

FURUNO

OPERATOR'S MANUAL

SSB RADIOTELEPHONE

(Incl. Installation Instructions)

MODEL FS-8000

(For ROM version No.21 & AF board suffix no.-33)

After installation, if necessary,
change system settings and
adjust output power referring
to pub. no. TI-E5519.

Applicable to Antenna Coupler having
serial number 1001 and after



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(YOSH)

PUB. No. OME-55210
FS-8000

•Your Local Agent/Dealer

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SAFETY INSTRUCTIONS

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



DANGER

This notice indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury.



WARNING

This notice indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION

This notice indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury, or property damage.



SAFETY INFORMATION FOR THE OPERATOR

DANGER



This equipment contains **high voltages** in the transceiver unit and the antenna couple unit. These voltages are sufficient to kill anyone coming in direct contact with them.

Any internal adjustment, servicing and repair shall only be performed by qualified service personnel.

A residual charge remains in capacitors and other devices several minutes after turning off the power. **Wait at least 3 minutes** to allow residual charge to disappear.

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.

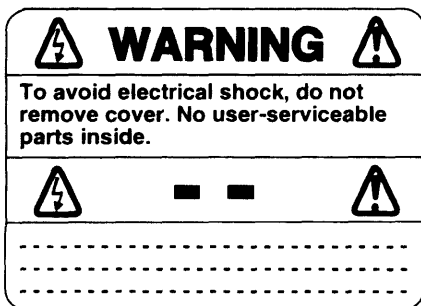
Do not disassemble or modify the equipment.

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.

WARNING Label attached



Name : Warning Label (1)
Type : 86-003-1011-0
Code No. : 100-236-230



SAFETY INFORMATION FOR THE OPERATOR



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.

SAFETY INFORMATION FOR THE INSTALLER

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 electromagnetic 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.

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Declaration of conformity to type

* * * * OPERATOR'S GUIDE * * * *

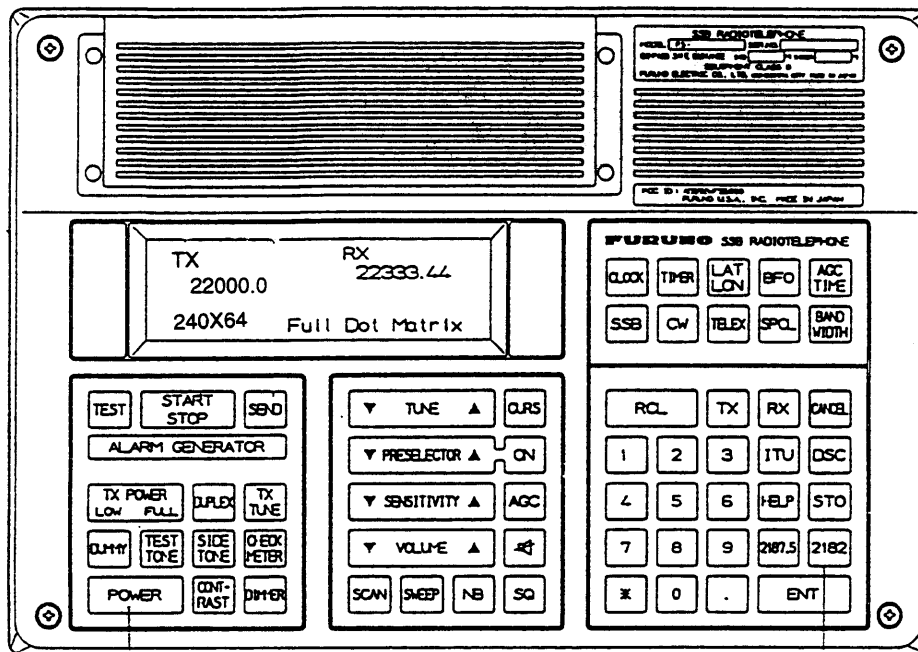
SSB RADIOTELEPHONE MODEL FS-5000/8000

USER (PRESET) CHANNEL		
Storing frequency	(Call up ITU or DSC CH.) <input type="button" value="STO"/> (CH No.) <input type="button" value="ENT"/> <input type="button" value="ENT"/> ↑ 1 to 8999CH (Storage capacity: 400CH)	Class of emission & bandwidth are also stored.
Recalling freq.	TX/RX <input type="button" value="RCL"/> (CH No.) <input type="button" value="ENT"/>	To see stored USER CH, press <input type="button" value="RCL"/> <input type="button" value="9"/> <input type="button" value="9"/> <input type="button" value="9"/> <input type="button" value="8"/> <input type="button" value="ENT"/> in that order.
	TX <input type="button" value="RCL"/> <input type="button" value="TX"/> (CH No.) <input type="button" value="ENT"/>	
	RX <input type="button" value="RCL"/> <input type="button" value="RX"/> (CH No.) <input type="button" value="ENT"/>	
Changing CH No. quickly	Move the cursor to "CH No.indication" by using the <input type="button" value="CURS"/> key. Then, press <input type="button" value="▼"/> TUNE <input type="button" value="▲"/> key. (This operation is available for ITU/DSC CH as well.)	
Watching TX freq. on two-frequency communication	Watch <input type="button" value="RX"/> <input type="button" value="ENT"/>	
	Cancel <input type="button" value="CANCEL"/>	
ITU/DSC CHANNEL		
Recalling (Select class of emission prior to recalling.)	TX/RX <input type="button" value="ITU"/> <input type="button" value="DSC"/> (CH No.) <input type="button" value="ENT"/>	CH No. DSC: 1 to 79CH ITU: (EX) Recalling of 401 CH <u>41</u> , <u>401</u> or <u>4001</u>
	RX <input type="button" value="ITU"/> <input type="button" value="DSC"/> <input type="button" value="RX"/> (CH No.) <input type="button" value="ENT"/>	
RX. FREQ. SETTING FROM KEYBOARD		
	<input type="button" value="RX"/> (Freq. in kHz) <input type="button" value="ENT"/>	
REMARKS ON RX		
Tuning(Preselector)	<input type="button" value="ON"/> <input type="button" value="▼PRESELECTOR▲"/>	Effective for freq. less than 4.5MHz.
When changing RX freq. band	<input type="button" value="TX TUNE"/> (Change TX freq. band to agree with RX freq. band, then press this key.)	Only when ANT BK RELAY board is not provided in the ANT COUPLER.
Normal Setting	AGC---SLOW NB----- ON	

FREQUENCY SCANNING (AGC: ON)		
Starting	(Call up ITU, DSC or USER CH) <input type="button" value="SCAN"/>	CH Scan range • DSC/ All CH USER: • ITU: Within band selected. (EX) ① Standard---->"3" ② 5 sec. ----->"5"
Stopping	<input type="button" value="SCAN"/>	
Changing the settings	<input type="button" value="STO"/> <input type="button" value="SCAN"/> ① (Set stop signal level) <input type="button" value="ENT"/> ② (Set stop time) <input type="button" value="ENT"/>	
FREQUENCY SWEEPING (AGC: ON)		
Starting	(Set RX freq.) <input type="button" value="SWEEP"/>	(EX) ① 10MHz---->"10000" ② 100kHz---->"100" ③ Standard-->"3" ④ 5 sec. ----->"5"
Stopping	<input type="button" value="SWEEP"/>	
Changing the settings	<input type="button" value="STO"/> <input type="button" value="SWEEP"/> ① (Set sweep width freq.) <input type="button" value="ENT"/> ② (Set step freq.) <input type="button" value="ENT"/> ③ (Set stop signal level) <input type="button" value="ENT"/> ④ (Set stop time) <input type="button" value="ENT"/>	
TIMER		
Time setting	<input type="button" value="STO"/> <input type="button" value="CLOCK"/> (Y.M.D.H.M) <input type="button" value="ENT"/> (EX) 1990-4-8 7H5M <input type="text" value="9"/> <input type="text" value="0"/> <input type="text" value="."/> <input type="text" value="4"/> <input type="text" value="."/> <input type="text" value="8"/> <input type="text" value="."/> <input type="text" value="7"/> <input type="text" value="."/> <input type="text" value="5"/>	
Timer	<input type="button" value="STO"/> <input type="button" value="TIMER"/> (D.H.M) <input type="button" value="ENT"/> -----> Switch off after timer function is turned on ("Wake up" is displayed). (EX 1) 8H5M (daily) <input type="text" value="8"/> <input type="text" value="."/> <input type="text" value="5"/> (EX 2) 9th (day), 7H3M <input type="text" value="9"/> <input type="text" value="."/> <input type="text" value="7"/> <input type="text" value="."/> <input type="text" value="3"/>	

2182 kHz DISTRESS CALLING

NOTE: For installations which use an "antenna changer", connect the antenna to the Antenna Coupler before transmitting the two-tone alarm.



① Turn the power on.

② Press the 2182 key.

- ③ Speaking slowly and distinctly, say **MAYDAY, MAYDAY, MAYDAY**. This is ..." giving the name of vessel and call sign three times. Then continue with the distress message, as follows.
- ④ The name of calling vessel.
- ⑤ Position.
- ⑥ The assistance needed.
- ⑦ A description of vessel (type, color, number of persons aboard, etc.)
- ⑧ Indicate end of message by saying, Over."

DSC DISTRESS CALLING

WHEN DSC TERMINAL WITH FREQUENCY REMOTE CONTROL (e.g. Furuno DSC-6) IS EQUIPPED

1. Turn the unit on if it is not already on.
2. Press the **DISTRESS** key on the DSC terminal.
3. When a coast station acknowledges the call, the DSC terminal displays DIST-ACK and sets the predetermined DISTRESS frequency.
4. Communicate with the coast station.

WHEN DSC TERMINAL WITHOUT FREQUENCY REMOTE CONTROL IS EQUIPPED

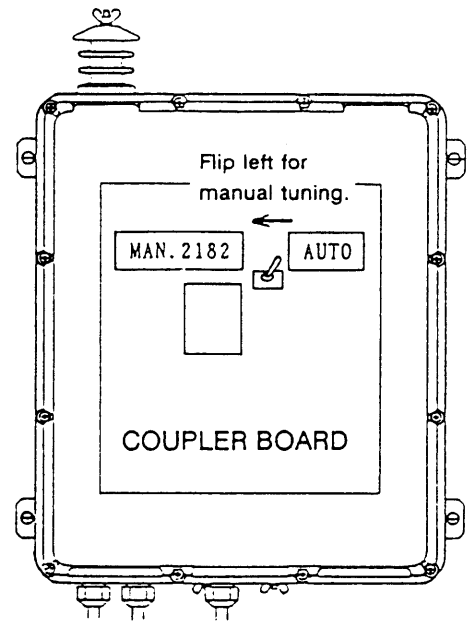
1. Turn the unit on if it is not already on.
2. On the FS-8000, press the **2187.5** key.
3. On the DSC terminal, press the **DISTRESS** key. The DSC distress signal is transmitted over 2187.5 kHz.
4. After the DSC terminal displays DIST-ACK, press the **2182** key on the FS-8000.
5. Communicate with the coast station.

