FURUNO

OPERATOR'S MANUAL

SSB RADIOTELEPHONE

MODEL FS-1502

This manual is applicable to the sets having Program Version No. 1.02.

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(TATA) FS-1502

000802884 00

⚠ SAFETY INSTRUCTIONS

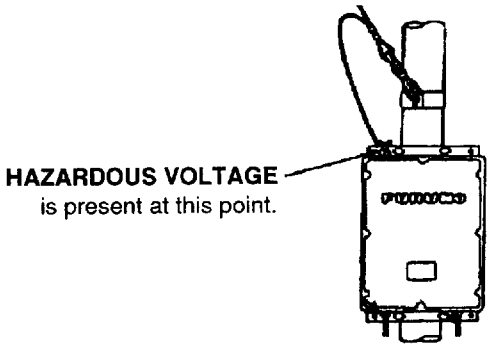
For Operator

⚠ DANGER

Do not work inside the equipment unless totally familiar with electrical circuits.

Hazardous voltage which will cause death or serious injury exists at the following locations:

- **Transceiver unit**
- **Antenna and antenna coupler (both at TX)**



ANTENNA COUPLER

⚠ WARNING

Do not open the cover of the equipment.

This equipment uses high voltage electricity which can shock, burn, or cause death. Only qualified personnel should work inside the equipment.

Do not dissasemble or modify the equipment.

Fire, electrical shock or serious injury can result.

Immediately turn off the power at the ship's mains switchboard if water or foreign object falls into the equipment or the equipment is emitting smoke or fire.

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

DANGER Label attached

DANGER
HIGH VOLTAGE
高圧危険

Name : High Voltage Label
Type : R-12135-D-1
Code No. : 390-100-011

For Installer

⚠ CAUTION

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

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

Do not place heater near the equipment.

Heat can melt the power cord, which can result in fire or electrical shock.

Do not operate the unit with wet hands.

Electrical shock can result.

Use the correct fuse.

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

⚠ WARNING

Only qualified personnel should work inside the equipment.

This equipment uses high voltage electricity which can shock, burn, or cause death.

Turn off the power at the ship's mains switchboard before beginning the installation. Post a warning sign near the switchboard to ensure that the power will not be applied while the equipment is being installed.

Serious injury or death can result if the power is not turned off, or is applied while the equipment is being installed.

⚠ CAUTION

Ground the equipment.

Ungrounded equipment can give off or receive electro-magnetic interference or cause electrical shock.

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

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

Factory Setting and Local Regulations

The FS-1502 is designed to meet the local regulations of various countries around the world.

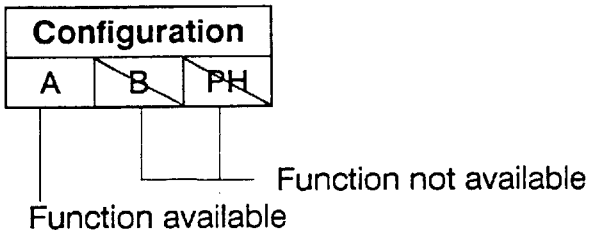
However, there are differences in regulations between countries, mainly on class of emission, output power and legality of transmission frequency programming.

To make for easier identification within our company, we have divided the FS-1502 into three configurations: A, B and PH, in accordance with functions allowed in each country group.
A sticker indicating the configuration is attached to rear panel immediately after the factory presetting is completed. This A, B and PH mark is only for our intra-company use and does not comprise part of the model number.

	Configuration		
	A	B	PH
Class of Emmission	J3E(USB/LSB)	J3E(USB)	J3E(USB)
	H3E	H3E on 2182kHz	H3E on 2182kHz
	J3C	J3C	
	F1B, J2B		
Output Power	150W	150W	100W
ITU channels	Yes	Yes	No
Sweep scanning	Yes	No	No

This manual describes all the functions incorporated in the FS-1502, however some functions may not be available depending on the configuration.
This availability of functions is expressed in this manual using the following table.

(Example of function availability)



Before Installing or Operating the Equipment...

be sure to read all the safety, installation and operating information which follows.

General Safety Information

"NOTICE", "CAUTION" and "WARNING" notices appear throughout this manual. It is the responsibility of the user of this equipment to read, understand and follow these notices. If you have any questions regarding these instructions, please contact a FURUNO agent or dealer.

Installation and Operation Information

- The installation of this unit requires special technical skills. If the user has doubts about his or her technical ability we recommend that the unit be installed by a FURUNO representative or a licensed radiotelephone technician. Without a thorough installation, an SSB radiotelephone cannot work properly – if at all.
- Before operating the equipment, a proper license and call sign must be released for the radio station. The operator of the equipment must be familiar with the rules and regulations of radio communication before operating the equipment. Ignorance of the law is no excuse.
- This equipment can be operated only by a person holding a valid radio operator license or permit.
- Although the FS-1502 is capable of transmitting any frequency between 1.6 and 26.2 MHz, the station licensee is always responsible for the lawful and proper operation of his station.

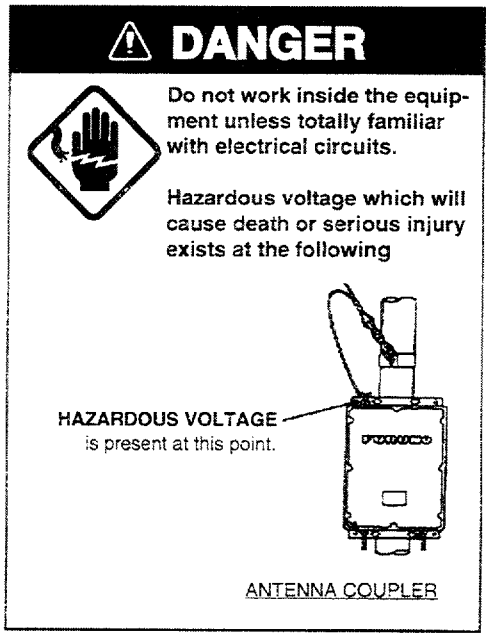
■ **NOTICE:** *FURUNO Electric Company will assume no responsibility for any communication disturbance or inconvenience because of illegal transmission on an unauthorized frequency range.*

- The radio wave is public property and should be used in accordance with appropriate regulations. Do not transmit with too much power or when unnecessary.
- It is unlawful to divulge what is overhead by radio or wire.
- Because heat dissipates through the cabinet, it will become warm to the touch after a long transmission. Allow for sufficient air circulation around the unit and NEVER put anything on the top of the unit.
- Your electrical system (battery) must be able to supply ample current if the transmitter is to be able to deliver full power to the antenna. Unless the current flow is available, the radio won't transmit effectively. Always make sure the battery is fully charged.
- For reference, APPENDIX B discusses SSB operating principles and frequency selection method.

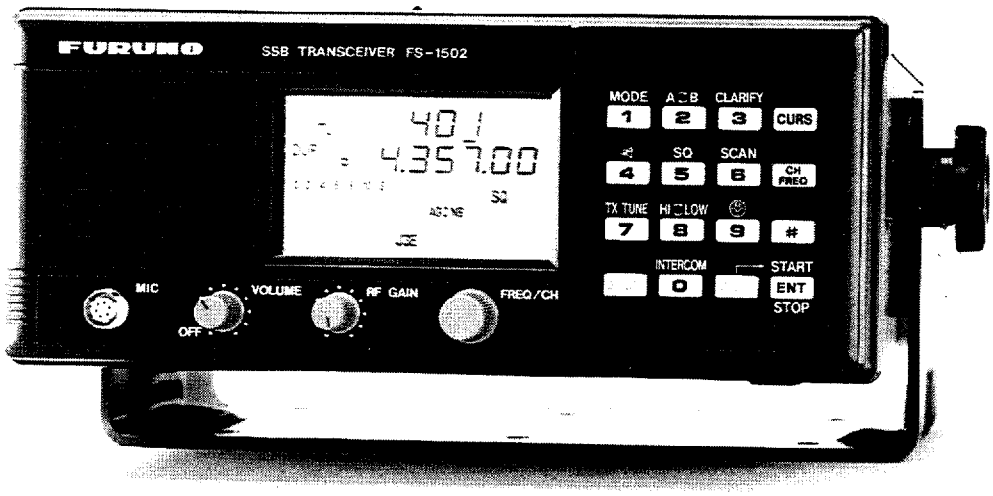
Table of Contents

DANGER
HIGH VOLTAGE
高圧危険

Name : High Voltage Label
Type : R-12135-D-1
Code No. : 390-100-011



AT-1502
Antenna coupler



FS-1502 Transceiver

Introduction

Congratulations on your choice of the FURUNO FS-1502 SSB Radiotelephone. We are confident you will see why the FURUNO name has become synonymous with quality and reliability.

For over 40 years FURUNO Electric Company has enjoyed an enviable reputation for quality and reliability throughout the world. This dedication to excellence is furthered by our extensive global network of agents and dealers.

While this unit is designed and constructed with much attention to operation and maintenance simplicity, familiarity with its functions and regular maintenance are important for good performance. Please carefully read and follow the recommended procedures set forth in this manual.

We would appreciate feedback from you, the end-user, about whether we are achieving our purposes.

Thank you for considering and purchasing FURUNO equipment.

Features

The FS-1502 SSB Radiotelephone is an all-purpose communications MF/HF transceiver especially designed for marine mobile communication. The fully synthesized transceiver has a frequency range of 1.6 to 26.2 MHz.

Entire operation is carried out with easy to use front panel controls. The large, backlit LCD shows complete operational status, including receive signal strength and transmitter output power.

The automatic Antenna Coupler AT-1502 automatically tunes a whip or wire antenna of 6 to 15 meters long.

The FS-1502 operates on 12 VDC power. For other power supplies

IF the supply voltage is...	THEN you will need a...
24 or 32 VDC	converter.
110 or 220 VAC	rectifier (with voltage regulator).

- Transceiver constructed of rugged die cast aluminum. An integral heat sink ensures efficient heat dissipation.
- Non-volatile memory holds up to 64 user-programmed semi-duplex channels along with class of emission.
- Automatic scanning for watch on selected frequencies.
- Large, backlit high contrast LCD shows all operational data.
- Frequency/channel selection may be made directly through the keyboard or by the FREQ/CH encoder.
- [2182] key provides instantaneous call up of distress/calling frequency (2182 kHz).
- Built-in two-tone alarm generator.
- Built-in noise blanker cancels random noise.
- Built-in squelch mutes the receiver when no voice or carrier is received. It can open by voice or signal strength, or both voice and signal strength.

Specifications

GENERAL

Communication System	Simplex or semi-duplex
Frequency Range	1.6 to 26.2 MHz (transmit) 0.1 to 30 MHz (receive)
Frequency Resolution	Transmit: 100 Hz Receive: 10 Hz
Class of Emission	J3E (LSB) J3E (USB) H3E (AM compatible) F1B, J2B (for NBDP terminal) J3C
Frequency Stability	±10 Hz
Number Of Channels	1) 64 semi-duplex or 128 simplex channels max., presettable 2) Factory preset ITU SSB, Telex, USA SSB channels 3) 2182 kHz (single action)
Ambient Temperature Range	-20°C to +55°C
Relative Humidity	93% at 40°C
Power Supply & Power Consumption	13.6 VDC: -/+15% (floating ground) Receive: 1.5A Transmit speech: 18 A Transmit (max.): 30 A
Frequency Selection	Key or dial encoder
Dimmer	Illumination for keyboard and LCD (four levels incl. off)

Display	Channel number, frequency, class of emission, status of controls, signal strength, transceiver output level
I/O Connection	Standard: microphone, external antenna coupler, external speaker Option: 1) RS-232C port for connecting DP-5 NBDP Terminal 2) Current loop port for connecting RB-500 Remote Station/DB-500 Distributor
Coating Color	Cabinet: 2.5GY 5/1.5 Newtone #5 Front panel: N-3.0
Dimensions and Weight	100 mm x 250 mm x 300 mm, 5.8 kg

RECEIVER

Receiving System	Double-conversion superheterodyne IF: 54.455 MHz and 455 kHz
Sensitivity	Input level at 50 ohms to produce SINAD 20 dB J3E: 3 dB μV(1.4 μV) H3E: 16 dB μV (6.3 μV)
Selectivity	2.4 kHz at -6 dB (J3E) 4.5 kHz at -60 dB (J3E)
Spurious Response	Better than 70 dB
Intermodulation	Better than 80 dB
Audio Output	3 W rated into internal speaker 5 W max. into external 4 ohm speaker
Other Features	RF Gain: Adjustable Squelch: ON/OFF, Activated by voice/signal level Dimmer: OFF/Low/Medium/High Speaker: ON/OFF (Handset always alive) AGC: always ON Noise blanker: always ON

TRANSMITTER

Output Impedance	50 ohms
RF Output Power	J3E/H3E: 150 W pep or 100 W pep F1B: 100 W Tune: 10 W approx. (greater than 70 W pep for 23 to 26.2 MHz)
Power Reduction	60 – 70 W pep
Controls	Output HI/LOW, test/send of two-tone alarm generator, 2182kHz single action key

ANTENNA COUPLER

Tuning System	CPU controlled fully automatic tuning system
Frequency Range	1.6 to 26.2 MHz
Input Impedance	50 ohms (viewed from transceiver)
Antenna Required	6 to 15 m wire or whip
Power Capability	150 W pep, 75 W continuous
Tuning Power	10 W
VSWR	Less than 1.5
Tuning Time	Within 2 to 15 seconds Within 0.5 seconds on pretuned bands
Dummy Load	External (10 ohms + 250 pF), optional supply
Power Requirement	15 VDC 0.6 A (supplied from transceiver)
Ambient Temperature	-30°C to +70°C at 95% relative humidity
Construction	Waterproof plastic cabinet, stainless steel mount
Color	White
Dimensions and Weight	267 mm (W) x 390 mm (H) x 90 mm (D), 2.9 kg approx.

EQUIPMENT LIST

Complete Set

No.	Name	Type	Code No.	Qty	Remarks
1	Transceiver Unit	FS-1502		1	
2	Antenna Coupler	AT-1502	000-054-319	1	
3	Accessories	FP05-02000	000-055-200	1 set	for microphone
		FP05-02010	000-055-201		for handset
		FP05-02020	000-055-202		for noise-canceling microphone
		FP05-02100	000-055-205	1 set	for ant. coupler
4	Installation Materials	CP05-04400	000-054-318	1 set	for trans. unit
		CP05-02800	000-055-204	1 set	for ant. coupler
5	Spare Parts	SP05-02100	000-055-188	1 set	
6	Documentation	OM-E5548	000-802-884	1 set	

Option

No.	Name	Type	Code No.	Qty	Remarks
1	Rectifier	PR-270	000-113-349	1	
2	DC-DC Converter	PC-220	000-113-350	1	
3	External Speaker	HCB100D	000-113-352	1	
4	Doublet Antenna	E22	000-050-631	1 set	
5	Single Wire Antenna	E24	000-050-634	1 set	
6	Double-span Antenna	E25	000-050-635	1 set	
7	Whip Antenna Lead-in	E26	000-050-636	1 set	
8	Whip Antenna Feeder	E27	000-050-637	1 set	
9	Whip Antenna	FAW-6D	000-572-128	1 set	
10	Whip Antenna	FAW-6R2A	000-107-921		
11	Whip Antenna	FAW-6R2	000-572-108		
12	Whip Antenna	FAW-4B	000-572-123		
13	Coupler Installation Materials	OP05-12	005-923-680	1 set	U-bolts for fixing antenna coupler
14	REMOTE-A Kit	OP05-39	005-920-310	1	RS-232C, for DP-5, DSC-5
15	REMOTE-B Kit	OP05-40	005-920-320	1	Current loop, for RB-500/DB-500
16	CONTROL Kit	OP05-41	005-920-330	1	For BK connection
17	Crystal Filter	K00F04D	000-113-494	1	For Telex

Accessories for transceiver unit (FP05-02000; hand-microphone type)

No.	Name	Type	Code No.	Qty	Remarks
1	Hanger	FP05-02001	005-922-690	1	
2	Tapping Screw	6 x 20 SUS304	000-800-414	6	
3	Knob Bolt	KG-B2 M8 x 20 SUS 304	000-800-601	2	
4	Flat Washer	M6 SUS304	000-864-129	6	
5	Hanger Washer	05-029-0132	100-087-911	2	
6	Knob Washer	05-029-0135	100-100-390	2	
7	Microphone	DM1620FZ1	000-112-622	1	

Accessories for transceiver unit (FP05-02010; handset type)

No.	Name	Type	Code No.	Qty	Remarks
1	Hanger	FP05-02001	005-922-690	1	
2	Tapping Screw	6 x 20 SUS304	000-800-414	6	
3	Knob Bolt	KG-B2 M8 x 20 SUS 304	000-800-601	2	
4	Flat Washer	M6 SUS304	000-864-129	6	
5	Hanger Washer	05-029-0132	100-087-911	2	
6	Knob Washer	05-029-0135	100-100-390	2	
7	Handset Hanger	05-024-1001	100-095-691	2	
8	Stopper	05-024-1002	100-095-701	1	
9	Template	05-024-1003	100-095-711	1	
10	Tapping Screw	3 x 20 SUS304	000-801-662	6	
11	Handset	HS-6000FZ5	000-112-623	1	

Accessories for transceiver unit (FP05-02020; noise-canceling mic. type)

No.	Name	Type	Code No.	Qty	Remarks
1	Hanger	FP05-02001	005-922-690	1	
2	Tapping Screw	6 x 20 SUS304	000-800-414	6	
3	Knob Bolt	KG-B2 M8 x 20 SUS 304	000-800-601	2	
4	Flat Washer	M6 SUS304	000-864-129	6	
5	Hanger Washer	05-029-0132	100-087-911	2	
6	Knob Washer	05-029-0135	100-100-390	2	
7	Noise-canceling Microphone	M112D4509910	000-113-344	1	

Accessories for antenna coupler (FP05-02100)

No.	Name	Type	Code No.	Qty	Remarks
1	Pipe Seal	12W-R	000-113-354	1	

Installation Materials for transceiver unit (CP05-04400)

No.	Name	Type	Code No.	Qty	Remarks
1	Power Cable	05S0414	000-113-347	1	2m
2	Ground Wire	05S0479	000-113-348	1	2m

Installation Materials for antenna coupler (CP05-02800)

No.	Name	Type	Code No.	Qty	Remarks
1	Tapping Screw	6 x 20 SUS304	000-800-414	4	
2	Flat Washer	M6 SUS304	000-864-129	4	
3	Ground Wire	05S0479	000-113-348	1	2m

Spare Parts for transceiver unit (SP05-02100)

No.	Name	Type	Code No.	Qty	Remarks
1	Fuse	FGBO 30A 125 VAC	000-549-017	2	

1 OPERATIONAL OVERVIEW

Overview

This chapter acquaints you with the basic operating procedure for your radiotelephone.

Contents

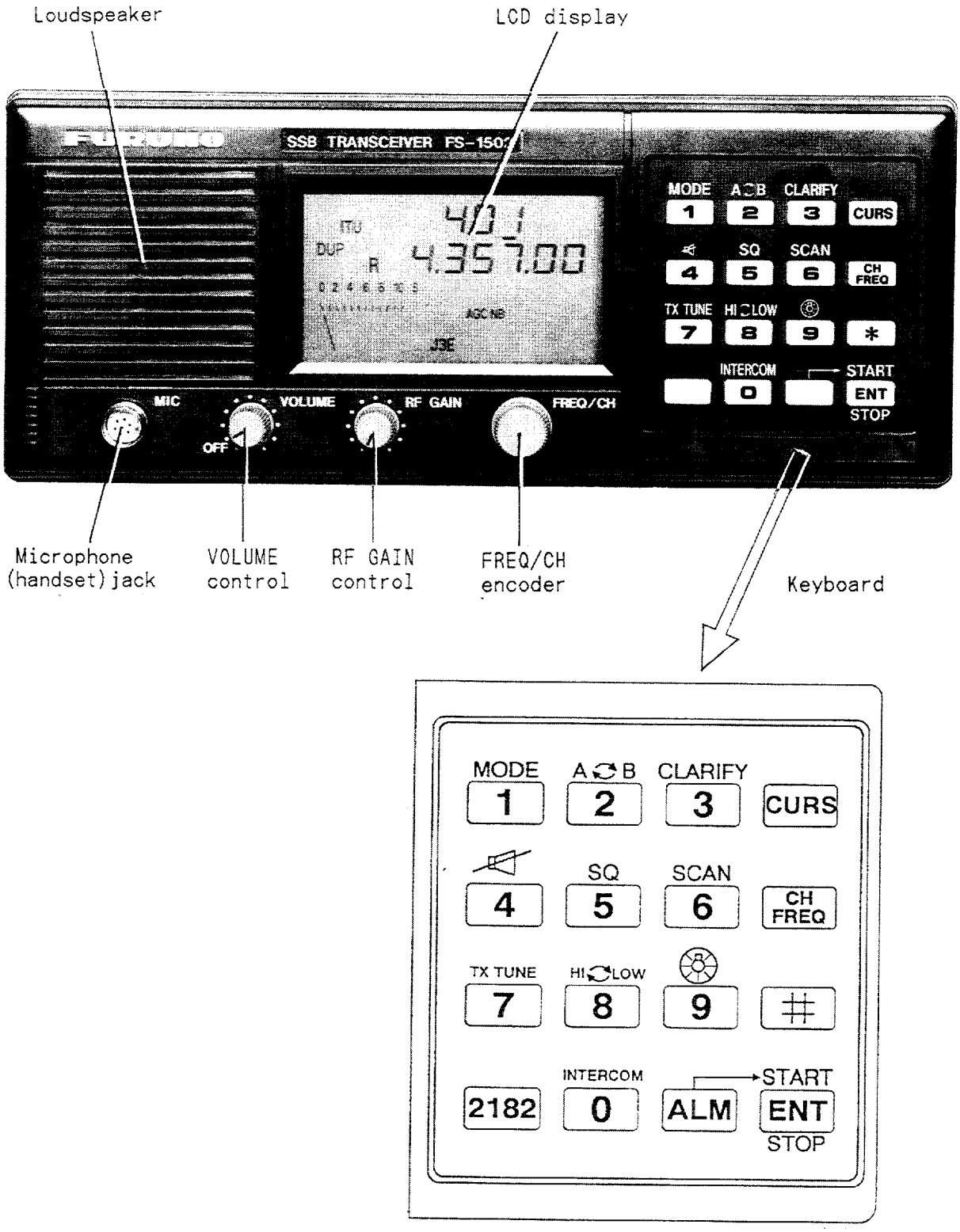


Figure 1-1 Transceiver front panel

Description of Controls

Table 1-1 Description of controls

Control	Function
VOLUME	Turns the power on and off and adjusts speaker volume.
RF GAIN	Adjusts rf amplifier gain.
FREQ/CH	Changes frequency and selects channel number.
MODE	Selects a class of emission.
A B	Selects memory A (RX frequency) and memory B (TX frequency) on simplex channel. For semi-duplex channel, it enables watch on your TX frequency. **NOTE:** *This key functions only in the User Channel and ITU Channel Modes.*
CLARIFY	Adjusts RX frequency in channel mode. The factory-set rate of change is ±150 Hz in 10 Hz steps. (For AM the width is fixed at ±5 kHz, 100 Hz steps.)
CURS	Controls cursor for data input.
	Turns the internal or external speaker on and off. The speaker mark appears on the display when the speaker is off.
SQ	Turns the squelch function on and off. "SQ" appears on the display when the squelch is on.
SCAN	Turns the scan function on and off. "SCAN" appears on the display when the scan function is on.
CH FREQ	Selects frequency mode.
TX TUNE	Tunes the antenna coupler. "TUNE" appears during tuning, and "OK" appears after tuning is successfully completed.
HI LOW	Alternately selects high and low output power.
	Adjusts backlighting of keyboard and LCD.
*	Enables entry of numeric data.
2182	Selects 2182 kHz.
INTERCOM	Calls remote station. Press this key, enter station no. and then press [ENT].
ALM	Tests the two-tone alarm signal. To *transmit* the alarm, press this key and [ENT] together.
ENT	Terminates data entry.
1 – 0 keys	Enter numeric data. Press the [#] key then enter numeric data.

Indications

The LCD provides various marks and indications which show operational status. The figure below shows the location and meaning of each mark and indication.

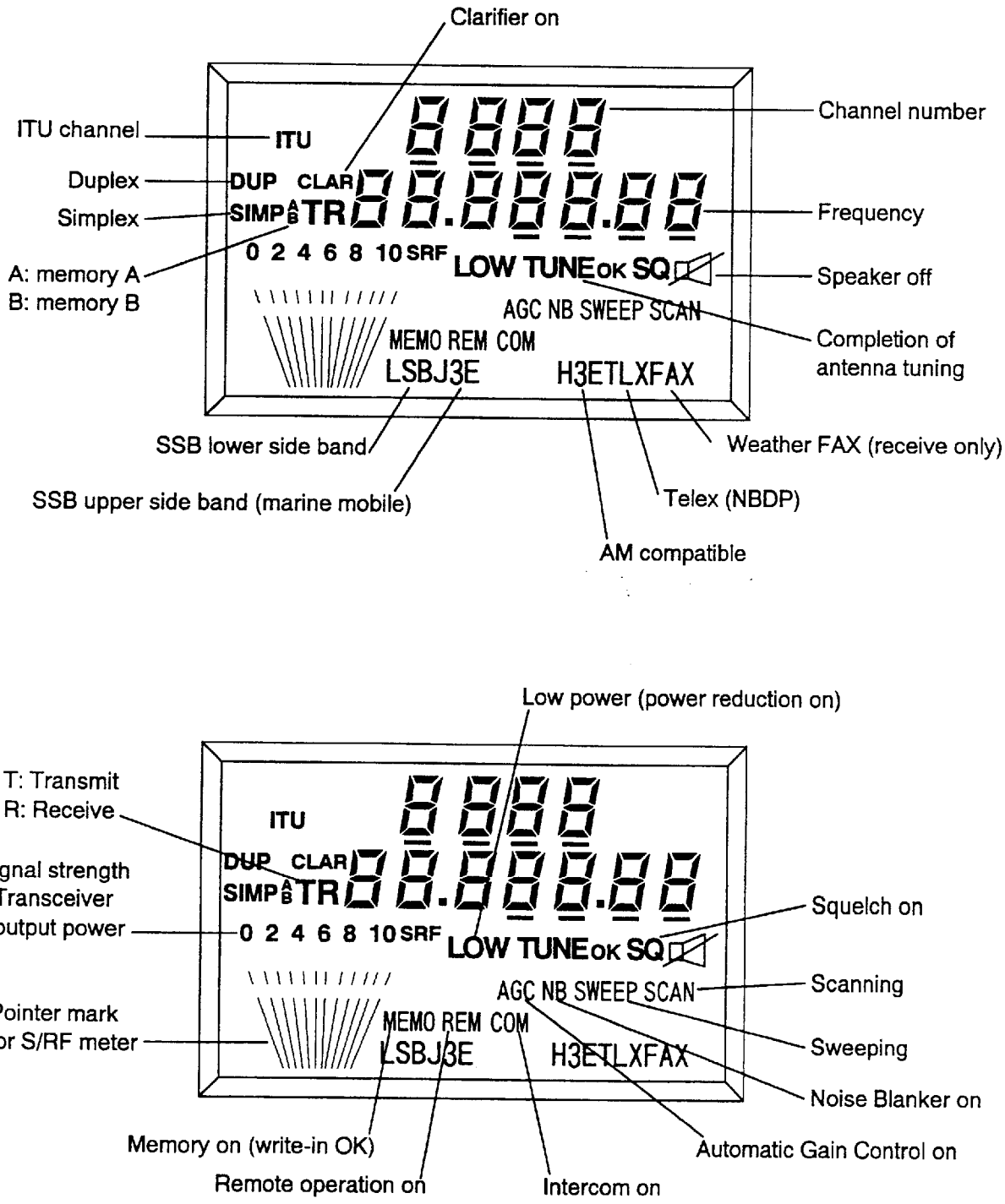


Figure 1-2 Indications

Basic Operation

Introduction

The FS-1502 is designed for intuitive operation. If you change a setting, the associated reaction appears on the LCD almost immediately.

Take a look at the front panel. It mostly consists of an LCD panel which shows operational status and a 16-key keyboard.

Most keys have two functions, main and numeric data entry. To enter numeric data, press [#], enter data and then press [ENT].

The transceiver contains a beeper which sounds in the following conditions.

IF...	THEN...	Remarks
a key input sequence is completed successfully	a short beep sounds.	
invalid data is entered	three beeps sound.	The data is rejected and previous data is restored.
the antenna coupler cannot tune the antenna	five beeps sound.	"TUNE OK," meaning successful completion of tuning, does not appear.

Turning the power on and off/ adjusting speaker volume

To turn on the power, turn the VOLUME control clockwise until you hear a click. Further clockwise rotation adjusts speaker volume. To turn off the power, turn the control fully counterclockwise until you hear the click.

- **NOTE 1:** *If it is within 3 days of the last power application, the unit starts up with the last-used frequency. Otherwise, 2182 kHz is automatically called.*
- **NOTE 2:** *When the supply voltage is higher than 17 VDC, the protector trips and the transceiver will be turned off automatically. If this happens, first switch off the set and check whether the battery charger is operating or not, then check transceiver input voltage. If the battery charger is working and the voltage is 12 to 15 V, the unit may be turned on again.*

Adjusting the backlighting

The dimmer key (9) adjusts the backlighting for the LCD and the keyboard. Each time the key is pressed the backlighting changes in the sequence of high, medium, low and off.

Turning the loudspeaker on and off

When you are using a handset and therefore do not require the internal or external speaker, you can turn it off by pressing the speaker key (4). The speaker mark appears on the display when the speaker is off.

Turning the squelch on and off

The squelch mutes the audio output in the absence of an incoming signal. When radio noise is too jarring during stand-by condition, it may be muted by activating the squelch. Press [SQ] to turn on or off the squelch. "SQ" appears when the squelch is on.

Selecting class of emission

The [MODE] key selects class of emission. Each time the key is pressed the class of emission changes in one of the sequences shown below. The selected class of emission appears on the bottom line on the LCD.

Configuration A: LSB, J3E (USB), H3E, TLX, FAX, LSB...
Configuraiton B: J3E (USB), H3E, FAX, J3E...
Configuration PH: J3E (USB), H3E, J3E...

Table 1-2 explains then meaning of each class of emission.

Table 1-2 Class of emission modes

Class of Emission	Meaning	Main Use	Power
LSB	SSB, Lower Side Band	Land Mobile	150 W
J3E (USB)	SSB, Upper Side Band	Marine Mobile, General	150 W or 100W
H3E	SSB with full carrier	Communication over 2182 kHz	37.5 W (carrier)
TLX	Frequency Shift Keying	Radioteletype (NBDP)	150 W (for ARQ)
FAX	Facsimile	Weather Facsimile	–

- **NOTE 1:** *Select "USB" for voice communication on marine mobile operation.*
- **NOTE 2:** *When [2182] is pressed, class of emission is selected as follows:*

  Configuration A: J3E (USB). To change to H3E, press [MODE] to display "H3E".

  Configuration B, PH: H3E only.
- **NOTE 3:** *Reception only for weather facsimile.*

Selecting Frequency

- Note that user channel programming should be done by an authorized Furuno agent or dealer.

Configuration A

You can select a TX or RX frequency one of three ways:

- Frequency Mode (direct keyboard input)
- User Channel Mode
- ITU Channel Mode

Press [CH/FREQ] to select a mode. Each time the key is pressed the mode changes in the sequence of:

User Channel, Frequency Mode (for fine tuning of user channel), ITU Channel, Frequency Mode (for fine tuning of ITU channel)

Configuration B

You can select User Channel or ITU Channel mode.
Press [CH/FREQ] to select a mode. Each time the key is pressed the mode changes in the sequence of User Channel, ITU Channel.

Configuration PH

User Channel mode only.

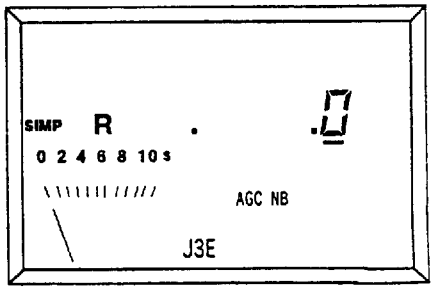
Manually entering a frequency (frequency mode)

Configuration		
A	B	PH

This mode is primarily used for programming user channels. Any frequency between 1.6 MHz and 26.2 MHz (resolution of 10 Hz = 0.01 kHz) can be manually entered through the keyboard.

To enter 12345.6 kHz, for example, place the cursor under the 10ths place (if it is not already there) by pressing [CH/FREQ] key. Then, press

[#] [1] [2] [3] [4] [5] [6] [ENT]



■ **NOTE 1:** *If an invalid frequency is entered, three beeps sound, informing you of unacceptable key entry. The frequency is rejected and the last-used frequency is restored.*

■ **NOTE 2:** *The frequency mode is inoperative on semi-duplex communications.*

Fine tuning frequency by FREQ/CH encoder

The last four digits of a frequency (x10 Hz, x100 Hz, x1 kHz and x10 kHz) may be raised or lowered by operating the FREQ/CH encoder. Press [CURS] to place the cursor on the digit desired; then operate the FREQ/CH encoder.

If frequency change by this method is too slow, enter a new frequency through the keyboard.

[A B] key

The [A B] key, when pressed in the ITU or user channel modes, alternately selects frequencies stored on memory banks A and B. The selected memory bank is denoted by "A" or "B" on the first line of the LCD.

For example, assume that you have preprogrammed into channel 1 KMI Radio, Dixon, CA: SHIPS RX freq. 4357.0 (memory A), SHIPS TX freq. 4065.0 (memory B), semi-duplex.

Select channel 1 and before initiating your call, verify that the station is neither transmitting nor receiving, by pressing [A B] as many times as necessary. After confirming that the line is unoccupied, go back to the memory A-stored frequency and initiate your call.

User channel mode

This mode recalls user channels saved to memory A and memory B by an authorized Furuno agent or dealer. For duplex channels, memory A stores SHIPS RX and memory B, SHIPS TX. There is no protocol for storing simplex channels.

You can select memory A or B by pressing [A B].

Table 1-3 Simplex and semi-duplex freq. selection by the [A B] key

Display on LCD	Frequency to be recalled;	
	RX	TX
SIMP A	A memory	
SIMP B	B memory	
DUP	A memory	B memory
SIMP B	B memory *	B memory

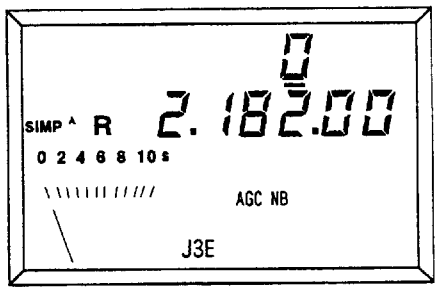
* *Enables watch on your TX frequency.*

The FS-1502 can store up to 64 user channels (1 to 64). You can recall a user channel by entering the channel number through the keyboard or by operating the FREQ/CH encoder.

In this mode the display shows channel number, memory (A or B), communication format and class of emission.

Recall by FREQ/CH encoder

1. Place the cursor under the channel number location by pressing [CH/FREQ].
2. Turn the FREQ/CH encoder to display desired channel number.



Recall by keyboard input

To call up channel 3, for example, press [CH/FREQ] key to place the cursor under the channel number location and then press [#] [3] [ENT].

■ **NOTE:** *If a channel having no frequency assigned to it is input, the set will reject the input and restore the last-used channel.*

ITU channel mode

Configuration		
A	B	PH

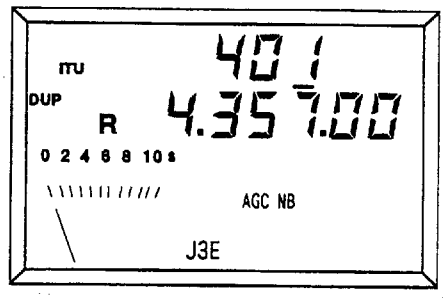
All standard and USA ITU marine channels are stored in the memory of this unit, and you can select either through the system settings. (More on system settings later.) Like recalling a user channel, a ITU channel can be called up through the keyboard or by operating the FREQ/CH encoder.

In this mode the display shows band number, channel number, type of channel (DUP or SIMP), communication status (TX or RX) and "ITU".

