting yoke.
3. Put the RAY 410 on a bench or on any other hard surface. Loosen four front panel retaining screws (A) at the outside of the rear, and pull the panel forward. (See Fig. 5-1-2)
4. Remove the four screws (B) retaining the P.C.B's, and pull the two P.C.B's forward. (See Fig. 5-1-3)
5. The power amplifier, cooling body and output transformer are mounted on a rear chassis. Loosen the four screws (C) at the inside of the rear of the case. Thus, all the parts can be removed from the case. (See Fig. 5-1-4)
6. Remove the connector for the flexible cord between each panel and P.C.B, and all the panels and P.C.B's can be separated from each other.
7. At this state, parts can be checked for normal function. If the power source is reconnected to the unit, each section can be checked while in the operation mode.

5.2 COMPONENT REPLACEMENT

The majority of the RAY 410 components are standard devices and may be removed and replaced using normal printed circuit techniques.

5.3 ADJUSTMENT

No special adjustments are necessary for proper performance of the RAY 410.

However, it is possible to adjust the 400Hz TONE LEVEL (RV201) and BELL LEVEL (RV202) on the AF control circuit (P.C.B NO. CAB-8612). RV201 may be used to adjust the 400Hz tone level and RV202 to adjust the bell level.

5.4 RE-ASSEMBLY

To re-assemble the RAY 410, reverse the procedures of disassembly (See Fig. 5-1).

In re-assembly, be sure that any wires will not be pinched by the cabinet.