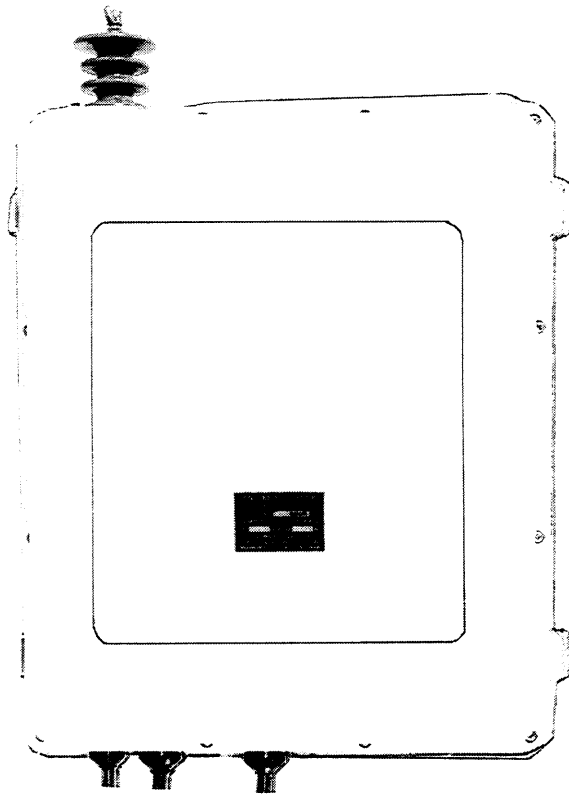
Note: For detail of distress calling using DSC, refer to the Operator's Manual for DSC terminal or one for DMC (Distress Message Control Unit).

IN THE EVENT OF ANTENNA COUPLER FAILURE

The antenna tuning circuit in the Antenna Coupler automatically tunes a wire or whip antenna. When the LCD displays "TX Tuning Error" for all frequencies, this means the coupler cannot be tuned automatically. In this case, you can communicate on 2182 kHz by tuning the coupler manually.

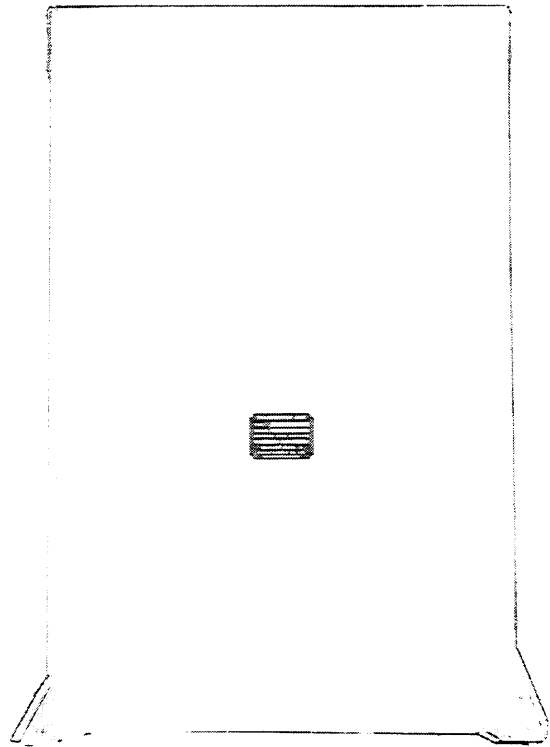
1. Remove the cover of the Antenna Coupler.
2. Set the **AUTO/MANUAL 2182 kHz** switch to the **MAN 2182** side.
3. Replace the cover.
4. Turn the FS-8000 on and select 2182 kHz.
5. Call a coast station and tell your situation. Be sure not to transmit during silent period (00 to 03 min. 30 to 33 min. of every hour).





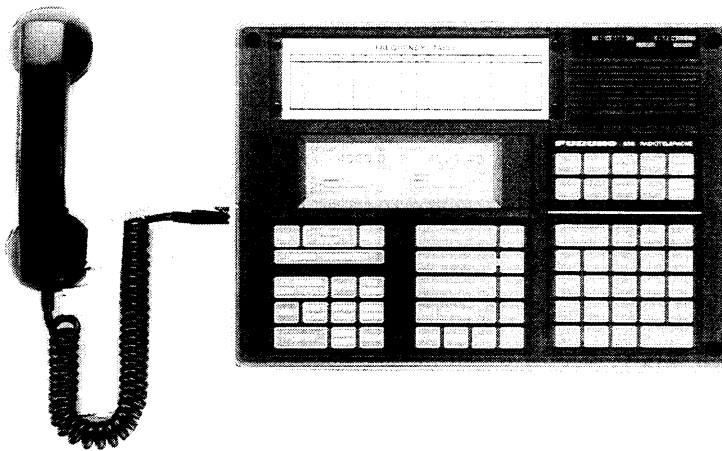
T Photo No. 1064

Antenna Coupler



T Photo No. 1064

Transceiver Unit



T Photo No. 1132

Control Unit

INTRODUCTION

Furuno Electric Company thanks you for selecting the FS-8000 SSB Radiotelephone. We are confident you will discover why the Furuno name has become synonymous with quality and reliability. To get maximum performance from your unit, please carefully read and follow the recommended procedures for operation, maintenance and installation.

The FS-8000 SSB Radiotelephone is an all-purpose communications transceiver especially designed for marine mobile communication in the frequency range of 1.6 to 30 MHz. All ITU channels are preprogrammed. Where required, TX/RX frequencies can be preprogrammed into a E² PROM having a capacity of 400 frequency pairs.

The FS-8000 consists of a Control Unit, a fully remote controlled Transceiver Unit, an Antenna Coupler and a Handset.

The Control Unit contains all controls for transmitter and receiver operating controls. The unit itself is housed in a rugged cabinet suitable for tabletop, bulkhead or flush mounting. All operations are touchpad key-controlled by means of a keyboard. For most key operations, an audible beep is released following valid key operation. And for visual confirmation of key operation the LCD displays an indication similar to or identical to that found on the label of the key operated. The LCD also displays frequency, receive signal sensitivity, transmitter antenna current, speaker volume, and more. Its backlighting is adjustable in eight steps.

The Transceiver Unit contains all receiver and transmitter RF circuitry. All frequencies are fully synthesized and controlled by CPU.

The Antenna Coupler automatically tunes a whip or wire antenna whose length is between 7 and 18 meters. Its splashproof construction permits installation either indoors or outdoors. An internal switch permits manual tuning in the event of coupler failure.

The FS-8000 operates from a 24 or 32 VDC power supply. For operation from 100/110/120/200/220/240 VAC power supply, two Rectifier Units are required.

- GMDSS operation: DSC and NBDP connections
- **2182** key provides for immediate selection of 2182 kHz (at FULL power automatically)
- Full duplex operation possible, Scan/Sweep receiving function, Timer operation
- PROM stores all ITU SSB/TELEX/CW frequencies
- Optional dummy load (in the Antenna Coupler) permits checking of transmitter
- Inputs for CIF/NMEA data, to display ship's L/L position on the LCD
- Effective noise blanker cancels pulse noise
- Advanced "voice" detect type squelch circuit filters out unwanted noise
- Additional control unit (priority setting available)
- Remote station (RB-500) connectable

SPECIFICATIONS OF FS-8000 SSB RADIOTELEPHONE

GENERAL

1) Communication System	Full duplex, semi-duplex or simplex (duplex operation requires receiving antenna)
2) Class of Emission	J3E, (USB, LSB), H3E, R3E, A1A, F1B (J2B), J3C
3) Frequency Range	1.6 MHz to 30 MHz
4) Number of Channels	Preset (User): 400 TX/RX pairs All ITU channels incorporated (Incl. DSC channels)
5) Frequency Accuracy	$\pm 10\text{Hz}$ (-20°C to +50°C)
6) Ambient Temperature Range	-20°C to 55°C
7) Power Supply	24/32 VDC +30%, -10% Consumption at 24 VDC Receive ----- 3A Transmit (SSB) ---- Peak 120A 24 VDC and 100/110/120/200/220/240 VAC, 1 ϕ , 50/60 Hz, 4.8 kVA (by two Rectifier Units PR-850A, optional supply)
8) Coating Color	Control Unit front panel: Munsell N-3.0 Transceiver Unit: 2.5GY5/1.5 Antenna Coupler: White

TRANSMITTER

- 1) Frequency Range 1.6065 MHz to 29.9999 MHz
(100 Hz steps)
- 2) RF Output Power 800 W pep +0/-1.4 dB (1.6 - 25.5 MHz)
at 50 ohm load (400 W pep --- below 4 MHz)
(@ 24 VDC, IEC rec.)
- 3) Modulation AF Response 350 Hz to 2700 Hz
- 4) Keying Speed CW: 25 bauds TELEX: 100 bauds
- 5) AF Input -46 dBm/600 ohms
- 6) Tone Frequency 1500 Hz

RECEIVER

- 1) Receiving System Double conversion superheterodyne
IF: 45455 kHz and 455 kHz
- 2) Frequency Range 10 kHz to 29.9999 MHz
(10 Hz steps)
- 3) Sensitivity Input level at 50 ohms to produce
SINAD 20 dB

Frequency Range	SSB	AM
100 kHz to 300 kHz	25 dB μ V	39 dB μ V
300 kHz to 1.6 MHz	15 dB μ V	29 dB μ V
1.6 MHz to 30 MHz	3 dB μ V	17 dB μ V

- 4) Intermodulation 90 dB μ V (CEPT method test)
- 5) Cross Modulation 94 dB μ V (CEPT method test)
- 6) Selectivity
 - J3E/R3E: 350 to 2700 Hz
 - H3E: \pm 3 kHz
 - A1A/F1B: \pm 150 Hz
- 7) AF Output Power
 - Internal speaker: 2 W/8 ohms
 - External speaker: 4 W/4 ohms
 - Handset: 10 mW/200 ohms
- 8) Standard Features Scan, Sweep, Noise Blanker, Voice-activated
Squelch, Preselector (for MF)

ANTENNA COUPLER

- | | |
|-------------------------------|---|
| 1) Tuning System | CPU controlled
manual tuning possible for 2182 kHz |
| 2) Frequency Range | 1.6 MHz to 30 MHz |
| 3) Input Impedance | 50 ohms |
| 4) Required Antenna | 7 to 18 meter wire and/or whip |
| 5) Tuning Power | 10 W |
| 6) VSWR | 1.5 max. |
| 7) Tuning Speed | 0.2 to 2 sec. typical. 15 sec. max. |
| 8) SOLAS Dummy Load | Internal (10 ohms + 250 pF, 200W average),
optional supply |
| 9) Antenna BK Relay | Internal, optional supply |
| 10) Ambient Temperature Range | -30°C to +70°C |
| 11) Relative Humidity | 95% @ 35°C |

MISCELLANEOUS FUNCTIONS

- 1) Ship's L/L Position display (inputs for CIF/NMEA format sentences)
- 2) Timer
- 3) Digital Selective Calling (DSC) & Narrow Band Direct Printing (NBDP) possible
- 4) Intership FAX connection possible
- 5) Remote station (RB-500) connection possible

COMPASS SAFE DISTANCE

Unit	Standard Compass	Steering Compass
Control Unit	0.9	0.7
Transceiver Unit	2.3	1.8
Antenna Coupler	1.0	0.7
Rectifier Unit	1.5	1.2

(dimensions in meters)

PRECAUTIONS

- 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 of radio communication before operating the equipment.
- This equipment can be operated only by a person holding a valid radio operator license or permit.
- Although the FS-8000 can transmit any frequency between 1.6 MHz to 30 MHz, the station licensee is always responsible for the lawful and proper operation of his station. FURUNO will assume no responsibility for any communication disturbance or inconvenience due to illegal transmission on an unauthorized frequency range.
- The radio wave is public property. Do not transmit with too much power or when unnecessary.
- It is unlawful to divulge what is overheard by radio or wire.
- Because heat dissipates through the cabinet of the Transceiver unit, secure enough space on all sides of the cabinet to permit circulation of cooling air. **NEVER** put anything on the top of the unit.
- The battery (power supply) must be fully charged so the transmitter can supply ample power to the antenna.
- The Antenna Coupler tunes the radio to the antenna when the PTT switch on the handset is pressed. Should the Antenna Coupler malfunction, the LCD displays TX Tuning Error. In this case, you can communicate on 2182 kHz by operating the Antenna Coupler manually. Open the cover of the Antenna Coupler, set the AUTO/MANUAL 2182 kHz switch to MAN 2182, and then press the **2182** key. Begin your call at any time other than silent time (0 to 3, 15 to 18, 30 to 33, 45 to 48 minutes of every hour). Before transmission, confirm that no distress message is received on 2182 kHz.