■ **NOTE:** *After selecting a channel, you can confirm if the transmission channel is occupied or not by pressing [A B]. ("SIMP-B" appears.)*

Recall by FREQ/CH encoder

1. Press [CH/FREQ] key to display "ITU" and "ITU channel number" on the LCD.
2. Rotate the FREQ/CH encoder to display desired channel.
3. If you need to change the band number, operate the [CURS] key and the FREQ/CH encoder.



Recall by keyboard input

To call up channel 401, for example, press [CH/FREQ] key to display "ITU" and "ITU channel number" and then press [#] [4] [0] [1] [ENT].

Table 1-4 ITU channel selection by the [A B] key

Display on the LCD	Frequency to be read out from memory;	
	Receive	Transmit
DUP	A	B
SIMP B	B*	B

* *Enables watch on your TX frequency.*

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Reception

Introduction

To receive a signal, in most cases, all that is required is to select an RX frequency.

Adjusting rf gain

In normal use the RF GAIN control is set for maximum rf gain. If the audio of a transmitting station is unclear or there is noise mixed with other signals, however, adjust rf gain to only pick up wanted signal.

Clarifying a receive signal

If reception is unclear, try to clarify the signal as follows.

1. Press [CLARIFY]. (The cursor, which was located under the channel number, automatically moves under the 10 Hz digit.)
2. Turn the FREQ/CH encoder to change (fine tune) the frequency. (In the Frequency Mode, simply turn the FREQ/CH encoder to fine tune a frequency.)
3. To return the cursor to the channel number, press [CLARIFY] again.

■ **NOTE:** *The clarify width can be set, by an authorized FURUNO service technician, for ±100 Hz or ±150 Hz (factory setting: ±150 Hz) on system setting menu 9927. Note however that the width is fixed at ±5 kHz on the AM.*

Monitoring RX signal strength

During reception the pointer indicates relative signal strength.

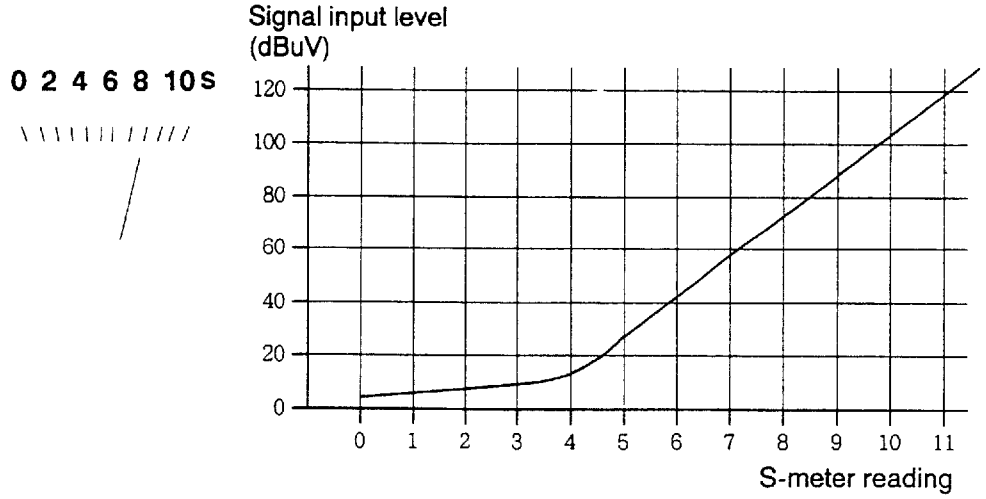


Figure 1-3 Signal strength and display

■ **NOTE:** *The AGC and noise blanker are, in the factory setting, always on.*

Transmission

⚠WARNING

Do not touch the antenna wire when transmitting.

Transmission high voltage can shock, burn, or cause death.

Tuning the antenna

Only when antenna impedance and transmitter impedance match can the transmitter (housed in transceiver) deliver full power to the antenna. Because antenna impedance changes each time a channel is changed it must retuned by the antenna coupler to the same impedance as the transmitter (50 ohms). The antenna coupler is tuned automatically when one of the following is pressed:

- PTT switch on the microphone (handset)
- [TX TUNE] on the front panel

After one of the above is pressed;

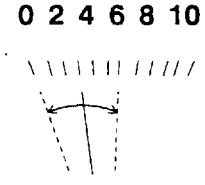
- "TUNE" appears on the display.
- Tuning should be completed within 2 to 15 seconds for a newly used frequency or less than 0.5 seconds for a memorized frequency. *(A built-in memory remembers coil and capacitor settings for a frequency band for about one week.)*
- When the tuning process is successfully completed "OK" appears.

■ **NOTE:** *Because it takes a mere 0.5 seconds to tune a memorized frequency, it is a good idea before beginning transmission to wait for a short period after "OK" appears, to verify that the channel is unoccupied.*

Monitoring transceiver output power

During transmission the pointer deflects according to transceiver output power.

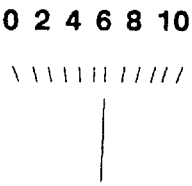
LSB
J3E (USB)



After pressing the PTT switch, the pointer deflects rightward with loudness of your voice.

H3E

The pointer deflects slightly when the PTT switch is pressed, and deflects rightward with voice level.

TLX 

When transmitting traffic the pointer positions stably. It returns to the left between intervals in the message.

■ **NOTE:** *The LCD shows "RF" but does not mean "antenna current". The LCD displays transceiver output power. For this reason the meter does not deflect with antenna length or frequency.*

Reducing transmitter power

To conserve electricity, reduce transmitter power. This can be done when using the transceiver in a harbor, near the shore or close to communication partner (other ship), since you are probably close enough to the receiving station to make the call in reduced power. Each pressing of [HI LOW] selects high or low output power. "LOW" appears on the display when low output power is selected.

Making a Call

Semi-duplex channel

1. Verify that the channel you want to call is not busy, by pressing [A B].
2. If line is clear, return to channel A ("DUP" appears on the display) and begin your call.

Simplex channel

Since the same frequency is used for both transmitting and receiving, simply check whether the channel is unoccupied before initiating a call. "TX" appears on the second line of the display while transmitting.

Using the microphone

Hold the microphone close to your mouth, press the PTT switch and speak clearly.

Telex

For Telex operation (optional REMOTE-A kit required), select both frequency and "TLX" class of emission. The frequency displayed on the LCD is the assigned frequency.

Configuration		
A	B	PH

■ **NOTE:** *To fine tune receive Telex signal, use the [CLARIFY] key.*

Emergency Communication

Introduction

In case of distress or emergency, transmit the two-tone alarm to alert a 2182 kHz watch receiver's attention, then call for help on 2182 kHz. Complete distress call procedure is provided in APPENDIX A.

Procedure

1. Press [2182]. 2182 kHz and class of emission J3E (Configuration A) or H3E (Configuration B, PH) are automatically selected. To communicate over H3E for configuration A, press [MODE] to display "H3E".
2. To send an emergency call, press [ALM] and [ENT] in order. The call sounds from the speaker and ceases automatically after 45 seconds. The alarm may be cancelled at any time by pressing [ENT].
3. When the alarm signal stops, press the PTT switch and transmit your message with a clear and calm voice. Release the PTT switch and wait for a reply. Repeat the distress message at regular intervals until a reply is received.

Testing the two-tone alarm

The two-tone alarm should be tested regularly for proper operation. Press [ALM] to test the alarm. The alarm should sound for 45 seconds then stop. To cease testing at any time press [ENT].

Scanning

Introduction

In scanning, the receiver scans user channels, ITU channels or a user-selected frequency. When a signal above a preset strength is detected, the receiver stops scanning momentarily. To stop scanning, press [ENT] or the PTT switch. This function is useful for fleet vessel communication and receiving general communication frequencies while maintaining watch on distress and emergency frequencies.

■ **NOTE:** *Dwell time and scan stop level can be selected on system setting numbers 9917 and 9918, respectively.*

Dwell time *is the amount of time in seconds which the receiver stops on a channel to confirm the absence or presence of a signal. The time is selectable among 1 to 9 seconds.*

Scan stop level *is the minimum receive signal strength which this radio will pick up.*

User channel mode

Follow the procedure below to start scanning a user channel group. (Note that user channel programming should be done by an authorized Furuno agent or dealer.)

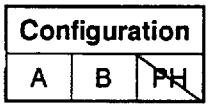
1. Turn the FREQ/CH encoder to select the scan group which you want to scan. See the table below.

Table 1-5 Scan group number and channel numbers

Scan Group Number	Channel Number and Scanning Range
1	1 to 8
2	9 to 16
3	17 to 24
4	25 to 32
5	33 to 40
6	41 to 48
7	49 to 56
8	57 to 64

2. Select memory A frequency or memory B frequency by pressing [A B].
3. Press [SCAN] to commence scanning. "SCAN" appears on the display.
4. To stop scanning, press [ENT] or the PTT switch. "SCAN" is erased from the LCD.

ITU channel mode



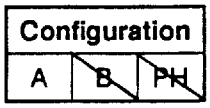
1. Enter channel number by keyboard input or by operating the [FREQ/CH] encoder. To enter international channel 401 by keyboard, for example, press

   [#] [4] [0] [1] [ENT]

2. Select memory A frequency or memory B frequency by pressing [A B].
3. Press [SCAN] to commence scanning. "SCAN" appears on the display.
4. To stop scanning, press [ENT] or the PTT switch on the microphone. "SCAN" is erased from the LCD.

Frequency mode (frequency sweeping)

The receiver sweeps the frequency set at the moment [SCAN] is pressed, depending on sweep interval, sweep step and scan stop level settings.



To start frequency sweeping;

1. Enter a frequency and press [SCAN]. "SWEEP" appears on the LCD.

2. To stop sweeping, press [ENT] or the PTT switch. "SWEEP" is erased from the LCD.

■ **NOTE: Sweep width** *is the frequency width to sweep on both sides of the selected frequency.*

Sweep step frequency *is the frequency interval at which the receiver scans the sweep width.*

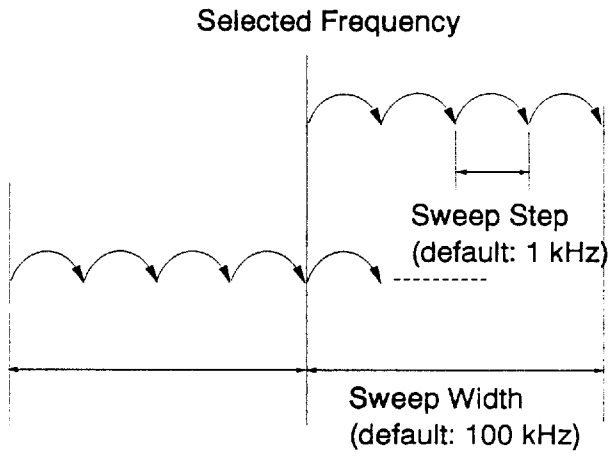


Figure 1-4 How frequency sweeping works

System Setting

Introduction

The system settings determine the operating mode of the FS-1502. Your FURUNO dealer can assist you with the presetting of this radio, depending on your needs and expected use of the equipment.

The table below lists the possible settings and factory setting for each system setting.

Table 1-6 System settings

CH No.	Function	Setting				Factory Setting
		0	1	2	3	
9917	Scan Stop Signal Level	SQ level	1 – 10 of S-meter reading			3
9918	Scan Stop Time	0 – 99 seconds				2
9919	Sweep Width	10 Hz – 30 MHz				100 k
9920	Sweep Step Frequency	10 Hz – 30 MHz				1 k
9922	AGC	Off	On	Mode		1
9923	Squelch Activation	Voice	Level	AND	OR	3
9924	Squelch Level	0 – 10 for level				5
9925	TLX RX Bandwidth	Wide	Narrow			0
9926	Meter Indication	Ant Curr	RF Pwr			1
9928	Squelch Decay Time	500 – 4000 ms				1000
9929	Squelch Activating Frequency	500 – 2000 Hz				1000
9930	TX High Power Level	0-255				0
9931	TX Low Power Level					5
9933	Tune Power Level					100

■ **NOTE 1:** *"Marine" means any frequency in the ranges below. You can call (through the keyboard) any user channel or ITU channel in the those ranges.*

"Marine free" means any ITU channel, user channel or marine frequency, selectable through the keyboard.

Marine band frequencies (frequency in kHz)

1606.5 – 4438	*18780 – 18900*
6200 – 6525	*19680 – 19800*
8100 – 8815	*22000 – 22855*
12230 – 13200	*25070 – 25210*
16360 – 17410	*26100 – 26175*

■ **NOTE 2:** *Squelch activation is the condition which opens the squelch.*

Voice: *The squelch opens by frequencies less than 1000 Hz (factory setting). The squelch activating frequency can be changed between 500 – 2000 Hz on system setting channel no. 9929.*

Level: *The squelch opens depending on signal strength. The factory setting is 5. You can change the level between 0 – 10 on system setting channel no. 9924.*

And: *The squelch opens depending on both voice and signal strength.*

Or: *The squelch opens by either voice or signal strength.*

■ **NOTE 3:** *Antenna Coupler AT-1502 does not have an antenna current detection circuit. If display of antenna current is required, use Antenna Coupler AT-1500. Be sure to set system setting 9926 for "0".*

Procedure

Follow the procedure below to select system settings.

1. While pressing and holding down [#] turn on the power. Release [#] when "MEMO" appears on the display.
2. Turn the FREQ/CH encoder to select desired channel number.
3. Press [#].
4. Enter desired setting with the numeric keys.
5. Press [ENT].
6. Repeat steps 2 to 5 for another setting.

■ **NOTICE:** *FURUNO Electric Company will assume no responsibility for the inconvenience or disturbance to communications due to inadequate or unlawful presetting of this equipment.*

Remote Station Operation

Introduction

By the [INTERCOM] key you can communicate with a remote station (optional Remote Station RB-500 required).

Priority

The remote station has first priority when a remote station is connected.
Note that when 2182kHz is selected by the [2182] key of the FS-1502, first priority is changed to the FS-1502.
For further details refer to the operator's manual for the RB-500.

2 MAINTENANCE

Overview

This chapter provides the information necessary for the maintenance of this unit.

■ **CAUTION:** *Before beginning any maintenance procedure, be sure to turn off the power.*

Contents

Regular Maintenance

Introduction

This radio is designed and manufactured to provide years of trouble-free performance. Without regular maintenance, however, no machine can perform its intended functions. A regular maintenance program should be established and should at least include the items listed in Table 2-1.

Table 2-1 Regular maintenance

Item	Check Point	Remedy/Remarks
Whip antenna	• Check for physical damage, corrosion and water leakage.	• Replace damaged parts.
Wire antenna	• Check that antenna is properly spanned and separated sufficiently apart from metal structures.	• If necessary, re-span antenna.
Insulators	• Check for salt water accumulation on insulators. • Check that connection at lead-in insulator is tight and rust-free.	• Replace damaged insulators. Remove salt water deposits with fresh water. • Remove rust, then tighten bolt and lock nut. Cover metallic surface with sealing compound.
Antenna coupler	• Check contact at * antenna terminal * ground connection * coaxial cable * composite cable (terminal board). • Check that coupler lid and cable glands are firmly secured. • Check for physical damage, corrosion and salt water deposits.	• Tighten loosened connections. • Fasten lid firmly and evenly to prevent water leakage. • Replace if damaged.
Transceiver	• Check contact at * antenna terminal * ground connection * power cable * composite cable. • Confirm that there are no objects on the top of the cabinet.	• Tighten loosened connections; remove foreign material from connectors. • Remove objects to prevent overheating.
	• Check air vents for foreign materials.	• Blocked air vent may cause overheating.

(continued on next page)

Item	Check Point	Remedy/Remarks
Power supply	• Check that supply voltage is within the rated range.	• If not within the range, call for service. *Low voltage may cause erratic operation.*
Power cable	• Check for loosened or corroded connection at power terminals.	• Clean and tighten.
Battery	• Check that the battery is fully charged.	• If discharged, charge.
Feeder (coax cable, control cable)	• Check for physical damage.	• Replace if damaged.
PCB connection	• Check that jumper cables between boards are firmly connected.	• Reconnect loosened connectors.
Microphone	• Check that microphone connector is firmly fastened.	• Fasten if loosened.

Replacement of Fuse

The power cable contains two 30 A fuses which protect the transceiver from overvoltage/reverse polarity of the ship's mains or internal fault of the equipment.

If a fuse blows, find the cause of the problem before replacing it. If it blows again after replacement, call for service.

⚠ CAUTION

Use the correct fuse.

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

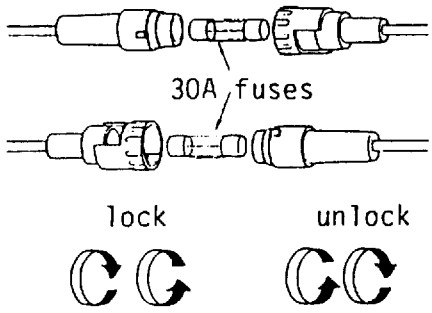


Figure 2-1 Replacement of fuse

Cleaning

The transceiver and the antenna coupler must be kept dry at all times. Wipe of dirt, dust and moisture with a soft, dry cloth. For stubborn dirt, use water-diluted mild detergent on a soft cloth. **NEVER USE PLASTIC SOLVENTS FOR CLEANING. THEY MAY REMOVE PAINT AND MARKINGS.**

If the transceiver will not be used for a long period, cover it.

3 TROUBLESHOOTING

Overview

This chapter provides simple troubleshooting procedures which the user can do.

Contents

Troubleshooting List

Introduction

The troubleshooting list (below) gives common symptoms of equipment malfunction and the means to restore normal operation. If you cannot restore normal operation, please do not check inside any unit. Any repair is best left to a licensed radiotelephone technician. Improper handling or adjustment may cause more serious damage.

Table 3-1 Troubleshooting list

IF...	THEN...	ACTION
you can't turn on the power	the mains switchboard may be off.	Turn on the mains switch.
	the battery may have discharged, or poor contact at terminals.	Recharge battery and tighten terminal connections.
	check fuse on rectifier.	If blown, replace.
frequency appears but no lamps light	dimmer key may be off.	Operate dimmer key.
power is on but no sound from speaker	speaker key may be off.	Turn on the speaker key.
	volume may be too low.	Adjust VOLUME control.
	squelch may be on.	Press the squelch key if "SQ" appears on the display.
you can't clarify SSB signal	wrong class of emission may be in use. (For example, receiving SSB signal in H3E mode.)	Select class of emission same as that of incoming signal.
	frequency may have detuned.	If USER or ITU channel receive mode, press [CLARIFY] then fine tune frequency by FREQ/CH encoder.
you can't transmit the two-tone alarm	remember that you must press [ALM] and [ENT] together to transmit the alarm.	

(continued on next page)

IF...	THEN...	ACTION
you can't send or receive Telex	RS-232C Board (fixed on TX/RX Board) required for Telex communication.	
antenna coupler can't tune antenna	antenna may be disconnected or shorted to ground. antenna is out of tunable length. poor coupler ground. breaker in coupler has tripped. connection cable has loosened or is disconnected.	Check antenna connections. Recommended length is 6 – 15 m. Check coupler ground. Check mains voltage and polarity. If they are normal, reset breaker. Check cable.

Self Test

Introduction

Both the transceiver and the antenna coupler contain a self test facility which can check them for proper operation.

Transceiver

The LCD and keyboard can be checked for proper operation by following the procedure below.

LCD

While pressing and holding down [ENT], turn on the transceiver. All LCD segments should appear.

Keyboard

1. Press a key. The corresponding hexadecimal of the key pressed appears on the first line of the display for two seconds. In addition, the program version no. appears on the second line of the display.
2. All LCD segments turn on again.
3. Repeat step 1 to test other keys.
4. You may escape from the self test at any time by turning off the transceiver.

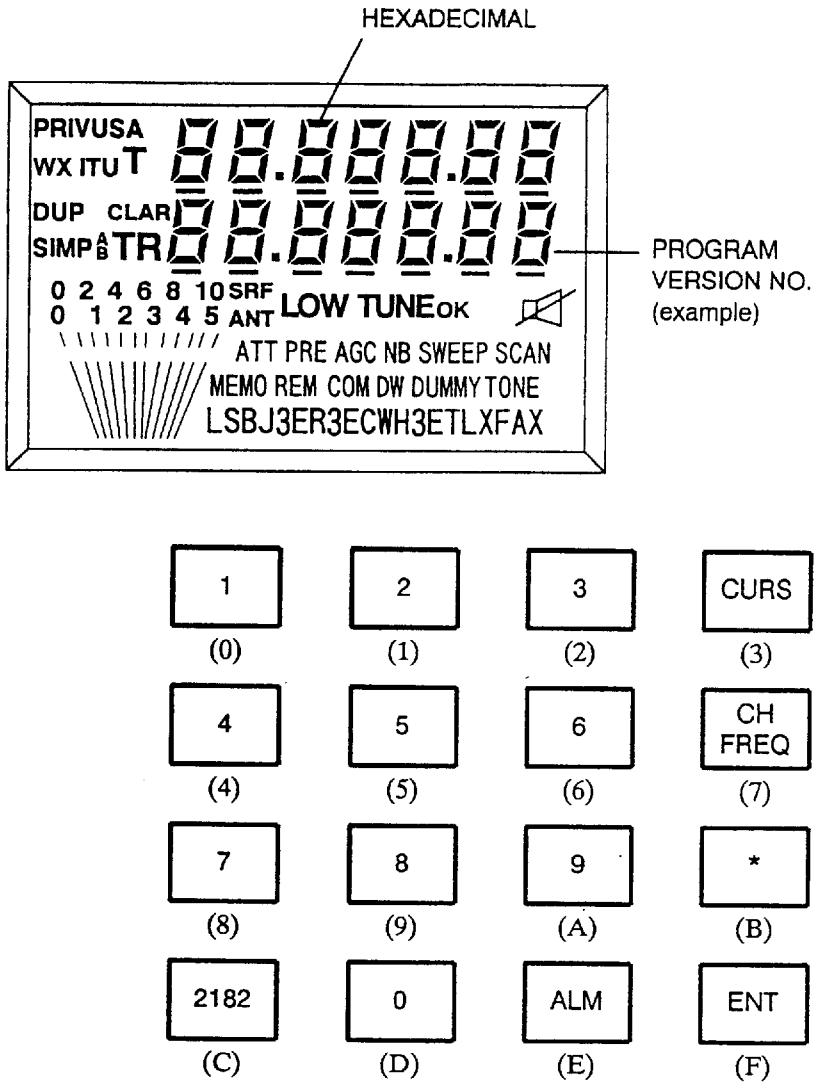


Figure 3-2 Appearance of display during key test, and keys and their corresponding hexadecimals (in parentheses)

Antenna coupler

The relays which select capacitor and coil can be checked for proper operation by following the procedure below.

1. Open the antenna coupler cover.
2. Open the shield cover inside the coupler.
3. Locate DIP switch S2 and turn No.2 on.
4. Press the TUNE switch in the antenna coupler.
5. The 20 LEDs (CR33 TO CR52) should light one by one 1 second each. LED and corresponding relay are as follows.

CR33→K3	CR38→K8	CR43→K14	CR48→K19
CR34→K4	CR39→K9	CR44→K15	CR49→K20
CR35→K5	CR40→K10	CR45→K16	CR50→K21
CR36→K6	CR41→K11	CR46→K17	CR51→K13
CR37→K7	CR42→K12	CR47→K18	CR52→K22

6. Turn off No.2 of DIP switch S2.
7. Close the covers.

4 PARTS LOCATION

Transceiver

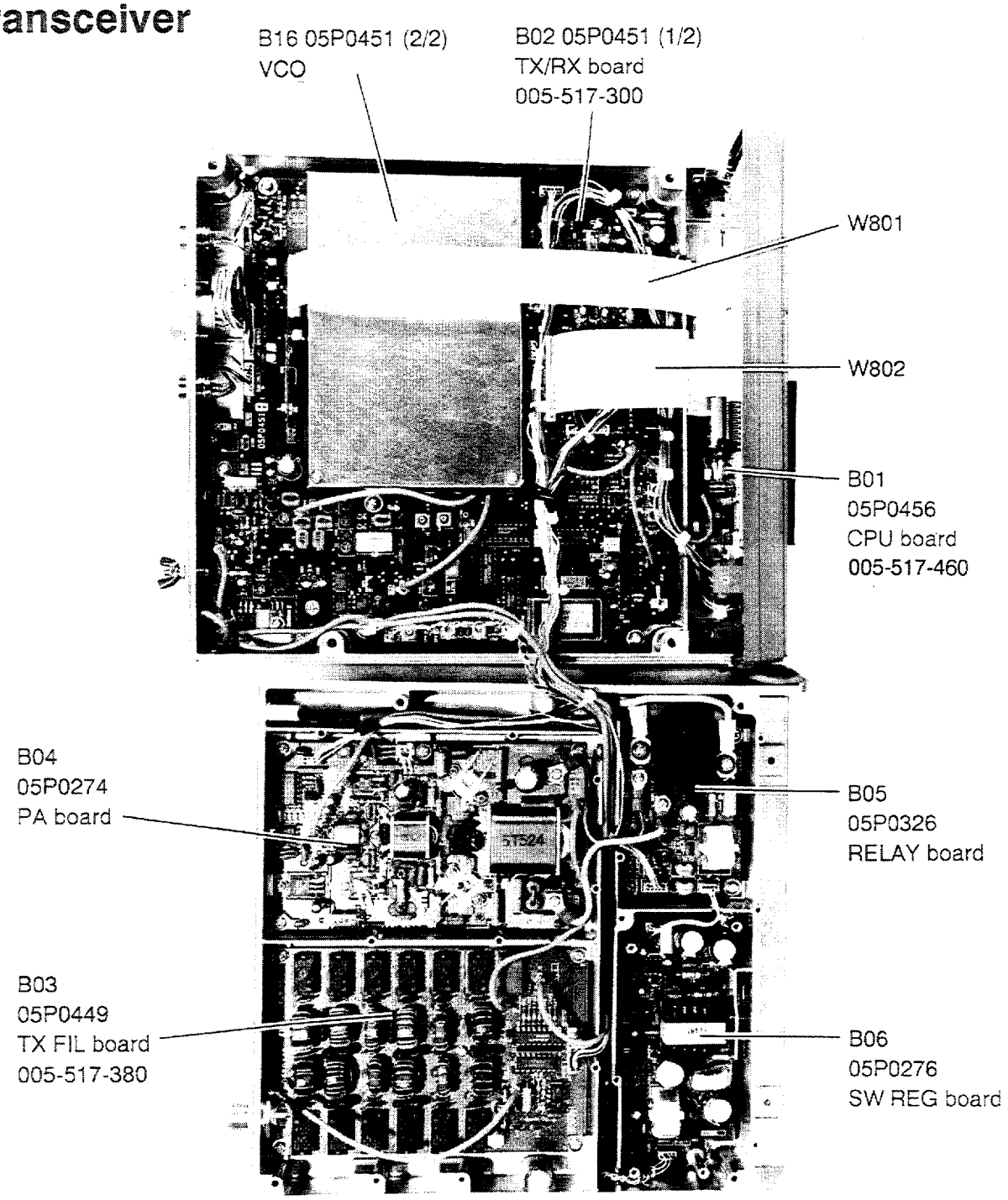


Figure 4-1 Transceiver unit, cover opened

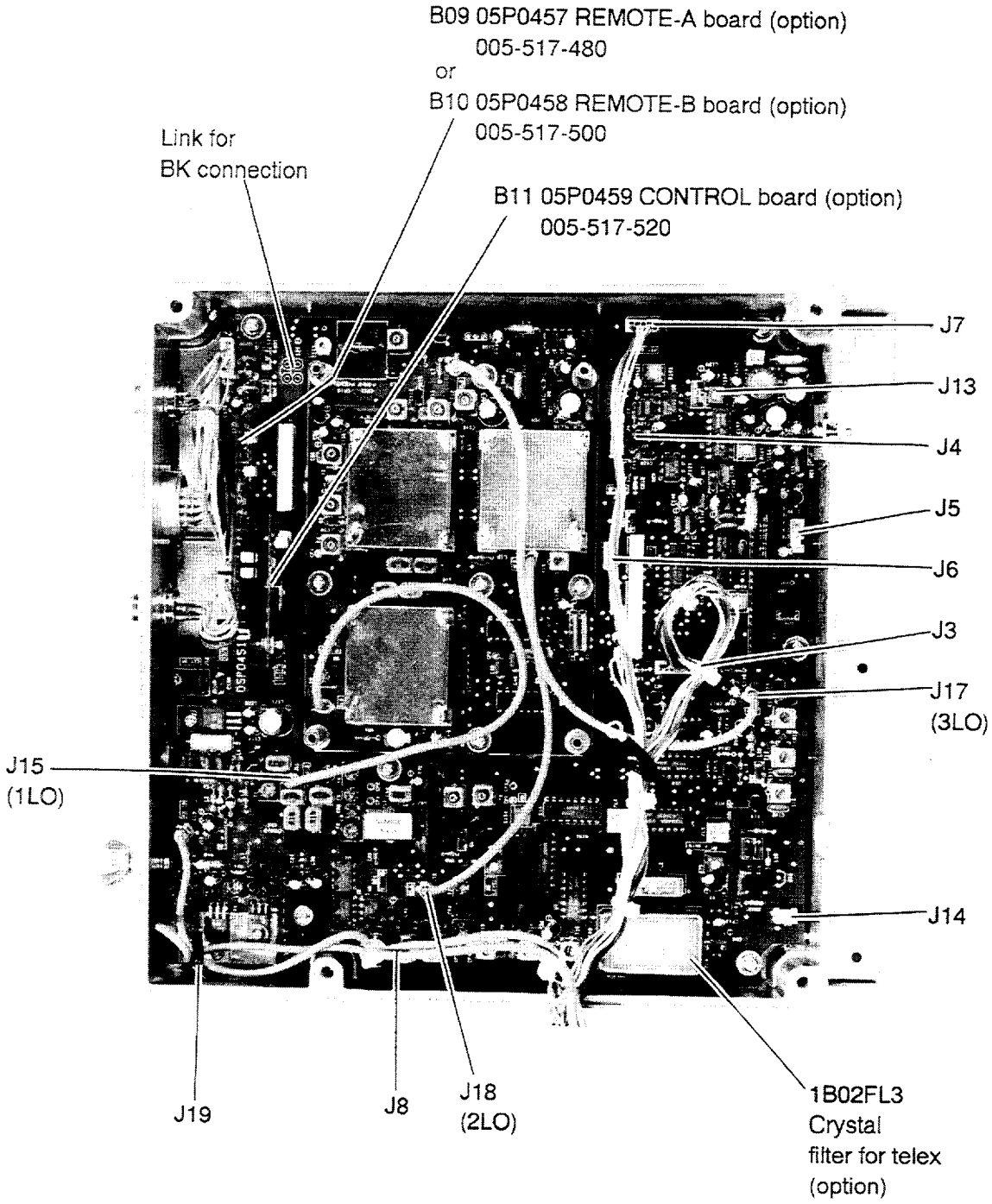


Figure 4-2 Transceiver, bottom view (TX/RX board)

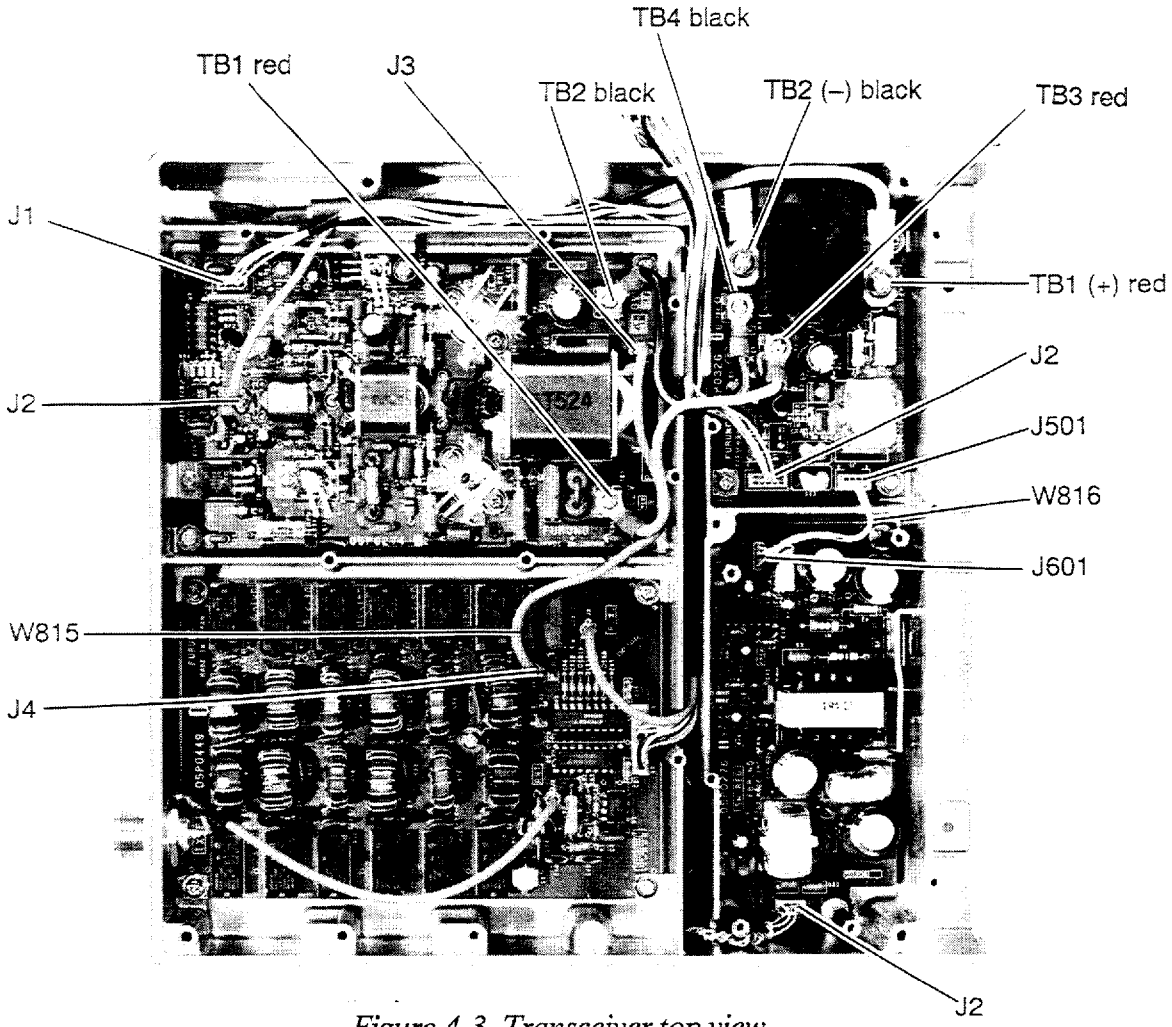


Figure 4-3 Transceiver top view

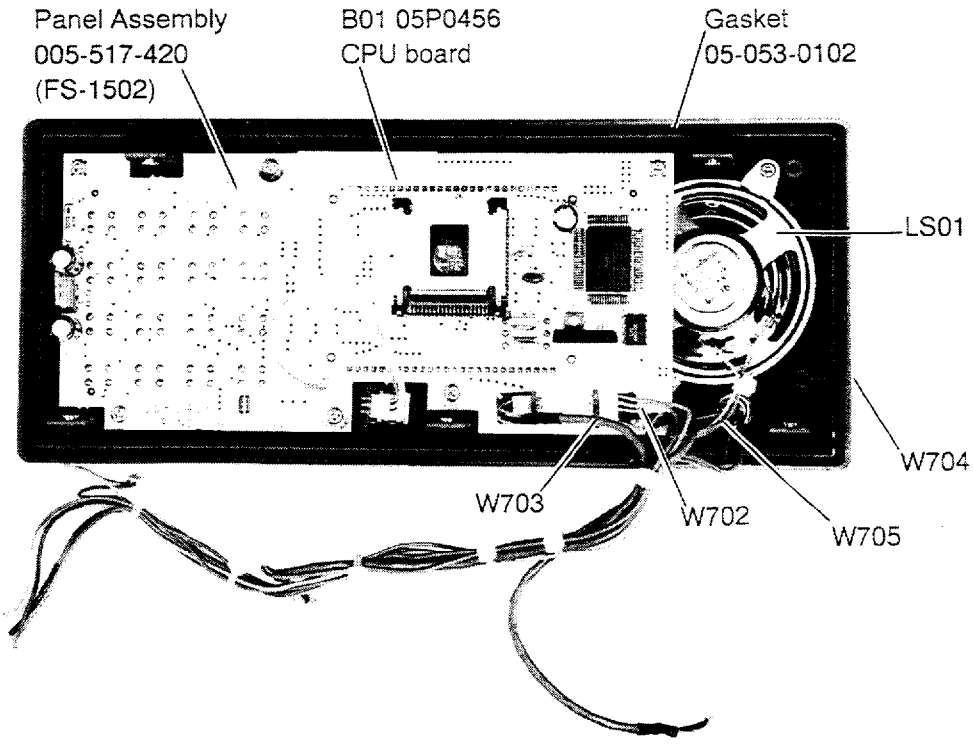


Figure 4-4 Transceiver, front panel, rear view

Antenna Coupler

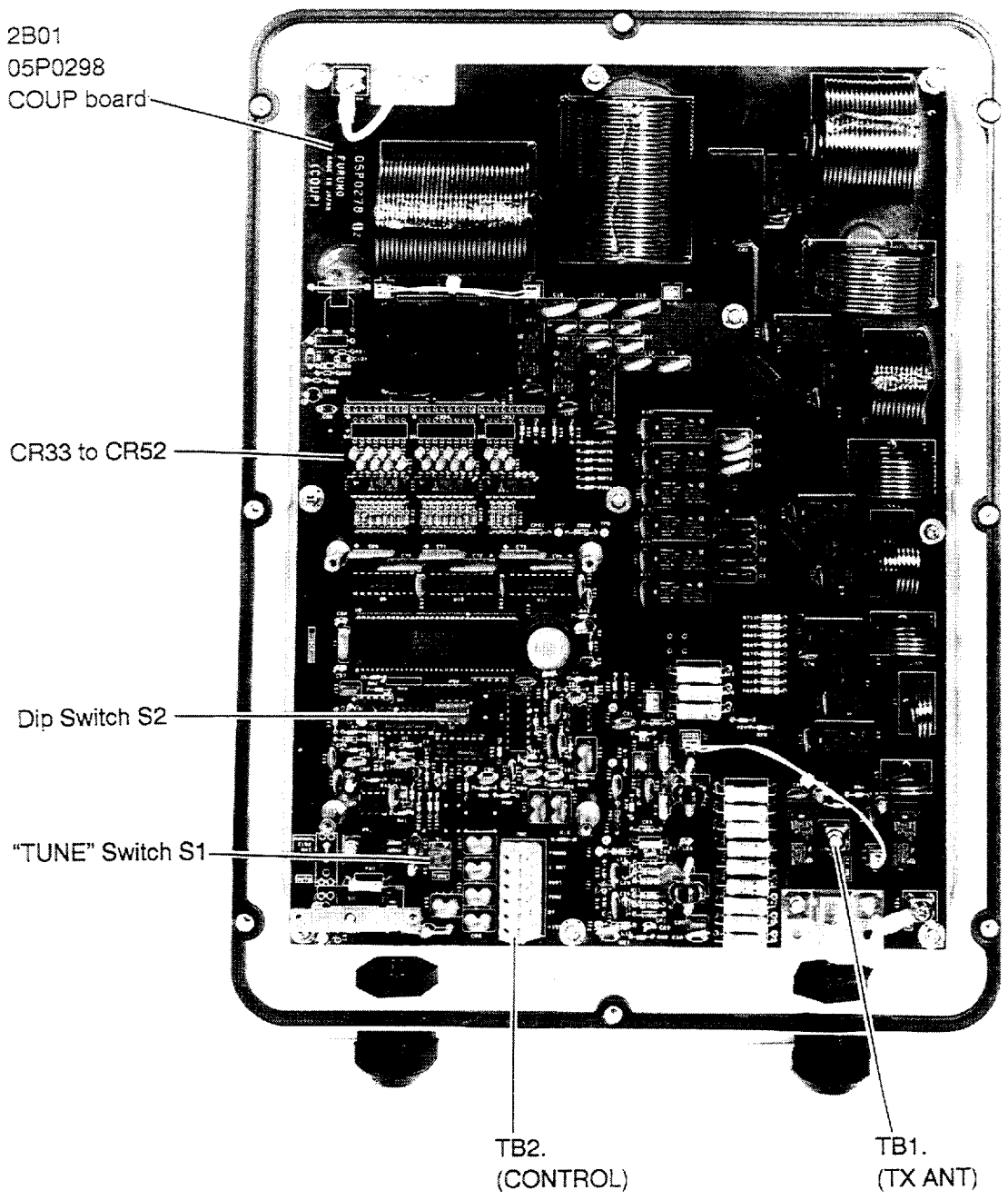


Figure 4-5 Antenna coupler 1502, cover removed, top view

5 INSTALLATION

Overview

This chapter provides the procedures necessary for the installation of this unit. Installation mainly consists of

- siting and mounting the transceiver and antenna coupler
- running interconnection cables between transceiver and coupler
- connecting a power cable to the power source
- erecting a suitable antenna and ground system
- checking the installation

Contents

Installation Guidelines

Introduction

Before beginning the installation, please read the following guidelines.