Fig. 5-1-1

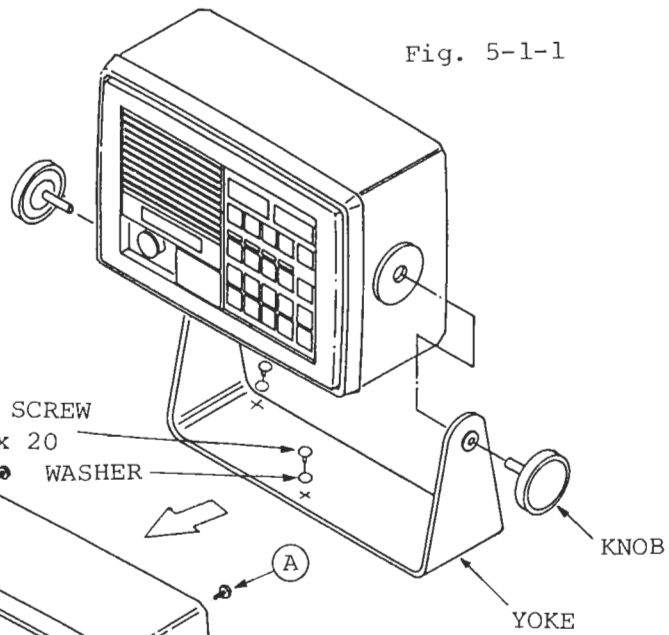


Fig. 5-1-2

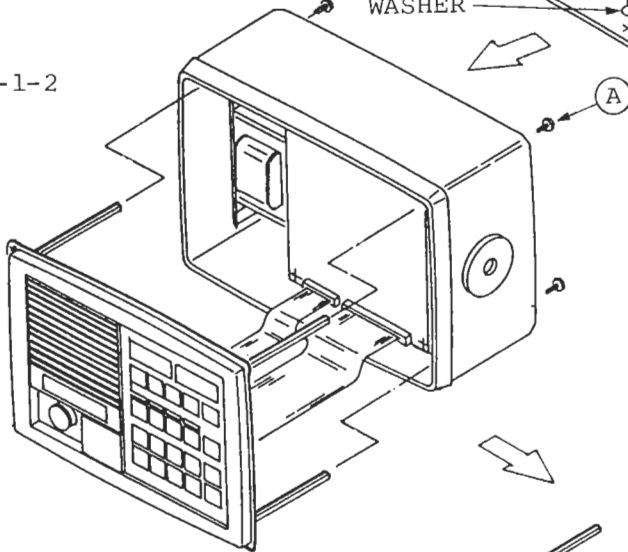


Fig. 5-1-3

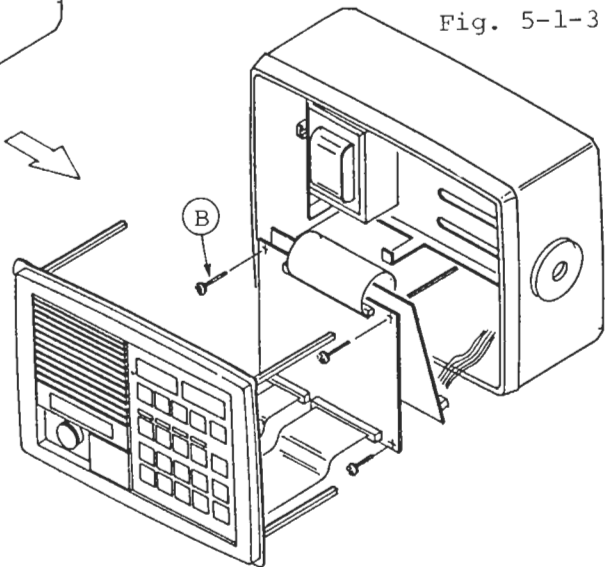


Fig. 5-1-4

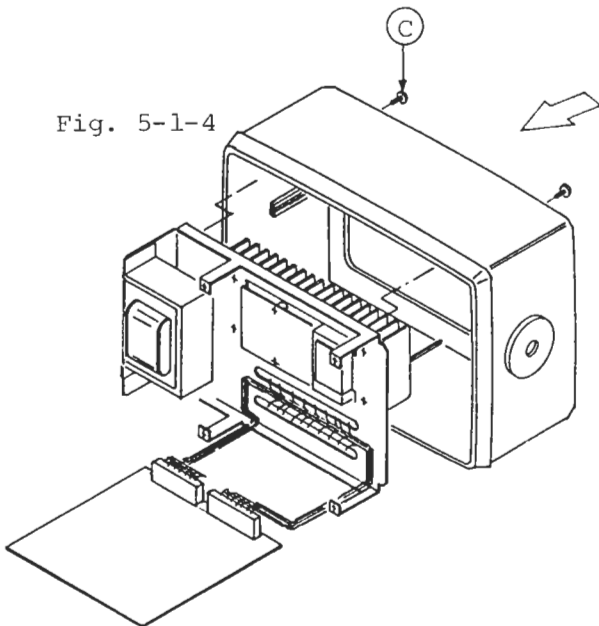


Fig. 5-1-5

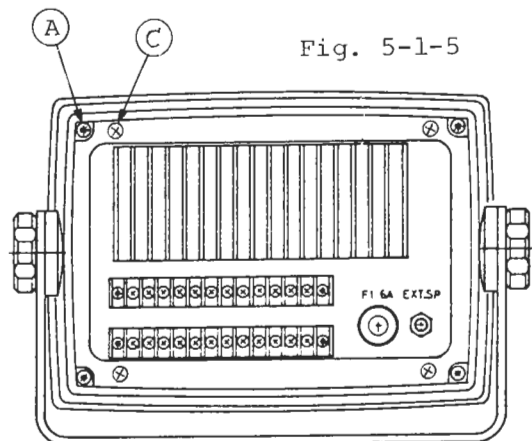


Figure 5-1 Disassembling Procedure

SECTION 6

DRAWINGS AND PARTS LIST

TABLE 6-1
RAY 410 PARTS LIST

	Description	Q'ty	Ref Des	Part Number
1	Case	1		MTV000273
2	Front Panel	1		MTV000269C
3	Yoke	1		MPBX14912
4	Knob	2		BRHD00317
5	Yoke Gum Washer	2		MTT019173
6	Panel Gum Packing	1		MTV000270
7	Rear Gum Packing	1		MTT020535A
8	Rear Chassis	1		MTB138255B
9	Heat Sink	1		MTH004022
10	Membrane Key Board	1		H-6SCAF00014
11	Terminal Board	2	TB-1. TB-2	ML-40S2AXS 12P
12	Output Transformer	1	T-1	H-6LRAF00003
13	Microphone Connector	1	J-18	FM14-8S 8P
14	Fuse Holder	1	FS-1	S-N2059 1P
15	Fuse	1	F-1	NF60NR-6A 6A
16	Speaker	1	SP-1	65A26 8 ohm
17	Ext Speaker Connector	1	J-17	S-G8022
18	Ext Sp Connector Cap	1		MPPK00059
19	CPU Control P.C.B Assembly	1		CDA-8613(PCAF00047B)
20	AF Control P.C.B Assembly	1		CAB-8612(PCAF00048A)
21	POWER AMP P.C.B Assembly	1		CAL-8603(PCAF00050A)
22	OUTPUT SELECT P.C.B Assembly	1		CSC-8617(PCAF00049A)

NOTE

The circuitry and components may be subject to change or modification without notice.