SYSTEM CONFIGURATION

The FS-8000 SSB Radiotelephone consists of a Control Unit, a Transceiver Unit, an Antenna Coupler and a Handset. Optionally available equipment includes a whip or wire antenna kit, two rectifiers, telegraphy key, external speaker, headphone and two types of microphones.

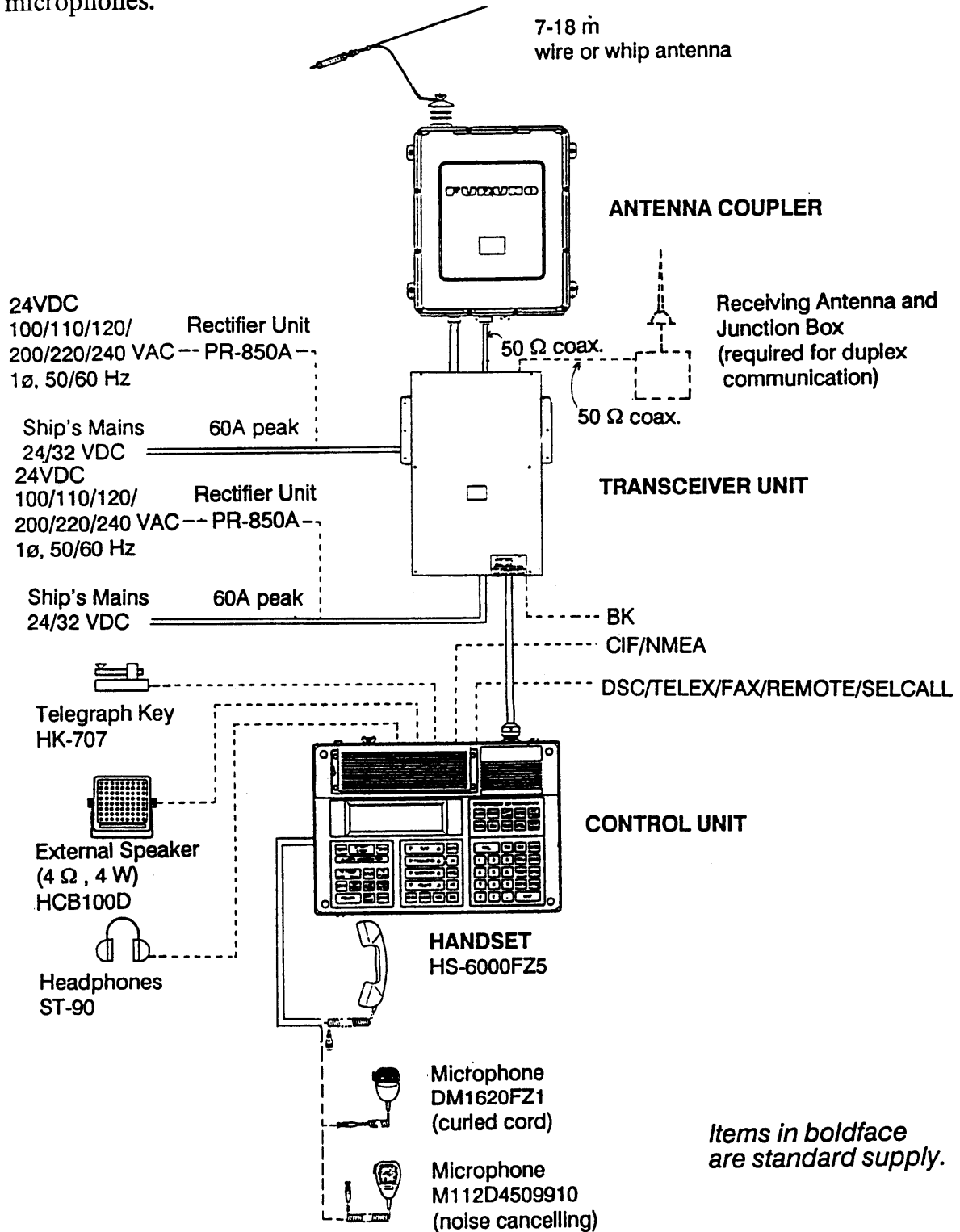


Fig. i System Configuration

1. OPERATION

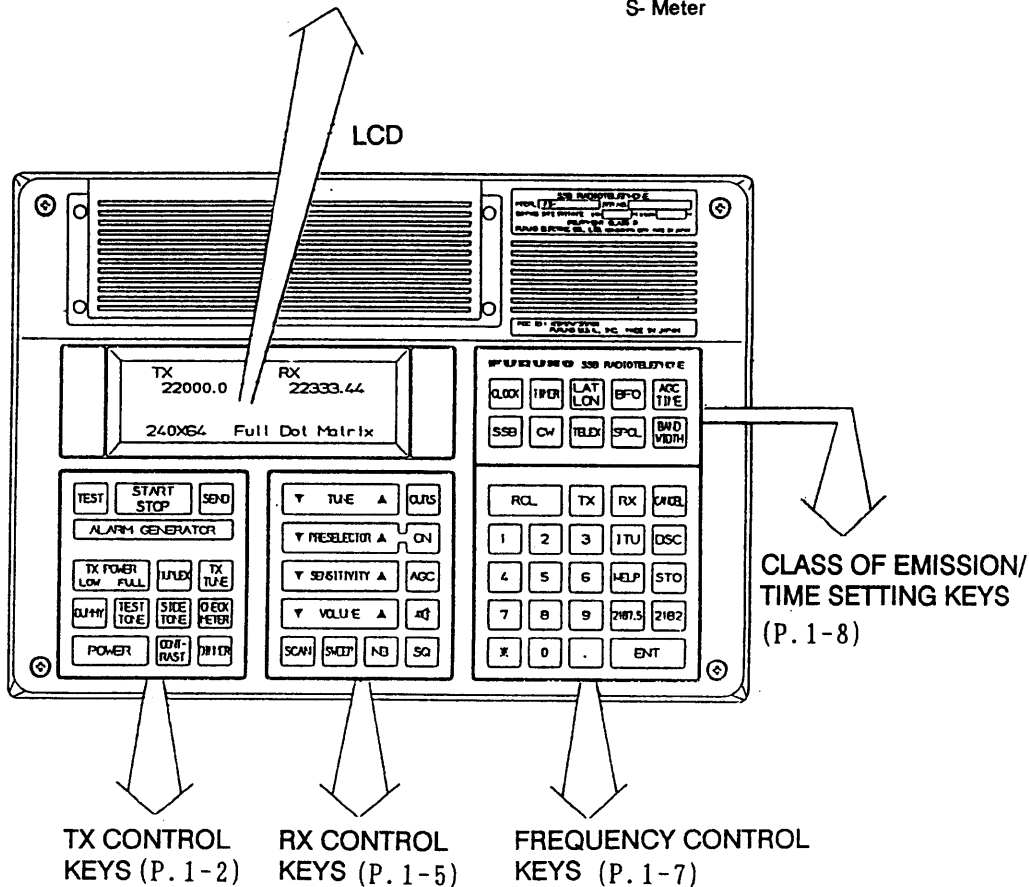
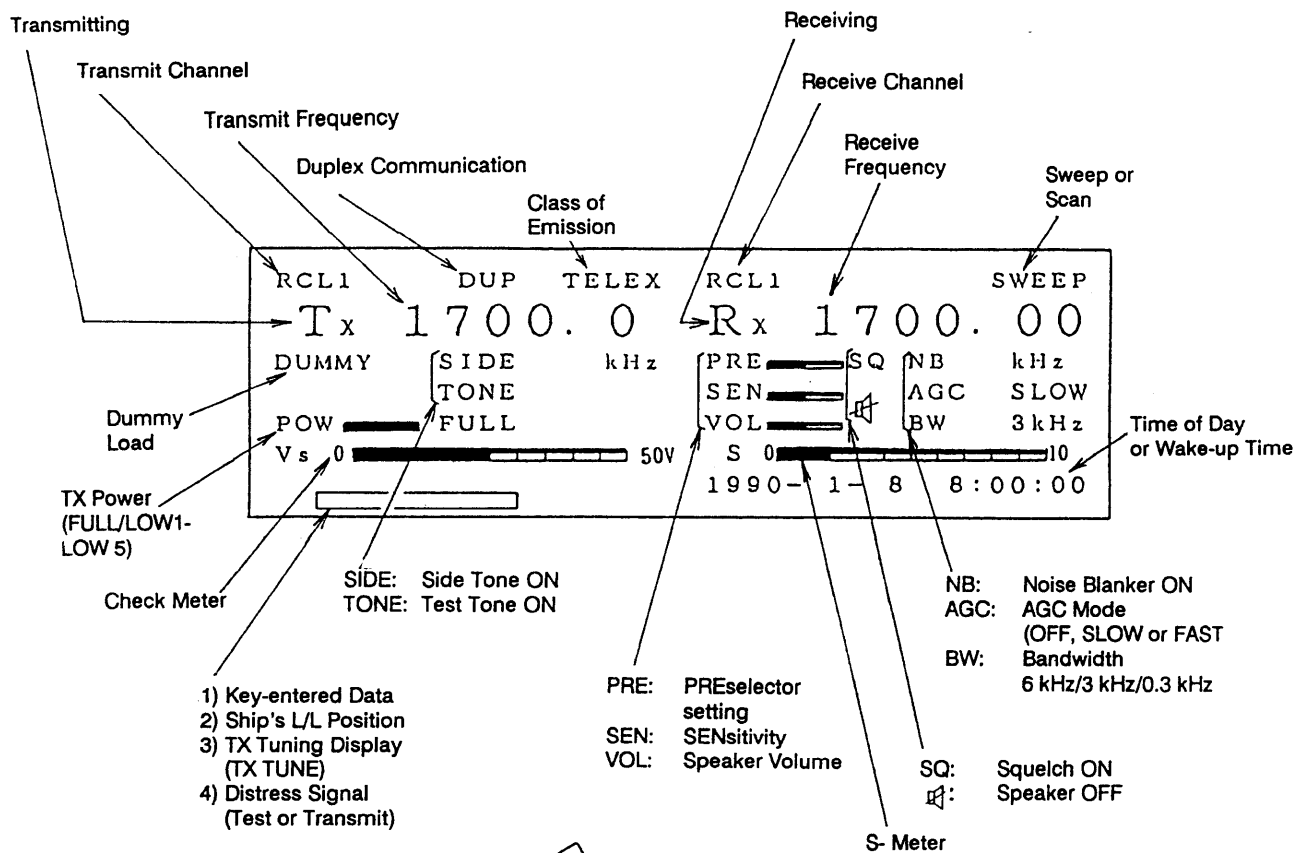


Fig. 1-1 Front Panel Controls & Indications

CONTROLS

The FS-8000 is operated from the Control Unit, and is completely keyboard controlled.