Transceiver

The transceiver should be located on the bridge, in the cabin or other suitable place where it is readily accessible and reasonably protected from water spray. Although the transceiver is splashproof, it is not designed to be used outside the cabin, directly exposed to the environment. Water (or even coffee spills!) will most assuredly damage the sensitive components inside. You should leave sufficient space at the rear of the unit to allow a service technician to get to the connectors for maintenance and servicing.

Although the LCD is quite legible in bright sunlight, keep the transceiver out of direct sunlight or at least shaded because of the heat that can build up inside the unit. It is also important to provide ventilation space behind and above the transceiver for sufficient air circulation.

The transceiver is housed in a aluminum die cast cabinet which affords excellent shielding against onboard noise. For better performance, however, keep the unit away from pulse generating equipment, computer-controlled equipment or motor-operated equipment (such as radar, echo sounder, gyrocompass, loran, satellite navigator and other navigation equipment).

Antenna coupler

The antenna coupler can be installed indoors or outdoors. For outdoor installation, be sure to select a place where it will not be exposed to salt water spray. Salt water on the antenna insulator may cause unstable operation of the coupler and may result in transmission power loss.

■ **NOTICE:** *FURUNO Electric Company will assume no responsibility for the damage caused by the exposure to salt or fresh water spray.*

Shock and vibration

The units of the FS-1502 are built to withstand possible shocks and vibrations normally experienced onboard a vessel. However, excessive and continued shock and vibration can shorten the life of the equipment. Where necessary, appropriate shock absorption measures should be taken.

Power cable length

The length of the supplied power cable is 2 meters. If extension is required, determine the proper gauge of cable to use by consulting the table below. When determining cable length, leave just enough "service loop" in the cable to allow a service technician to relocate the set without having to disconnect connectors on the rear panel. This will permit him to make adjustments on a "working" set.

This equipment requires ample current (peak 30 A at the peak of voice) to deliver full power to the antenna. Use a battery having a capacity of 130 AH or more. Keep battery terminals clean; a small amount of corrosion can markedly reduce transmission power. A liberal coat of anti-corrosion compound for battery terminals will keep the terminals corrosion-free.

Table 5-1 Power cable selection guide

Cable Length (m)	Conductor Area (mm^2)	AWG #	British SW Gauge
10	8 mm^2	#8	#10
15	12 mm^2	#6	#10
20	16 mm^2	#5	#6

Typical Installation

The figure below shows a typical installation using a long wire antenna.

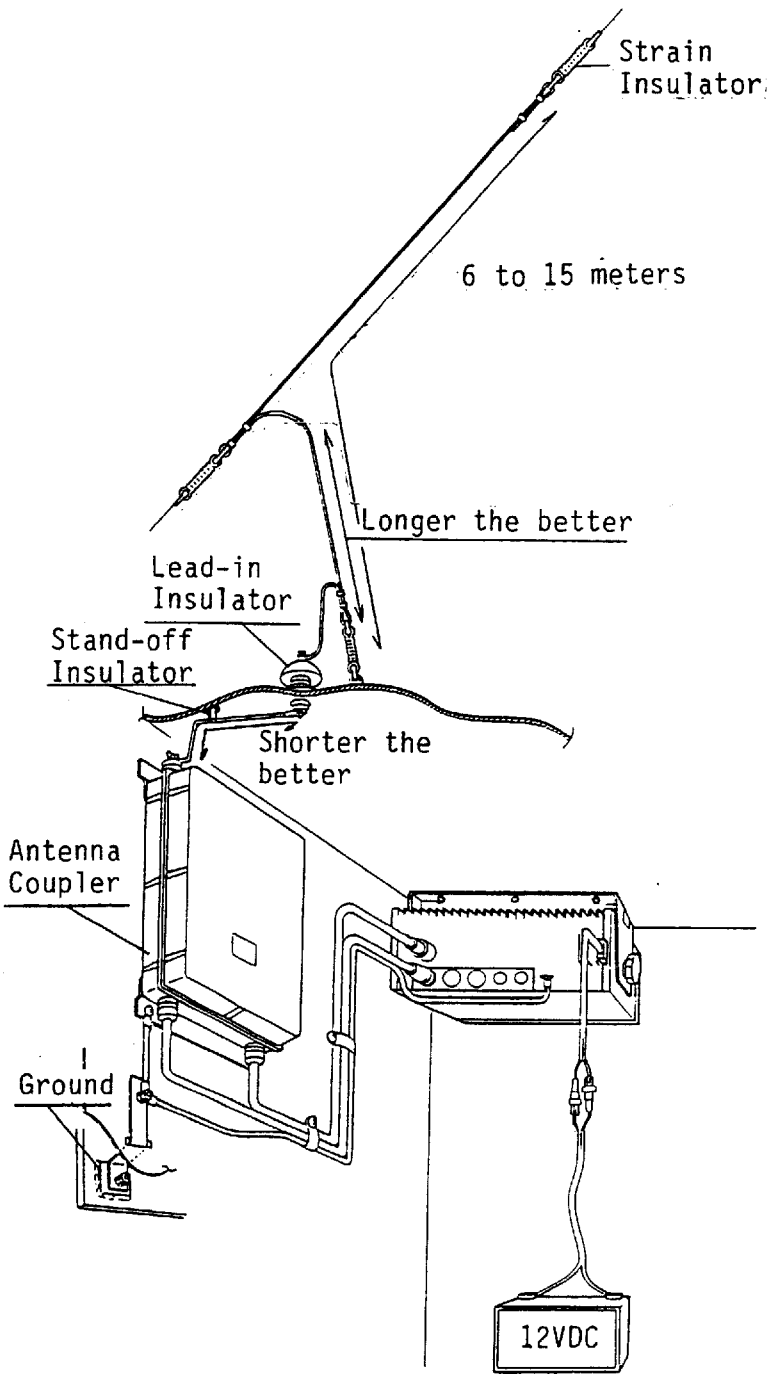


Figure 5-1 Typical installation using long wire antenna

The Antenna

Introduction

The antenna plays the most important role in radio communication. If it cannot receive or transmit effectively because of improper installation, even the most sophisticated transceiver will be rendered useless.

There are various types of SSB antennas. The most commonly used are a long wire and a whip. (A doublet antenna is often used for land installations.) Whatever antenna is to be used, the antenna coupler can tune a long wire or whip whose total length is 6 to 15 meters (19.6 to 49.2 feet). Although a longer antenna is preferable when the radio is operated only on low frequencies, use this size of antenna to ensure stable automatic tuning on all bands.

A long wire antenna is inexpensive and in general provides better performance than a whip antenna, provided the vertical part is long enough.

A whip antenna is easier than a long wire antenna to install and provides good overall coverage of most SSB frequencies. In fact, if you don't plan to venture more than 500 miles from shore and the ground system is excellent, a simple 7m (23 feet) whip antenna will probably suffice. A whip is installed as high as possible (though height is not so critical as with VHF since SSB is frequency dependent, not range dependent), away from any nearby objects.

■ **WARNING:** *Touching a transmitting SSB antenna can cause severe burn or shock.*

Long wire antenna

Ship station

On ship stations, the long wire antenna is spanned between supporting structures. The length of the horizontal wire should be between 7 and 15 meters. And the length of the vertical wire should be no less than 5 meters, the longer the better transmission. Figure 5-2 shows a typical long wire antenna installation on a fishing boat.

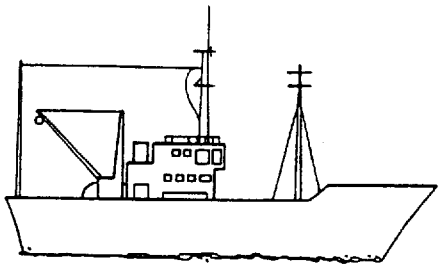


Figure 5-2 Typical long wire antenna installation on fishing boat

Sailboat

On sailboats, the long wire antenna is mounted on the backstay using special high-voltage insulators. Make sure the selected location is sufficiently apart from any metal riggings which might cause detuning. If a wire topping lift is used with an insulated backstay, special care must be taken to ensure the topping lift does not get caught in the backstay since the antenna may be shorted to ground – damaging the transmitter.

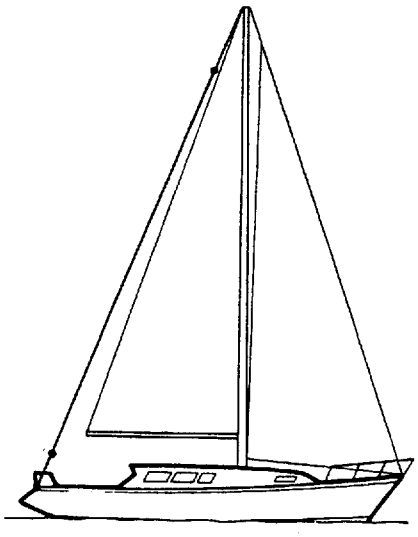


Figure 5-3 Typical long wire antenna installation on sailboat

Whip antenna

Fishing boat/sailboat

For whip antenna installation on a fishing boat or sailboat, the mounting location must be chosen carefully so as not to interfere with vessel operation. In case of a sailboat, locate the antenna away from the spinnaker, jib and of course the boom. Stay especially clear of the backstay. The taffrail is a good location in the event of dismasting, since the antenna won't be carried away. The best location, however, is atop the mast, the higher the better for effective communication. It is always a good idea to keep spare wire or an emergency antenna onboard in case of an emergency.

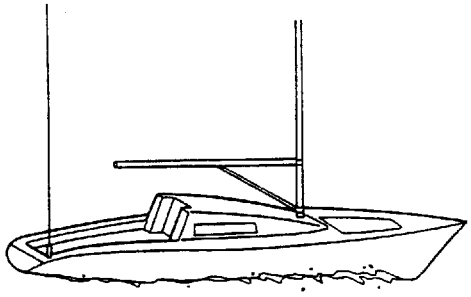


Figure 5-4 Typical whip antenna installation on sailboat

Power boats

On power boats, selection of a mounting location for a whip antenna is much easier, since there is no mast or deck fixture to worry about. A whip antenna can be installed almost anywhere, again the higher the better. If your boat has a flybridge, install it there. If not, install it atop the cabin. Make sure the mounting location is sufficiently apart from any nearby objects which might affect communication.

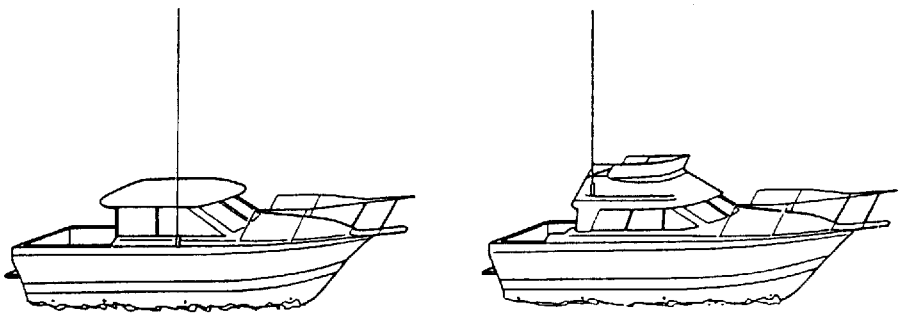


Figure 5-5 Whip antenna installation on power boats

Vehicles

For vehicles, the whip antenna should be a 2.5 to 3 meters plain whip antenna (local supply). Install it on the bumper or a support arm bolted or welded to the vehicle's chassis. The antenna coupler should be installed as near as possible to the base of the whip antenna.

Ensure the mounting place is strong enough to support the antenna under conditions of continued vehicle movement. DO NOT install the antenna near the engine because of engine noise. If the engine is computer controlled, ensure that the transmitting wave does not interfere with the control system for engine control.

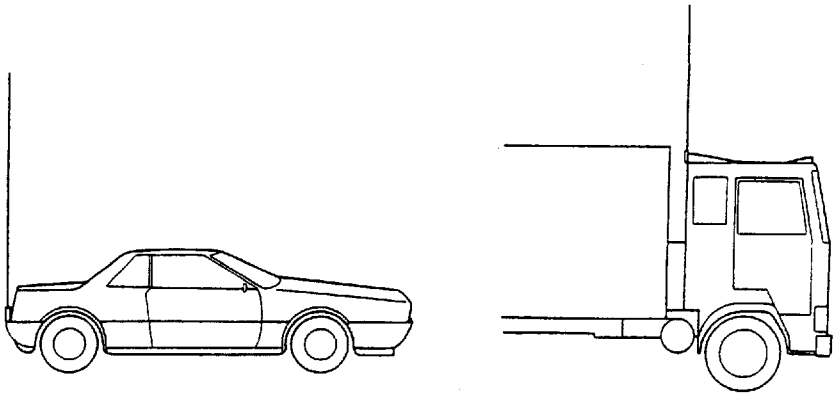


Figure 5-6 Whip antenna installation on vehicles

Doublet antenna

If the unit is to be operated as a land station, and you don't need many frequencies, then you can use a doublet antenna. (In this case, the antenna coupler is not necessary.) This antenna is simple to extend and very effective, but note that the number of antennas must be equal to the number of working frequencies used. For this reason the use of a doublet antenna may not be practical if you're going to set up for multi-frequency operation, since many antennas will be required and switching among them may be troublesome when a frequency is changed.

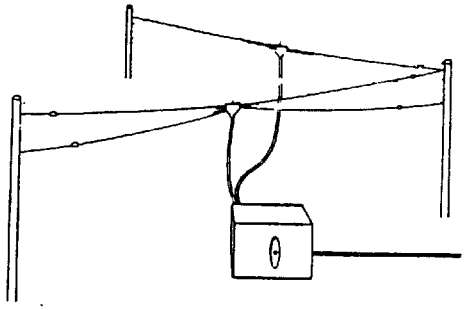


Figure 5-7 Typical land station wire antenna installation

Installation of Ground System

Introduction

A good antenna can work well only when it is connected to an efficient rf ground. Without a good ground system, the full potential of this radio cannot be realized.

■ **WARNING:** *Lack of ground connection or a long ground lead may allow the antenna coupler fixture to reach a high rf voltage with respect to ground, resulting in a safety hazard.*

Ground for metallic hull

Providing a good ground for a metallic hull is quite simple, since the structure itself makes a good ground. A simple yet reliable method is;

1. Drill a hole through the mounting location.
2. Sand the mounting location clean.
3. Weld (or bolt) bolt to the mounting location. If the antenna coupler is fitted to a metallic mast and the ship's hull is metallic, the grounding bolt may be brazed there.

■ **NOTE:** *The length of the supplied ground wire is 2 m; however, for better performance, we recommend that its length be no more than a few inches. If a longer length is necessary use a copper strap instead.*

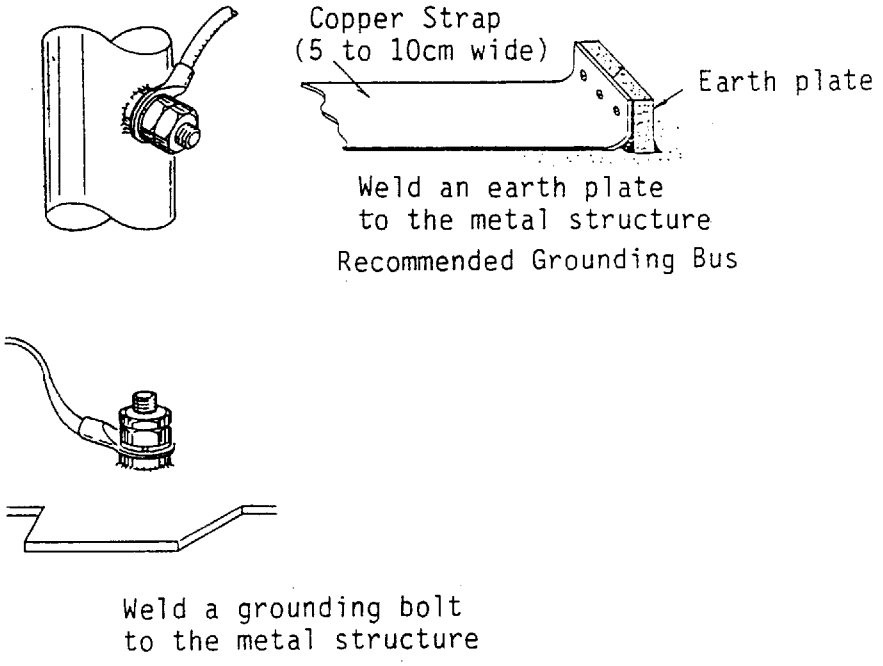


Figure 5-8 Recommended ground for metallic hull

Ground for non-metallic hull

Providing a good ground system for a wood or fiberglass hull is more difficult because of their poor electrical conductivity. There are two methods for establishing a ground system:

- Laminating bronze mesh screen into the inside of the hull.
- Bonding together almost everything metal with wide thin-gauge copper strap.

Which method should be used depends on the construction, size and design of the boat. In some cases both methods may be required.

For some boat owners, the former method may have been done for you since some boats have bronze mesh built into their hulls. The bronze mesh screen makes a non-metallic hull perform as if it were metallic.

A large area of bronze mesh can be laminated into the hull and connected to the ground terminal on the coupler. Bronze windowscreen works quite well and is readily available. Use a minimum of 100 square feet. Bond the screen to the inside of the hull and solder all connections. Gather a large section of the screen and fix it to the ground terminal on the antenna coupler. The screen should be painted, varnished or enameled to protect it from weather.

In many cases bronze screening alone can provide an efficient ground if an adequate amount can be laid and it interacts well with the radio. If the ground is poor, however, additional grounding with copper straps is necessary.

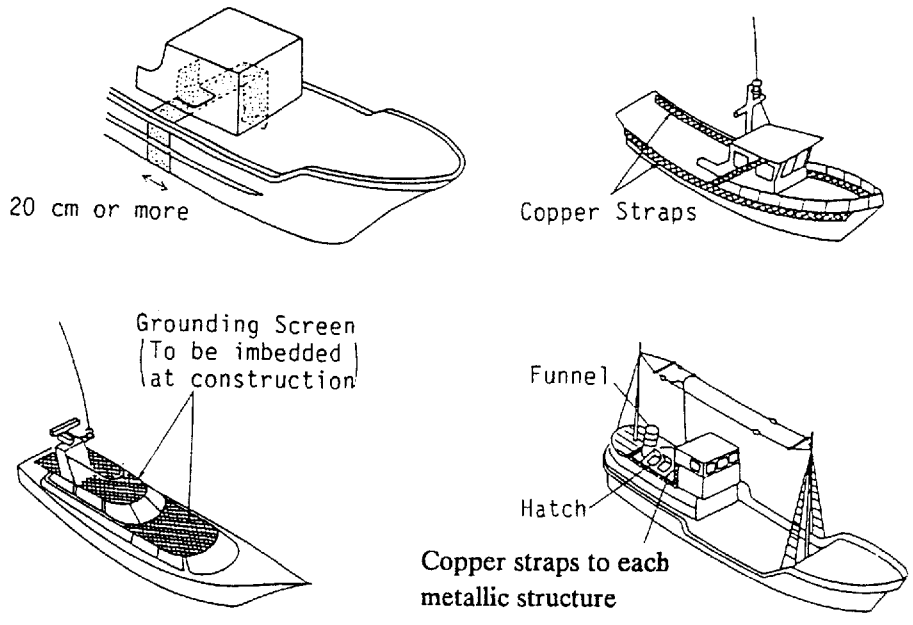


Figure 5-9 Recommended ground for non-metallic hulls

Anything metal—engines, keel, handrail, fuel and water tanks, pumps, etc.—should be tightly bonded together with 3 to 4 inch wide thin-gauge copper strap. The amount of copper strap to be used depends on the size of the boat, however a minimum of 9 square feet is recommended. Wide strips of copper strap run fore and aft and bonded to the rest of the bonding system are generally necessary as well. Make joints to straps by soldering. Tin all surfaces before soldering and check for signs of a "dry joint" afterwards.

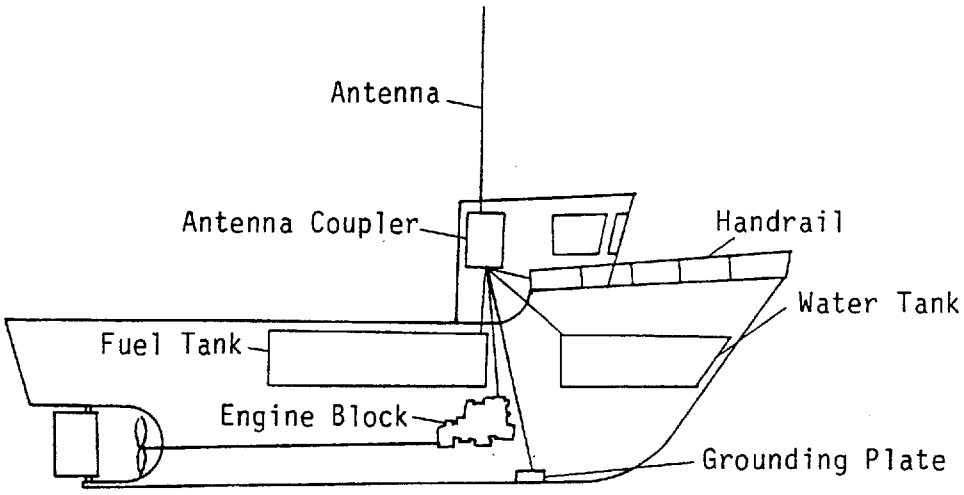


Figure 5-10 Recommended ground for ship's metallic structures

Ground for vehicles

For land vehicles ground the antenna coupler and the transceiver to the chassis. The ground lead should be less than 1 meter long. Remove paint at grounding points to provide good contact. Securely connect the ground terminal of the coupler to the grounding points with heavy wire.

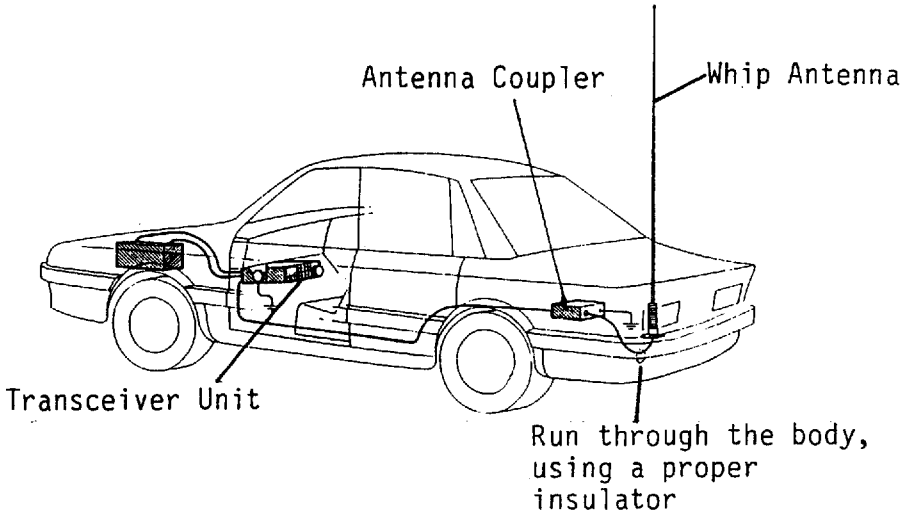


Figure 5-11 Recommended ground for vehicles

Ground for land stations

For most doublet antenna installations, a ground system is not required because of the working principle of the antenna. However, be sure to ground the transceiver unit for protection against lightning.

Installation of Antenna Coupler

Mounting location

The antenna coupler is installed between the antenna and the transceiver, and tunes the antenna to the transmitter.

The splashproof construction of the antenna coupler permits installation either indoors or outdoors. When selecting a location, keep in mind the following points, in addition to those outlined at the beginning of this chapter.

- All wires from the coupler to the antenna radiate radio energy. Keep wires as short as possible and routed away from any grounded conductors such as lifelines, mast shrouds, or fittings.
- For optimum radio energy, locate the coupler close to the antenna base and as near to the ground as possible.
- Although the unit is splashproof, it is not designed to take a continual soaking. If necessary, cover the top and sides with a wooden housing or by sealing any opening in the top or sides with silicone sealant.
- Select a place where the unit can be easily maintained, but where it will not interfere with crew or passengers.

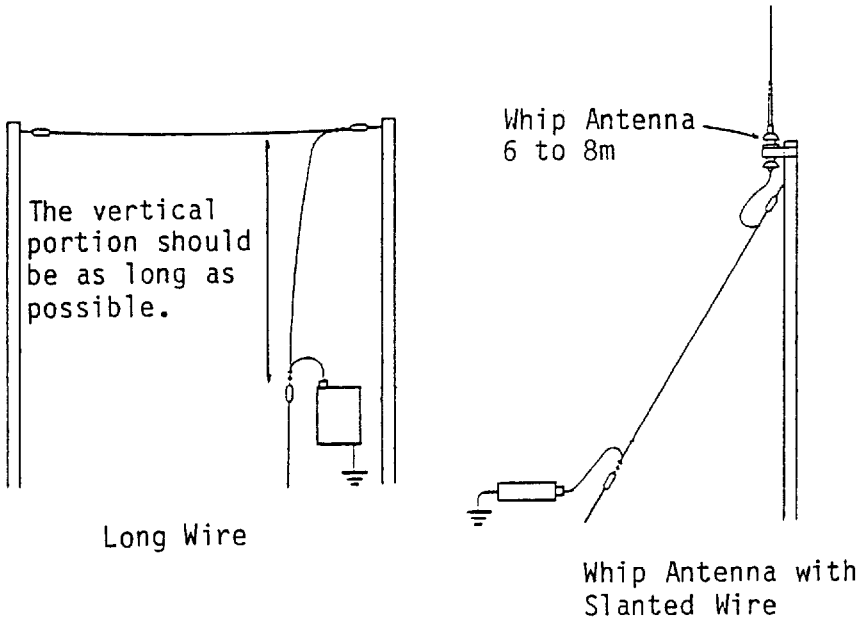


Figure 5-12 Installation of antenna and antenna coupler (1)

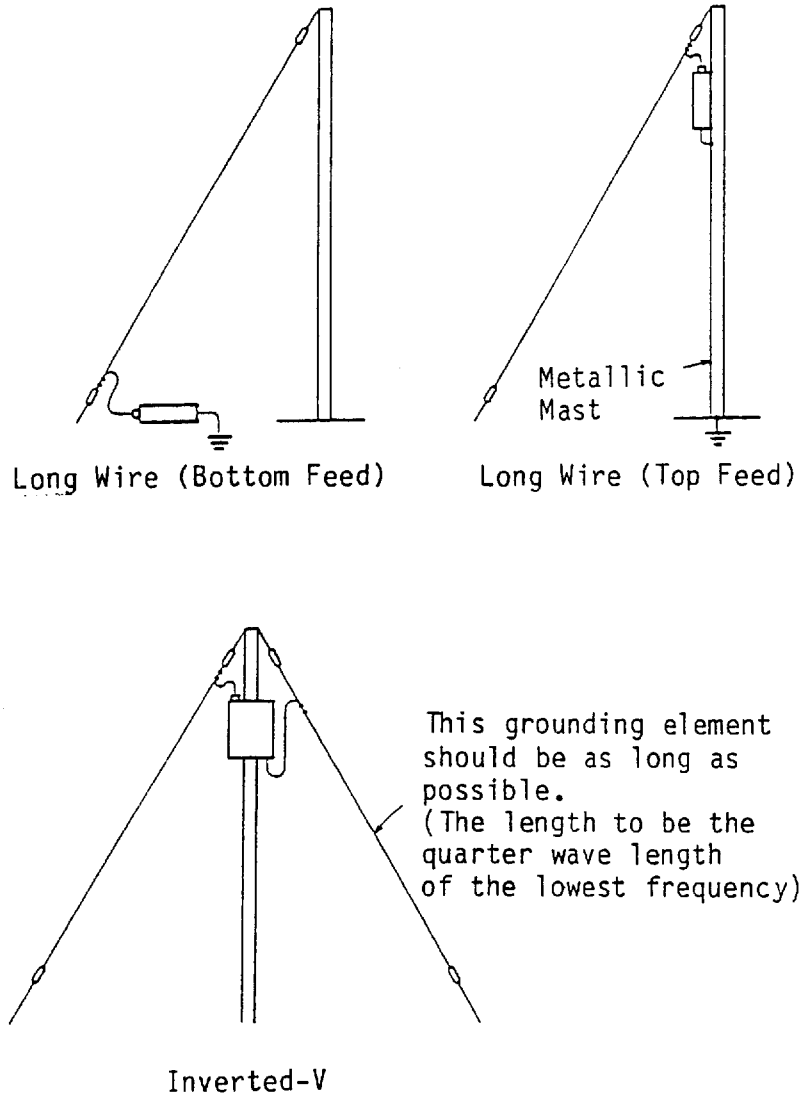


Figure 5-13 Installation of antenna and antenna coupler (2)

Mounting

The antenna coupler can be fixed to the floor, bulkhead, on the ceiling or mast. For mounting on the bulkhead, floor or ceiling, fix the coupler with either tapping screws or M6 bolts and nuts. For mounting on the mast, use two U-bolts (optional supply).