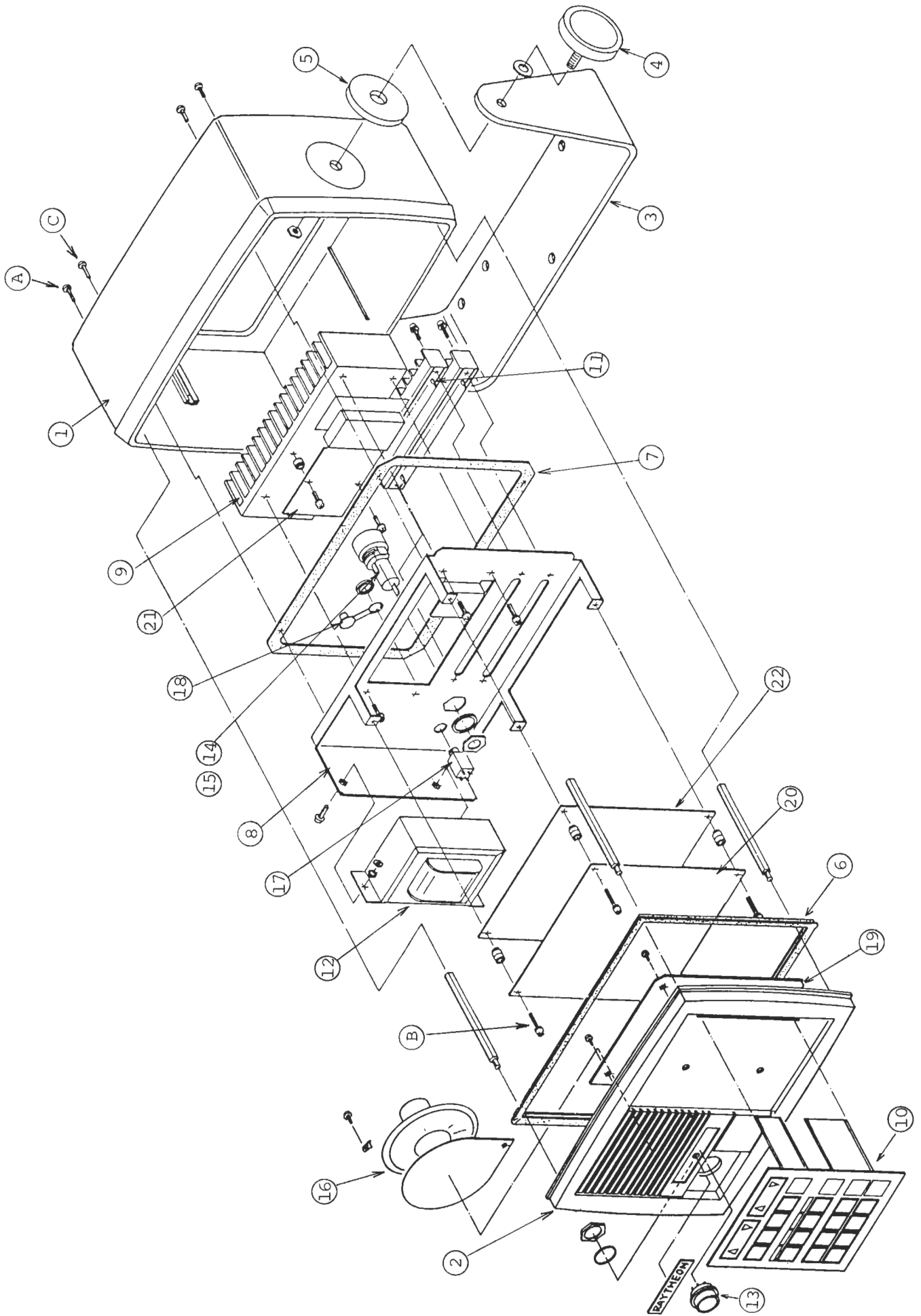
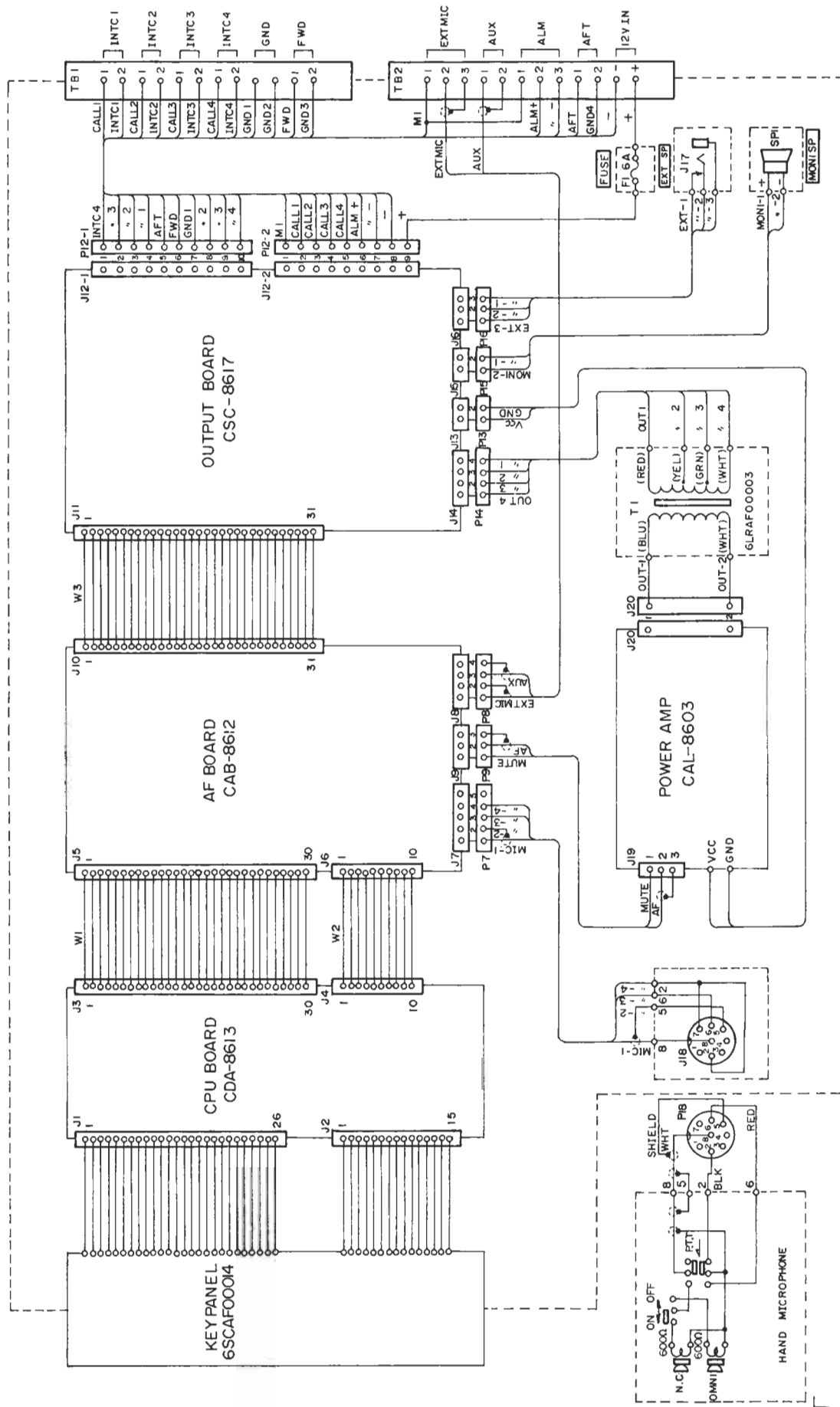