The simple and logical layout of the keyboard makes the FS-8000 easy and intuitive to use. The keyboard consists of 58 keys arranged in four blocks (TX, RX, frequency selection, and class of emission and time setting) according to function.

The LCD shows receive and transmit frequencies, transmitter output power, time of day, receiver signal strength, class of emission, etc.

When the transmitter is turned on, time of day is displayed from a built-in real time clock, which can also be used to turn on the equipment at a predetermined time.

When the unit is turned off, the real-time clock and the memory are supplied from a built-in Nicd battery. The non-volatile memory also stores the current settings of the equipment and restores them when turning the power on again.

TX Block Keys

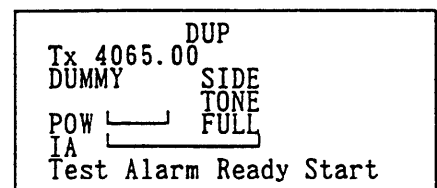
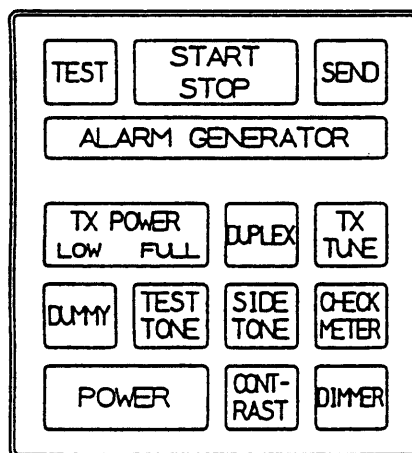


Fig. 1-2 TX Block Keys and Associated Indications

Key	Function	Indication on LCD
POWER	Turns the power on and off. To turn the power on or off, press and hold down the key for more than one second.	
CONTRAST	Adjusts the backlighting for the LCD in eight steps.	
DIMMER	Adjusts the illumination for the keyboard in eight steps.	

Key	Function	Indication on LCD															
TEST	Tests the two-tone signal generator for proper operation. To stop testing, press the key again.	Ready to test Alarm															
SEND	Enables transmission of the two-tone signal. To transmit the two-tone signal, press the SEND key followed by the START/STOP key. To stop transmission, press the START/STOP key again.	Ready to send Alarm															
START/STOP	Starts and stops transmission of the two-tone signal. Released two-tone signal will stop automatically in about 45 sec.	Start Stop															
TX POWER LOW/FULL	<p>Adjusts transmitter output power....(*8)</p> <p>max. output powerFULL low output power.....LOW</p> <p>Each press of the LOW key changes low output power in the sequence of LOW1, LOW2 ...</p> <table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th style="text-align: center;">TX Power (4 MHz or higher)</th> <th style="text-align: center;">TX Power (below 4 MHz)</th> </tr> </thead> <tbody> <tr> <td><u>Display</u></td> <td></td> <td></td> </tr> <tr> <td>FULL</td> <td style="text-align: center;">800 W approx.</td> <td style="text-align: center;">400 W approx.</td> </tr> <tr> <td>LOW1</td> <td style="text-align: center;">480 W approx.</td> <td style="text-align: center;">200 W approx.</td> </tr> <tr> <td>LOW2</td> <td style="text-align: center;">280 W approx.</td> <td style="text-align: center;">80 W approx.</td> </tr> </tbody> </table>		TX Power (4 MHz or higher)	TX Power (below 4 MHz)	<u>Display</u>			FULL	800 W approx.	400 W approx.	LOW1	480 W approx.	200 W approx.	LOW2	280 W approx.	80 W approx.	<p>FULL</p> <p>LOW1 {</p>
	TX Power (4 MHz or higher)	TX Power (below 4 MHz)															
<u>Display</u>																	
FULL	800 W approx.	400 W approx.															
LOW1	480 W approx.	200 W approx.															
LOW2	280 W approx.	80 W approx.															
DUPLEX	<p>Turns duplex communication on and off. (Duplex communication requires the use of a receiving antenna.) <u>DUPLEX SP</u></p> <p style="margin-left: 100px;"> ON → OFF } Automatic OFF → ON } Change </p>	DUP															
TX TUNE	Tunes the radio to the antenna. Tuning takes from 0.2 to 15 seconds. Tuning is also made when the PTT switch is pressed....(*1)	<p>TX TUNING</p> <p>OK appears after tuning is completed.</p>															
DUMMY	<p>Turns the dummy load on and off. (This key functions only when the optional dummy load is installed in the Antenna Coupler. Refer to page 1-17.)...(*2)</p> <p>*Dummy is automatically disconnected when SEND and START keys are pressed in this order. For the procedure for dummy test on 2182 kHz, refer to page 1-19.)</p>	DUMMY															

Key	Function	Indication on LCD
TONE	Turns the test tone on and off. Tone frequency may be changed. For further details, see page 1-16. (*3)	TONE
SIDE TONE	Turns the side tone on and off. Side tone frequency may be changed. For specifics, see page 1-16. (*3)	SIDE
CHECK METER (*4)	Selects check meter display. <div style="text-align: right; margin-right: 20px;"> Meter Swing <u>(J3E max.output)</u> </div> Ia: antenna current (*5) Po: TX output power90-100% (*6) Pi: input power.....about 1.8 kW Ic: collector current.....about 42 Vc: collector voltageabout 43 Vs: supply voltageabout 23 AL: ALC level 10 Th: final stage temperature (*7)	IA (10A) Po (100%) Pi (2 kW) Ic (100A) Vc (100V) Vs (50V) AL (10) Th (100°C)

(*1) When tuning is terminated, beep is released.

	For tuning OK	For tuning error
Audible Beep	One	Three
LCD Display	TX Tuning OK	TX Tuning Error

(*2) If the TX frequency is changed with the dummy load on, the dummy load is automatically turned off. For HF band with the TX POWER set to "FULL" or "LOW1", the dummy operation becomes inactive. When you press the PTT switch after turning on or off the [DUMMY] key, tuning is automatically done.

(*3) Tone volume may be set independently of speaker volume.

(*4) Analog value can be displayed concurrently with the bar display. For further details, see page 1-17.

(*5) Antenna current is subject to frequency. Generally, the meter swings greatly on MF (medium frequencies) and swings slightly on HF (high frequencies).

(*6) Output power appears in percentage.

(*7) Cooling fans turn on when the temperature at the final stage exceeds 55°C. Output power is reduced automatically when temperature is 90°C.

(*8) Power can not be reduced on both 2182 kHz and 2187.5 kHz. (Changeable depending on regulations)

RX Block Keys

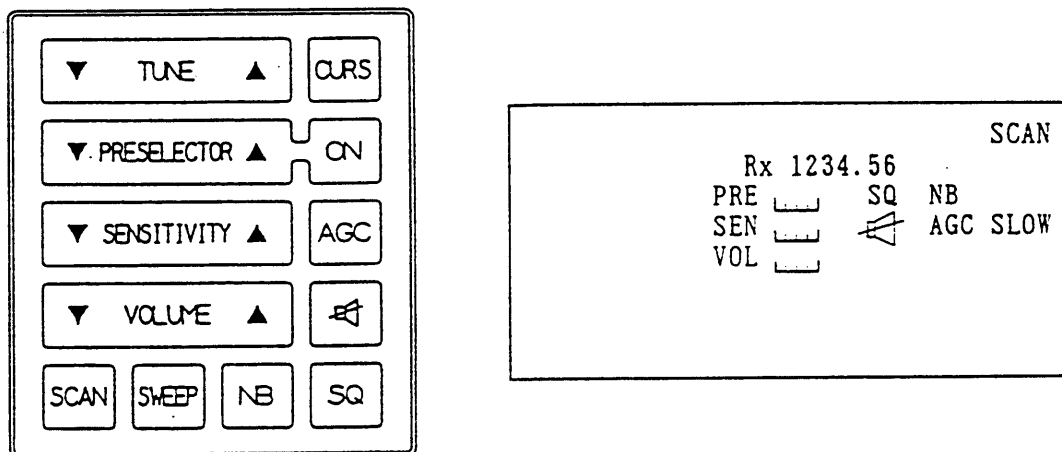




Fig. 1-3 RX Block Keys and Associated Indications

Key	Function	Indication on LCD
TUNE	Coarsely tunes RX frequency. To tune, press the CURS followed by the TUNE key.	
CURS	Positions the cursor to affect change of frequency.	
PRESELEC-TOR (*1)	Tunes the receiver and the antenna (for frequencies below 4.5 MHz). To tune, press the ON/OFF key followed by the PRESELECTOR key.	
ON/OFF	Turns PRESELECTOR (RX tuning) on and off.	PRE
SENSITIVITY	Adjusts receive signal sensitivity.	SEN
VOLUME	Adjusts speaker volume.	VOL
AGC	Turns AGC on and off.	AGC OFF SLOW or FAST
	Turns the speaker on and off.	 (SP OFF)
SCAN (*2)	Starts and stops frequency scanning. (The receiver scans receiving channels in ascending order beginning with current frequency.)	SCAN
SWEEP (*2)	Starts and stops frequency sweeping. (The receiver, using current frequency as center frequency, sweeps a frequency band according to preset frequency width.)	SWEEP
NB	Turns the noise blanker circuit on and off.	NB (*5)
SQ (*3)	Turns the squelch circuit on and off.	SQ (*5)

- (*1) Adjust for maximum sensitivity. The setting position is displayed by bar graph and appears to the right of the indication PRE.

Once the preselector is set, the setting position is memorized until the setting is changed. (The resolution of data storing for the frequency lower than 1 MHz is 50 kHz and for frequency range between 1 and 4.5 MHz, 100 kHz.)

In scan/sweep reception mode, the preselector setting is disregarded when frequencies above 4.5 MHz are received and becomes effective when frequencies lower than 4.5 MHz are received. However note that you should adjust the preselector before starting reception.

Note: The preselector turns off automatically when the frequency is changed from MF to HF. ("PRE" indication remains.) When the frequency is restored to MF, the preselector turns on automatically. "PRE □□□" is displayed.)

- (*2) To perform scanning and sweeping, turn the AGC on.

Parameters for sweeping and scanning (signal strength, stop time, sweep width, step intervals, etc.) are operator-adjustable. For further details, see pages 1-14 and 1-15.

- (*3) The squelch circuit functions to quiet the receiver in the absence of a receive signal. When the squelch is on, the receiver filters out noise in high frequency components (noise), outputting only low frequency components (voice signal).
- (*4) When setting the TUNE, PRESELECTOR, SENSITIVITY and VOLUME, beep is not released to enable the receiving sound to be heard.
- (*5) To select class of emission TELEX turn off the noise blanker and the squelch circuits.