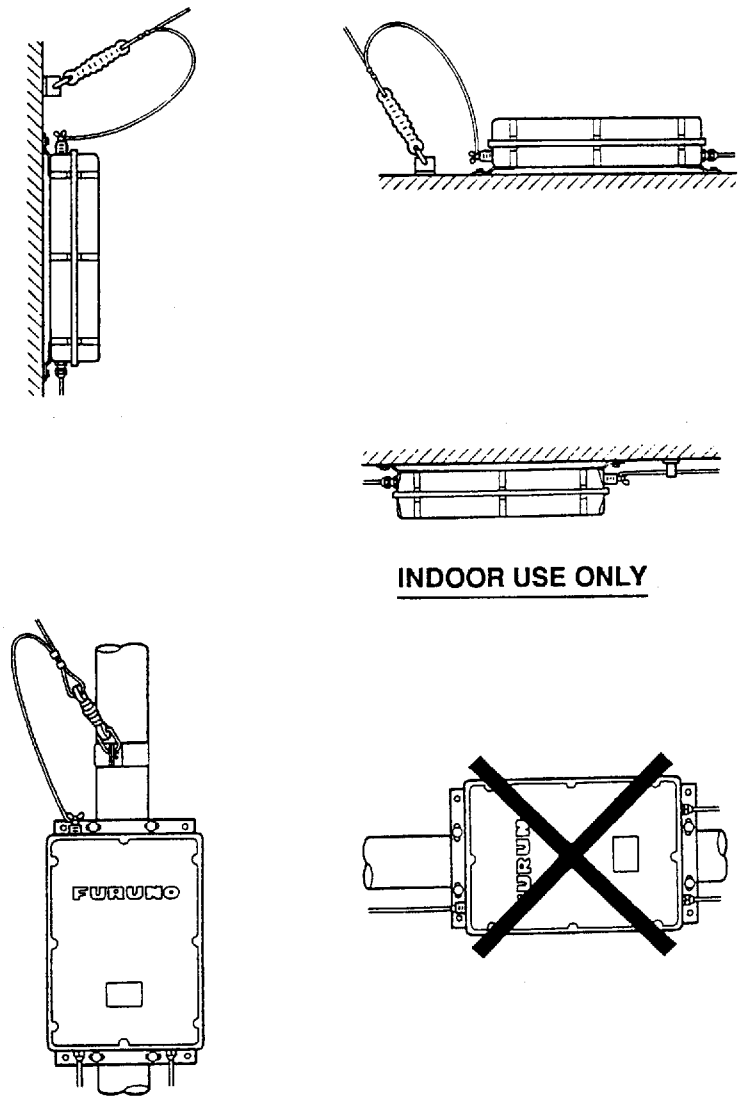


Figure 5-14 Typical antenna coupler installations

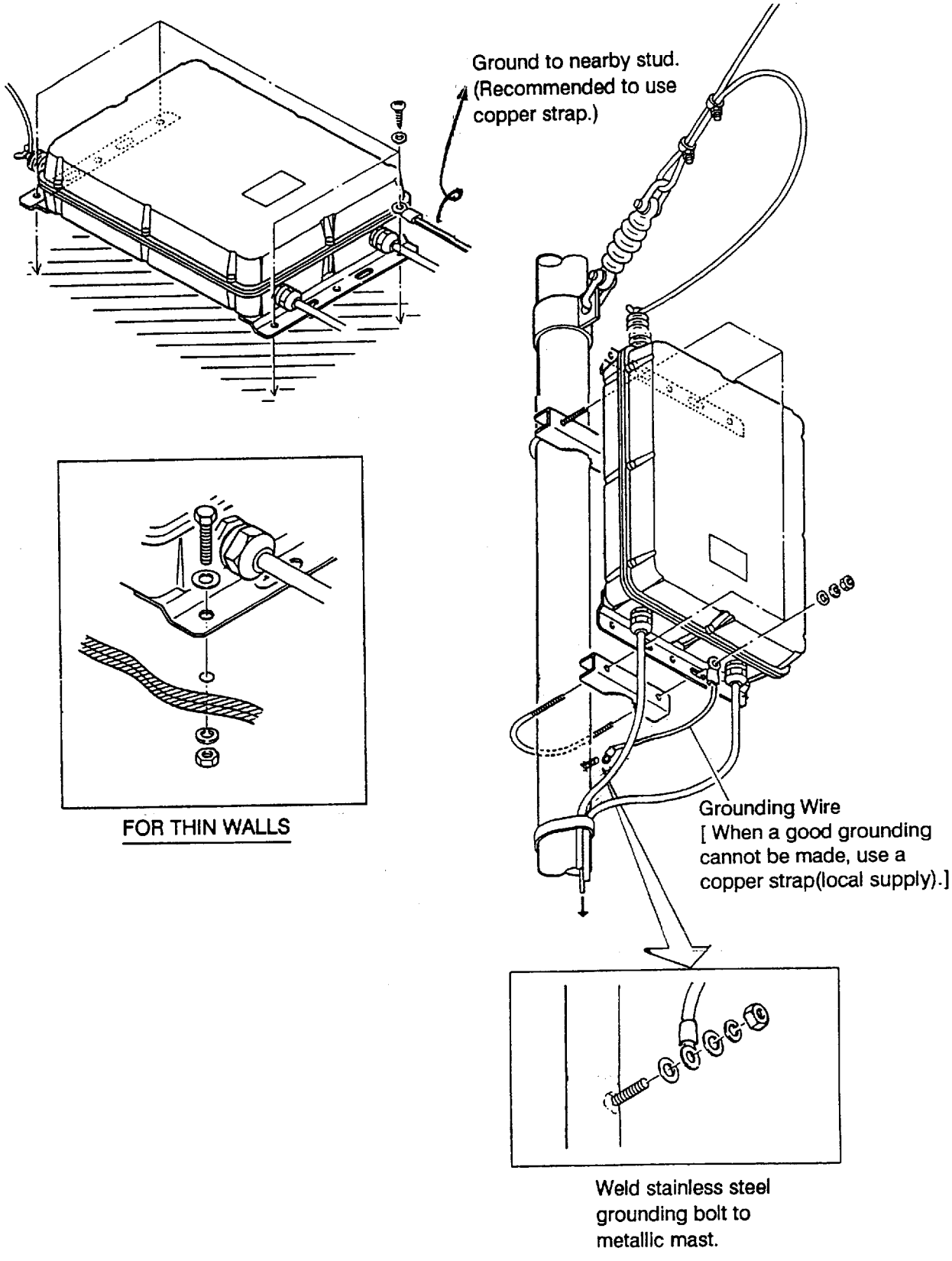


Figure 5-15 Installing the antenna coupler

Anti-moisture measure

Ventilation must be provided to prevent moisture from being drawn into the enclosure during atmospheric pressure changes and to allow trapped humid air to escape. Two vent holes are provided on the unit (see Figure 5-16), one at the rear and one at the bottom, and bottom vent hole B should be mounted a vent tube at factory. The vent tube should be mounted according to the installation direction. If the coupler is installed horizontally, remove screw A and mount the vent tube removed from vent hole B to vent hole A. The screw is remounted to vent hole B. *These measures should be done before mounting the unit.*

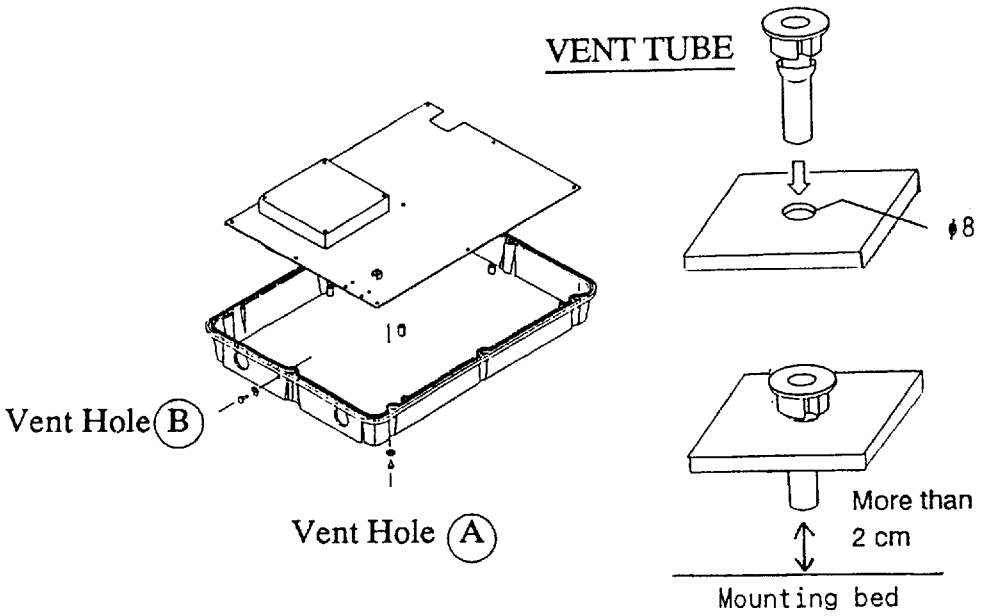


Figure 5-16 Location of vent holes and vent tube

■ **NOTE:** *How to fix vent tube.*

1. *Dismount the p.c. board.*
2. *Insert the vent tube from inside of the coupler.*
3. *Mount the p.c. board.*
4. *Before fixing the coupler, confirm that the space between mounting bed of antenna coupler and the tip of the tube is at least 2 cm. If not, water may leak into the coupler.*

Ground

Connect the ground wire to the EARTH terminal (stainless steel fixture) on the antenna coupler. If the distance to the earth location is more than a few inches make the connection with a copper strap instead of the ground wire.

THE NEED FOR PROPER GROUND CANNOT BE OVER-STRESSED; EVEN THE MOST EXPENSIVE ANTENNA WILL NOT WORK WITHOUT A PROPER GROUND.

Connections

The antenna is connected to the antenna terminal on the antenna coupler. For long wire antennas, connect a lead-in wire between the strain insulator and the antenna terminal to relieve the strain insulator of mechanical stress. A whip antenna should be connected to the coupler with up to one foot of heavy wire. In either case, ensure the lead-in wire is kept well away from any nearby objects.

When the antenna coupler is installed inside, keep the length of the lead-in wire as short as possible and run it through a high quality lead-in insulator (see Figure 5-18).

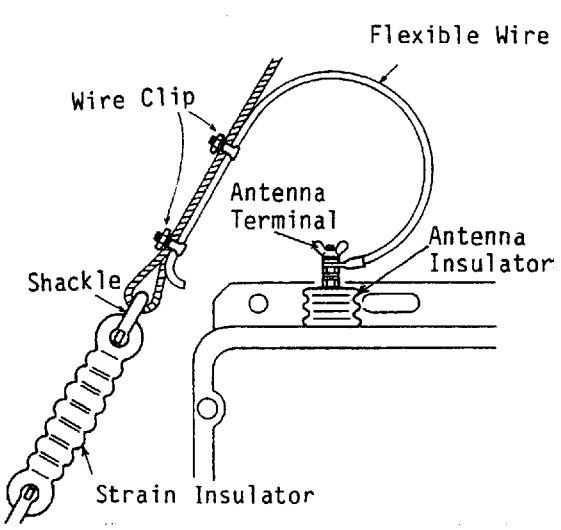


Figure 5-17 Connection of antenna terminal

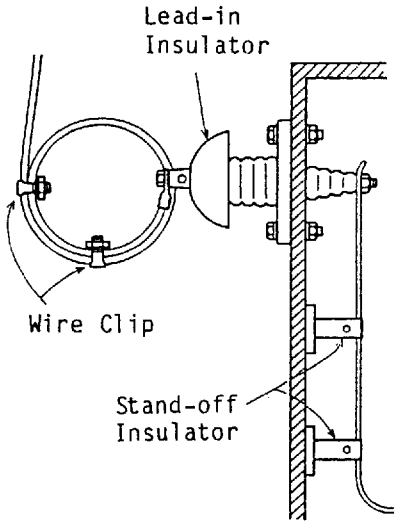


Figure 5-18 Antenna feed-thru using a lead-in insulator

■ **WARNING:** *High rf voltage which can shock or burn may exist at the antenna and lead-in wire of some antennas. Excellent rf insulation from the antenna must be maintained and an appropriate warning sign posted wherever anyone may accidentally contact with the antenna wire or lead-in insulator.*

Installation of Transceiver

Mounting location

The hanger (supplied) permits installation on the overhead, a bulkhead, or on a tabletop. A flush mounting kit is optionally available for mounting the unit in a panel. Mounting dimensions of this unit appear in the outline drawing on the next page.

When selecting a mounting location;

- Make sure the selected location is strong enough to support the unit under the conditions of continued vibration and shock normally encountered on the boat.
- Where necessary, reinforce the mounting location by lining block or doubling plate.
- Locate the unit where it is easily accessible and does not interfere with personnel or operation of other equipment; for example, ship's wheel.
- For hanger mounting, be sure to leave enough space around the sides and rear of the unit so a service technician can access the connectors for maintenance.

Hanger mounting

To mount the transceiver using the hanger;

1. Using the hanger as a template, mark hole locations.
2. Fix the hanger with self-tapping screws (supplied). (If extra support is required, drill six pilot holes and use bolts, nuts and washers instead of the tapping screws.)
3. Set the transceiver to the hanger and fix it with the washers and knobs.

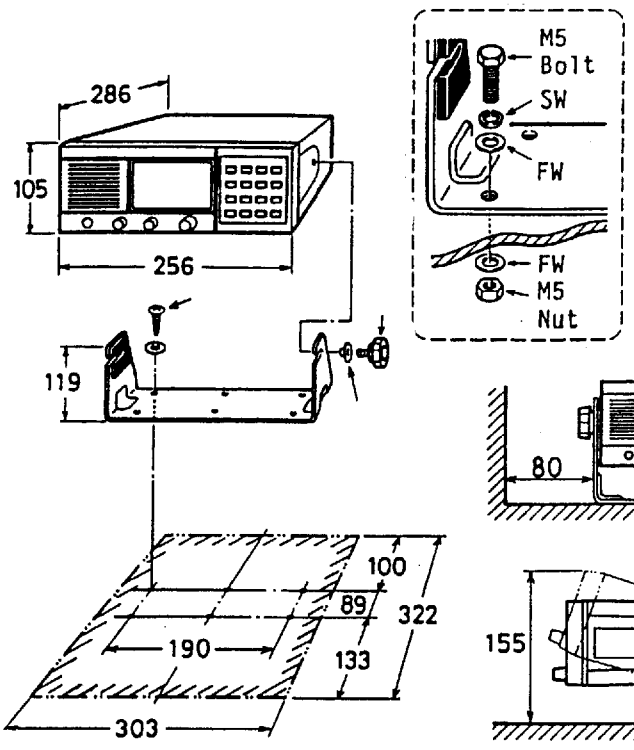


Figure 5-19 Installing transceiver

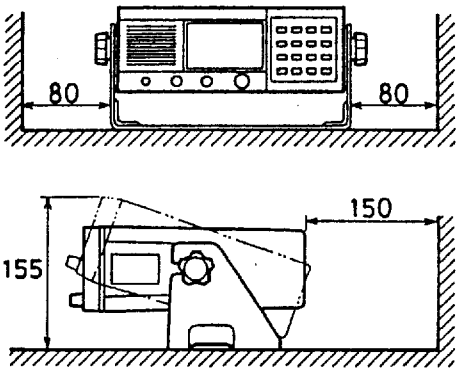


Figure 5-20 Service clearance

Flush Mounting

For fixing, observe the following mounting guidelines.

- The mounting location should be strong enough to support the weight of the unit. If necessary, fix the unit to a suitable doubling plate.
- Select a place where the LCD can be easily viewed, keeping in mind that the LCD viewing angle is as shown in Figure 5-21.

This method does not require any additional kit. However, the mounting dimensions must be accurate since the hanger also is installed.

Prepare a cutout in the mounting location as shown in Figure 5-21.

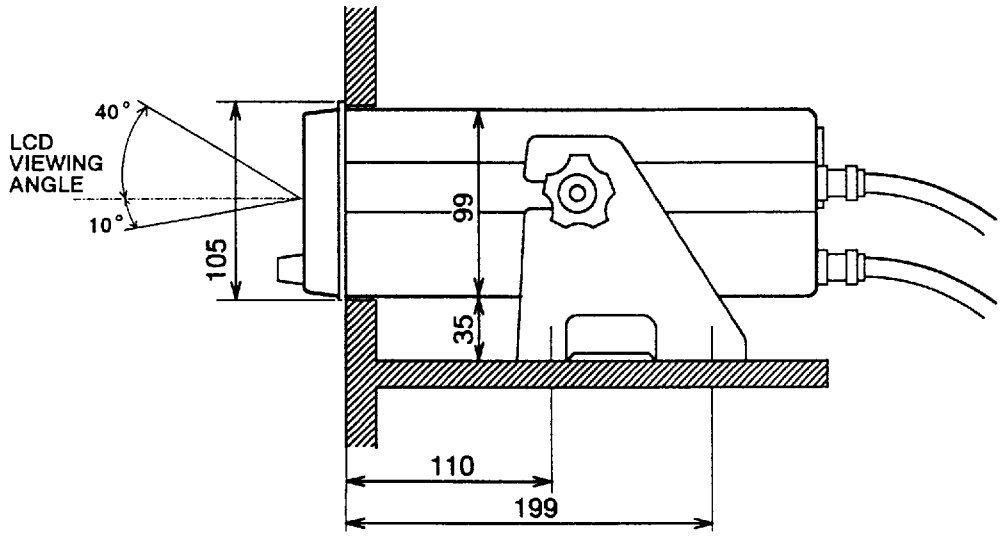


Figure 5-21 Mounting dimensions for semi-flush mount

■ **NOTE:** *The flush mount kit for the FS-1500 Series SSB and FM-7000 VHF Radiotelephone cannot be used for this model.*

Connections

The table below describes the connectors on the transceiver. For complete wiring information see pages D-3 and S-1.

Table 5-2 Description of connectors

Connector	Function	Pin No. & Description (see NOTE 1)	
MIC (front panel)	Connects microphone.	1. 0V	Connected to ground.
		2. PTT	Gets transceiver ready to transmit.
		3. MIC(+)	Path for microphone.
		4. MIC(-)	Same as above.
		5. PHONE	Audio freq. output for handset.
		6. +15V	Not used.
ANT	Connects antenna.		
13.6 VDC	Connects power supply.	1. RED(+)	
		2. RED(+)	
		3. BLK(-)	
		4. BLK(-)	
SPKR	Connects external speaker.		
GND	Connects ground wire.		
CONTROL (option)	Connects BK (Break-in) control line.	1. GND	Transmit Data.
		2. ALARM OUT(H)	For crypto device.
		3. ALARM OUT(C)	Same as above.
		4. $\overline{\text{TX KEYED}}$	Gets 0V during transmission.
		5. $\overline{\text{RX MUTE}}$	Receiver muted while this line is 0V.
		6. BK12/24V(+)	BK relay drive power supply (12V).
		7. BK12/24V(-)	Same as above.
REMOTE (option)	Connects telex terminal/ remote station/ distributor/ DSC terminal.	1.TXD-H	Transmit Data.
		2. TXD-C	Same as above.
		3. RXD-H	Receive Data.
		4. RXD-C	Same as above.
		5. F-GND	Grounded to chassis.
		6. +15V	+15V for remote station.
		7. NC	No connection.
		8. NC	Same as above.
		9. S-GND	Grounded to 0V line.
		10. LINE OUT-H	0 dB/600 ohms audio output.
		11. LINE OUT-C	Same as above.
		12. LINE IN-H	0 dB/600 ohms audio input.
		13. LINE IN-C	Same as above.
		14. $\overline{\text{TX KEYED}}$	Gets transceiver ready to transmit.
		15. $\overline{\text{RX MUTE}}$	Receiver muted while this line is 0V.
		16. NC	No connection.
COUPLER	Connects antenna coupler.	1. +15V(RED)	+15 V for antenna coupler.
		2. 0V(BLK)	Return line of +15V.
		3. TUNE(ORG)	Signal to start tuning.
		4. BUSY(YEL)	Signal to indicate tuning in process.
		5. IANT(GRN)	Not used.
		6. THRU(BLU)	Bypassing the coupler. ("Bypass" is made when coupler cannot be tuned.)

■ **NOTE 1:** *Pin number read from solder side of plug.*

■ **NOTE 2:** *If a resonant antenna like a doublet antenna is used without an antenna coupler, set system setting 9911 for "1" (prohibited).*

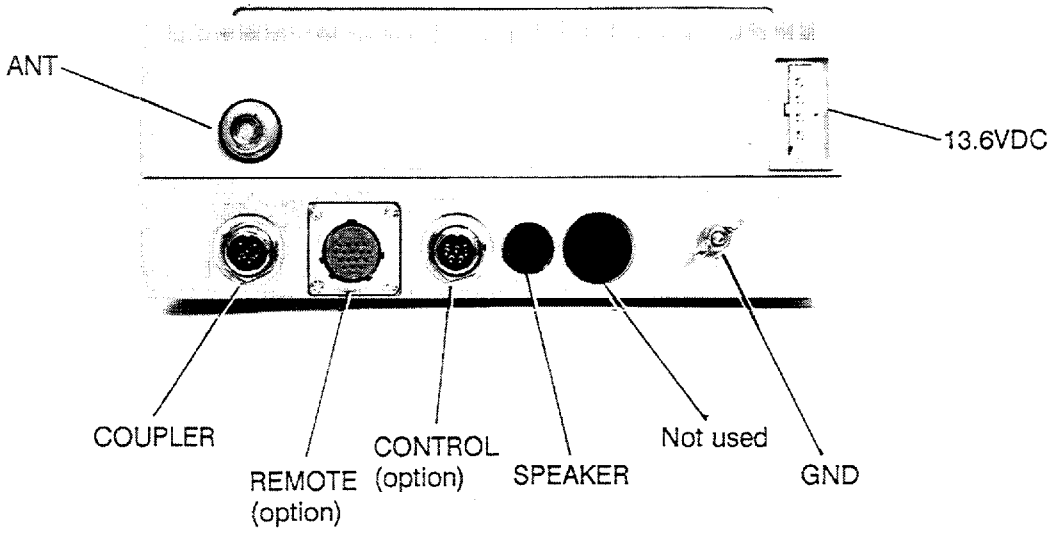


Figure 5-22 Rear view of transceiver

Connection of System

A control cable and 50 ohm coaxial cable connect the transceiver with the antenna coupler. A 10 meter control cable is supplied, however length is not critical; longer cables are optionally supplied. Note that not only the supplied cable but any other cable that satisfies the specifications listed in the table in APPENDIX A may be used. The length of cables should be determined considering future maintenance. Connect wires to the clipper terminal in the antenna coupler with the terminal opener, contained inside the coupler. For wiring connection inside the coupler see the next page.

To prevent noise interference;

- Separate 450 mm or more from the cables of pulse generating equipment (for example, radar, echo sounder) and SCR controlled equipment.
- Separate 50 mm or more from other general power cables; for example, cables of electric lights.

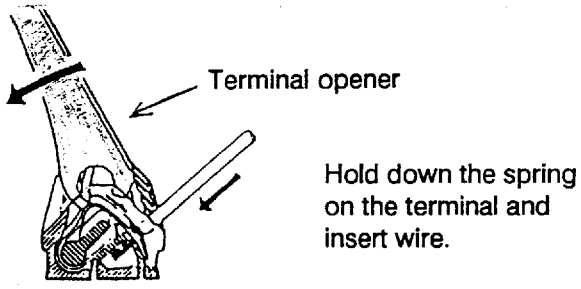
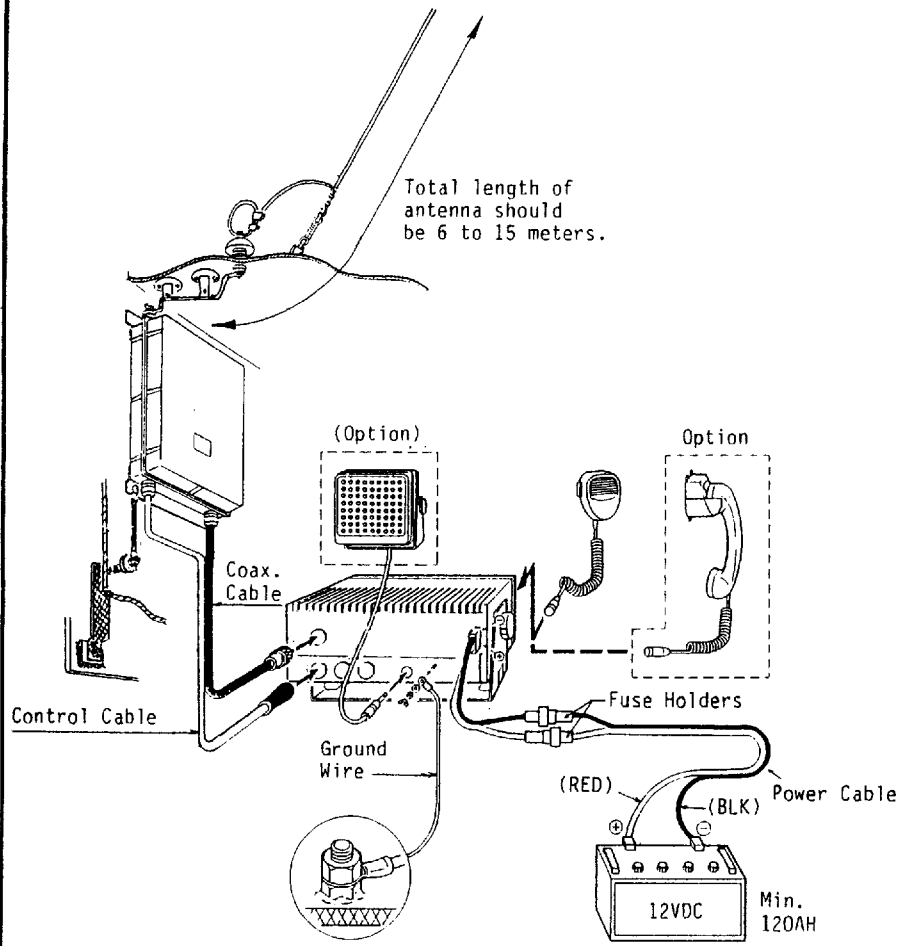
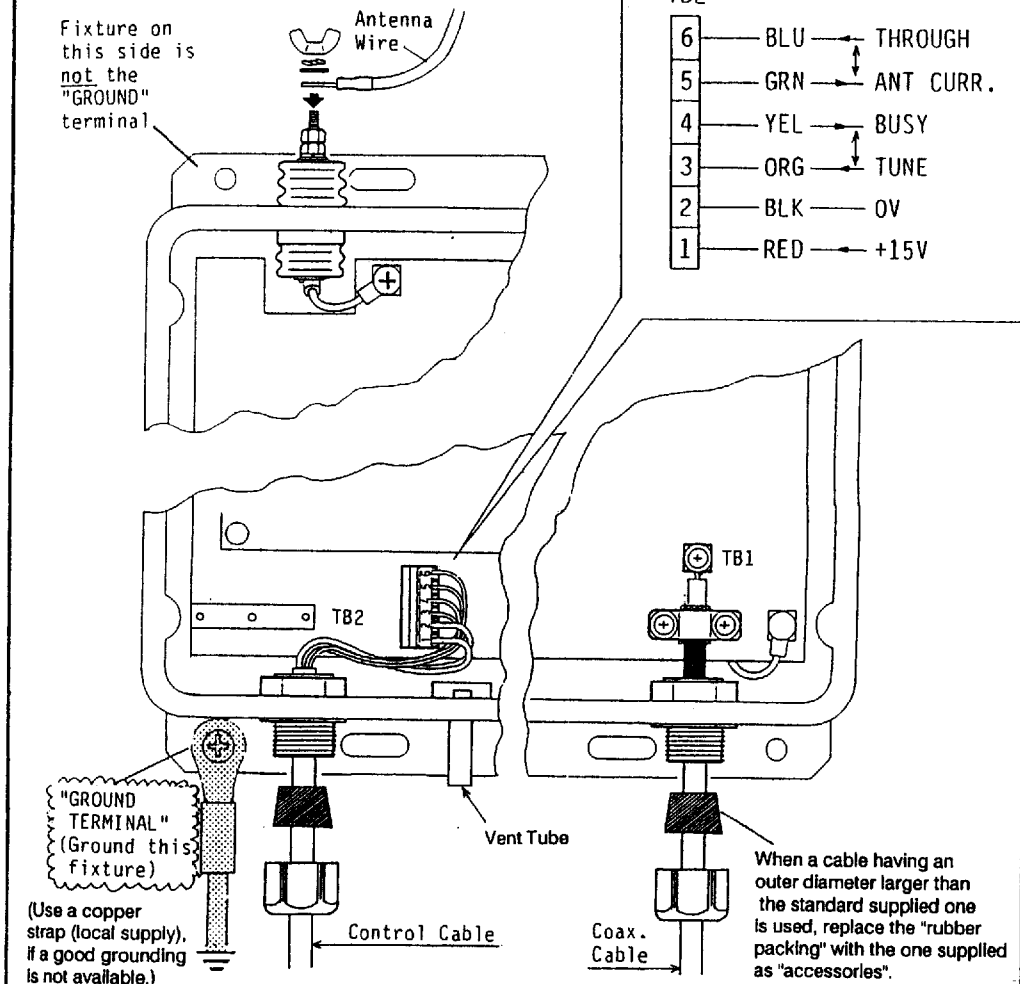
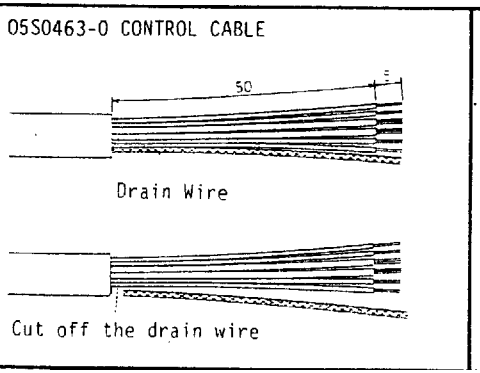
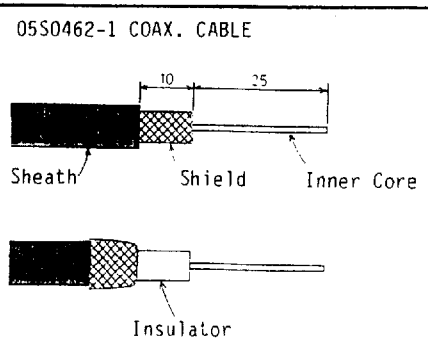


Figure 5-23 Using the terminal opener









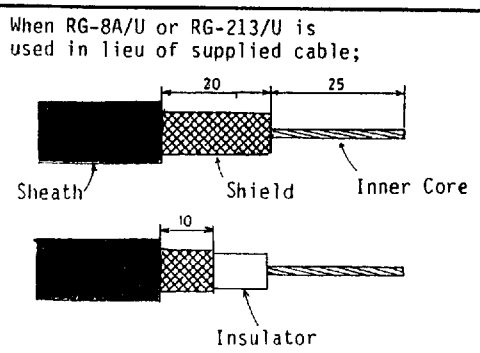


Figure 5-24 Connections

WIRING GUIDE FOR
FS-1502
SSB RADIOTELEPHONE

Installation of Optional Equipment

Telex terminal (NBDP terminal)

For better radiotelex communication performance we recommend the FURUNO DP-5 NBDP (Narrow Band Direct Printing) Terminal. The DP-5 offers remote control operation by the FS-1502, providing ease of operation. Further, its advanced TX-RX switching circuitry gives you up to 7,500 km communication range in the ARQ mode.

The figure below shows how to connect the FS-1502 to the DP-5.

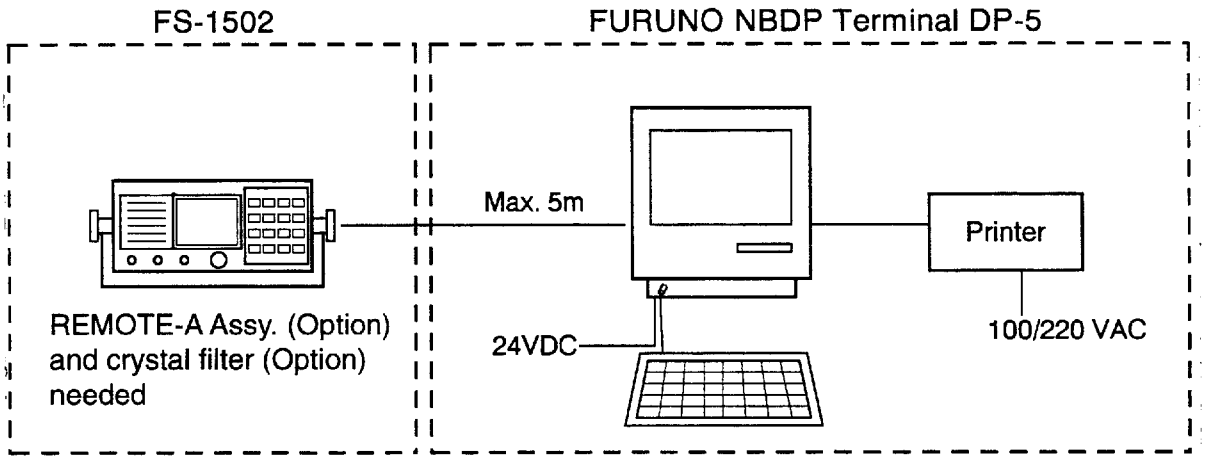
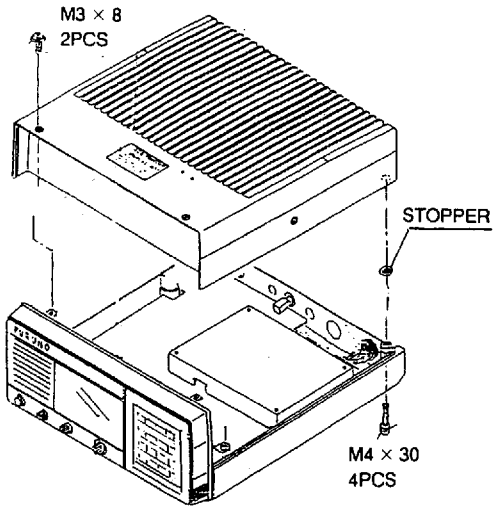


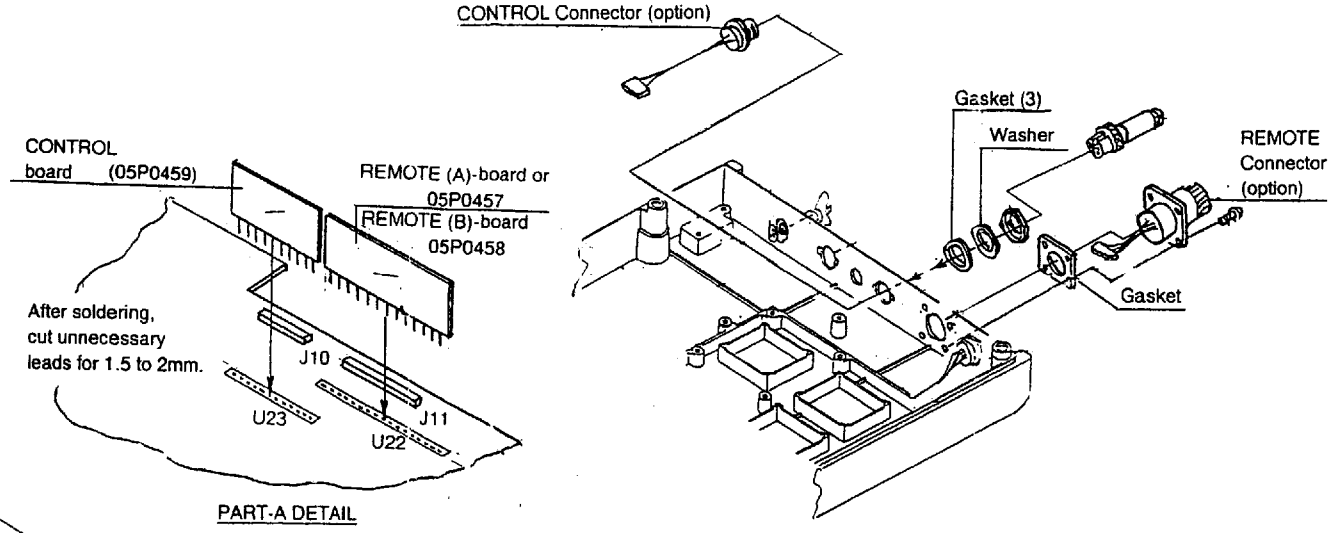
Figure 5-25 How to connect the FS-1502 to the DP-5

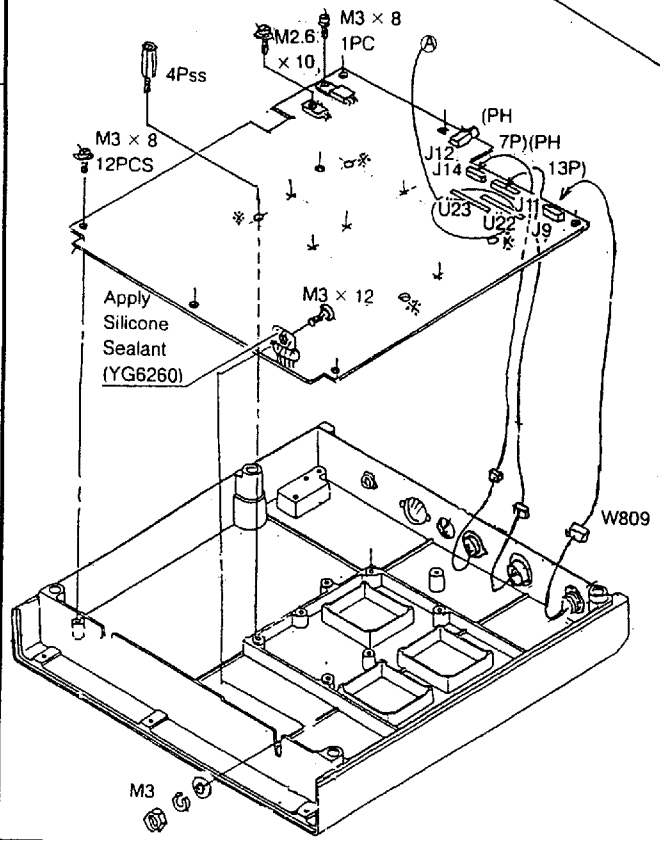
■ **NOTE:** *Early models of the FURUNO FS-1500 series SSB radiotelephone are compatible with the "T-BUS" communication system used by the Thrane-Thrane Model 1600 Telex Terminal system. The FS-1502, however, is not.*

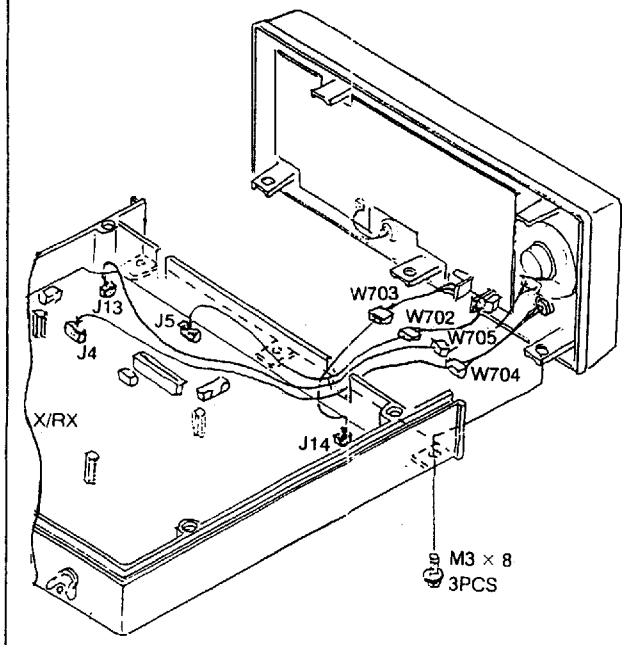
Technically speaking, any make of Telex terminal could be connected. However, the FS-1502 communicates by RS-232C level format, using FURUNO's unique MIF data. Thus we recommend the DP-5 since it shares the same data communication system with the FS-1502.