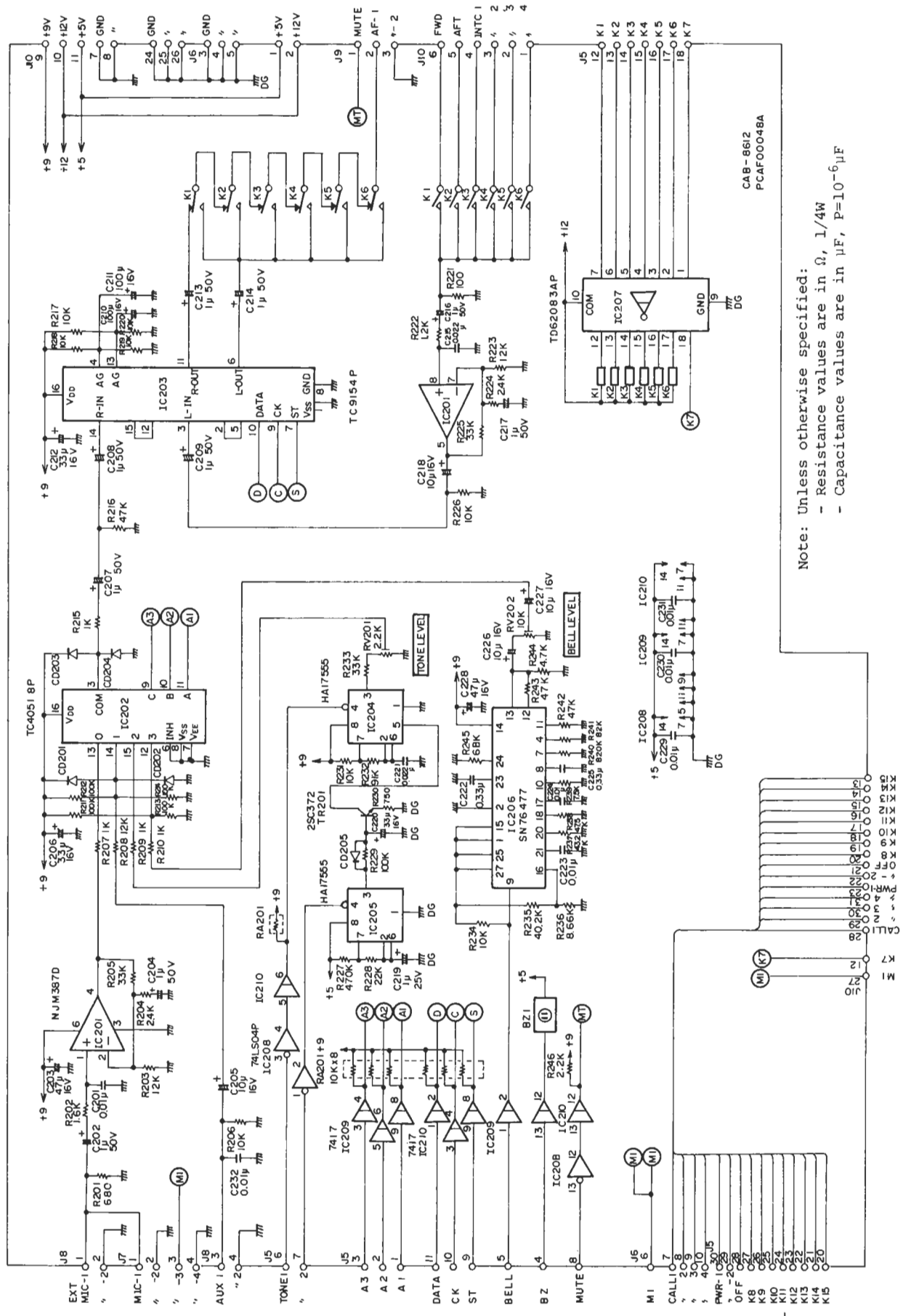