Frequency Control Block Keys

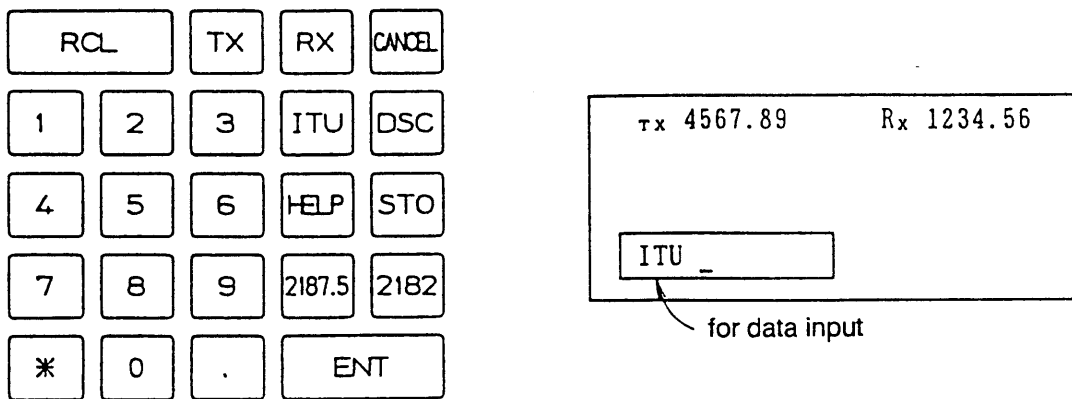


Fig. 1-4 Frequency Control Block Keys and Associated Indications

Key	Function
RCL	Recalls user predetermined channels. (*1)
TX RX	Selects TX frequency. Selects RX frequency.
CANCEL	Cancels wrong data.
Numeral & Decimal Keys	Ten keys for entering frequency.
ITU DSC	Recalls ITU frequency. Recalls DSC frequency.
HELP	Gives information about a key's function. To get operating information, press a key followed by the HELP key. To escape from a help screen, press the HELP key again.
STO	Registers user frequencies (see page 1-12) and changes factory-set parameters (see page 1-17).
2182 & 2187.5	Changes receiver and transmitter frequency to 2182 kHz (distress frequency.) ----- Output power: "FULL" (max.) --- (*2) Changes receiver and transmitter frequency to 2187.5 kHz (DSC frequency.) ----- Output power: "FULL" (max.) --- (*2)
ENT	Terminates keyboard operation.
*	Turns key lock function on and off, and calls remote station (Intercom). See page 1-17.

(*1) User channels are operator-set channels numbered 1-8999 (max. 400 channels).

(*2) When you press one of these keys, if the setting of the sensitivity is less than "7", the settings of AGC and sensitivity are automatically changed to "ON" and "maximum", respectively.

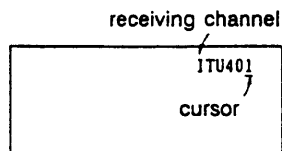
CHANNEL CHANGE BY CURS & TUNE KEYS

The **CURS** & **TUNE** keys permit manual change of channel. To change a memory-stored ITU channel, for example;

Example: Change ITU channel from 401 (press: ITU, 4, 0, 1, ENT) to 405

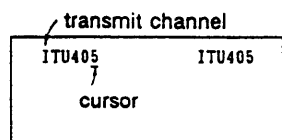
(1) Change only receiving channel

Operate the **CURS** key to place the cursor on the last digit of the RX channel; and then press the **TUNE** key to change the RX channel.



(2) Simultaneous change of TX and RX channel

Operate the **CURS** key to place the cursor on the last digit of the TX channel; and then press the **TUNE** key to change both the RX and TX channels.



Class of Emission/Time Setting Block Keys

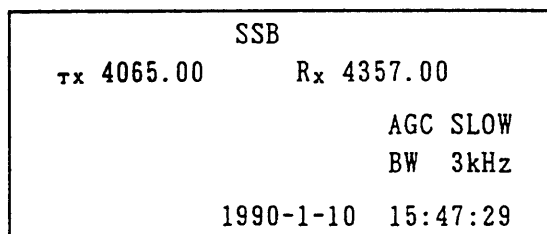
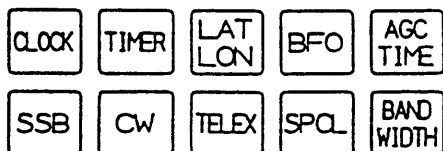


Fig. 1-5 Class of Emission/Time Setting Block Keys and Associated Indications

Key	Function	Indication on LCD
SSB CW TELEX SPCL	Selects SSB. Selects CW. Selects TELEX. Selects class of emission in order of AM, R3E, FAX and LSB each time it is pressed. (FAX is for weather reports; for intership FAX messages, use SSB.)	
BFO	Selects BFO frequency. (Effective only in CW, TELEX and FAX.) The operator may change the BFO frequencies. — (*4)	
AGC TIME (*1)	Selects AGC curve: FAST or SLOW.	AGC SLOW AGC FAST
BANDWIDTH (*2)	Selects receiver bandwidth. Each time the key is pressed the bandwidth changes in the sequence of 6 kHz, 3 kHz and 0.3 kHz.	BW 6 kHz 3 kHz 0.3 kHz
CLOCK (*3)	Turns the time of day display on and off.	Displayed on bottom-right hand side. Display priority: { LAT LON...Highest } { CLOCK...Lowest }
TIMER (*3)	Turns the wake-up timer on and off.	
LAT LON	Turns the ship's L/L position display on and off. (Key does not function without CIF/NMEA data input.)	

(*1) Recommended AGC Curve

Condition	Setting
SSB, TELEX, Telegraphy	SLOW
High levels of pulse noise or for duplex communication	FAST
Noise on long-distance communication	OFF

To select class of emission TELEX set AGC curve FAST. For other class of emissions, set AGC curve SLOW.

(*2) Standard Bandwidth for Each Class of Emission

Class of Emission	* Bandwidth
SSB/LSB/R3E/FAX	3 kHz
AM	6 kHz
TELEX/CW	0.3 kHz

*changeable

(*3) Refer to page 1-10 for date and timer settings.

(*4) The AF output frequency (center freq.) of the radiotelephone for combined equipment is also changed. For example, if the DSC-6(DP-6) is combined, the BFO frequency should be set to 1700Hz.

BASIC OPERATION

Turning the Power On And Off

To turn the power on or off, press and hold down the **POWER** key for more than one second. *The power cannot be applied when the power supply voltage is out of its rating.*

Adjusting LCD Contrast & Keyboard Illumination

The **CONTRAST** key adjusts LCD contrast, and the **DIMMER** key keyboard illumination.

Setting Date & Time

The internal real-time clock shows the date and time of day. To set the clock, press the **STO** key followed by the **CLOCK** key. Enter date and time followed by the **ENT** key.

Example: January 10, 1990, 9 hr. 32 min.

9 0 [.] 1 [.] 1 0 [.] 9 [.] 3 2 ENT
(press the ENT key in synchronization with a time signal)

The current date and time of day appear at the bottom right-hand corner of the LCD. *When the wake-up timer is turned on, the date and time of day display disappears, and vice versa.*

Setting the Wake-up Timer

The internal wake-up timer turns on the set at a predetermined time. The wake-up time can be a specific day and time, daily or hourly. To set the wake-up timer, press the **STO** key followed by the **TIMER** key. Enter the wake-up time desired followed by the **ENT** key. Use 24-hour notation to enter time. *The wake-up time appears at the bottom right-hand corner of the LCD.*

Specific Date & Time

To have the set turn on at 6:05 on the 11th day of the current month, for example, press;

1 1 [.] 6 [.] 5 ENT

Daily

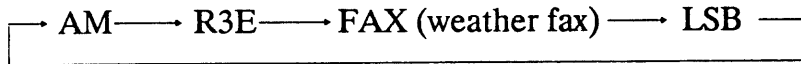
To have the set turn on daily at 8:30, for example, press **8**, **[.]**, **3** and **ENT**.

Hourly

To have the set turn on hourly on the 6th minute, for example, press **6**, and **ENT**.

Class of Emission Selection

To select class of emissions SSB, CW or TELEX, press the corresponding key. For other class of emissions, use the **SPCL** key. Each time the key is pressed the class of emission changes in the following sequence.



Frequency Selection

Conventions

- Entered data appears at the lower left-hand side of the LCD.
- The **ENT** key functions to terminate keyboard operation. When the key is pressed, the LCD displays OK to confirm that the unit has received the operator's command. For invalid key operation, the unit releases three audible beeps and clears the LCD.
- The **CANCEL** key cancels wrongly entered data.

Function		Keying Sequence				Remarks
Direct Frequency Input	TX (*1)	TX	frequency	ENT	<u>TX Freq. Range:</u> 1606.5 kHz to 29999.9 kHz <u>RX Freq. Range:</u> 10 kHz to 29999.99 kHz	
	RX	RX	frequency	ENT		
	TX/RX (*1) (*2)	TX	RX	frequency		ENT
ITU Channel	TX (*1) (*2)	TX	ITU	channel no.	ENT	Select class of emission beforehand. ITU channel may be entered as 41, 401 or 4001.
	RX (*2)	RX	ITU	channel no.	ENT	
	TX/RX (*1)	ITU		channel no.	ENT	
User Channel	TX (*2)	TX	RCL	channel no.	ENT	User channel must be stored in the memory.
	RX (*2)	RX	RCL	channel no.	ENT	
	TX/RX	RCL		channel no.	ENT	

Function		Keying Sequence	Remarks
Copy RX freq. to TX freq. (Watch of TX freq. on duplex channel)		RX ENT ENT (*3)	
Copy TX freq. to RX freq. (*1)		TX ENT ENT (*3)	
Alternate selection of TX and RX frequencies. (*1) (*2)		TX RX ENT ENT (*3)	Exchange between TX and RX freq.
Immediate selection of 2182, 2187.5	2182	2182	
	2187.5	2187.5	
DSC calling	TX (*1) (*2)	TX DSC channel no. ENT	Range of channel numbers is 1 to 79.
	RX (*2)	RX DSC channel no. ENT	
	TX/RX(*1)	DSC channel no. ENT	
Storing/clearing user channels (*4)	Storing (*1)	(*) STO channel no. ENT ENT (*3) ↓ (*): Determine TX or RX frequency, class of emission and bandwidth before hitting the STO key.	channel setting range is 1-8999, max. 400 channels.
	Clearing (*1)	STO channel no. ENT 0 ENT	

(*1) Capability depending on regulations.

(*2) Sequence of operation for selecting TX or RX and channel may be reversed. For example: TX, ITU or ITU, TX.

(*3) The ENT key must be pressed twice to affect a reaction. When you desire to cancel this function, press the CANCEL key after pressing the ENT key once.

(*4) To clear all user channels, change specification 9997. Refer to page 1-17.


Viewing the Contents of User CH.

To view the contents of user channel, press;

RCL	9	9	9	8	Channel No.	TX Freq.	RX Freq.	Class of Emission	Bandwidth	TX Power	
ENT	_____				1	Txxx ...	Rxxx ...	AM	W	255-25	
				ENT	_____	2	Txxx ...	Rxxx ...	SSB	M	250-20
				ENT	_____	4	Txxx ...	Rxxx ...	CW	N	250-20

To escape, press any key.