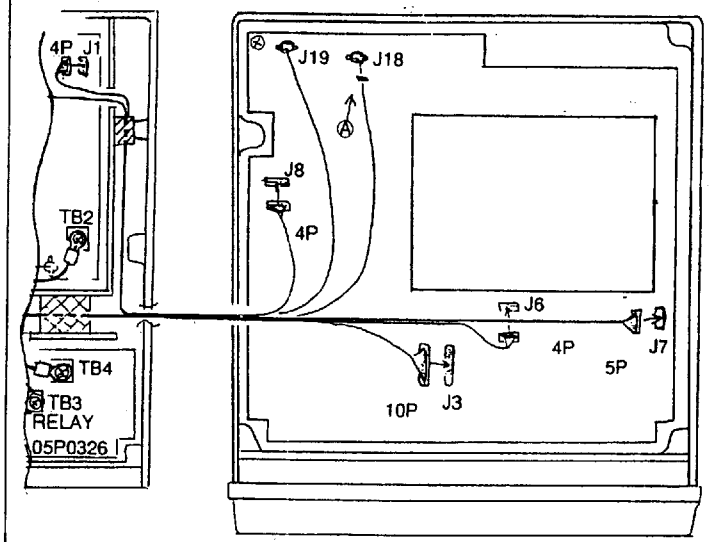
FURUNO











承認 APPROVED		名称 TITLE GUIDE FOR FIXING REMOTE/CONTROL BOARD AND CONNECTOR
検図 CHECKED		
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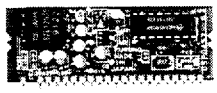
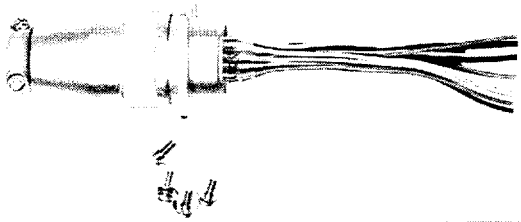
Required parts

To connect the FS-1502 to the DP-5 you will need the REMOTE-A Assy. (Type, OP05-39; Code No. 005-920-310), which consists of

Table 5-1 REMOTE Assembly

Name	Type	Code No.	Figure
REMOTE-A Board (RS-232C Board)	05P0457	005-517-480	
Connector Assy.	05S0845	000-125-318	

Installation of REMOTE-A assy.

1. Remove the transceiver cover.
2. Disconnect connectors on the TX/RX Board and then dismount the board.
3. Solder the REMOTE-A Board to U22 on the TX/RX Board as shown in Figure 5-26.

■ **NOTE:** *If the TX/RX Board no. is 05P0455-1, cut off the far left-hand side pin (anti-mismount pin) on the REMOTE-A Board.*

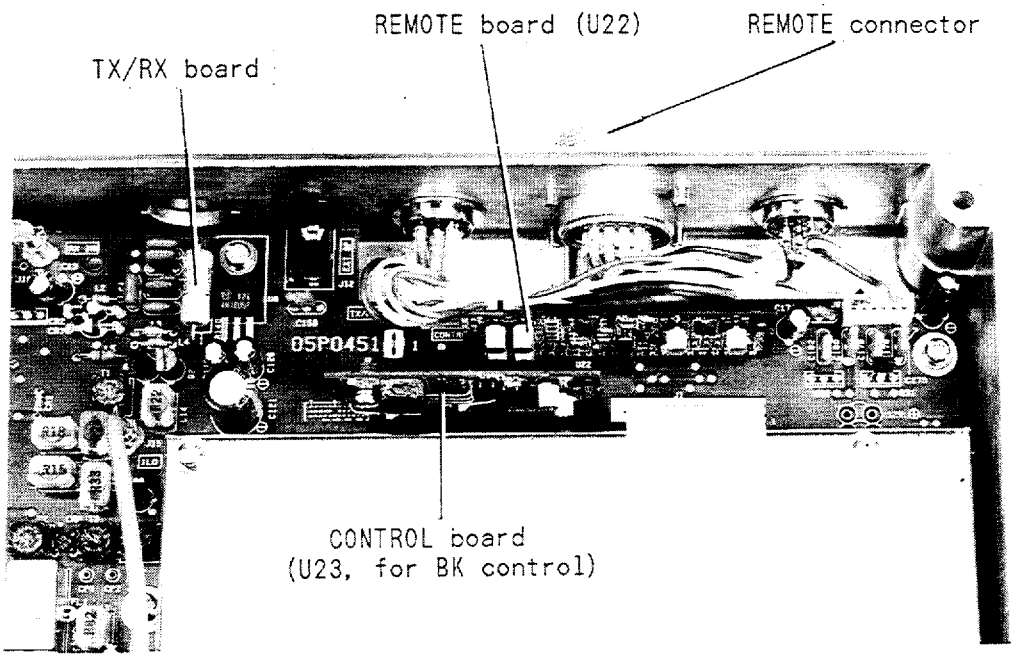


Figure 5-26 REMOTE board on TX/RX board

4. Peel off the seal covering the REMOTE connector at the rear of the transceiver; and then fix the connector assembly to the connector.
5. Mount the TX/RX Board.
6. Reconnect the connectors of the TX/RX Board.
7. Connect the REMOTE connector to J11 on the TX/RX Board.
8. Reinstall the cover.

Connection of the DP-5

The DP-5 optionally supplies a connection cable (13 pair, length: 1, 3, 5 m) with (or without) connectors.

For the cable with no connectors, attach the SRCN connector supplied with the FS-1502.

And for the cable with connector, cut off the D-sub connector (cable end marked with "B") and attach the SRCN connector.

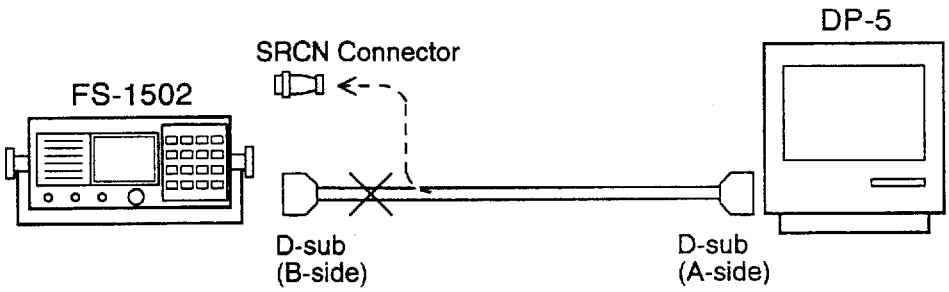


Figure 5-27 Connection of DP-5

For further details about the DP-5, refer to the operator's manual.

DSC terminal

To maintain communication protocol between the FS-1502 and DSC Terminal, use the FURUNO DSC-5 DSC Terminal.

Connection

If the DSC-5 alone is to be installed, install it the same as the Telex terminal.

For installation of both the DSC-5 and DP-5 install the REMOTE-B (current loop) kit, and connect them to the FS-1502 via the FURUNO DB-500 Distributor.

Remote station RB-500

For installation of single remote station simply connect it to the FS-1502 with the connector assembly. In the case of multiple remote stations plus NBDP terminal and DSC terminal (maximum four units total) install the REMOTE-B kit and connect these units to the FS-1502 via the DB-500.

■ **NOTE:** *The DB-500 requires 10.8 to 31.2 VDC power.*

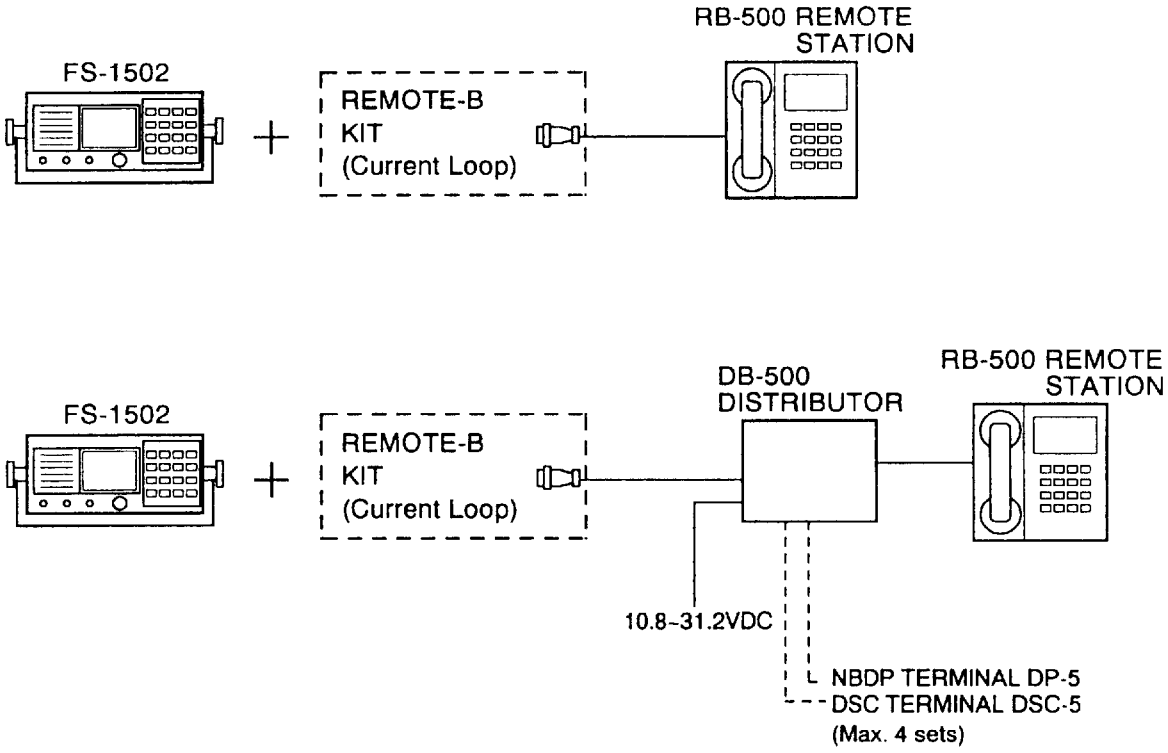
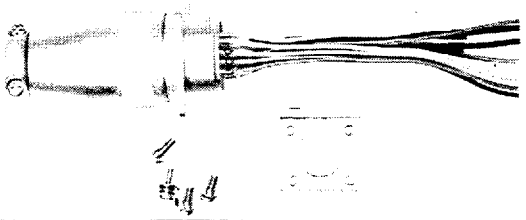


Figure 5-28 Connection of remote station

Parts required

To connect the FS-1502 to the DB-500/RB-500 you will need the REMOTE-B Assy. (Type, OP05-40; Code No., 005-920-320), which consists of

Name	Type	Code No.	Figure
REMOTE-B Board (current loop)	05P0458	005-517-500	
Connector Assy.	05S0845	000-125-318	

Installation of REMOTE-B assy.

The procedure for installation of the REMOTE-B Board is similar to that for the REMOTE-A Board. See page 5-28.

■ **NOTE:** *For TX/RX Board no.05P0455-1, cut off the far left-hand side pin (anti-mismount pin) on the REMOTE-B Board.*

Connection of the RB-500 and DB-500

Connect the RB-500 and DB-500 to the FS-1502 with a 10 pair cable (optional supply). A SRCN type connector comes with the FS-1502; make the connection at the FS-1502 with that connector.

Connection at the RB-500 (and DB-500) is done at the terminal board. For wiring inside those units, refer to the interconnection diagram on page D-3.

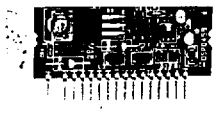
BK (Break-in) connection

BK connection is necessary when the FS-1502 is installed together with a HF receiver or transceiver. The BK relay (circuit) functions to mute the receiver when it and the FS-1502 are operated together. With no BK connection, the receiver may generate unwanted noise or its front end may be damaged by strong signals when the radio is transmitted.

Parts required

To install the BK, you will need the CONTROL Assy. (Type, OP05-41; Code No. 005-920-330), which consists of

Table CONTROL Assy.

Name	Type	Code No.	Figure
CONTROL Board	05P0459	005-517-520	
Connector Assy.	05S0846-0	000-125-319	
Gasket	05-029-0122-2	100-878-420	
Washer	16.2x22.0x0.5 SUS 304	000-801-849	

Connection of floating ground radiotelephone (FS-5000, etc.)

Make the connection between the FS-1502 and FS-5000 with a connection cable of 0.75 mm^2 or larger (3C cable, or equivalent), as shown in Figure 5-29.

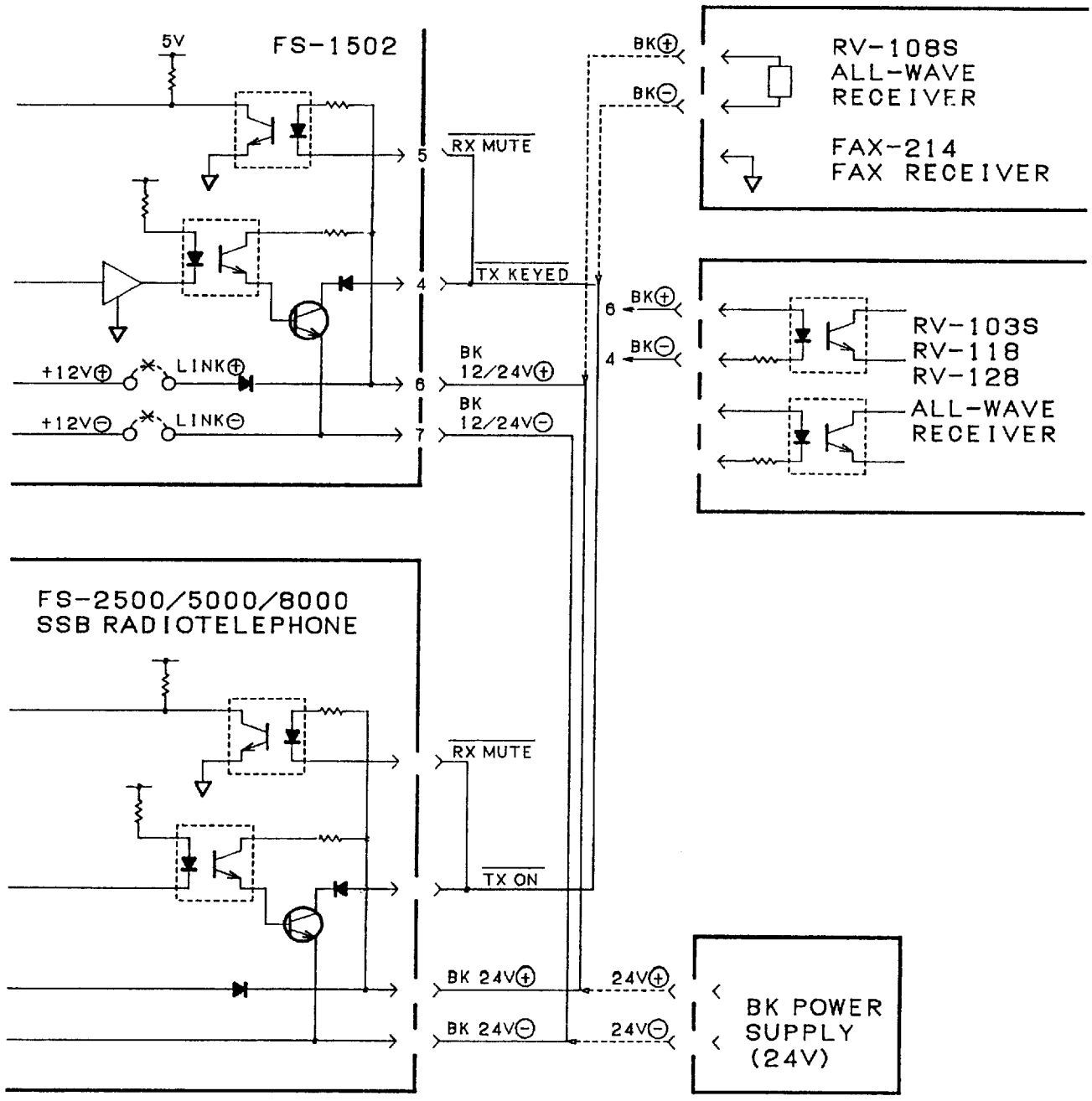


Figure 5-29 Connection of floating ground radiotelephone

Because the FS-5000 operates from 24 V and the FS-1502 from 12 V, the BK relay control voltage must be 24 V. This is done by removing the link wire on the +12 V and -12 V lines on the FS-1502.

Connection of all-wave receiver or FAX

Make the connection between the FS-1502 and the all-wave receiver or FAX with a connection cable of 0.75 mm^2 or larger (2C cable, or equivalent), as shown in Figure 5-29.

For 12 V all-wave receiver, connect a link wire on both the + 12 V and -12 V lines on the FS-1502 to apply voltage to the relay on the all-wave receiver. In the case of 24 V, disconnect the link wire and add an external power supply.

Connection of negative ground receiver

Figure 5-30 shows how to connect a negative ground receiver.

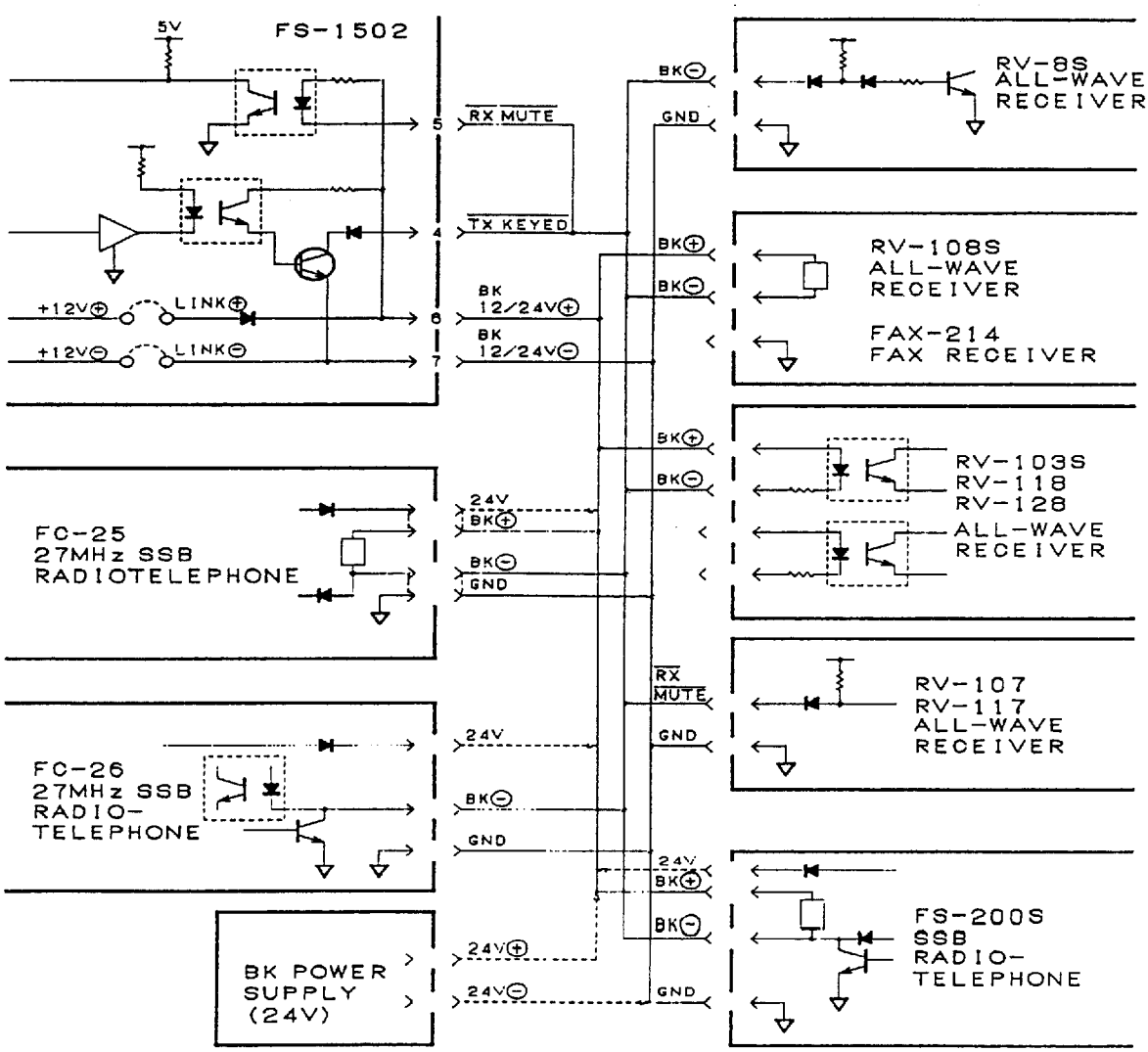


Figure 5-30 Connection of negative ground receivers

■ **NOTE:** *Connecting the FS-1502 with a negative ground receiver (the negative power line is connected to ground) connects the negative power line of the FS-1502 to ground.*

Installation of CONTROL assy.

1. Fix the CONTROL connector assembly to the CONTROL connector; connect the assembly to J10 on the TX/RX Board.
2. Solder the CONTROL Board to U23 on the TX/RX Board.

■ **NOTE:** *For TX/RX Board no. 05P0455-1, remove the first three left-hand side pins on the CONTROL Board.*

Crystal filter

A narrow band-pass crystal filter (0.3 kHz) provides low-noise Telex communication.

Parts required

Name	Type	Code No.	Figure
Crystal filter	K00F04D	000-113-494	

Procedure

1. Dismount the TX/RX Board.
2. Solder the crystal filter to FL3 on the TX/RX Board as shown in Figure 5-31.

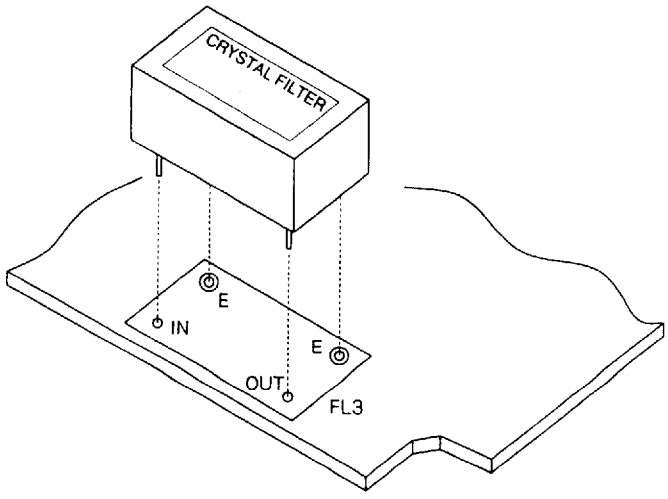


Figure 5-31 How to install the crystal filter

3. Remount the TX/RX Board.
4. Set system setting 9925 for NARROW.

Installation Checks

Introduction

After completing the installation, check the FS-1502 and all units connected to it for proper connection and operation.

Visual check

Before turning on the radiotelephone, visually check it as follows.

Antenna

1) Are fixing bolts, wire clips, shackles securely tightened?
2) Are the antenna and/or coaxial lead-in waterproofed?
3) Is the antenna wire securely connected to the coupler?
4) Make sure no mechanical stress is applied to the antenna at the connection with the coupler.

Antenna coupler

1) Is the unit perfectly grounded?
2) Is the length of the ground wire as short as possible?
3) Is the vent hole open?
4) Is the vent tube installed (outdoors installation)?
5) Are all wirings correctly made?

Transceiver

1) Is the unit grounded with the supplied ground wire? Length of the wire is as short as possible?
2) Are all wirings correctly made?
3) Are all connectors securely tightened?

Rectifier (if installed)

Is the voltage of the rectifier unit and the ship's mains the same?

Optional equipment

1) Is the unit grounded?
2) Are all wirings between the unit and the FS-1502 correctly made?
3) Are all connectors securely tightened?

Supply voltage check

Make sure the power switch on the transceiver is off; then check that the supply voltage is 13.6 VDC ±15%.

Performance check

If no problems were found in the preceding sections, then turn on the transceiver and check performance.

Receiver

1. Turn on the speaker.
2. Turn off the squelch.
3. Check that all the bands can be received clearly.

If signal strength is too low or there is too much noise then return to "Visual check" and recheck. Double check the antenna and ground. If there is no trouble, proceed to the next step.

Transmitter

On each band, confirm that the antenna is automatically tuned when [TX TUNE] or the PTT switch is pressed. ("OK" appears when tuning is completed successfully.)

Automatic tuning of the antenna should take no longer than 15 seconds. If you find a channel which takes more than 15 seconds to tune, recheck antenna length.

Antenna coupler

Check antenna coupler performance by doing the antenna coupler self test, described on page 3-4.

Noise

Noise generated on board or by electrical storms can severely degrade communication. Storm-generated static, unfortunately, is impossible to suppress or eliminate. Radio traffic on lower frequency bands is sometimes completely blocked out in certain areas.

Man-made noise, however, can often be suppressed by a marine electronics technician, using special noise filtering and shielding techniques. In most cases the source of electrical noise is the ignition system, although generators, alternators, winches, pumps, radar and echosounder can interfere with radio communication as well.

Turn on electrical equipment one by one to check for interference to the FS-1502.

Because no two boats are built or equipped exactly alike, there is no one general noise suppressing technique that can be applied to all cases. If electrical noise interferes with SSB operation, consult a marine electronics technician.

APPENDIX A Tables

Overview

This appendix contains user channel tables, specifications of control cable and distress calling procedure.

Contents

User Channel Table

Group No. (scan)	CH No.	Memory A (T/R for SIMP RX for DUP)	Memory B (T/R for SIMP TX for DUP)	Tick for SIMP	Purpose/Remarks
1	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
2	9				
	10				
	11				
	12				
	13				
	14				
	15				
	16				
3	17				
	18				
	19				
	20				
	21				
	22				
	23				
	24				
4	25				
	26				
	27				
	28				
	29				
	30				
	31				
	32				

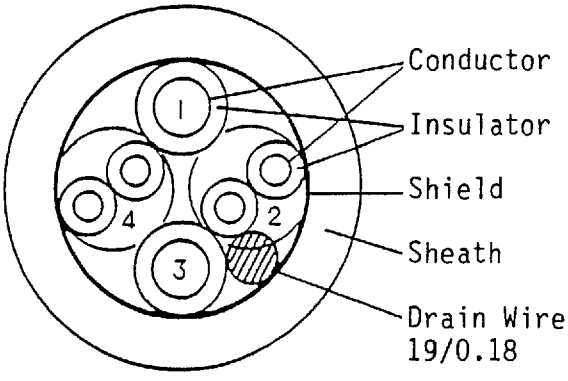
Group No. (scan)	CH No.	Memory A (T/R for SIMP RX for DUP)	Memory B (T/R for SIMP TX for DUP)	Tick for SIMP	Purpose/Remarks
5	33				
	34				
	35				
	36				
	37				
	38				
	39				
	40				
6	41				
	42				
	43				
	44				
	45				
	46				
	47				
	48				
7	49				
	50				
	51				
	52				
	53				
	54				
	55				
	56				
8	57				
	58				
	59				
	60				
	61				
	62				
	63				
	64				

Specifications of Control Cable

		2 Pairs	2 Cores
Conductor	Nominal section area	0.18	0.5
	Construction	7/0.18	20/0.18
	Outer diameter	0.54	1.0
Insulator	Thickness	0.25	0.5
	Outer diameter	1.05	2.0
	Material	PVC	
	Color	See color table.	
Twist	Direction	CCW (pair)	–
	Pitch	25	60
	Outer diameter	2.1	4.85
Shield	Construction	Aluminum laminated tape plus drain wire (7/0.18)	
Sheath	Thickness	0.7	
	Finished diameter	6.5	
	Material	PVC	
	Color	White-gray	

** All dimensions in millimeters.*

No.	Color		Size
1	RED		0.5
2	ORG	YEL	0.18
3	BLK		0.5
4	GRN	BLU	0.18



Distress Calling Procedure

< FURUNO FS-1502 SSB Radiotelephone >

Photocopy this procedure, fill it in, and post it near your radiotelephone.

1. Turn on the power switch.
2. Press [2182].
3. Press [ALM] and [ENT] together.
4. Wait until the two-tone alarm stops. (About 45 seconds.)
5. Press PTT switch and send the distress message.
6. Speaking SLOWLY – CLEARLY – CALMLY;

   - Say: "MAYDAY – MAYDAY – MAYDAY".
   - Say: "This is _____ (your boat's name), _____ (your boat's name), _____ (your boat's name), _____ (your call sign)".
   - Say: "MAYDAY _____ (your boat's name)".
   - TELL WHERE YOU ARE. (What navigational aids or landmarks are near?)
   - STATE THE NATURE OF YOUR DISTRESS.
   - GIVE NUMBER OF ADULTS AND CHILDREN ABOARD, AND CONDITIONS OF ANY INJURED.
   - ESTIMATE PRESENT SEAWORTHINESS OF YOUR BOAT.
   - BRIEFLY DESCRIBE YOUR BOAT:

     _____ (State Registration No.); _____ (Length) FEET; _____ (Draft) FEET;

     _____ (Type) _____ (Color) HULL; _____ (Color) TRIM; _____ (Number) MASTS; _____ (HP) POWER

     _____ (Construction Material).

     _____
     Anything else you think will help rescuers to find you.

   - Say: I WILL BE LISTENING ON 2182 kHz".
   - End message by saying: "This is _____ (your boat's name and call sign) OVER".

7. Release PTT switch and listen: Someone should answer. Listen to his instructions. IF NO ONE ANSWERS, REPEAT CALL BEGINNING AT STEP 6.