Figure 5-2 Mechanical Assembly



(LOUDHAILER UNIT)

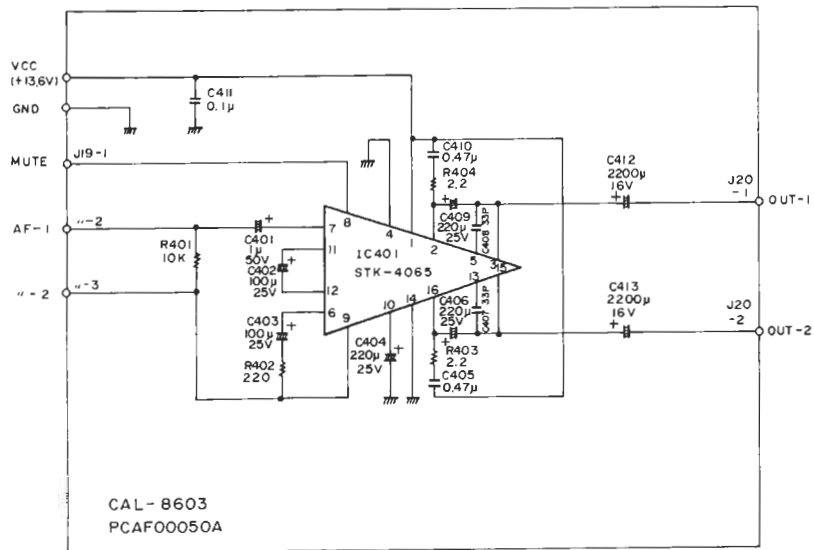
Figure 6-2-1 Schematic Diagram



(AF CONTROL)