RECEIVING

Function	Keying Sequence	Remarks
Fine tuning	CURS TUNE	Place the cursor on the digit (1 kHz, 100 Hz, 10 Hz places) to be changed and then press the TUNE key. In AM, 1 k, 10 k and 100 kHz places can be changed.
Tune receive signal. (preselector on/off)	ON OFF PRESELECTOR	Effective for frequencies below 4.5 MHz.
Adjust receive sensitivity.	SENSITIVITY	Adjust so that signal is picked up.
Adjust speaker volume.	VOLUME	
Adjust AGC.	ON/OFF Curve	AGC AGC TIME (FAST/SLOW)
Select bandwidth.	BANDWIDTH (6 kHz/3 kHz/0.3 kHz)	
Select BFO frequency.	BFO frequency ENT	For CW, TELEX and FAX only.
Turn the squelch circuit on or off.	SQ	
Turn the noise blanker circuit on or off.	NB	When the radio is just turned on, or frequency is just changed, it may take a few seconds to make the NB effective.
Turn the speaker on or off.	 appears when the speaker is off.	
Reading signal strength		The S-meter displays receive signal strength when the AGC is on.

S meter indication

The S meter bar graph indicates the strength of received signal with AGC turned on. It is used for settings of "Scan/Sweep stop signal level". First, adjust the SENSITIVITY key so that white noise is slightly heard, and then read the value of the S meter bar graph. (This value is used for "Scan/Sweep stop signal level settings". Refer to page 1-14.)

Note: When the receiving band is changed (with 50 ohm BK relay used), tune the antenna coupler by selecting a TX frequency in the same band and pressing the TX TUNE key.

SCAN RECEIVING (AGC on)

Function	Keying Sequence/Remarks
Select memory-stored channel.	For DSC and user channels, the receiver scans all channels. For ITU channels, the receiver scans the channels in the band selected by the operator. <u>Example: user channel 5</u>
To begin scanning.	RCL 5 ENT..... RCL5 RCL5 SCAN (The receiver scans memory stored TX/RX frequency pairs according to predetermined parameters. Note that some authorities prohibit scan receiving.)
To stop scanning.	SCAN

Setting Scan Parameters

Example
 Stop S Level: 5
 Stop Time: 2 sec

1. Press the **STO** key followed by the **SCAN** key. The scan stop signal level setting screen appears.

SCAN stop S level [3,0-10] _

2. Enter a value among 0-10 seconds followed by the **ENT** key. The scan stop time setting screen appears.

SCAN stop S level [3,0-10] 5

S meter indication "0"~"10"
 (Ref. to page 1-13.)

3. Enter a scan stop time followed by the **ENT** key.

SCAN stop time [1 sec] _

Viewing Scan Parameters

To view scan parameters, press **STO**, **SCAN** and **ENT** keys in that order.

SCAN stop time [1 sec] 2

Integral number

SWEEP RECEIVING (AGC on)

Function	Keying Sequence/Remarks
Set center frequency for sweep receiving.	<u>Example: 4350 kHz</u> RX 4 3 5 0 ENT
To start sweeping.	SWEEP (The receiver sweeps frequencies according to predetermined parameters.)
To stop sweeping.	SWEEP

Setting Sweep Parameters

Example
Sweep Width: 25 kHz, Step Freq.: 1.5 kHz,
Stop S Level: 5, Stop Time: 2 sec

1. Press the **STO** key followed by the **SWEEP** key. The sweep width frequency setting screen appears. Enter a value among 10 to 29999.99 kHz followed by the **ENT** key. The sweep step frequency setting screen appears.
2. Enter the sweep step frequency desired among 0.01 to 29999.99 kHz followed by the **ENT** key. The sweep stop level setting screen appears.
3. Enter a sweep stop level among 0 to 10 followed by the **ENT** key. The sweep stop time setting screen appears.
4. Enter a sweep stop time followed by the **ENT** key.

SWEEP width [100.00kHz] _

SWEEP width [100.00kHz] 25

"10"~"29999.99"

SWEEP step freq. [10.00kHz] _

SWEEP step freq. [10.00kHz] 1.5

"0.01"~"29999.99"

SWEEP stop S level [3,0-10] _

SWEEP stop S level [3,0-10] 5

S meter indication "0"~"10"
(Ref. to page 1-13.)

SWEEP stop time [1 sec] _

SWEEP stop time [1 sec] 2

Integral number

Viewing Sweep Parameters

To view sweep parameters, press the **STO**, **SWEEP** and **ENT** keys in that order.

TRANSMITTING

Function	Keying Sequence	Remarks
Adjust transmitter output power.	max. output power...FULL (FULL) low output power.....LOW (LOW1, etc.)	
Duplex communication	DUPLEX	Receiving antenna required. To reduce transmission noise, AGC time and NB should be set at "FAST" and "ON", respectively.
To test transmitter by dummy load.	DUMMY (Inactive on HF band)	Dummy load required (in antenna coupler). Refer to page 1-17. For two-tone test using dummy load, refer to page 1-19.
Tuning to antenna.	TX TUNE (whenever the key is pressed, tuning starts)	Initial press of PTT switch after selecting frequency also starts tuning.

During transmission, the FS-8000 monitors final stage temperature, final stage transistor collector current and antenna matching. If any abnormality is detected, output power is reduced automatically and "LOW1" may be displayed on the LCD display.

CHANGING FACTORY-SET TONES

The frequency of the test tone, side tone and BFO frequency may be changed depending on operator's requirements.

Test Tone Frequency

Press the **STO** and **TONE** keys, key in frequency desired and then press the **ENT** key. The factory setting is 1500 Hz.

Side Tone Frequency

Press the **STO** and **SIDE TONE** keys, key in frequency desired and then press the **ENT** key. The factory setting is 800 Hz.

BFO Frequency

Press the **BFO** key, key in frequency desired and then press the **ENT** key. The factory settings are CW, 800 Hz; TELEX, 1700 Hz, and FAX, 1900 Hz.

CHANGE OF SPECIFICATIONS

Several specifications may be changed depending on requirements. To change a specification, press the **STO** key, enter item number (referring to the table below; factory settings are highlighted) and setting number desired, and press the **ENT** key.

Table 1-1 Operator-changeable Specifications

No.	Specification		Setting Number			
			0	1	2	3
9907	Time System (*1)		Japan	USA	Europe	—
9908	Second Unit display		YES	NO	—	—
9909	Expression for Class of Emission		NORM (SSB)	ITU (J3E)	—	—
9910	Check meter numeral display		NO	YES	—	—
9915	Check meter items		FULL	SHORT (*2)	—	—
9916	Key lock (controlled by * key)		OFF	ON (*3)	Intercom: ON (*4)	—
9918	Time adjustment (clock)		Auto	Man	—	—
9919	Control unit priority (*5)		No	#1	#2	—
9920	Key response	ON/OFF	OFF	ON	—	—
9921	(beep)	Volume	(0-10, factory setting: 6)			
9922		Freq.	(100 Hz-3000 Hz, factory setting: 2000 Hz)			
9923	Dummy (*6)		Enable	Disable	Not used	—
9940	Receiver bandwidth	SSB	6 k	3 k	0.3 k	—
9941		CW	6 k	3 k	0.3 k	—
9942		TELEX	6 k	3 k	0.3 k	—
9943		AM	6 k	3 k	0.3 k	—
9944		R3E	6 k	3 k	0.3 k	—
9945		FAX	6 k	3 k	0.3 k	—
9946		LSB	6 k	3 k	0.3 k	—
9951	RX antenna in telex mode (only when R ANT SEL PCB is installed)		Not used	Used	—	—
9952	Tx antenna status at reception -- (*7)		OFF (No change)	ON (To GND) -- *7	—	—
9997	Clear all user channels		—	ON	—	—

(*1) Factory setting depends on country of delivery.

(*2) If you select "1" (Short), only check data for Ia, Vc, Ic and Pi are displayed (repeatedly) every pressing of the **CHECK METER** key.

(*3) To lock the keyboard (except for **SEND, START, 2182, and 2187.5**), select "1" (ON). Then press the * key to turn on the key lock function. First press of the * key make the keys inactive. ("Keyboard Lock [ON]" appears on the display.)

(*4) Operation of Intercom

- Calling: [*]→(Remote Station Terminal No.)→[ENT], then communicate.
- Ending communications: [CANCEL]
- Answering: [ENT], then communicate.

(*5) For Control Unit priority setting, both Control Units must share the same setting number;

No. 1 Control Unit priority

Control Unit	Setting No.
No. 1	"1"
No. 2	"1"

No. 2 Control Unit priority

Control Unit	Setting No.
No. 1	"2"
No. 2	"2"

(*6)

Setting	Function	LCD Indication	Remarks
"0" (ON/OFF)	Dummy load ON/OFF by DUMMY key	DUMMY	DUMMY LOAD board required
"1" (prohibited)	DUMMY key inactive	none	no DUMMY LOAD board

(*7) This function is available only when Rx antenna is installed. Dummy load board with **ANTENNA EARTH RELAY** is required. If "ON" is selected, Tx (main) antenna is connected to ground at reception.

If you want to connect Tx antenna to ground manually (irrespective of 9952 setting), press [DUMMY] key. (For HF band of FS-8000, this is operative only when output power of "LOW2" or less is selected.)

TESTING THE TRANSMITTER BY DUMMY ANTENNA (OPTIONAL SUPPLY)


1. Press the **DUMMY** key.
2. Select a frequency near 2182 kHz.
3. Select SSB.
4. Communicate with the handset, confirming that antenna current (I_a) flows with voice level.

2. MAINTENANCE

GENERAL

The FS-8000 provides years of trouble-free operation provided it is properly installed and maintained. To ensure continued performance, follow the recommended procedures for maintenance.

⚠ DANGER




This equipment contains **high voltages** in the transceiver unit and the antenna couple unit. These voltages are sufficient to kill anyone coming in direct contact with them.

Any internal adjustment, servicing and repair shall only be performed by qualified service personnel.

A residual charge remains in capacitors and other devices several minutes after turning off the power. **Wait at least 3 minutes** to allow residual charge to disappear.

⚠ 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 disassemble or modify the equipment.

Fire, electrical shock or serious injury can result.

Power Supply Periodically confirm that the power supply (connected at two places: upper unit and lower unit of Transceiver Unit) is operating within its rating (24/32 VDC, +30%, -10%).

Handset The handset is sensitive to heat, moisture and shock. Handle it carefully.

Coils & Potentiometers Unnecessary adjustment of coils and/or potentiometers may permanently damage the equipment.

Memory If the power is off more than a month, time data and Wake-up timer settings will be erased. To reenter date and time, press the **STO** and **CLOCK** keys to call up the time setting screen. To reset the wake-up timer, press the **STO** and **TIMER** keys to call up the wake-up timer setting screen.

Cleaning

Accumulated dust on units may be removed with a soft cloth. For stubborn dirt use water and mild soap. **NEVER USE SOLVENTS FOR CLEANING**, since they may remove paint and markings.