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USA SSB FREQUENCY TABLE FOR FURUNO SSB RADIOTELEPHONES

SSBUSA

4 MHz BAND			6 MHz BAND			8 MHz BAND			12 MHz BAND			16 MHz BAND			18/19 MHz BAND			22 MHz BAND			25/26 MHz BAND			Remarks
No.	TX	RX	No.	TX	RX	No.	TX	RX	No.	TX	RX	No.	TX	RX	No.	TX	RX	No.	TX	RX	No.	TX	RX	
300	3023	3023	600	6215	6215	800	8291	8291	1200	12290	12290	1600	16420	16420										Distress Channels
400	4125	4125																						
500	5680	5680																						
401	4065	4357	601	6200	6501	801	8195	8719	1201	12230	13077	1601	16360	17242	1801	18780	19755	2201	22000	22696	2501	25070	26145	ITU SSB Duplex Channels
402	4068	4360	602	6203	6504	802	8198	8722	1202	12233	13080	1602	16363	17245	1802	18783	19758	2202	22003	22699	2502	25073	26148	
403	4071	4363	603	6206	6507	803	8201	8725	1203	12236	13083	1603	16366	17248	1803	18786	19761	2203	22006	22702	2503	25076	26151	
404	4074	4366	604	6209	6510	804	8204	8728	1204	12239	13086	1604	16369	17251	1804	18789	19764	2204	22009	22705	2504	25079	26154	
405	4077	4369	605	6212	6513	805	8207	8731	1205	12242	13089	1605	16372	17254	1805	18792	19767	2205	22012	22708	2505	25082	26157	
406	4080	4372	606	6215	6516	806	8210	8734	1206	12245	13092	1606	16375	17257	1806	18795	19770	2206	22015	22711	2506	25085	26160	
407	4083	4375	607	6218	6519	807	8213	8737	1207	12248	13095	1607	16378	17260	1807	18798	19773	2207	22018	22714	2507	25088	26163	
408	4086	4378	608	6221	6522	808	8216	8740	1208	12251	13098	1608	16381	17263	1808	18801	19776	2208	22021	22717	2508	25091	26166	
409	4089	4381				809	8219	8743	1209	12254	13101	1609	16384	17266	1809	18804	19779	2209	22024	22720	2509	25094	26169	
410	4092	4384				810	8222	8746	1210	12257	13104	1610	16387	17269	1810	18807	19782	2210	22027	22723	2510	25097	26172	
411	4095	4387				811	8225	8749	1211	12260	13107	1611	16390	17272	1811	18810	19785	2211	22030	22726				
412	4098	4390				812	8228	8752	1212	12263	13110	1612	16393	17275	1812	18813	19788	2212	22033	22729				
413	4101	4393				813	8231	8755	1213	12266	13113	1613	16396	17278	1813	18816	19791	2213	22036	22732				
414	4104	4396				814	8234	8758	1214	12269	13116	1614	16399	17281	1814	18819	19794	2214	22039	22735				
415	4107	4399				815	8237	8761	1215	12272	13119	1615	16402	17284	1815	18822	19797	2215	22042	22738				
416	4110	4402				816	8240	8764	1216	12275	13122	1616	16405	17287				2216	22045	22741				
417	4113	4405				817	8243	8767	1217	12278	13125	1617	16408	17290				2217	22048	22744				
418	4116	4408				818	8246	8770	1218	12281	13128	1618	16411	17293				2218	22051	22747				
419	4119	4411				819	8249	8773	1219	12284	13131	1619	16414	17296				2219	22054	22750				
420	4122	4414				820	8252	8776	1220	12287	13134	1620	16417	17299				2220	22057	22753				
421	4125	4417				821	8255	8779	1221	12290	13137	1621	16420	17302				2221	22060	22756				
422	4128	4420				822	8258	8782	1222	12293	13140	1622	16423	17305				2222	22063	22759				
423	4131	4423				823	8261	8785	1223	12296	13143	1623	16426	17308				2223	22066	22762				
424	4134	4426				824	8264	8788	1224	12299	13146	1624	16429	17311				2224	22069	22765				
425	4137	4429				825	8267	8791	1225	12302	13149	1625	16432	17314				2225	22072	22768				
426	4140	4432				826	8270	8794	1226	12305	13152	1626	16435	17317				2226	22075	22771				
427	4143	4435				827	8273	8797	1227	12308	13155	1627	16438	17320				2227	22078	22774				
428	4060	4351				828	8276	8800	1228	12311	13158	1628	16441	17323				2228	22081	22777				
						829	8279	8803	1229	12314	13161	1629	16444	17326				2229	22084	22780				
						830	8282	8806	1230	12317	13164	1630	16447	17329				2230	22087	22783				
						831	8285	8809	1231	12320	13167	1631	16450	17332				2231	22090	22786				
						832	8288	8812	1232	12323	13170	1632	16453	17335				2232	22093	22789				
									1233	12326	13173	1633	16456	17338				2233	22096	22792				
									1234	12329	13176	1634	16459	17341				2234	22099	22795				
									1235	12332	13179	1635	16462	17344				2235	22102	22798				
						836	8113	8713	1236	12335	13182	1636	16465	17347				2236	22105	22801				
						837	8128	8716	1237	12338	13185	1637	16468	17350				2237	22108	22804				
												1638	16471	17353				2238	22111	22807				
												1639	16474	17356				2239	22114	22810				
												1640	16477	17359				2240	22117	22813				
												1641	16480	17362				2241	22120	22816				
												1642	16483	17365				2242	22123	22819				
												1643	16486	17368				2243	22126	22822				
												1644	16489	17371				2244	22129	22825				
												1645	16492	17374				2245	22132	22828				
												1646	16495	17377				2246	22135	22831				
												1647	16498	17380				2247	22138	22834				
												1648	16501	17383										
												1649	16504	17386										
461	4146	4146	661	6224	6224	861	8294	8294	1261	12353	12353	1661	16528	16528	1861	18840	18840	2261	22159	22159	2561	25115	25115	Simplex Channels
462	4149	4149	662	6227	6227	862	8297	8297	1262	12356	12356	1662	16531	16531	1862	18843	18843	2262	22162	22162	2562	25118	25118	
463	4417	4417	663	6230	6230				1263	12359	12359	1663	16534	16534				2263	22165	22165				
			664	6516	6516													2264	22168	22168				
																		2265	22171	22171				
471	4065	4065	671	6209	6209	871	8201	8201	1271	12362	12362	1671	16543	16543										Mississippi River Channels
472	4089	4089	672	6212	6212	872	8213	8213	1272	12365	12365	1672	16546	16546										
473	4116	4116	673	6510	6510	873	8725	8725																
474	4408	4408	674	6513	6513	874	8737	8737																
481	4366	4366																						Alaska Radio Channels
482	4369	4369																						
483	4396	4396																						
484	4402	4402																						
485	4420	4420																						
486	4423	4423																						

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FURUNO

ITU SSB FREQUENCY TABLE FOR FURUNO SSB RADIOTELEPHONES

1991/10 ITUSSB

1			2			3			4			5			6					
4 MHz BAND			6 MHz BAND			8 MHz BAND			12 MHz BAND			16 MHz BAND			18/19 MHz BAND			22 MHz BAND			25/26 MHz BAND		
No.	TX	RX	No.	TX	RX	No.	TX	RX	No.	TX	RX	No.	TX	RX	No.	TX	RX	No.	TX	RX	No.	TX	RX
300	3023	3023	600	6215	6215	800	8291	8291	1200	12290	12290	1600	16420	16420									
400	4125	4125																					
500	5680	5680																					
401	4065	4357	601	6200	6501	801	8195	8719	1201	12230	13077	1601	16360	17242	1801	18780	19755	2201	22000	22696	2501	25070	26145
402	4068	4360	602	6203	6504	802	8198	8722	1202	12233	13080	1602	16363	17245	1802	18783	19758	2202	22003	22699	2502	25073	26148
403	4071	4363	603	6206	6507	803	8201	8725	1203	12236	13083	1603	16366	17248	1803	18786	19761	2203	22006	22702	2503	25076	26151
404	4074	4366	604	6209	6510	804	8204	8728	1204	12239	13086	1604	16369	17251	1804	18789	19764	2204	22009	22705	2504	25079	26154
405	4077	4369	605	6212	6513	805	8207	8731	1205	12242	13089	1605	16372	17254	1805	18792	19767	2205	22012	22708	2505	25082	26157
406	4080	4372	606	6215	6516	806	8210	8734	1206	12245	13092	1606	16375	17257	1806	18795	19770	2206	22015	22711	2506	25085	26160
407	4083	4375	607	6218	6519	807	8213	8737	1207	12248	13095	1607	16378	17260	1807	18798	19773	2207	22018	22714	2507	25088	26163
408	4086	4378	608	6221	6522	808	8216	8740	1208	12251	13098	1608	16381	17263	1808	18801	19776	2208	22021	22717	2508	25091	26166
409	4089	4381	609	6224	6224	809	8219	8743	1209	12254	13101	1609	16384	17266	1809	18804	19779	2209	22024	22720	2509	25094	26169
410	4092	4384	610	6227	6227	810	8222	8746	1210	12257	13104	1610	16387	17269	1810	18807	19782	2210	22027	22723	2510	25097	26172
411	4095	4387	611	6230	6230	811	8225	8749	1211	12260	13107	1611	16390	17272	1811	18810	19785	2211	22030	22726	2511	25100	25100
412	4098	4390				812	8228	8752	1212	12263	13110	1612	16393	17275	1812	18813	19788	2212	22033	22729	2512	25103	25103
413	4101	4393				813	8231	8755	1213	12266	13113	1613	16396	17278	1813	18816	19791	2213	22036	22732	2513	25106	25106
414	4104	4396				814	8234	8758	1214	12269	13116	1614	16399	17281	1814	18819	19794	2214	22039	22735	2514	25109	25109
415	4107	4399				815	8237	8761	1215	12272	13119	1615	16402	17284	1815	18822	19797	2215	22042	22738	2515	25112	25112
416	4110	4402				816	8240	8764	1216	12275	13122	1616	16405	17287	1816	18825	18825	2216	22045	22741	2516	25115	25115
417	4113	4405				817	8243	8767	1217	12278	13125	1617	16408	17290	1817	18828	18828	2217	22048	22744	2517	25118	25118
418	4116	4408				818	8246	8770	1218	12281	13128	1618	16411	17293	1818	18831	18831	2218	22051	22747			
419	4119	4411				819	8249	8773	1219	12284	13131	1619	16414	17296	1819	18834	18834	2219	22054	22750			
420	4122	4414				820	8252	8776	1220	12287	13134	1620	16417	17299	1820	18837	18837	2220	22057	22753			
421	4125	4417				821	8255	8779	1221	12290	13137	1621	16420	17302	1821	18840	18840	2221	22060	22756			
422	4128	4420				822	8258	8782	1222	12293	13140	1622	16423	17305	1822	18843	18843	2222	22063	22759			
423	4131	4423				823	8261	8785	1223	12296	13143	1623	16426	17308				2223	22066	22762			
424	4134	4426				824	8264	8788	1224	12299	13146	1624	16429	17311				2224	22069	22765			
425	4137	4429				825	8267	8791	1225	12302	13149	1625	16432	17314				2225	22072	22768			
426	4140	4432				826	8270	8794	1226	12305	13152	1626	16435	17317				2226	22075	22771			
427	4143	4435				827	8273	8797	1227	12308	13155	1627	16438	17320				2227	22078	22774			
428	4351	4351				828	8276	8800	1228	12311	13158	1628	16441	17323				2228	22081	22777			
429	4354	4354				829	8279	8803	1229	12314	13161	1629	16444	17326				2229	22084	22780			
430	4146	4146				830	8282	8806	1230	12317	13164	1630	16447	17329				2230	22087	22783			
431	4149	4149				831	8285	8809	1231	12320	13167	1631	16450	17332				2231	22090	22786			
432	4000	4000				832	8288	8812	1232	12323	13170	1632	16453	17335				2232	22093	22789			
433	4003	4003				833	8291	8291	1233	12326	13173	1633	16456	17338				2233	22096	22792			
434	4006	4006				834	8707	8707	1234	12329	13176	1634	16459	17341				2234	22099	22795			
435	4009	4009				835	8710	8710	1235	12332	13179	1635	16462	17344				2235	22102	22798			
436	4012	4012				836	8713	8713	1236	12335	13182	1636	16465	17347				2236	22105	22801			
437	4015	4015				837	8716	8716	1237	12338	13185	1637	16468	17350				2237	22108	22804			
438	4018	4018				838	8294	8294	1238	12341	13188	1638	16471	17353				2238	22111	22807			
439	4021	4021				839	8297	8297	1239	12344	13191	1639	16474	17356				2239	22114	22810			
440	4024	4024				840	8101	8101	1240	12347	13194	1640	16477	17359				2240	22117	22813			
441	4027	4027				841	8104	8104	1241	12350	13197	1641	16480	17362				2241	22120	22816			
442	4030	4030				842	8107	8107	1242	12353	12353	1642	16483	17365				2242	22123	22819			
443	4033	4033				843	8110	8110	1243	12356	12356	1643	16486	17368				2243	22126	22822			
444	4036	4036				844	8113	8113	1244	12359	12359	1644	16489	17371				2244	22129	22825			
445	4039	4039				845	8116	8116	1245	12362	12362	1645	16492	17374				2245	22132	22828			
446	4042	4042				846	8119	8119	1246	12365	12365	1646	16495	17377				2246	22135	22831			
447	4045	4045				847	8122	8122				1647	16498	17380				2247	22138	22834			
448	4048	4048				848	8125	8125				1648	16501	17383				2248	22141	22837			
449	4051	4051				849	8128	8128				1649	16504	17386				2249	22144	22840			
450	4054	4054				850	8131	8131				1650	16507	17389				2250	22147	22843			
451	4057	4057				851	8134	8134				1651	16510	17392				2251	22150	22846			
452	4060	4060				852	8137	8137				1652	16513	17395				2252	22153	22849			
						853	8140	8140				1653	16516	17398				2253	22156	22852			
						854	8143	8143				1654	16519	17401				2254	22159	22159			
						855	8146	8146				1655	16522	17404				2255	22162	22162			
						856	8149	8149				1656	16525	17407				2256	22165	22165			
						857	8152	8152				1657	16528	16528				2257	22168	22168			
						858	8155	8155				1658	16531	16531				2258	22171	22171			
						859	8158	8158				1659	16534	16534				2259	22174	22174			
						860	8161	8161				1660	16537	16537				2260	22177	22177			
						861	8164	8164				1661	16540	16540									
						862	8167	8167				1662	16543	16543									
						863	8170	8170				1663	16546	16546									
						864	8173	8173															
						865	8176	8176															
						866	8179	8179															
						867	8182	8182															
						868	8185	8185															
						869	8188	8188															
						870	8191	8191															

FURUNO ITU TELEX FREQUENCY TABLE

4 MHz BAND			6 MHz BAND			8 MHz BAND			12 MHz BAND			16 MHz BAND			18/19 MHz BAND			22 MHz BAND			25/26 MHz BAND		
No.	TX	RX	No.	TX	RX	No.	TX	RX	No.	TX	RX	No.	TX	RX	No.	TX	RX	No.	TX	RX	No.	TX	RX
4001	4172.5	4210.5	6001	6263.0	6314.5	8001	8376.5	8376.5	12001	12477.0	12579.5	16001	16683.5	16807.0	18001	18870.5	19681.0	22001	22284.5	22376.5	25001	25173.0	26101.0
4002	4173.0	4211.0	6002	6263.5	6315.0	8002	8377.0	8417.0	12002	12477.5	12580.0	16002	16684.0	16807.5	18002	18871.0	19681.5	22002	22285.0	22377.0	25002	25173.5	26101.5
4003	4173.5	4211.5	6003	6264.0	6315.5	8003	8377.5	8417.5	12003	12478.0	12580.5	16003	16684.5	16808.0	18003	18871.5	19682.0	22003	22285.5	22377.5	25003	25174.0	26102.0
4004	4174.0	4212.0	6004	6264.5	6316.0	8004	8378.0	8418.0	12004	12478.5	12581.0	16004	16685.0	16808.5	18004	18872.0	19682.5	22004	22286.0	22378.0	25004	25174.5	26102.5
4005	4174.5	4212.5	6005	6265.0	6316.5	8005	8378.5	8418.5	12005	12479.0	12581.5	16005	16685.5	16809.0	18005	18872.5	19683.0	22005	22286.5	22378.5	25005	25175.0	26103.0
4006	4175.0	4213.0	6006	6265.5	6317.0	8006	8379.0	8419.0	12006	12479.5	12582.0	16006	16686.0	16809.5	18006	18873.0	19683.5	22006	22287.0	22379.0	25006	25175.5	26103.5
4007	4175.5	4213.5	6007	6266.0	6317.5	8007	8379.5	8419.5	12007	12480.0	12582.5	16007	16686.5	16810.0	18007	18873.5	19684.0	22007	22287.5	22379.5	25007	25176.0	26104.0
4008	4176.0	4214.0	6008	6266.5	6318.0	8008	8380.0	8420.0	12008	12480.5	12583.0	16008	16687.0	16810.5	18008	18874.0	19684.5	22008	22288.0	22380.0	25008	25176.5	26104.5
4009	4176.5	4214.5	6009	6267.0	6318.5	8009	8380.5	8420.5	12009	12481.0	12583.5	16009	16687.5	16811.0	18009	18874.5	19685.0	22009	22288.5	22380.5	25009	25177.0	26105.0
4010	4177.0	4215.0	6010	6267.5	6319.0	8010	8381.0	8421.0	12010	12481.5	12584.0	16010	16688.0	16811.5	18010	18875.0	19685.5	22010	22289.0	22381.0	25010	25177.5	26105.5
4011	4177.5	4177.5	6011	6268.0	6268.0	8011	8381.5	8421.5	12011	12482.0	12584.5	16011	16688.5	16812.0	18011	18875.5	19686.0	22011	22289.5	22381.5	25011	25178.0	26106.0
4012	4178.0	4215.5	6012	6268.5	6319.5	8012	8382.0	8422.0	12012	12482.5	12585.0	16012	16689.0	16812.5	18012	18876.0	19686.5	22012	22290.0	22382.0	25012	25178.5	26106.5
4013	4178.5	4216.0	6013	6269.0	6320.0	8013	8382.5	8422.5	12013	12483.0	12585.5	16013	16689.5	16813.0	18013	18876.5	19687.0	22013	22290.5	22382.5	25013	25179.0	26107.0
4014	4179.0	4216.5	6014	6269.5	6320.5	8014	8383.0	8423.0	12014	12483.5	12586.0	16014	16690.0	16813.5	18014	18877.0	19687.5	22014	22291.0	22383.0	25014	25179.5	26107.5
4015	4179.5	4217.0	6015	6270.0	6321.0	8015	8383.5	8423.5	12015	12484.0	12586.5	16015	16690.5	16814.0	18015	18877.5	19688.0	22015	22291.5	22383.5	25015	25180.0	26108.0
4016	4180.0	4217.5	6016	6270.5	6321.5	8016	8384.0	8424.0	12016	12484.5	12587.0	16016	16691.0	16814.5	18016	18878.0	19688.5	22016	22292.0	22384.0	25016	25180.5	26108.5
4017	4180.5	4218.0	6017	6271.0	6322.0	8017	8384.5	8424.5	12017	12485.0	12587.5	16017	16691.5	16815.0	18017	18878.5	19689.0	22017	22292.5	22384.5	25017	25181.0	26109.0
4018	4181.0	4218.5	6018	6271.5	6322.5	8018	8385.0	8425.0	12018	12485.5	12588.0	16018	16692.0	16815.5	18018	18879.0	19689.5	22018	22293.0	22385.0	25018	25181.5	26109.5
4019	4181.5	4219.0	6019	6272.0	6323.0	8019	8385.5	8425.5	12019	12486.0	12588.5	16019	16692.5	16816.0	18019	18879.5	19690.0	22019	22293.5	22385.5	25019	25182.0	26110.0
4020	4202.5	4202.5	6020	6272.5	6323.5	8020	8386.0	8426.0	12020	12486.5	12589.0	16020	16693.0	16816.5	18020	18880.0	19690.5	22020	22294.0	22386.0	25020	25182.5	26110.5
4021	4203.0	4203.0	6021	6273.0	6324.0	8021	8386.5	8426.5	12021	12487.0	12589.5	16021	16693.5	16817.0	18021	18880.5	19691.0	22021	22294.5	22386.5	25021	25183.0	26111.0
4022	4203.5	4203.5	6022	6273.5	6324.5	8022	8387.0	8427.0	12022	12487.5	12590.0	16022	16694.0	16817.5	18022	18881.0	19691.5	22022	22295.0	22387.0	25022	25183.5	26111.5
4023	4204.0	4204.0	6023	6274.0	6325.0	8023	8387.5	8427.5	12023	12488.0	12590.5	16023	16694.5	16818.0	18023	18881.5	19692.0	22023	22295.5	22387.5	25023	25184.0	26112.0
4024	4204.5	4204.5	6024	6274.5	6325.5	8024	8388.0	8428.0	12024	12488.5	12591.0	16024	16695.0	16695.0	18024	18882.0	19692.5	22024	22296.0	22388.0	25024	25184.5	26112.5
4025	4205.0	4205.0	6025	6275.0	6326.0	8025	8388.5	8428.5	12025	12489.0	12591.5	16025	16695.5	16818.5	18025	18882.5	19693.0	22025	22296.5	22388.5	25025	25185.0	26113.0
4026	4205.5	4205.5	6026	6275.5	6326.5	8026	8389.0	8429.0	12026	12489.5	12592.0	16026	16696.0	16819.0	18026	18883.0	19693.5	22026	22297.0	22389.0	25026	25185.5	26113.5
4027	4206.0	4206.0	6027	6281.0	6327.0	8027	8389.5	8429.5	12027	12490.0	12592.5	16027	16696.5	16819.5	18027	18883.5	19694.0	22027	22297.5	22389.5	25027	25186.0	26114.0
4028	4206.5	4206.5	6028	6281.5	6327.5	8028	8390.0	8430.0	12028	12490.5	12593.0	16028	16697.0	16820.0	18028	18884.0	19694.5	22028	22298.0	22390.0	25028	25186.5	26114.5
4029	4207.0	4207.0	6029	6282.0	6328.0	8029	8390.5	8430.5	12029	12491.0	12593.5	16029	16697.5	16820.5	18029	18884.5	19695.0	22029	22298.5	22390.5	25029	25187.0	26115.0
4030	4207.5	4207.5	6030	6282.5	6328.5	8030	8391.0	8431.0	12030	12491.5	12594.0	16030	16698.0	16821.0	18030	18885.0	19695.5	22030	22299.0	22391.0	25030	25187.5	26115.5
4031	4208.0	4219.5	6031	6283.0	6329.0	8031	8391.5	8431.5	12031	12492.0	12594.5	16031	16698.5	16821.5	18031	18885.5	19696.0	22031	22299.5	22391.5	25031	25188.0	26116.0
4032	4208.5	4220.0	6032	6283.5	6329.5	8032	8392.0	8432.0	12032	12492.5	12595.0	16032	16699.0	16822.0	18032	18886.0	19696.5	22032	22300.0	22392.0	25032	25188.5	26116.5
4033	4209.0	4220.5	6033	6284.0	6330.0	8033	8392.5	8432.5	12033	12493.0	12595.5	16033	16699.5	16822.5	18033	18886.5	19697.0	22033	22300.5	22392.5	25033	25189.0	26117.0
			6034	6284.5	6330.5	8034	8393.0	8433.0	12034	12493.5	12596.0	16034	16700.0	16823.0	18034	18887.0	19697.5	22034	22301.0	22393.0	25034	25189.5	26117.5
			6035	6300.5	6300.5	8035	8393.5	8433.5	12035	12494.0	12596.5	16035	16700.5	16823.5	18035	18887.5	19698.0	22035	22301.5	22393.5	25035	25190.0	26118.0
			6036	6301.0	6301.0	8036	8394.0	8434.0	12036	12494.5	12597.0	16036	16701.0	16824.0	18036	18888.0	19698.5	22036	22302.0	22394.0	25036	25190.5	26118.5
			6037	6301.5	6301.5	8037	8394.5	8434.5	12037	12495.0	12597.5	16037	16701.5	16824.5	18037	18888.5	19699.0	22037	22302.5	22394.5	25037	25191.0	26119.0
			6038	6302.0	6302.0	8038	8395.0	8435.0	12038	12495.5	12598.0	16038	16702.0	16825.0	18038	18889.0	19699.5	22038	22303.0	22395.0	25038	25191.5	26119.5
			6039	6302.5	6302.5	8039	8395.5	8435.5	12039	12496.0	12598.5	16039	16702.5	16825.5	18039	18889.5	19700.0	22039	22303.5	22395.5	25039	25192.0	26120.0
			6040	6303.0	6303.0	8040	8396.0	8436.0	12040	12496.5	12599.0	16040	16703.0	16826.0	18040	18890.0	19700.5	22040	22304.0	22396.0	25040	25192.5	26120.5
			6041	6303.5	6303.5	8041	8396.5	8396.5	12041	12497.0	12599.5	16041	16703.5	16826.5	18041	18890.5	19701.0	22041	22304.5	22396.5	25041	25193.0	25193.0
			6042	6304.0	6304.0	8042	8397.0	8397.0	12042	12497.5	12600.0	16042	16704.0	16827.0	18042	18891.0	19701.5	22042	22305.0	22397.0	25042	25193.5	25193.5
			6043	6304.5	6304.5	8043	8397.5	8397.5	12043	12498.0	12600.5	16043	16704.5	16827.5	18043	18891.5	19702.0	22043	22305.5	22397.5	25043	25194.0	25194.0
			6044	6305.0	6305.0	8044	8398.0	8398.0	12044	12498.5	12601.0	16044	16705.0	16828.0	18044	18892.0	19702.5	22044	22306.0	22398.0	25044	25194.5	25194.5
			6045	6305.5	6305.5	8045	8398.5	8398.5	12045	12499.0	12601.5	16045	16705.5	16828.5	18045	18892.5	19703.0	22045	22306.5	22398.5	25045	25195.0	25195.0
			6046	6306.0	6306.0	8046	8399.0	8399.0	12046	12499.5	12602.0	16046	16706.0	16829.0	18046	18893.0	18893.0	22046	22307.0	22399.0	25046	25195.5	25195.5
			6047	6306.5	6306.5	8047	8399.5	8399.5	12047	12500.0	12602.5	16047	16706.5	16829.5	18047	18893.5	18893.5	22047	22307.5	22399.5	25047	25196.0	25196.0
			6048	6307.0	6307.0	8048	8400.0	8400.0	12048	12500.5	12603.0	16048	16707.0	16830.0	18048	18894.0	18894.0	22048	22308.0	22400.0	25048	25196.5	25196.5
			6049	6307.5	6307.5	8049	8400.5	8400.5	12049	12501.0	12603.5	16049	16707.5	16830.5	18049	18894.5	18894.5	22049	22308.5	22400.5	25049	25197.0	25197.0
			6050	6308.0	6308.0	8050	8401.0	8401.0	12050	12501.5	12604.0	16050	16708.0	16831.0	18050	18895.0	18895.0	22050	22309.0	22401.0	25050	25197.5	25197.5
			6051	6308.5	6308.5	8051	8401.5	8401.5	12051	12502.0	12604.5	16051	16708.5	16831.5	18051	18895.5	18895.5	22051	22309.5	22401.5	25051	25198.0	25198.0
			6052	6309.0	6309.0	8052	8402.0	8402.0	12052	12502.5	12605.0	16052	16709.0	16832.0	18052	18896.0	18896.0	22052	22310.0	22402.0	25052	25198.5	25198.5
			6053	6309.5	6309.5	8053	8402.5	8402.5	12053	12503.0	12605.5	16053	16709.5	16832.5	18053	18896.5	18896.5	22053	22310.5	22402.5	25053	25199.0	25199.0
			6054	6310.0	6310.0	8054	8403.0	8403.0	12054	12503.5	12606.0	16054	16710.0	16833.0	18054	18897.0	18897.0	22054	22311.0	22403.0	25054	25199.5	25199.5
			6055	6310.5	6310.5	8055	8403.5	8403.5	12055	12504.0	12606.5	16055	16710.5	16833.5	18055	18897.5	18897.5	22055	22311.5	22403.5	25055	25200.0	25200.0

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			6056	6311.0	6311.0	8056	8404.0	8404.0	12056	12504.5	12607.0	16056	16711.0	16834.0	18056	18898.0	18898.0	22056	22312.0	22404.0	25056	25200.5	25200.5
			6057	6311.5	6311.5	8057	8404.5	8404.5	12057	12505.0	12607.5	16057	16711.5	16834.5	18057	18898.5	19703.5	22057	22312.5	22404.5	25057	25201.0	25201.0
			6058	6312.0	6312.0	8058	8405.0	8405.0	12058	12505.5	12608.0	16058	16712.0	16835.0	18058	18899.0	19704.0	22058	22313.0	22405.0	25058	25201.5	25201.5
			6059	6312.5	6331.0	8059	8405.5	8405.5	12059	12506.0	12608.5	16059	16712.5	16835.5	18059	18899.5	19704.5	22059	22313.5	22405.5	25059	25202.0	25202.0
			6060	6313.0	6331.5	8060	8406.0	8406.0	12060	12506.5	12609.0	16060	16713.0	16836.0				22060	22314.0	22406.0	25060	25202.5	25202.5
			6061	6313.5	6332.0	8061	8406.5	8406.5	12061	12507.0	12609.5	16061	16713.5	16836.5				22061	22314.5	22406.5	25061	25203.0	25203.0
						8062	8407.0	8407.0	12062	12507.5	12610.0	16062	16714.0	16837.0				22062	22315.0	22407.0	25062	25203.5	25203.5
						8063	8407.5	8407.5	12063	12508.0	12610.5	16063	16714.5	16837.5				22063	22315.5	22407.5	25063	25204.0	25204.0
						8064	8408.0	8408.0	12064	12508.5	12611.0	16064	16715.0	16838.0				22064	22316.0	22408.0	25064	25204.5	25204.5
						8065	8408.5	8408.5	12065	12509.0	12611.5	16065	16715.5	16838.5				22065	22316.5	22408.5	25065	25205.0	25205.0
						8066	8409.0	8409.0	12066	12509.5	12612.0	16066	16716.0	16839.0				22066	22317.0	22409.0	25066	25205.5	25205.5
						8067	8409.5	8409.5	12067	12510.0	12612.5	16067	16716.5	16839.5				22067	22317.5	22409.5	25067	25206.0	25206.0
						8068	8410.0	8410.0	12068	12510.5	12613.0	16068	16717.0	16840.0				22068	22318.0	22410.0	25068	25206.5	25206.5
						8069	8410.5	8410.5	12069	12511.0	12613.5	16069	16717.5	16840.5				22069	22318.5	22410.5	25069	25207.0	25207.0
						8070	8411.0	8411.0	12070	12511.5	12614.0	16070	16718.0	16841.0				22070	22319.0	22411.0	25070	25207.5	25207.5
						8071	8411.5	8411.5	12071	12512.0	12614.5	16071	16718.5	16841.5				22071	22319.5	22411.5	25071	25208.0	25208.0
						8072	8412.0	8412.0	12072	12512.5	12615.0	16072	16719.0	16842.0				22072	22320.0	22412.0	25072	25208.5	26121.0
						8073	8412.5	8412.5	12073	12513.0	12615.5	16073	16719.5	16842.5				22073	22320.5	22412.5	25073	25209.0	26121.5
						8074	8413.0	8413.0	12074	12513.5	12616.0	16074	16720.0	16843.0				22074	22321.0	22413.0	25074	25209.5	26122.0
						8075	8413.5	8413.5	12075	12514.0	12616.5	16075	16720.5	16843.5				22075	22321.5	22413.5			
						8076	8414.0	8414.0	12076	12514.5	12617.0	16076	16721.0	16844.0				22076	22322.0	22414.0			
						8077	8414.5	8414.5	12077	12515.0	12617.5	16077	16721.5	16844.5				22077	22322.5	22414.5			
						8078	8415.0	8436.5	12078	12515.5	12618.0	16078	16722.0	16845.0				22078	22323.0	22415.0			
						8079	8415.5	8437.0	12079	12516.0	12618.5	16079	16722.5	16845.5				22079	22323.5	22415.5			
						8080	8416.0	8437.5	12080	12516.5	12619.0	16080	16723.0	16846.0				22080	22324.0	22416.0			
									12081	12517.0	12619.5	16081	16723.5	16846.5				22081	22324.5	22416.5			
									12082	12517.5	12620.0	16082	16724.0	16847.0				22082	22325.0	22417.0			
									12083	12518.0	12620.5	16083	16724.5	16847.5				22083	22325.5	22417.5			
									12084	12518.5	12621.0	16084	16725.0	16848.0				22084	22326.0	22418.0			
									12085	12519.0	12621.5	16085	16725.5	16848.5				22085	22326.5	22418.5			
									12086	12519.5	12622.0	16086	16726.0	16849.0				22086	22327.0	22419.0			
									12087	12520.0	12520.0	16087	16726.5	16849.5				22087	22327.5	22419.5			
									12088	12520.5	12622.5	16088	16727.0	16850.0				22088	22328.0	22420.0			
									12089	12521.0	12623.0	16089	16727.5	16850.5				22089	22328.5	22420.5			
									12090	12521.5	12623.5	16090	16728.0	16851.0				22090	22329.0	22421.0			
									12091	12522.0	12624.0	16091	16728.5	16851.5				22091	22329.5	22421.5			
									12092	12522.5	12624.5	16092	16729.0	16852.0				22092	22330.0	22422.0			
									12093	12523.0	12625.0	16093	16729.5	16852.5				22093	22330.5	22422.5			
									12094	12523.5	12625.5	16094	16730.0	16853.0				22094	22331.0	22423.0			
									12095	12524.0	12626.0	16095	16730.5	16853.5				22095	22331.5	22423.5			
									12096	12524.5	12626.5	16096	16731.0	16854.0				22096	22332.0	22424.0			
									12097	12525.0	12627.0	16097	16731.5	16854.5				22097	22332.5	22424.5			
									12098	12525.5	12627.5	16098	16732.0	16855.0				22098	22333.0	22425.0			
									12099	12526.0	12628.0	16099	16732.5	16855.5				22099	22333.5	22425.5			
									12100	12526.5	12628.5	16100	16733.0	16856.0				22100	22334.0	22426.0			
									12101	12527.0	12629.0	16101	16733.5	16856.5				22101	22334.5	22426.5			
									12102	12527.5	12629.5	16102	16739.0	16857.0				22102	22335.0	22427.0			
									12103	12528.0	12630.0	16103	16739.5	16857.5				22103	22335.5	22427.5			
									12104	12528.5	12630.5	16104	16740.0	16858.0				22104	22336.0	22428.0			
									12105	12529.0	12631.0	16105	16740.5	16858.5				22105	22336.5	22428.5			
									12106	12529.5	12631.5	16106	16741.0	16859.0				22106	22337.0	22429.0			
									12107	12530.0	12632.0	16107	16741.5	16859.5				22107	22337.5	22429.5			
									12108	12530.5	12632.5	16108	16742.0	16860.0				22108	22338.0	22430.0			
									12109	12531.0	12633.0	16109	16742.5	16860.5				22109	22338.5	22430.5			
									12110	12531.5	12633.5	16110	16743.0	16861.0				22110	22339.0	22431.0			
									12111	12532.0	12634.0	16111	16743.5	16861.5				22111	22339.5	22431.5			
									12112	12532.5	12634.5	16112	16744.0	16862.0				22112	22340.0	22432.0			
									12113	12533.0	12635.0	16113	16744.5	16862.5				22113	22340.5	22432.5			
									12114	12533.5	12635.5	16114	16745.0	16863.0				22114	22341.0	22433.0			
									12115	12534.0	12636.0	16115	16745.5	16863.5				22115	22341.5	22433.5			

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12116	12534.5	12636.5	16116	16746.0	16864.0				22116	22342.0	22434.0												
12117	12535.0	12637.0	16117	16746.5	16864.5				22117	22342.5	22434.5												
12118	12535.5	12637.5	16118	16747.0	16865.0				22118	22343.0	22435.0												
12119	12536.0	12638.0	16119	16747.5	16865.5				22119	22343.5	22435.5												
12120	12536.5	12638.5	16120	16748.0	16866.0				22120	22344.0	22436.0												
12121	12537.0	12639.0	16121	16748.5	16866.5				22121	22344.5	22436.5												
12122	12537.5	12639.5	16122	16749.0	16867.0				22122	22345.0	22437.0												
12123	12538.0	12640.0	16123	16749.5	16867.5				22123	22345.5	22437.5												
12124	12538.5	12640.5	16124	16750.0	16868.0				22124	22346.0	22438.0												
12125	12539.0	12641.0	16125	16750.5	16868.5				22125	22346.5	22438.5												
12126	12539.5	12641.5	16126	16751.0	16869.0				22126	22347.0	22439.0												
12127	12540.0	12642.0	16127	16751.5	16869.5				22127	22347.5	22439.5												
12128	12540.5	12642.5	16128	16752.0	16870.0				22128	22348.0	22440.0												
12129	12541.0	12643.0	16129	16752.5	16870.5				22129	22348.5	22440.5												
12130	12541.5	12643.5	16130	16753.0	16871.0				22130	22349.0	22441.0												
12131	12542.0	12644.0	16131	16753.5	16871.5				22131	22349.5	22441.5												
12132	12542.5	12644.5	16132	16754.0	16872.0				22132	22350.0	22442.0												
12133	12543.0	12645.0	16133	16754.5	16872.5				22133	22350.5	22442.5												
12134	12543.5	12645.5	16134	16755.0	16873.0				22134	22351.0	22443.0												
12135	12544.0	12646.0	16135	16755.5	16873.5				22135	22351.5	22443.5												
12136	12544.5	12646.5	16136	16756.0	16874.0				22136	22352.0	22352.0												
12137	12545.0	12647.0	16137	16756.5	16874.5				22137	22352.5	22352.5												
12138	12545.5	12647.5	16138	16757.0	16875.0				22138	22353.0	22353.0												
12139	12546.0	12648.0	16139	16757.5	16875.5				22139	22353.5	22353.5												
12140	12546.5	12648.5	16140	16758.0	16876.0				22140	22354.0	22354.0												
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12142	12547.5	12649.5	16142	16759.0	16877.0				22142	22355.0	22355.0												
12143	12548.0	12650.0	16143	16759.5	16877.5				22143	22355.5	22355.5												
12144	12548.5	12650.5	16144	16760.0	16878.0				22144	22356.0	22356.0												
12145	12549.0	12651.0	16145	16760.5	16878.5				22145	22356.5	22356.5												
12146	12549.5	12651.5	16146	16761.0	16879.0				22146	22357.0	22357.0												
12147	12555.0	12652.0	16147	16761.5	16879.5				22147	22357.5	22357.5												
12148	12555.5	12652.5	16148	16762.0	16880.0				22148	22358.0	22358.0												
12149	12556.0	12653.0	16149	16762.5	16880.5				22149	22358.5	22358.5												
12150	12556.5	12653.5	16150	16763.0	16881.0				22150	22359.0	22359.0												
12151	12557.0	12654.0	16151	16763.5	16881.5				22151	22359.5	22359.5												
12152	12557.5	12654.5	16152	16764.0	16882.0				22152	22360.0	22360.0												
12153	12558.0	12655.0	16153	16764.5	16882.5				22153	22360.5	22360.5												
12154	12558.5	12655.5	16154	16765.0	16883.0				22154	22361.0	22361.0												
12155	12559.0	12656.0	16155	16765.5	16883.5				22155	22361.5	22361.5												
12156	12559.5	12656.5	16156	16766.0	16884.0				22156	22362.0	22362.0												
12157	12560.0	12560.0	16157	16766.5	16884.5				22157	22362.5	22362.5												
12158	12560.5	12560.5	16158	16767.0	16885.0				22158	22363.0	22363.0												
12159	12561.0	12561.0	16159	16767.5	16885.5				22159	22363.5	22363.5												
12160	12561.5	12561.5	16160	16768.0	16886.0				22160	22364.0	22364.0												
12161	12562.0	12562.0	16161	16768.5	16886.5				22161	22364.5	22364.5												
12162	12562.5	12562.5	16162	16769.0	16887.0				22162	22365.0	22365.0												
12163	12563.0	12563.0	16163	16769.5	16887.5				22163	22365.5	22365.5												
12164	12563.5	12563.5	16164	16770.0	16888.0				22164	22366.0	22366.0												
12165	12564.0	12564.0	16165	16770.5	16888.5				22165	22366.5	22366.5												
12166	12564.5	12564.5	16166	16771.0	16889.0				22166	22367.0	22367.0												
12167	12565.0	12565.0	16167	16771.5	16889.5				22167	22367.5	22367.5												
12168	12565.5	12565.5	16168	16772.0	16890.0				22168	22368.0	22368.0												
12169	12566.0	12566.0	16169	16772.5	16890.5				22169	22368.5	22368.5												
12170	12566.5	12566.5	16170	16773.0	16891.0				22170	22369.0	22369.0												
12171	12567.0	12567.0	16171	16773.5	16891.5				22171	22369.5	22369.5												
12172	12567.5	12567.5	16172	16774.0	16892.0				22172	22370.0	22370.0												
12173	12568.0	12568.0	16173	16774.5	16892.5				22173	22370.5	22370.5												
12174	12568.5	12568.5	16174	16775.0	16893.0				22174	22371.0	22371.0												
12175	12569.0	12569.0	16175	16775.5	16893.5				22175	22371.5	22371.5												

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12176	12569.5	12569.5
12177	12570.0	12570.0
12178	12570.5	12570.5
12179	12571.0	12571.0
12180	12571.5	12571.5
12181	12572.0	12572.0
12182	12572.5	12572.5
12183	12573.0	12573.0
12184	12573.5	12573.5
12185	12574.0	12574.0
12186	12574.5	12574.5
12187	12575.0	12575.0
12188	12575.5	12575.5
12189	12576.0	12576.0
12190	12576.5	12576.5
12191	12577.0	12577.0
12192	12577.5	12657.0
12193	12578.0	12657.5
12194	12578.5	12658.0

16176	16776.0	16894.0
16177	16776.5	16894.5
16178	16777.0	16895.0
16179	16777.5	16895.5
16180	16778.0	16896.0
16181	16778.5	16896.5
16182	16779.0	16897.0
16183	16779.5	16897.5
16184	16780.0	16898.0
16185	16780.5	16898.5
16186	16781.0	16899.0
16187	16781.5	16899.5
16188	16782.0	16900.0
16189	16782.5	16900.5
16190	16783.0	16901.0
16191	16783.5	16901.5
16192	16784.0	16902.0
16193	16784.5	16902.5
16194	16785.0	16785.0
16195	16785.5	16785.5
16196	16786.0	16786.0
16197	16786.5	16786.5
16198	16787.0	16787.0
16199	16787.5	16787.5
16200	16788.0	16788.0
16201	16788.5	16788.5
16202	16789.0	16789.0
16203	16789.5	16789.5
16204	16790.0	16790.0
16205	16790.5	16790.5
16206	16791.0	16791.0
16207	16791.5	16791.5
16208	16792.0	16792.0
16209	16792.5	16792.5
16210	16793.0	16793.0
16211	16793.5	16793.5
16212	16794.0	16794.0
16213	16794.5	16794.5
16214	16795.0	16795.0
16215	16795.5	16795.5
16216	16796.0	16796.0
16217	16796.5	16796.5
16218	16797.0	16797.0
16219	16797.5	16797.5
16220	16798.0	16798.0
16221	16798.5	16798.5
16222	16799.0	16799.0
16223	16799.5	16799.5
16224	16800.0	16800.0
16225	16800.5	16800.5
16226	16801.0	16801.0
16227	16801.5	16801.5
16228	16802.0	16802.0
16229	16802.5	16802.5
16230	16803.0	16803.0
16231	16803.5	16803.5
16232	16804.0	16804.0
16233	16804.5	16804.5
16234	16805.0	16903.0
16235	16805.5	16903.5
16236	16806.0	16904.0

22176	22372.0	22372.0
22177	22372.5	22372.5
22178	22373.0	22373.0
22179	22373.5	22373.5
22180	22374.0	22374.0
22181	22374.5	22444.0
22182	22375.0	22444.5
22183	22375.5	22445.0

APPENDIX B
What is Marine SSB?