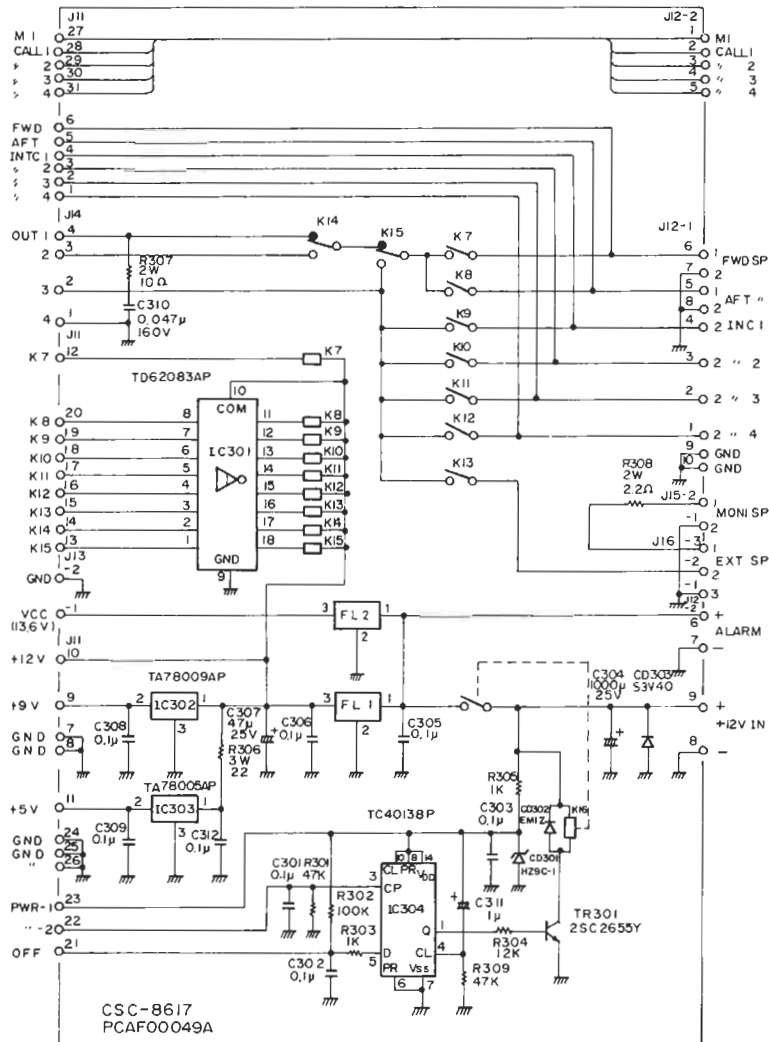
Figure 6-2-3 Schematic Diagram

Note: Unless otherwise specified:
 - Resistance values are in Ω , 1/4W
 - Capacitance values are in μF , $P=10^{-6}\mu\text{F}$



(POWER AMP)

Figure 6-2-4 Schematic Diagram



Note: Unless otherwise specified:

- Resistance values are in Ω , 1/4W
- Capacitance values are in μF , $P=10^{-6}\mu\text{F}$

(OUTPUT SELECT)

Figure 6-2-5 Schematic Diagram

LIMITED WARRANTY CERTIFICATE

RAYTHEON MARINE COMPANY WARRANTS ALL PARTS OF EACH NEW MARINE PRODUCT TO BE OF SOUND DESIGN, GOOD MATERIALS AND WORKMANSHIP, AND WILL REPAIR OR EXCHANGE ANY PARTS PROVEN TO BE DEFECTIVE UNDER NORMAL USE AT NO CHARGE FOR A PERIOD OF 24 MONTHS FROM THE DATE OF PURCHASE OR 30 MONTHS FROM THE DATE OF SHIPMENT FROM THE FACTORY WHICHEVER EXPIRES FIRST, EXCEPT AS PROVIDED BELOW. 12" AND 16" BRIGHT DISPLAY RADARS, RAYCAS AND DOPPLER SYSTEMS ARE COVERED BY A SEPARATE WARRANTY POLICY.