Regular Maintenance

A quarterly maintenance program should be established and should include at least the following:

Table 2-1 Checks to be Performed Every 3 Months

Item	Check Point
Antenna	<ol style="list-style-type: none"> 1. Check the antenna for physical damage. 2. For wire antenna, check for loosened span and confirm that it is sufficiently separated from metallic objects.
Insulators	<ol style="list-style-type: none"> 1. Check for damage and salt deposits. Remove salt deposits with fresh water. Replace damaged insulators. 2. Confirm that the lead-in wire is firmly connected. Check metallic parts for rust.
Antenna Coupler	<ol style="list-style-type: none"> 1. Confirm that the antenna wire is firmly connected. 2. Confirm that the cover is firmly tightened. 3. Check for loosened coaxial cable. 4. Check for loosened ground connections. 5. Check the vent hole for foreign material. (A vent tube is mounted at position A in Fig. 2-1.)
Transceiver Unit	<ol style="list-style-type: none"> 1. Confirm that no objects prevent circulation of air at the cooling fans. 2. Confirm that the coaxial cable is properly seated. 3. Check for loosened connection at input power terminals TB1/TB2.
Control Unit	<ol style="list-style-type: none"> 1. Check all connection cables for proper seating.

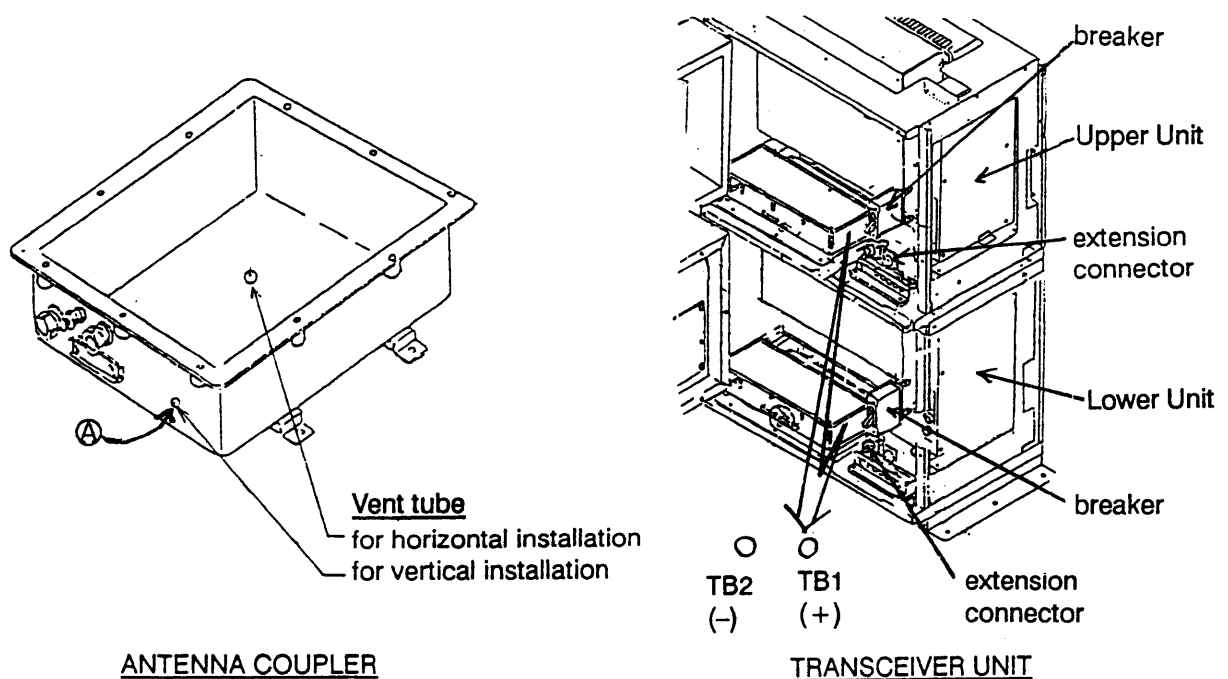


Fig. 2-1 Location of Parts in Antenna Coupler and Transceiver Unit

SELF TESTS

Control Unit & Transceiver Unit

To execute a self test, press the **RCL** key, enter a test number and hit the **ENT** key. The LCD displays an appropriate indication during testing, and, after completion of the test, the results, either OK or an error message. For error messages, see pages 2-11 and 2-12. To escape from a self test at any time, press any key after the test is completed.

Table 2-2 Self Tests

Test No.	Test	Indication During Testing
9900	All self tests except the key/LCD test	
TRANSCEIVER UNIT		
9910	Consecutive execution of tests 9911 to 9916	
9911	TX synthesizer on the EXC Board (PLL)	Checking Tx Local OSC
9912	MIC Input/Output on EXC Board Vc/Ic on PA Boards SWR detection on TX FIL Boards SWR detection on COMBINER Board	Checking Tx board (*)
9913	RX synthesizer on RX Board (PLL)	Checking Rx Local OSC
9914	RX Board	Checking Rx board
9915	ROM (U10) on CPU Board	Checking TRx ROM
9916	RAM (U12) on CPU Board	Checking TRx RAM
CONTROL UNIT		
9920	Consecutive execution of tests 9921-9925	
9921	<u>Key Check</u> The name of each key appears on the LCD. Press each key one by one, and its corresponding indication will be highlighted if the key is functioning properly.	
9922	<u>LCD Check</u> Properly functioning LCD segments appear in highlight.	
9923	AF Board	Checking AF board
9924	ROM (U9) on the CPU Board	Checking Control ROM
9925	RAM (U15/U21) on the CPU Board	Checking Control RAM
Connection between Transceiver Unit and Antenna Coupler		
9930	Connection between Transceiver Unit and Antenna Coupler	Checking ATU

(*) If some board is faulty, an error message appears. The message with "800 W unit" means the boards in the upper unit.

ex "No TX signal on TX FIL PCB" ----- in lower unit
"No TX signal on TX FIL PCB (800 W unit)" --- in upper unit

Antenna Coupler

To check the Antenna Coupler for proper operation, press the **CHECK** button (S2) on the Coupler Board. The relays start chattering and LEDs CR1 to CR24 blink one by one in ascending order. If device failure is found, an appropriate LED lights to indicate the offending device:

<u>Device</u>	<u>LED</u>
ROM	CR1
RAM	CR2
A/D converter or SWR detector	CR3

NOTE: ROM/RAM/A/D converter are incorporated in the CPU.

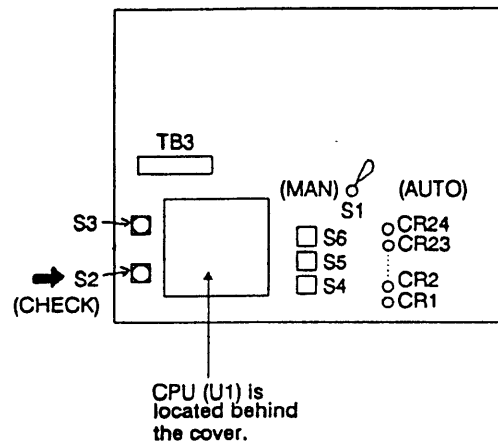




Fig. 2-2 CHECK Button on the Coupler Board

TROUBLESHOOTING

Table 2-3 Troubleshooting Guide

Symptom	Cause	Remedy
Cannot turn set on.	<ol style="list-style-type: none"> 1. Breaker of the lower unit in the Transceiver Unit has tripped (refer to Fig. 2-1). 2. Input voltage out of rating (24/32 VDC, +30%, -10%), or poor connection. 3. For installations which use AC Rectifiers, confirm that the rectifier for the lower unit in the Transceiver Unit is on and there is no blown fuse (refer to Fig. 2-4). 4. The following breakers may have tripped: CB2 to CB4 on the Interface Board of the lower unit in the Transceiver Unit (refer to Fig. 2-3) CB1 on the AF Board of the Control Unit (refer to Fig. 2-5) 	<ol style="list-style-type: none"> 1. Turn the breaker on. 2. Measure input voltage at TB1 (+)/TB2 (-) of the lower unit in the Transceiver Unit. If low, check for discharged battery. 3. Reset breaker. Replace fuse. If the fuse blows after replacement, call for service. 4. Reset breakers. If they trip again, call for service.

Symptom	Cause	Remedy
Power is on but no noise from speaker.	<ol style="list-style-type: none"> 1. Speaker is turned off. ( appears when the speaker is off.) 2. Sensitivity is too low. 	<ol style="list-style-type: none"> 1. Press the  key to turn the speaker on. 2. Adjust sensitivity with the SENSITIVITY key.
Cannot receive SSB signal clearly.	<ol style="list-style-type: none"> 1. Wrong class of emission 2. Frequency is off. 	<ol style="list-style-type: none"> 1. Select correct class of emission. 2. Tune with the TUNE key.
Cannot store user channel.	<ol style="list-style-type: none"> 1. Memory is full (storage capacity: 1-8999, 400 channels max.). 	
Time is wrong.	<ol style="list-style-type: none"> 1. Backup battery on CPU Board (refer to Fig. 2-5) of the Control Unit has released its contents. (This occurs if the power is off for about one week.) 	<ol style="list-style-type: none"> 1. Reset the clock. (Press the STO and CLOCK keys to call up the time setting screen).
No scan receiving	<ol style="list-style-type: none"> 1. Have not designated memory stored channels (ITU, DSC, or user) to be scanned. 	<ol style="list-style-type: none"> 1. Designate the channels to be scanned.
In scan receiving, cannot capture signal.	<ol style="list-style-type: none"> 1. AGC is off. 2. Scan stop signal level setting is too high. 	<ol style="list-style-type: none"> 1. Turn AGC on. 2. Lower the setting. (Press the STO and SCAN keys to call up the scan parameter setting screen).
No sweep receiving, or cannot capture signal.	<ol style="list-style-type: none"> 1. AGC is off. 2. Unsuitable sweep settings. <p><u>Sweep width</u> 100 = 100 kHz intervals</p> <p><u>Step</u> 10 = 10 kHz intervals</p> <p><u>Stop signal level</u> If too high cannot capture signal.</p>	<ol style="list-style-type: none"> 1. Turn the AGC circuit on. 2. Reenter settings. (Press STO and SWEEP keys to call up the sweep parameter setting screen).

Symptom	Cause	Remedy
No automatic antenna tuning.	<ol style="list-style-type: none"> 1. Antenna is broken or damaged. 2. Bad connection between Antenna Coupler and Transceiver Unit. 3. AUTO/MAN 2182 switch (S1) inside the Antenna Coupler is set to MAN 2182 (refer to Fig. 2-6). 4. Breaker CB1 in the Antenna Coupler has tripped. 	<ol style="list-style-type: none"> 1. Check antenna connections and then check antenna itself. 2. Check connections. 3. Set to AUTO. 4. Reset breaker. If the breaker trips again, call for service.
L/L position does not appear when LAT LON key is pressed.	<ol style="list-style-type: none"> 1. CIF/NMEA format data not input from external navigation device. 2. Wrong setting of input data format. 	<ol style="list-style-type: none"> 1. Check connection between navigation device and Control Unit. If normal, check navigation device for proper operation. 2. Set correctly. (Refer to page 5-4.)