Overview

Marine SSB (Single Side Band) is a long-range communication system which makes use of MF (medium frequency) and HF (high frequency) radio waves. With an SSB radio, you have the capability of making a call to almost anywhere on Earth at any time.

Telephone companies and private operators located throughout the world maintain round-the-clock radio watches on designated frequencies to patch your call into commercial telephone systems. In the United States American Telephone & Telegraph (AT&T) operate three high-frequency shore stations to facilitate high seas ship-to-shore traffic.

The United States Coast Guard provides two valuable services to SSB users

- 24-hour watch on several frequencies to render assistance to vessels in distress
- regular weather broadcasts ("Broadcast to Mariners")

Of course, you can communicate with any other SSB-equipped vessel as well.

While making an SSB radiotelephone call may appear to be as easy as making an ordinary telephone call, in reality however it is not. Radio waves (frequency) must be selected according to the time of day, season of the year, etc. Knowing what frequency to select is the most important factor in learning how to use your SSB effectively.

Radio Wave Propagation

HF radio waves transmitted from the transmitting antenna to the receiving antenna bounce off the ionosphere, an upper part of the Earth's atmosphere. The ionosphere, composed of several layers of electrically charged air particles, known as ions, is created from ultraviolet radiation. Its base is at about 40—50 miles and it extends to about 300 miles. The height and ion density of these layers depends on the time of day, season of the year, ultraviolet radiation level, etc. It is the condition of the ionosphere which determines

the effectiveness of radio wave propagation in the marine SSB spectrum.

A transmitted HF radio wave strikes the ionosphere and, if conditions are right, is received at its desired destination somewhere on the surface of the Earth. Because the radio wave "skips" (see Figure B-1) off the ionosphere it can travel great distances. In ideal conditions, a wave reflected returns to the Earth, is reflected upward from the ground, travels again to the ionosphere, and reflects to Earth again. This cycle can be repeated several times, leading to very long-range communication. While these "skips" make global contact possible, they also create "skip zones," areas where marginal signals exist. A skip zone is usually located about 50—750 miles from the transmitting station, depending on the frequency used.

Ionospheric density, created from ultraviolet radiation, determines how well a radio wave will reflect off the ionosphere. If the ionosphere is too dense, it will absorb low frequency waves. Highest density occurs between the early morning and peaks shortly after noon. If, on the other hand, the ionosphere is not highly ionized, high frequencies may not be reflected and make a beeline to outer space. Ionospheric density decreases sharply after dark.

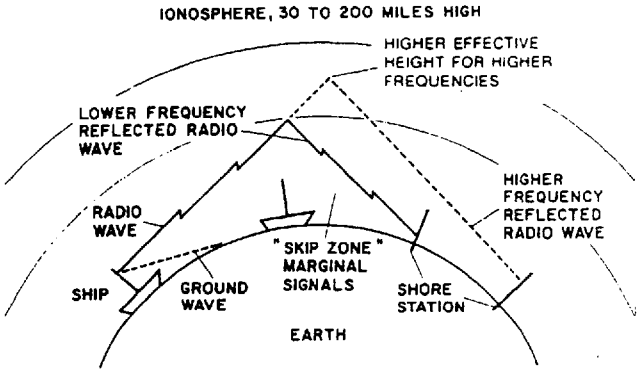

Figure B-1 Simplified skywave skip propagation

Frequency Selection

Sunlight increases ionospheric density during daylight hours. Since lower frequencies such as 2 and 4 MHz tend to get absorbed in the lower layers when ionospheric activity is high, the 8, 12 or 16 MHz should be used for long-range communication. The lower frequencies will suffice for short-range communication.

During nighttime, when ionospheric activity is low, the 4 and 8 MHz frequency bands should provide sufficient long-range communication. The higher frequencies are all but shut down because of decreased ionospheric activity.

The table below shows the bands of the Marine SSB spectrum (except 2 MHz) and their expected communication range.

Table B-1 SSB bands and ranges

Band	Range
4 MHz	20 – 250 miles during the day 300 – 700 miles from dawn to mid morning
8 MHz	200 – 1000 miles during the day, 300 – 2000 miles at night
16 MHz	6,000 miles possible during the day and sometimes into the late evening
22 MHz	almost "closed down" during periods of low sunspot activity; 8000 miles possible otherwise

Words can never tell a story quite as well as an illustration. Figure B-2 shows the most probable frequency to use as a function of the distance between stations and local time of the most easterly location. (The easterly station is picked as a reference since it is the one closer in time to the sunset.)

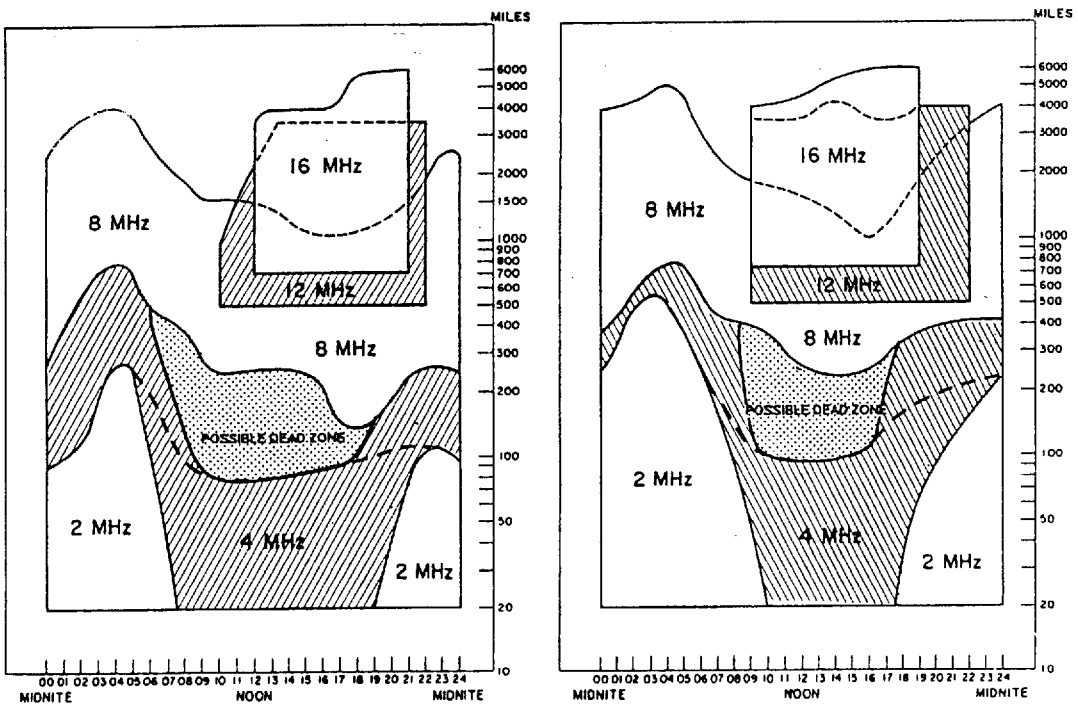

Figure B-2 Most probable freqeuncy band for use in spring/summer and fall/winter

Skip Angle

The skip angle is the amount the wave bends when it strikes the ionosphere. The angle and frequency are directly related to one another; the higher the frequency the greater the skip angle. Therefore, select a higher frequency when long range-communication is the objective. If, however, the skip angle is too great, communication is not possible to stations in the area skipped by the radio wave. In this case, select a lower frequency since they skip shorter distances.

Propagation Charts

Propagation charts, available from a wide variety of organizations, help you predict the best channels.

The United States Coast Guard includes propagation charts in its monthly publication "Amver Bulletin." Four Pacific charts and four Atlantic charts are provided, each of which designates the appropriate frequencies for one quarter of the day.

It must remembered that these charts are approximations; use them wisely.

As mentioned earlier, the AT&T operate three high-frequency stations. The antennas of each station point in a particular ocean area. The Antenna Coverage Charts show what areas are covered by each station. The charts are available by writing: AT&T Long Lines Headquarters, 201 Littleton Road, Morris Plains, NJ, 07950.

Experience

The expression "experience is the best teacher" can be applied to SSB frequency (channel) selection. Experience can be gained only through listening. Leave your radio on while underway and make a note of time, band, quality of reception, etc. of each signal received. Get to know and anticipate what the various marine bands do at different times of the day and night and in different seasons.

List of Drawings and Schematic Diagrams

No.	Name	Block No.	Type	Dwg. No.	Page
1	Transceiver Unit Outline		FS-1502	E5548-G01	D-1
2	Antenna Coupler Outline		AT-1500/AT-1502	C5485-010	D-2
3	Power Supply Outline		PR-270	C5485-031	D-3
4	DC-DC Converter Outline		PC-220	C5485-029	D-4
5	SSB Radiotelephone Interconnection		FS-1502	C5548-C03	S-1
6	SSB Radiotelephone Interconnection		FS-1502	C5548-C01	S-2
7	Interconnection		FS-1502 + DB-500	C5548-C02	S-3
8	Examples of BK Connection			E5037-K01	S-4
9	Examples of BK Connection			E5037-K02	S-5
10	Block Diagram			C5548-B01	S-6
11	Transceiver, General			E5548-K04	S-7
12	ntenna Coupler		05P0278B	E5548-K05	S-8
13	AC Power Supply		PR-270	C5485-032	S-9
14	DC-DC Converter		PC-220	C5485-030	S-10

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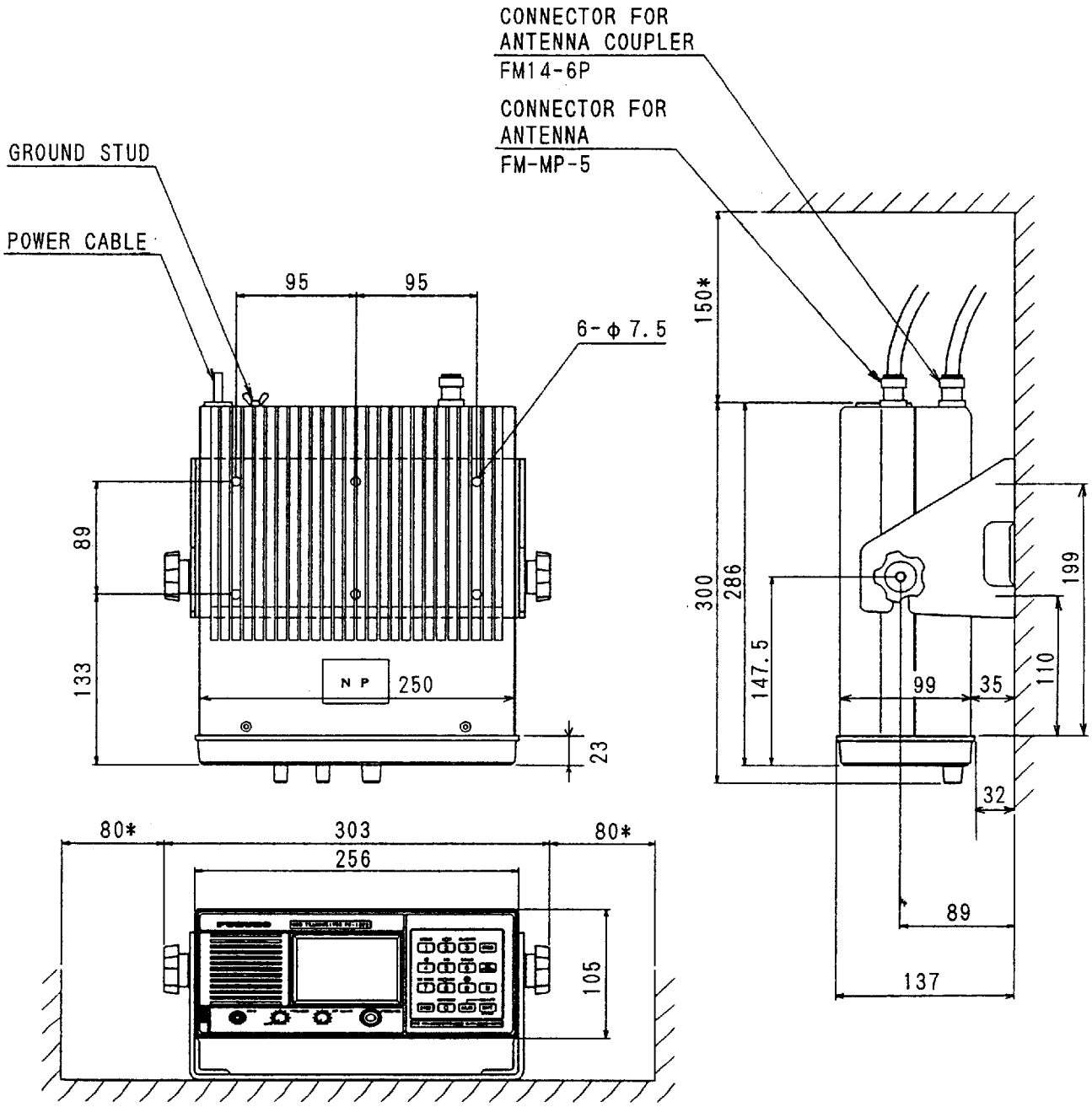
D - 1



*: RECOMMENDED SERVICE CLEARANCE

品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.NO.	摘要 REMARKS

承認 APPROVED	DEC.27.'91 T.NAKANO	三角法 THIRD ANGLE PROJECTION		名称 TITLE	FS-1502 TRANSCEIVER UNIT
検図 CHECKED	Dec.26.'91 M.IKEDA	尺度 SCALE	1/5		
製図 DRAWN	Dec.26.'91 C.TANAKA	重量 WEIGHT	6 kg	図番 DWG.NO.	E5548-G01-B

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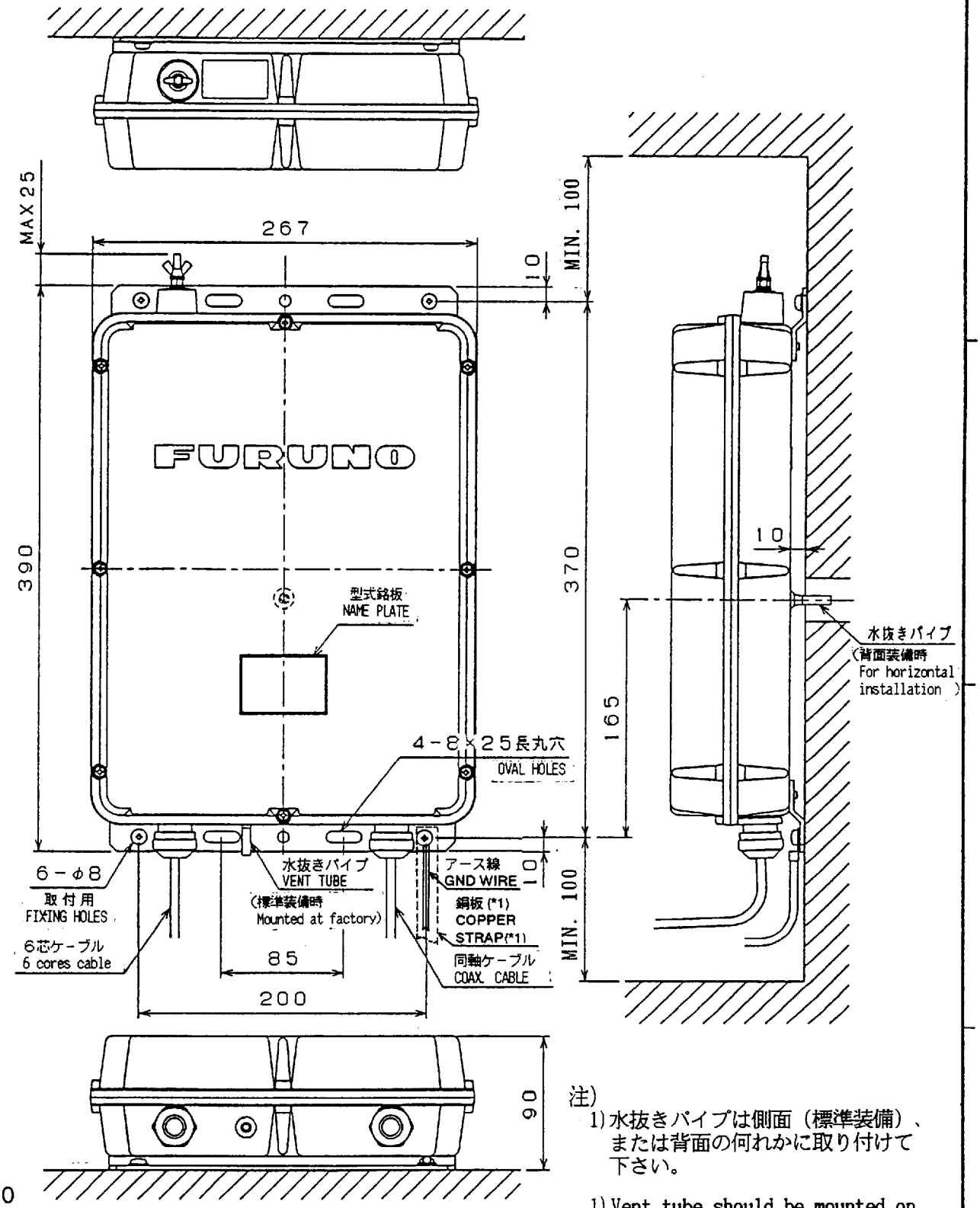
D - 2



注)

1) 水抜きパイプは側面（標準装備）、または背面の何れかに取り付けて下さい。

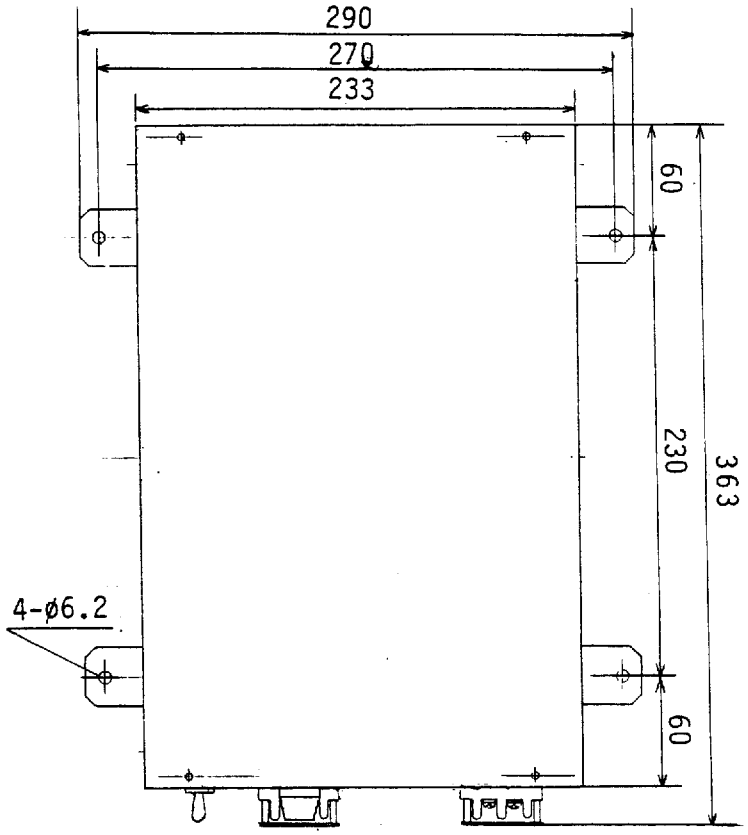
1) Vent tube should be mounted on either bottom (factory mount) or rear of the coupler, depending on installation methods.

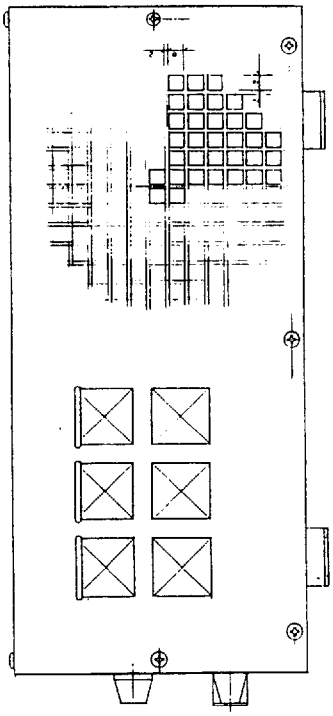
*1：ノイズが多い船は銅板を使用すること
Use copper strap for ships having lots of noise.

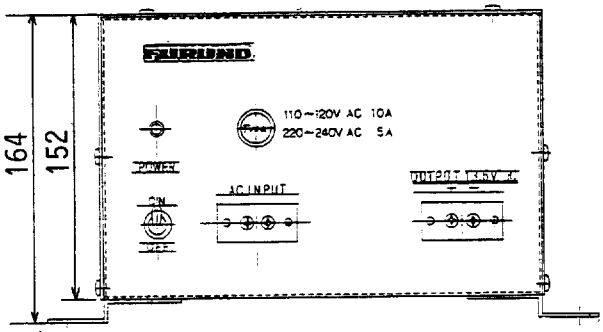
FS-1500
FS-1501
FS-1502
FS-1550
FS-1552

ITEM 品番	NAME 品名	MATERIAL 材質	Q'TY 数量	DWG.NO. 図番	REMARKS 摘要

承認 APPROVED	NOV. 22 '91 T.NAKANO	三角法 THIRD ANGLE PROJECTION		名称 TITLE	アンテナカプラ外寸図
検図 CHECKED	Nov 20 '91 M.IKEDA	尺度 SCALE	1/4	AT-1500/AT-1502	ANTENNA COUPLER
製図 DRAWN	SEP. 3 '91 J.ISHIHARA	重量 WEIGHT	2.9 kg	図番 DWG.NO.	C5485-010-F

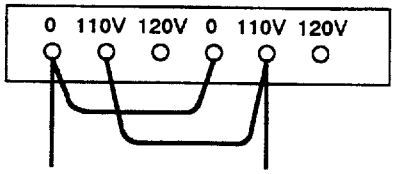




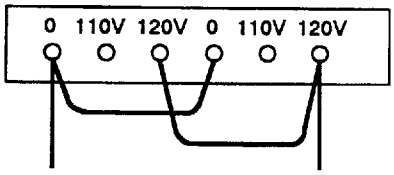


内部結線
Internal Connection

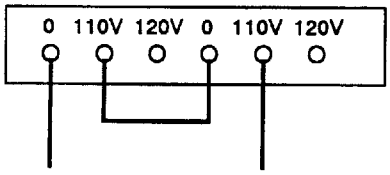
110VAC



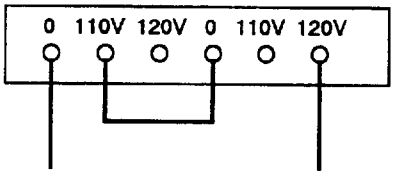
120VAC



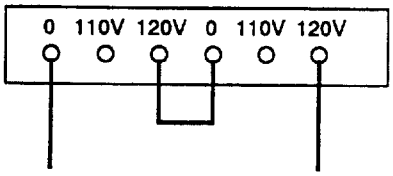
220VAC



230VAC



240VAC



承認 APPROVED	DEC. 14. '88 T. NAKAUO	三角法 THIRD ANGLE PROJECTION		名称 TITLE	PR-270 AC 電源 POWER SUPPLY
検図 CHECKED	Dec. 14. '88 M. IKEDA	尺度 SCALE	/		
製図 DRAWN	Dec. 14. '88 S. NISHI	重量 WEIGHT	14 kg	図番 DWG. NO.	C5485 – 031 – C

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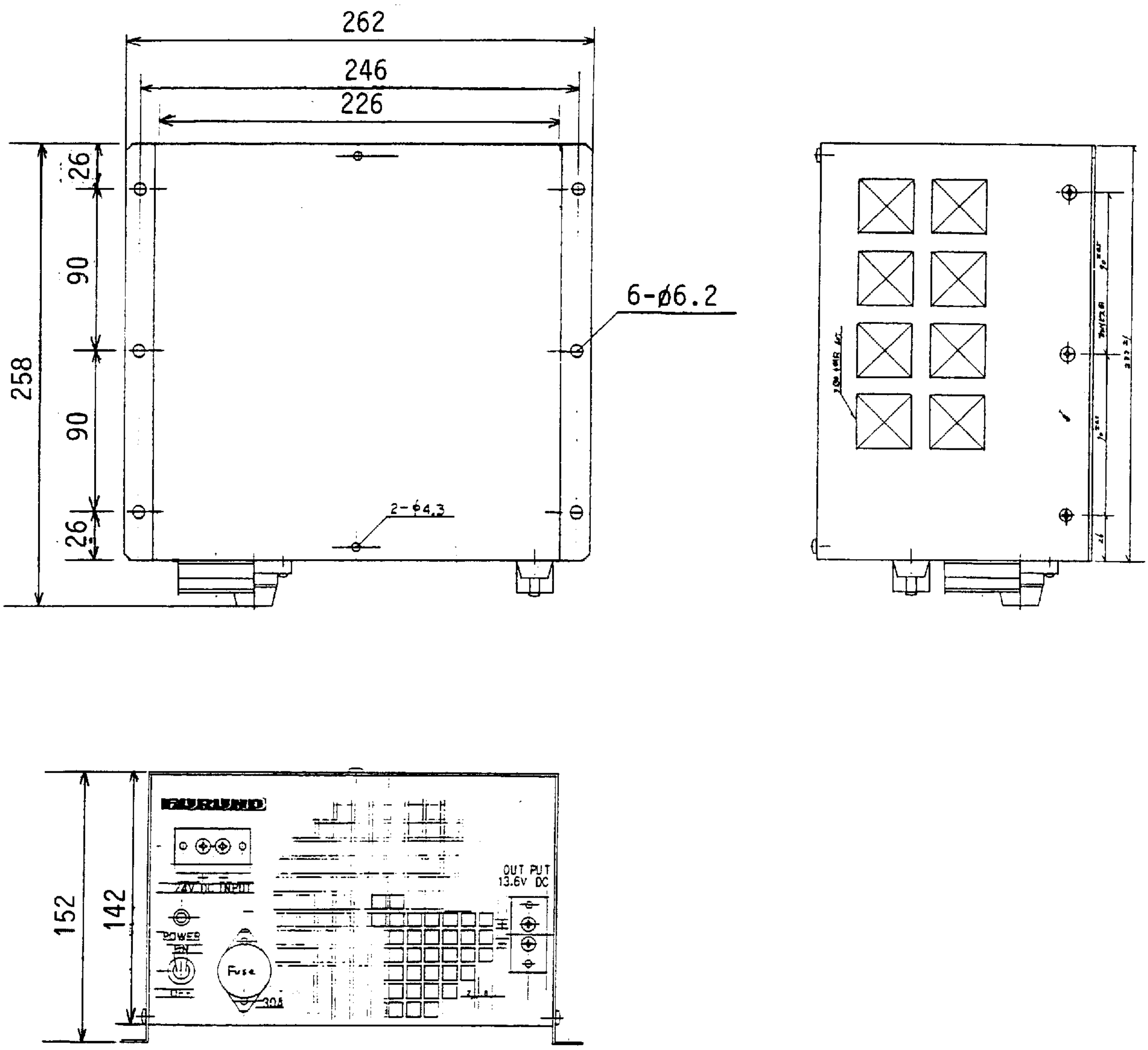
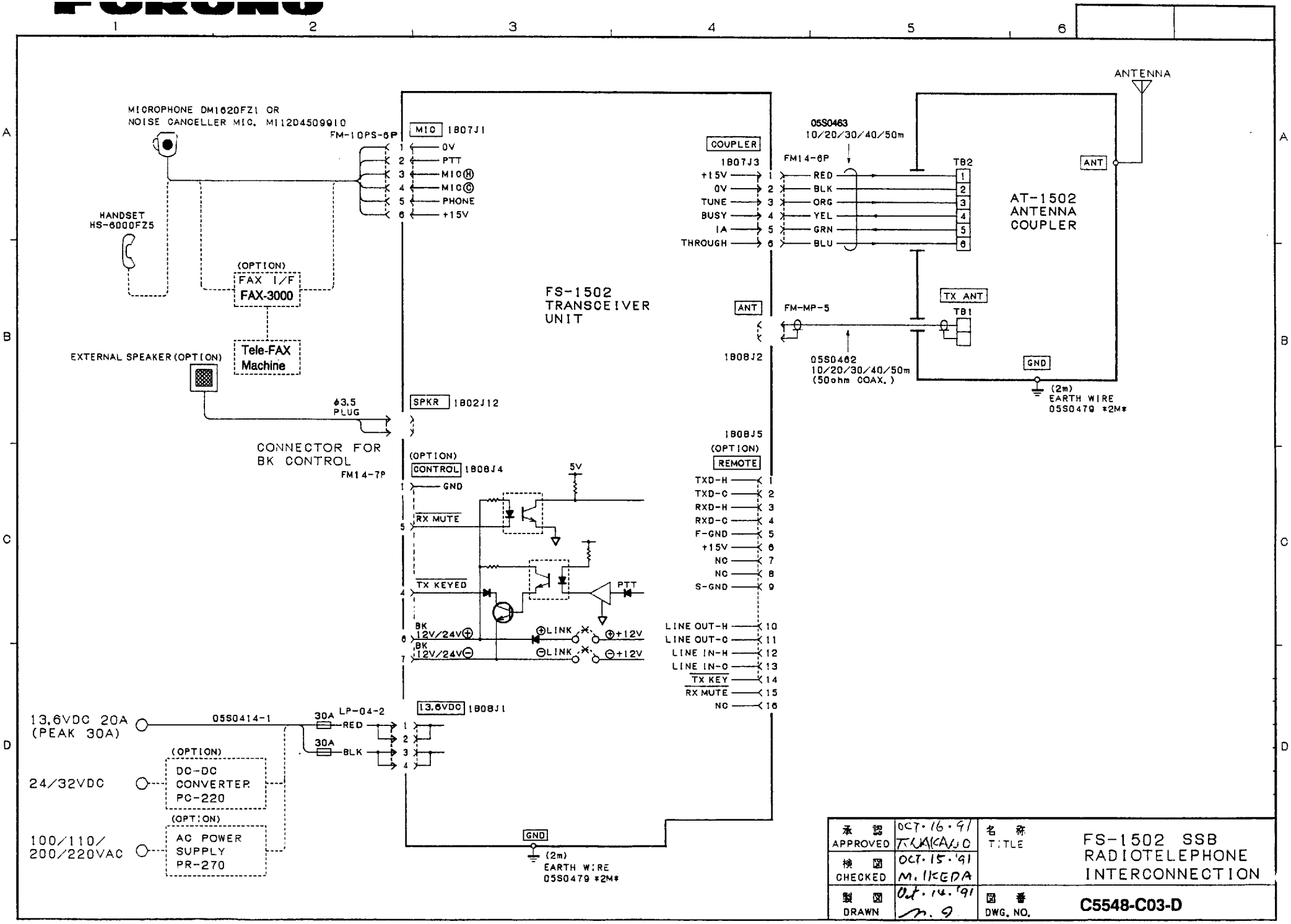


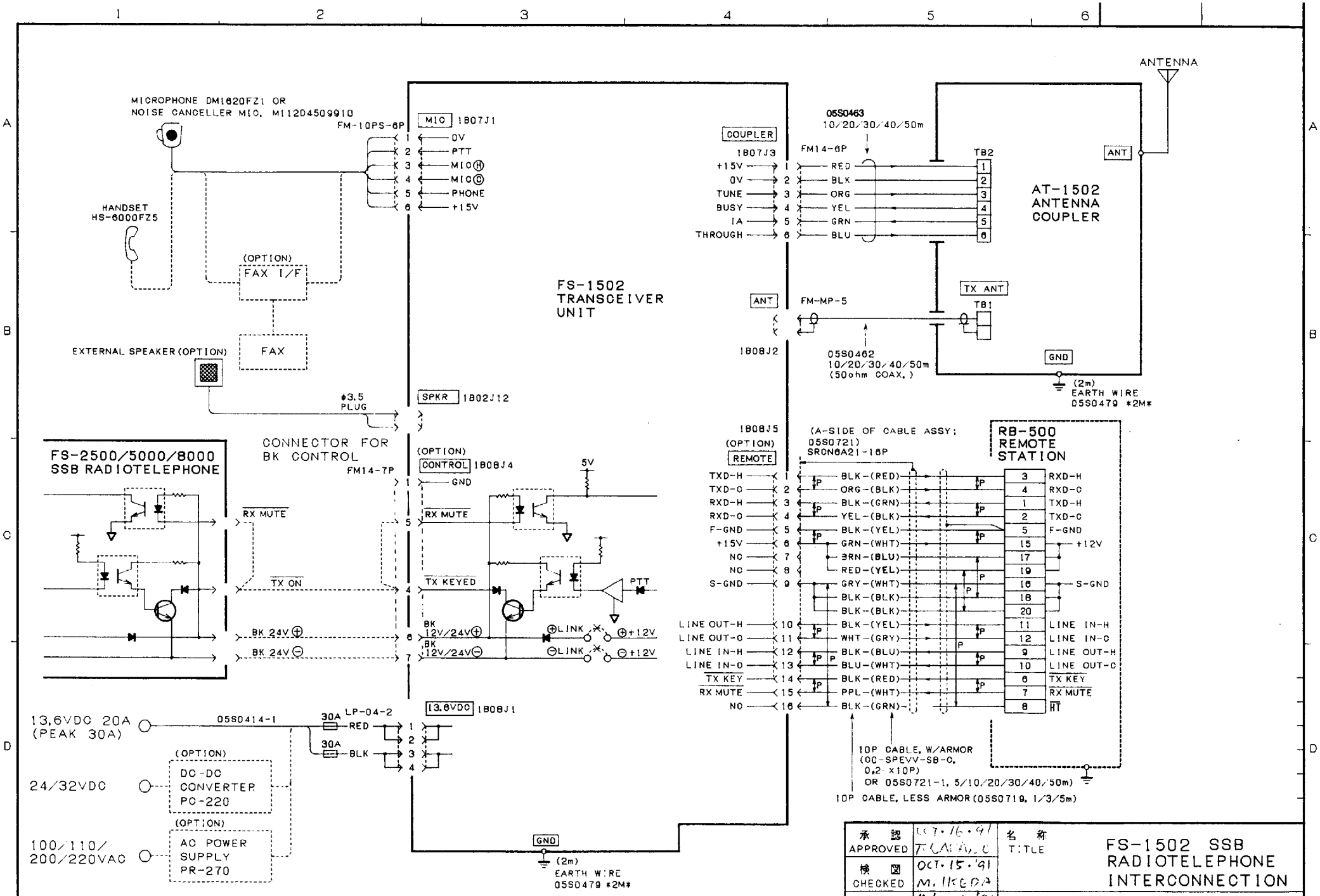
品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG. NO.	摘要 REMARKS