DEFECTS WILL BE CORRECTED BY AN AUTHORIZED RAYTHEON MARINE COMPANY DEALER. THERE WILL BE NO CHARGE FOR LABOR DURING NORMAL WORKING HOURS FOR A PERIOD OF 12 MONTHS FROM DATE OF ORIGINAL INSTALLATION, EXCEPT AS PROVIDED BELOW. AND DURING THIS TIME RAYTHEON MARINE COMPANY WILL FOR CERTAIN PRODUCTS, ASSUME TRAVEL COSTS OF ITS AUTHORIZED DEALERS UP TO A TOTAL OF 100 ROUND TRIP HIGHWAY MILES/TWO HOURS TRAVEL TIME. FOR SERVICE OUTSIDE NORMAL WORKING HOURS, THE OVERTIME PREMIUM PORTION IS NOT COVERED BY THIS WARRANTY, AND MUST BE PAID BY THE OWNER.

WARRANTY LIMITATIONS

Products with a suggested retail price below \$2,000 must be forwarded to an authorized Raytheon Dealer at owner's expense and will be returned via surface carrier at no cost to the owner. Travel expenses other than auto mileage (taxi and launch fees, customs duties, shipping and telephone costs, etc.) are specifically excluded on all products.

Raytheon Marine Company warranty policy does not apply to equipment which has been subject to accident, abuse, incorrect service or alterations by non-authorized service personnel, or misuse, nor any equipment on which the serial plate has been removed, altered or mutilated.

Except where Raytheon Marine Company has performed the installation, it assumes no responsibility for damage incurred during installation.

This warranty is effective only with respect to the original purchaser from Raytheon Marine Company or an authorized Raytheon Marine Company Dealer.

A validated warranty certificate and station logbook (if applicable) must be made available to the authorized Raytheon Marine Dealer at the time of service.

Magnetron, modulator, cathode ray tubes, hailer horns, and transducers are warranted for SIX MONTHS from date of original installation or 2,000 OPERATING HOURS, whichever expires first. These items must be returned to an authorized Raytheon Marine Company Factory Dealer.

Chart paper, stylii, stylus belts, lamps, and fuses are consumable items, and are specifically excluded from this warranty.

Any cost associated with transducer replacement, other than the cost of the transducer itself, is specifically excluded from this warranty.

This warranty is **STRICTLY LIMITED** to the terms indicated herein, and no other express warranties or remedies thereunder shall be binding on Raytheon Marine Company. TO THE EXTENT CONSISTENT WITH STATE AND FEDERAL LAW: (1) ANY IMPLIED WARRANTIES SHALL BE LIMITED TO THE SAME TIME PERIODS STATED HEREIN FOR EXPRESS WARRANTIES, AND (2) RAYTHEON MARINE COMPANY SHALL NOT BE LIABLE FOR CONSEQUENTIAL DAMAGES UNDER ANY EXPRESS OR IMPLIED WARRANTIES RELATING TO THIS EQUIPMENT.

Serial _____

Serial _____

Detach and mail this portion within 48 hours

To validate warranty, this card should be completed and mailed to Raytheon Marine Company, 676 Island Pond Road, Manchester, New Hampshire, 03103.

Vessel Name: _____ Vessel Type: _____

Home Port: _____ Length: _____ Voltage: _____

Sold/Installed by: _____ Installation Date: _____
(Dealer)

Equipment Model No: _____ Equipment Serial No: _____

FACTORY SERVICE CENTER

RAYTHEON MARINE CO.

1521 So. 92nd Place
Seattle, WA 98108
Phone: (206) 763-7500

Vessel Name: _____ Owner's Name: _____

Home Port: _____ Address: _____

Equipment
Model No: _____

Voltage: _____

Equipment
Serial No: _____ Installed by: _____

Date of Sale/Installation: _____

This portion of card should be completed and retained by the owner.

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RAYTHEON MARINE COMPANY

676 ISLAND POND ROAD MANCHESTER, NEW HAMPSHIRE 03103

ATTN: WARRANTY DEPARTMENT, DEALER PRODUCTS

Raytheon Marine Company
676 Island Pond Road
Manchester NH 03103-1509

Tel 603 668 1600
Telex 943459
TWX 710 220 1339