承認 APPROVED	DEC・14・'88 T. WAKAUC	三角法 THIRD ANGLE PROJECTION	名称 TITLE	PC−220 DC−DC コンバータ DC-DC CONVERTER
検図 CHECKED	Dec・14・'88 M. IKEDA	尺度 SCALE	∼	
製図 DRAWN	Dec・14・'88 S. Nishi	重量 WEIGHT	5 kg	図番 DWG. NO. C5485−029−B



承認 APPROVED	OCT.16.'91 TAKANO	名称 TITLE	FS-1502 SSB RADIOTELEPHONE INTERCONNECTION
検図 CHECKED	OCT.15.'91 M.IKEDA		
製図 DRAWN	Oct.14.'91 M.9	図番 DWG. NO.	C5548-C03-D

S-1



承認 APPROVED	OCT.16.'91	名称 TITLE	FS-1502 SSB RADIOTELEPHONE INTERCONNECTION
検図 CHECKED	OCT.15.'91		
製図 DRAWN	Oct.14.'91	図番 DWG. NO.	C5548-C01-D

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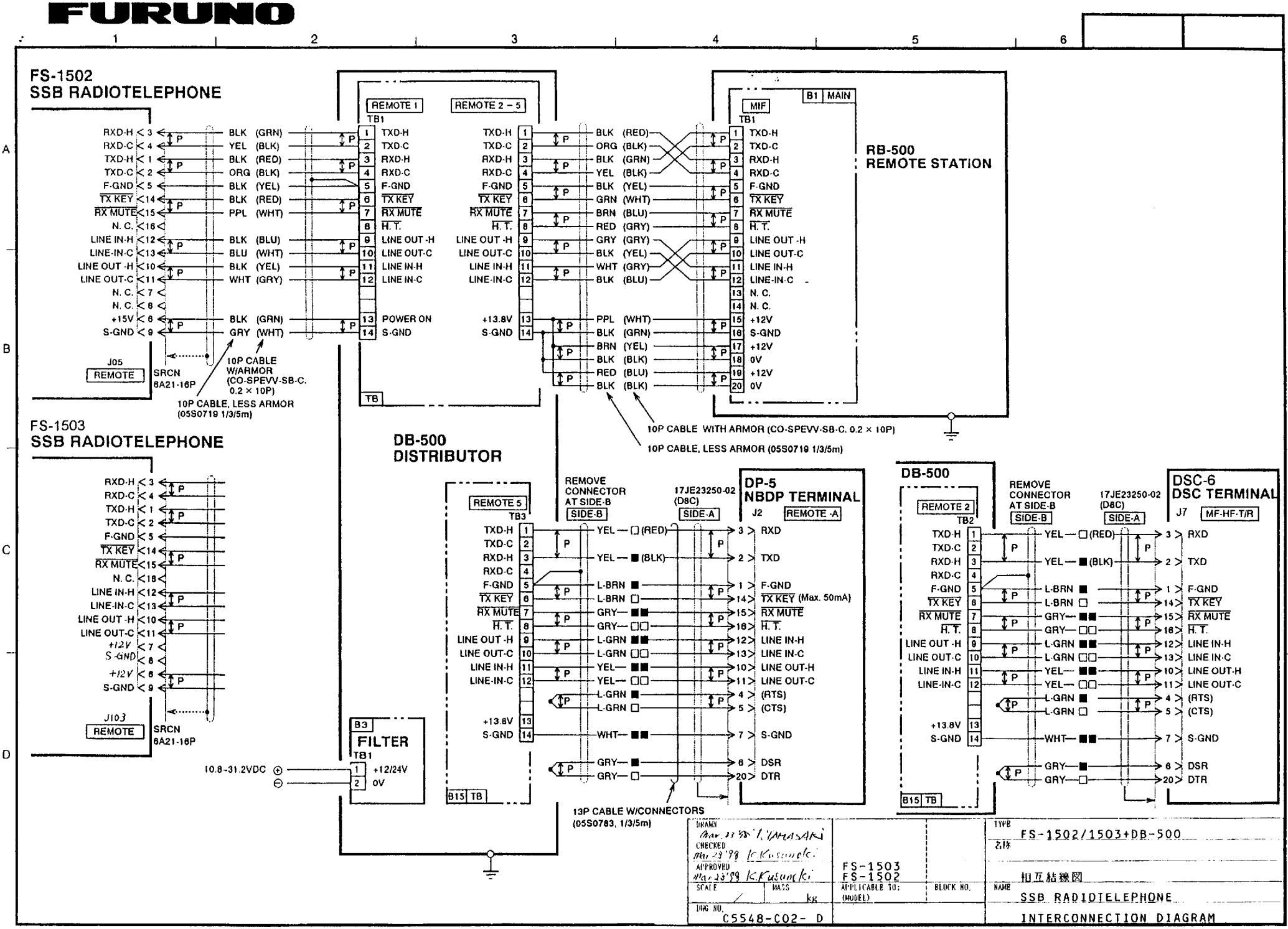
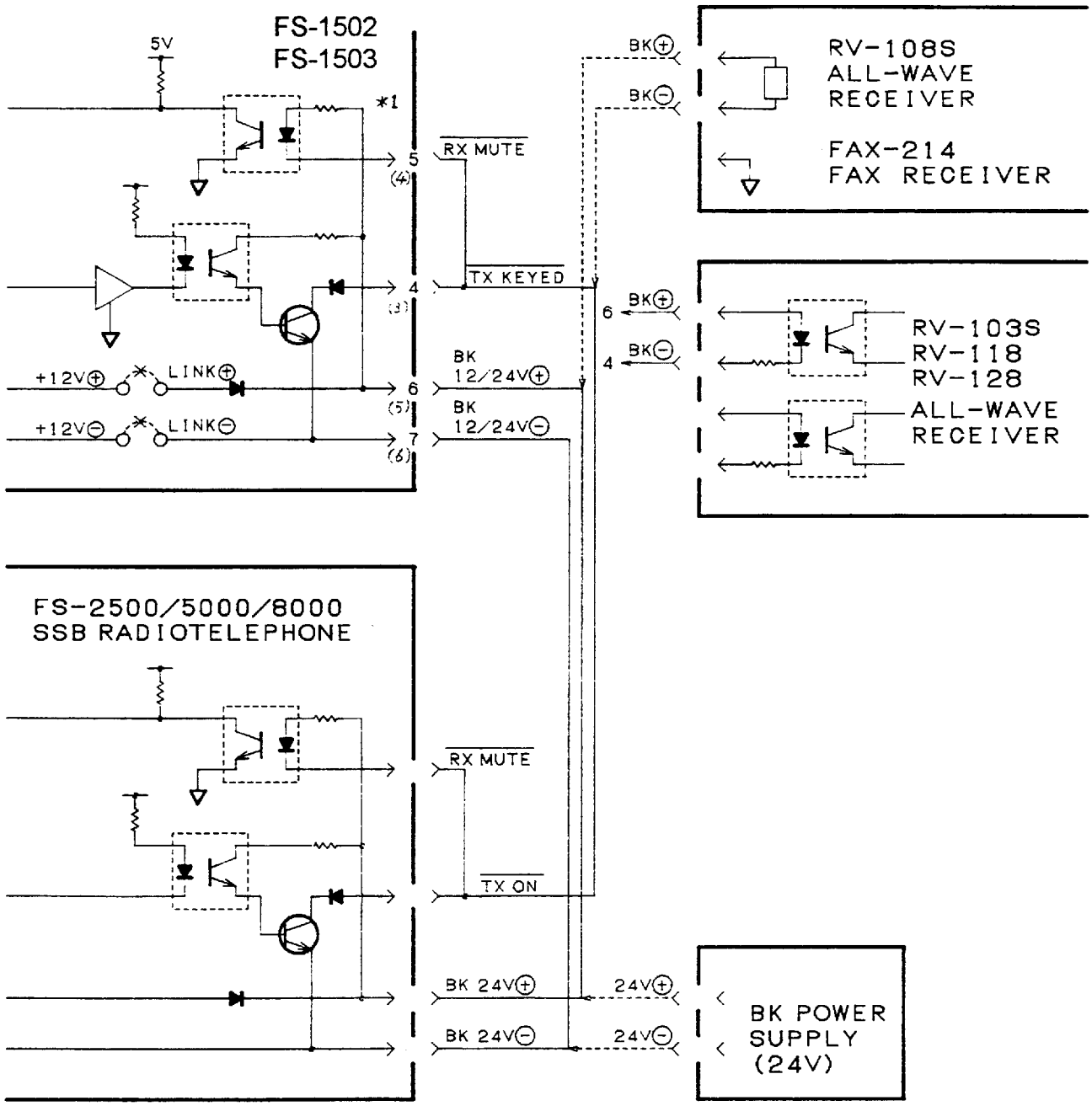
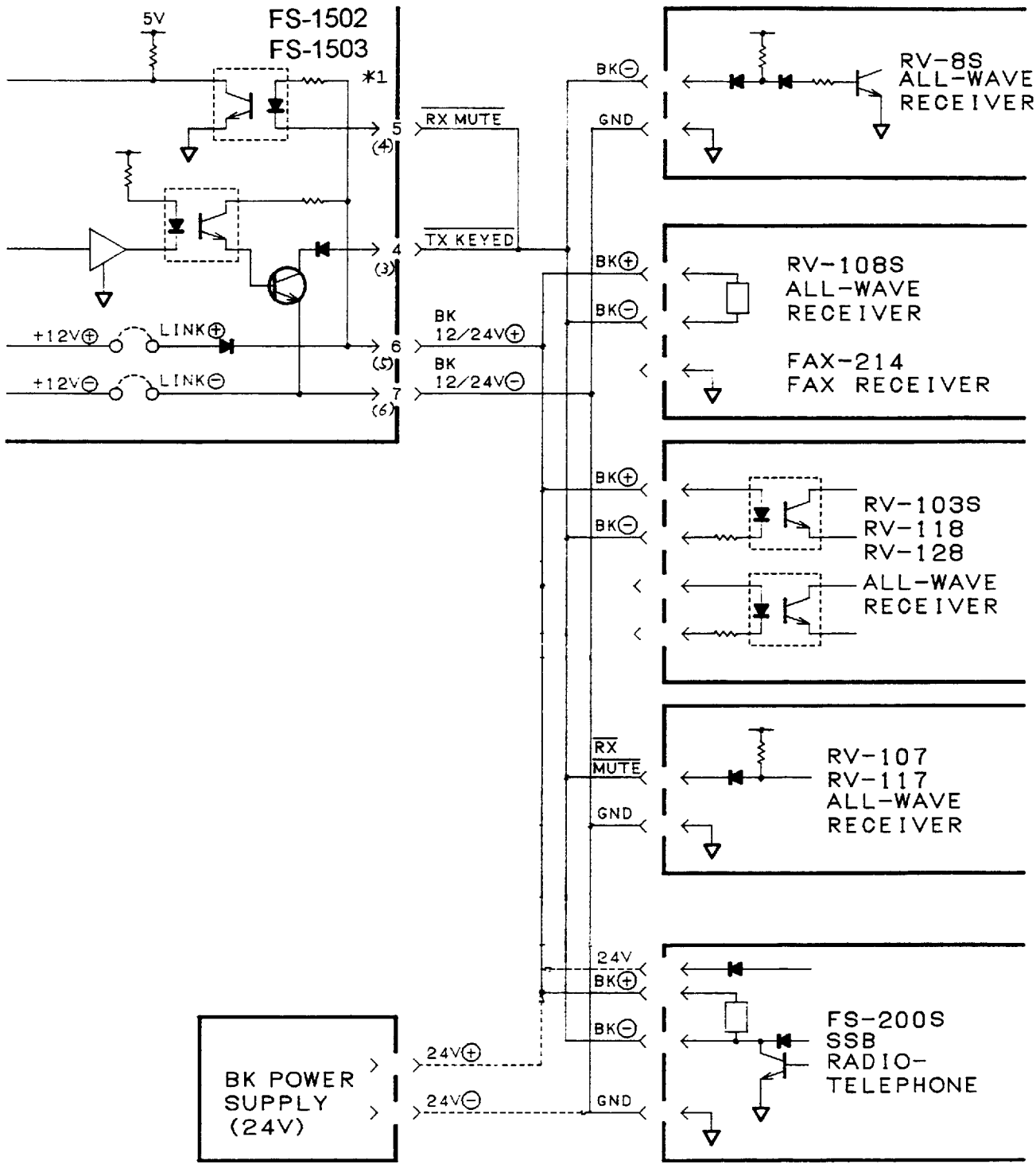


DRAWN	Mar.23'99 T.YAMASAKI	TYPE	FS-1502/1503+DB-500
CHECKED	Mar.23'99 K.Kusunoki	名称	相互結線図
APPROVED	Mar.23'99 K.Kusunoki	NAME	SSB RADIOTELEPHONE INTERCONNECTION DIAGRAM
SCALE / MASS kg	FS-1503 FS-1502		
DWG NO.	C5548-C02- D	APPLICABLE TO: (MODEL)	BLOCK NO.



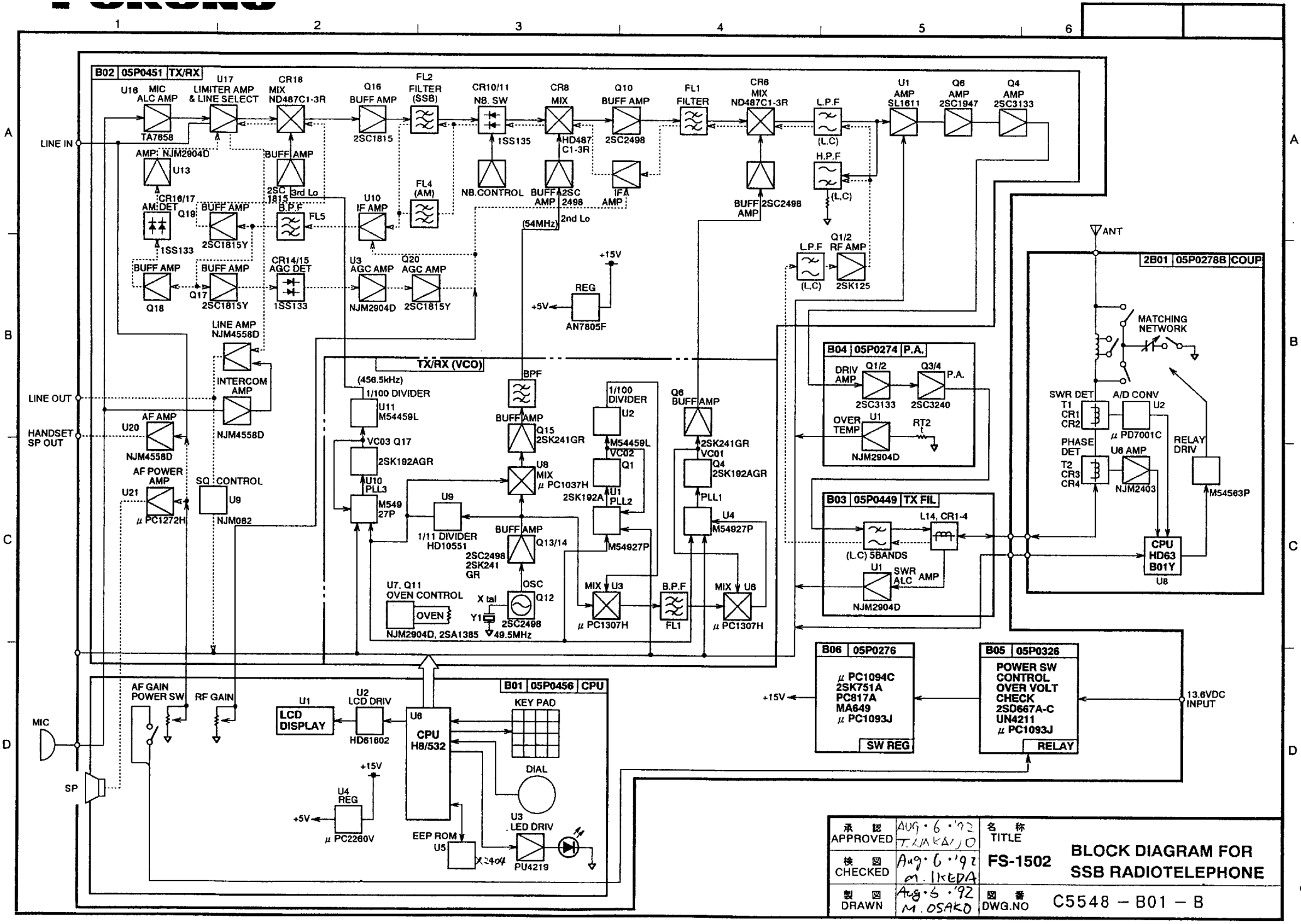
NOTE
*1. ( ): PIN NUMBER OF FS-1503.

DRAWN: Mar 23 '98 T.YAMASAKI				TYPE
CHECKED: Mar 24 '98 K.Kasuno'ki				名称
APPROVED: Mar '98 K.Kasunoki				回路図
SCALE: /	MASS: kg	APPLICABLE TO: (MODEL)	BLOCK NO.	NAME: BK CONNECTION(FLOATING GROUND)
DWG NO.: E5073-K01- B				SCHEMATIC DIAGRAM



NOTE
*1. ( ) : PIN NUMBER OF FS-1503.

DRAWN Mar. 23 '98 T. Tamsaki			TYPE
CHECKED Mar. 23 '98 K. Kusunoki			名称
APPROVED Mar. 23 '98 K. Kusunoki			回路図
SCALE /	MASS kg	APPLICABLE TO; (MODEL)	BLOCK NO.
DWG NO. E5073-K02- B			NAME BK CONNECTION (NEGATIVE GROUND) SCHEMATIC DIAGRAM



承認 APPROVED	AUG・6・'92 T.NAKAJO	名称 TITLE	BLOCK DIAGRAM FOR SSB RADIOTELEPHONE
検図 CHECKED	Aug・6・'92 M.IKEDA	FS-1502	
製図 DRAWN	Aug・6・'92 M.OSAKO	図番 DWG.NO	C5548 – B01 – B

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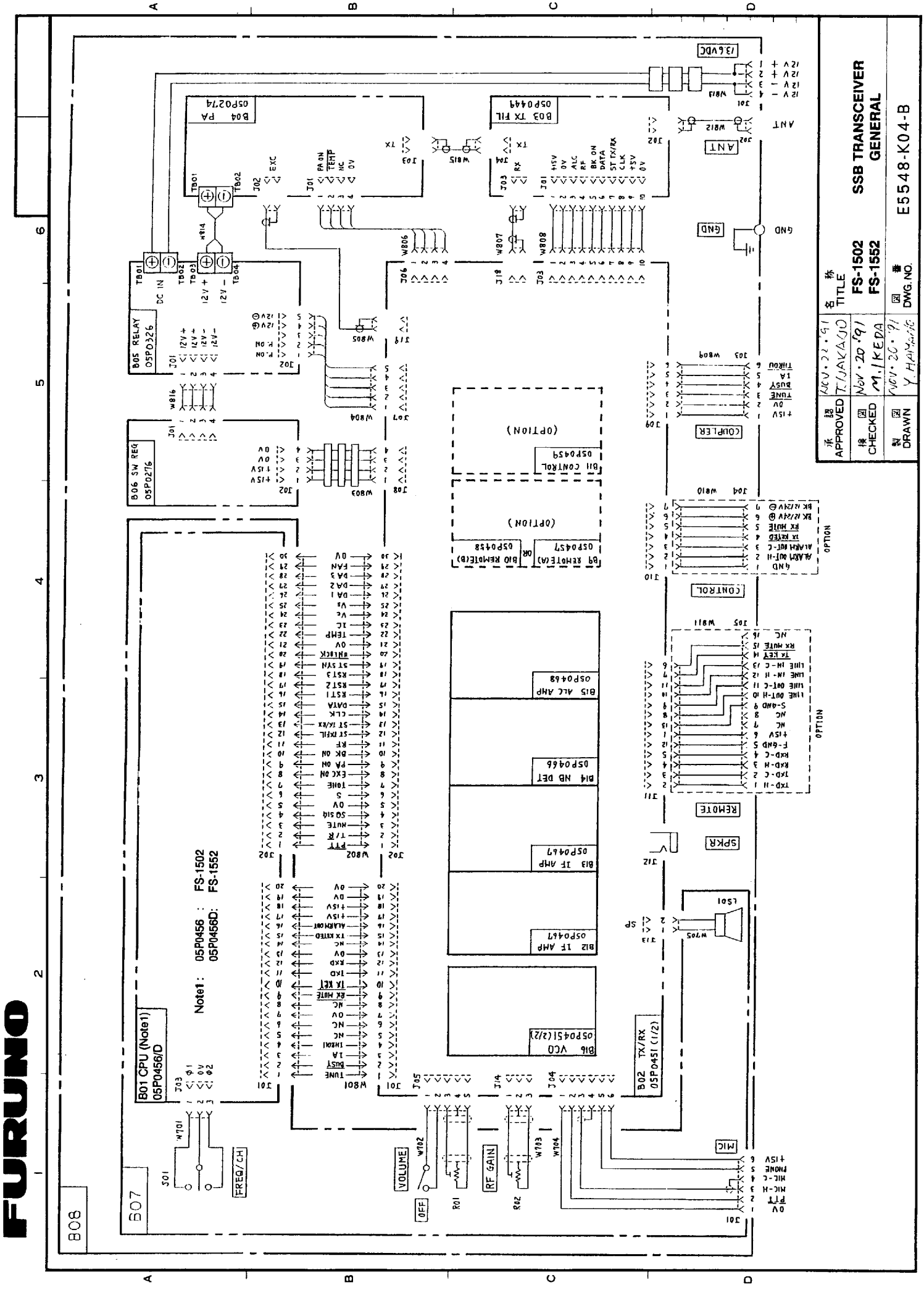
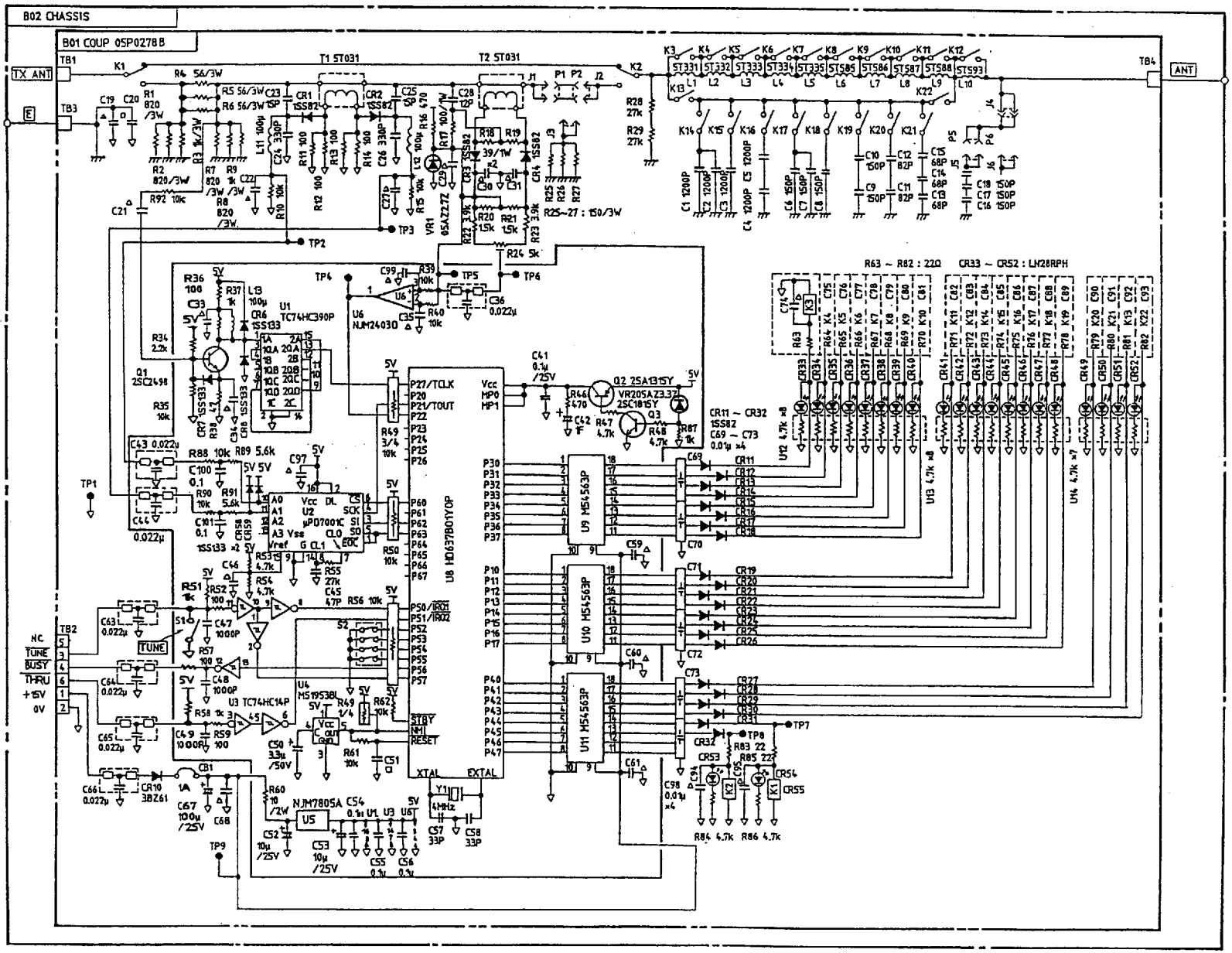

SSB TRANSCEIVER
GENERAL
FS-1502
FS-1552
E5548-K04-B
APPROVED
CHECKED
DRAWN
TITLE
DWG.NO.
Note1 : 05P0456 : FS-1502
05P0456D: FS-1552
B01 CPU (Note1)
05P0456/D
B02 TX/RX
05P0451 (1/2)
B03 TX FIL
05P0449
B04 PA
05P0274
B05 RELAY
05P0326
B06 SW REG
05P0276
B07
B08
VOLUME
RF GAIN
FREQ/CH
MIC
SPKR
CONTROL
REMOTE
COUPLER
OPTION
GND
ANT
13.6VDC

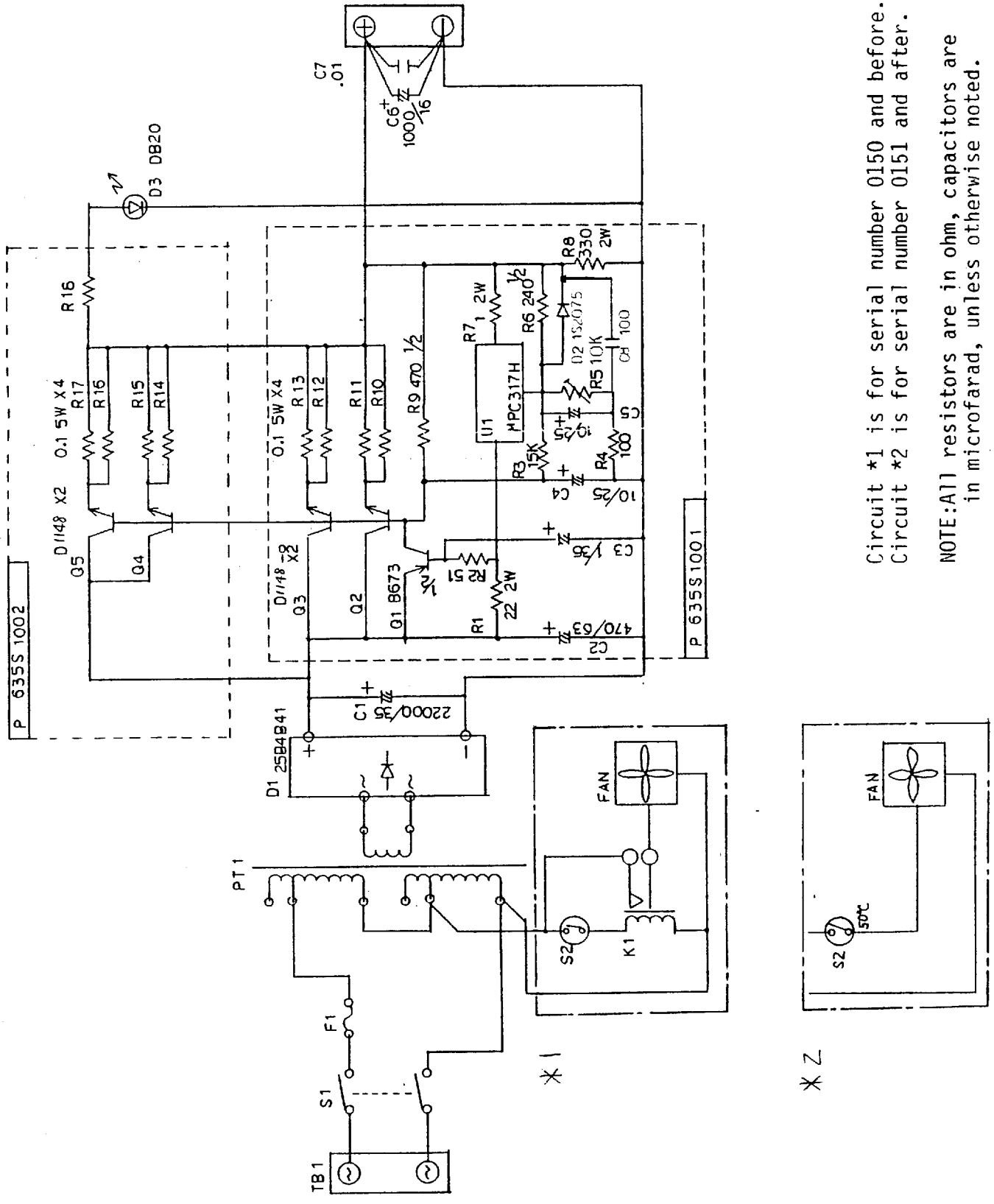


NOTE : (1) RESISTORS ARE IN Ω (1/6W), CAPACITORS ARE IN F, INDUCTORS ARE IN H, UNLESS OTHERWISE NOTED.
(2) MARKS ○ARE 1000PF/50WV CAPACITORS
△ ARE 0.01μF/50WV CAPACITORS AND
□ ARE 0.1μF/25WV CAPACITORS.

FS-1502

承認 APPROVED	Nov.22.'91 T.NAKANO	名称 TITLE	05P0278B
検図 CHECKED	Nov.29.'91 M.IKEDA		AT-1502 ANTENNA COUPLER
製図 DRAWN	Nov.26.'91 Y.HAYASHI	図番 DWG.NO.	E5548-K05-A

FURUNO ELECTRIC CO., LTD.

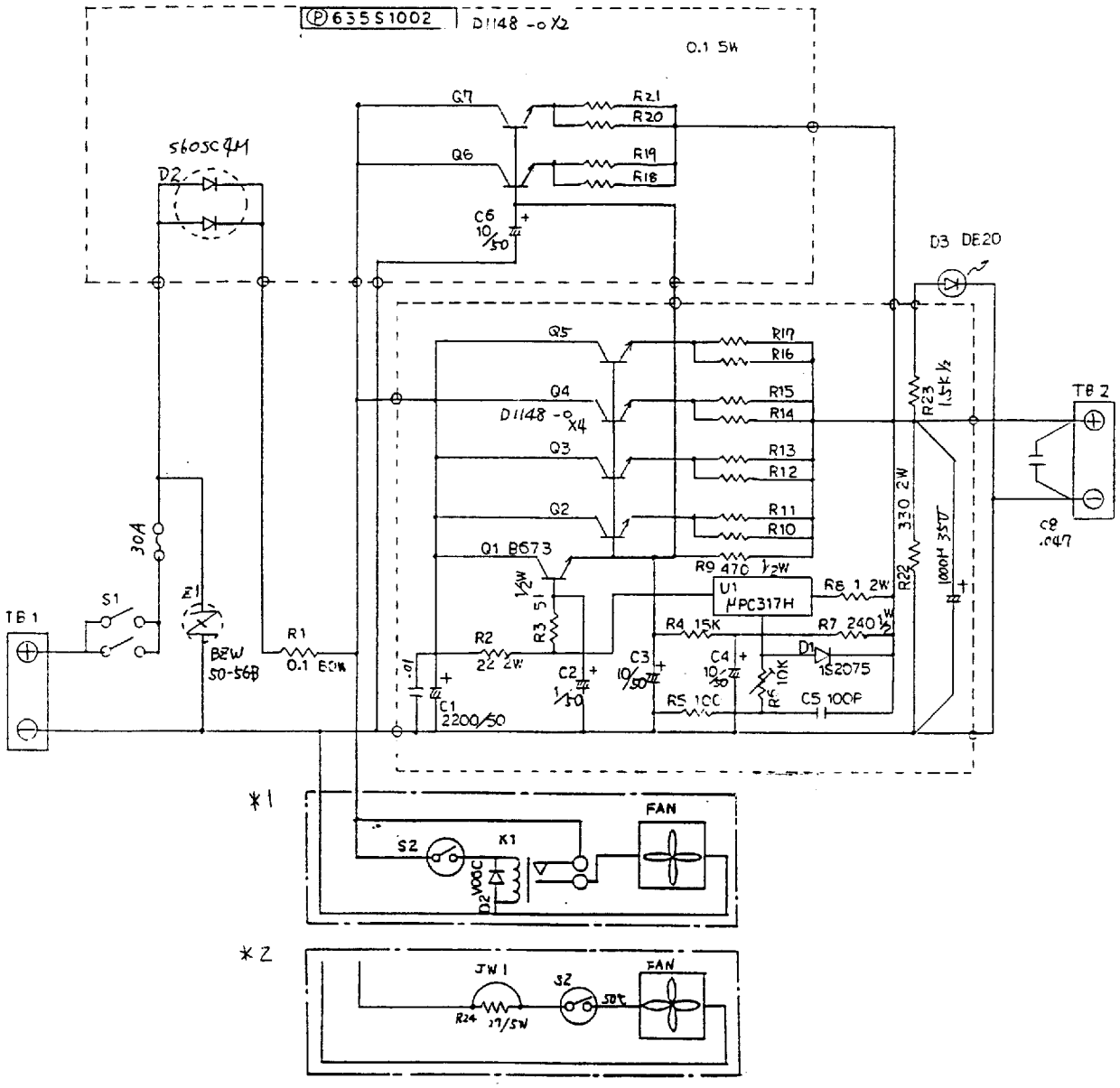


Circuit *1 is for serial number 0150 and before.
Circuit *2 is for serial number 0151 and after.

NOTE:All resistors are in ohm, capacitors are in microfarad, unless otherwise noted.

品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.NO.	摘要 REMARKS

承認 APPROVED	DEC・14・'88	三角法 THIRD ANGLE PROJECTION		名称 TITLE	PR-270 AC 電源 POWER SUPPLY
検図 CHECKED	Dec・14・'88	尺度 SCALE	/		
製図 DRAWN	Dec・14・'88	重量 WEIGHT	kg	図番 DWG.NO.	C5485-032-C



*1 Circuit *1 is for serial number 0150 and before.
Circuit *2 is for serial number 0151 and after.

NOTE: All resistors are in ohm, capacitors are in microfarad, unless otherwise noted.

品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.NO.	摘要 REMARKS

承認 APPROVED	DEC・14・'88	三角法 THIRD ANGLE PROJECTION		名称 TITLE	DC-DC コンバータ DC-DC CONVERTER
検図 CHECKED	Dec・14・'88 M. HEDA	尺度 SCALE	/	PC-220	
製図 DRAWN	Dec・14・'88	重量 WEIGHT	kg	図番 DWG. NO.	C5485-030-C