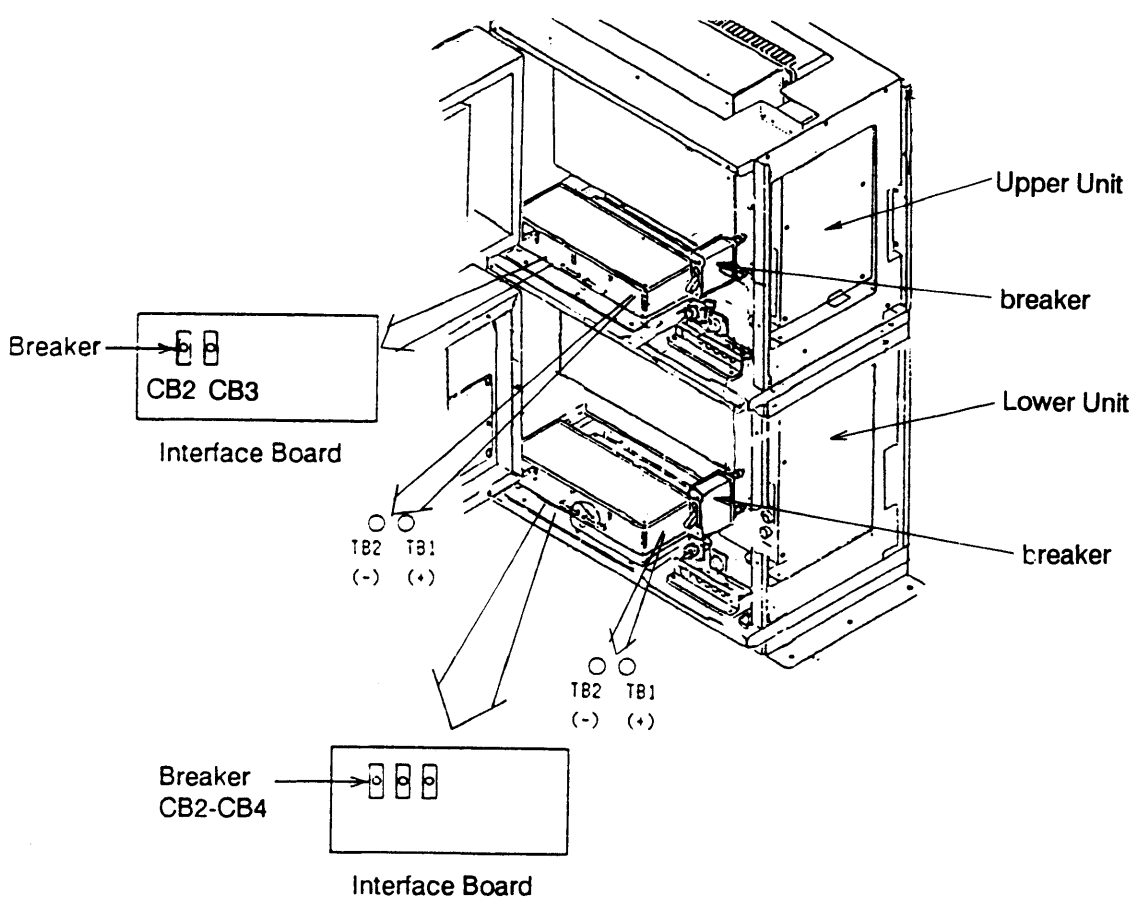
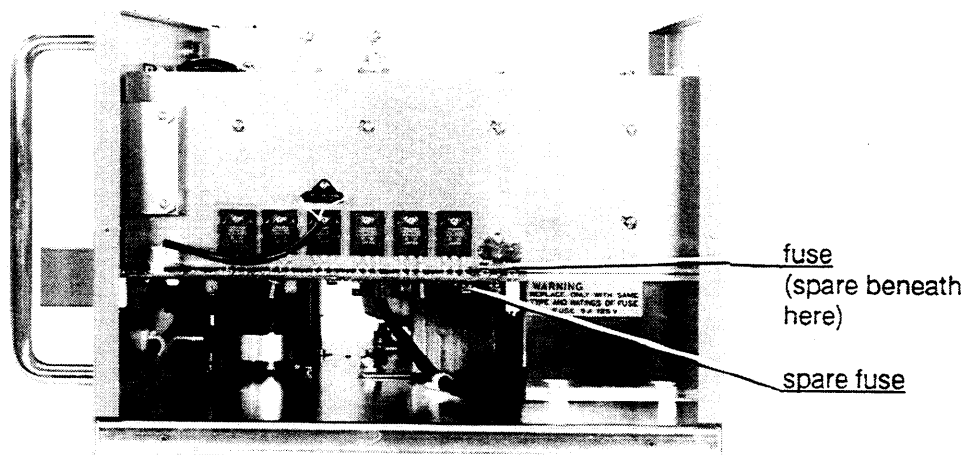


Fig 2-3 Transceiver Unit Inside View



T Photo No.1094

Fig. 2-4 Rectifier Unit, Cover Opened

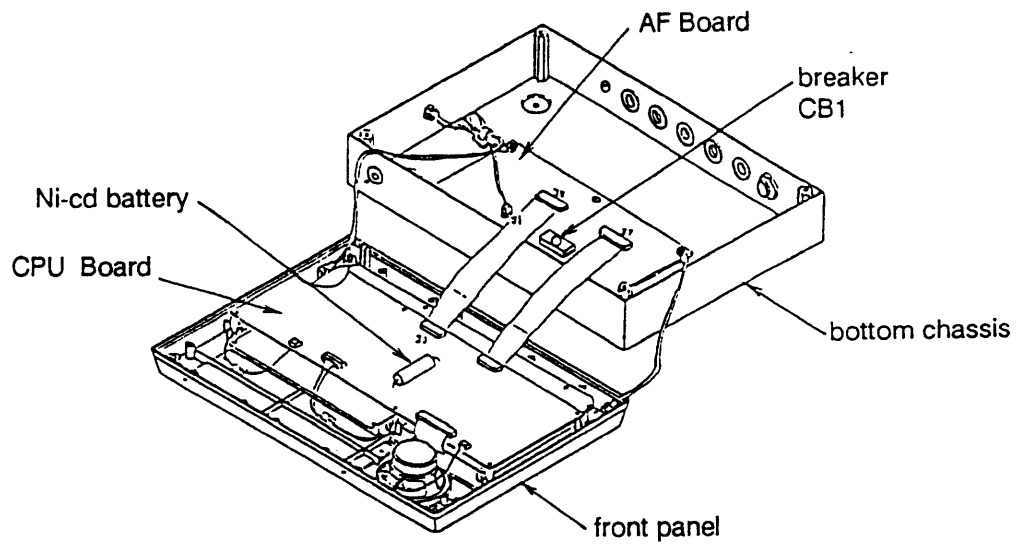


Fig. 2-5 Control Unit, Inside View

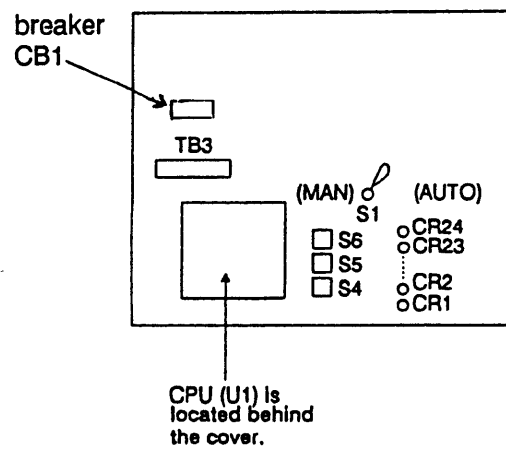


Fig. 2-6 Location of AUTO/MANUAL 2182 kHz Switch on the Coupler Board

ERROR MESSAGES

This set displays error message when it detects invalid key operation and equipment fault.

Table 2-4 Error Messages for Invalid Key Operation

Error Message	Reason	Remedy
Invalid Frequency	Frequency not within frequency range of the unit.	Select proper frequency. <u>TX Frequency Range:</u> 1.6065 MHz to 29.9999 MHz <u>RX Frequency Range:</u> 10 kHz to 29.99999 MHz
Invalid Channel	Invalid channel number	Channel Numbers are: DSC: 1-79 User: 1-8999
Can't change BFO frequency	Cannot select BFO frequency except in CW, FAX or TELEX mode.	Select CW, FAX or TELEX.
First select channel	Scanning attempted without selecting channel.	Select channel.
Dif. between TxF and RxF too small	In duplex communications, frequencies of TX and RX are too near one another.	Check the frequencies.

(continued on next page)

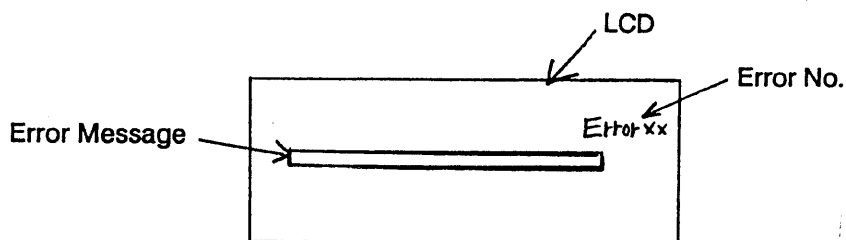
Table 2-5 Error Messages for Equipment Fault and Other

Error Message	Reason	Remedy
COMM Error	Trouble with data communication between CPU's of the Control Unit and Transceiver Unit.	Try to repeat key operations. If this does not work, reapply the power.
TX tuning Error	Trouble with antenna and/or automatic tuning circuit in the Antenna Coupler, or Antenna Coupler connections have loosened.	First, check the antenna. Then, check for loosened connections. If these are in good order, there may be trouble with the automatic tuning circuit.
Tx frequency unlocked	Problem with TX local OSC	Retry key operations. If the error message reappears, try replacing the EXC Board/REF OSC Board.
Rx frequency unlocked	Problem with RX local OSC	Retry key operations. If the error message reappears, try replacing the RX Board/REF OSC Board.
Excessive Ic on PA (*)	Excessive collector current	Retune. Check antenna.
Excessive power reflected (*)	Too many reflections	
High temperature on PA (*)	High temperature at power transistor on the PA Board	Wait for a while and then retransmit.
No position data input	The LAT LON key was pressed to display ship's L/L position, but CIF or NMEA format data is not input to the CPU of the Control Unit.	No connection with navigation device (CIF/NMEA output): Run shielded twist-pair cable between navigation device and the Control Unit. Connection with navigation device (CIF/NMEA output): Confirm that the navigation device is correctly outputting L/L position data. If it is, there may be a problem with the I/O port on the Control Unit. In this case, call for service.

(*) Output power is reduced automatically.
("FULL" → "LOW1")

Error Messages for self tests

If one of the error messages shown below appears at self tests, check the corresponding boards.



Test No.	Error No.	Error Message	Check Point
9915/9916	1	CPU/Communication error	CPU board (in the transceiver unit) or Interconnection cable
9924/9925	1	CPU/Communication error	CPU board (in the control unit) or Interconnection cable
9923	2	No Tx AF signal on AF PCB	AF board
	3	No Rx AF sig. on AF PCB or TRx unit	AF board or RX board
	4	No SQ AF signal on AF PCB	AF board
	5	SQ not open on AF PCB	
	6	SQ not closed on AF PCB	
9913	7	Unlock freq. xxxx.xx kHz on RX PCB	RX board
9911	8	Unlock freq. xxxx.xx kHz on EXC PCB	EXC board
9914	9	No Rx signal through BPF on RX PCB	RX board
	10	No Rx signal through Pre-sel on RX PCB	
	11	No Rx signal on RX PCB	
	12	No S signal on RX PCB	
	13	Unable to control sensitivity on RX	
	14	Unable to mute Rx on RX PCB	

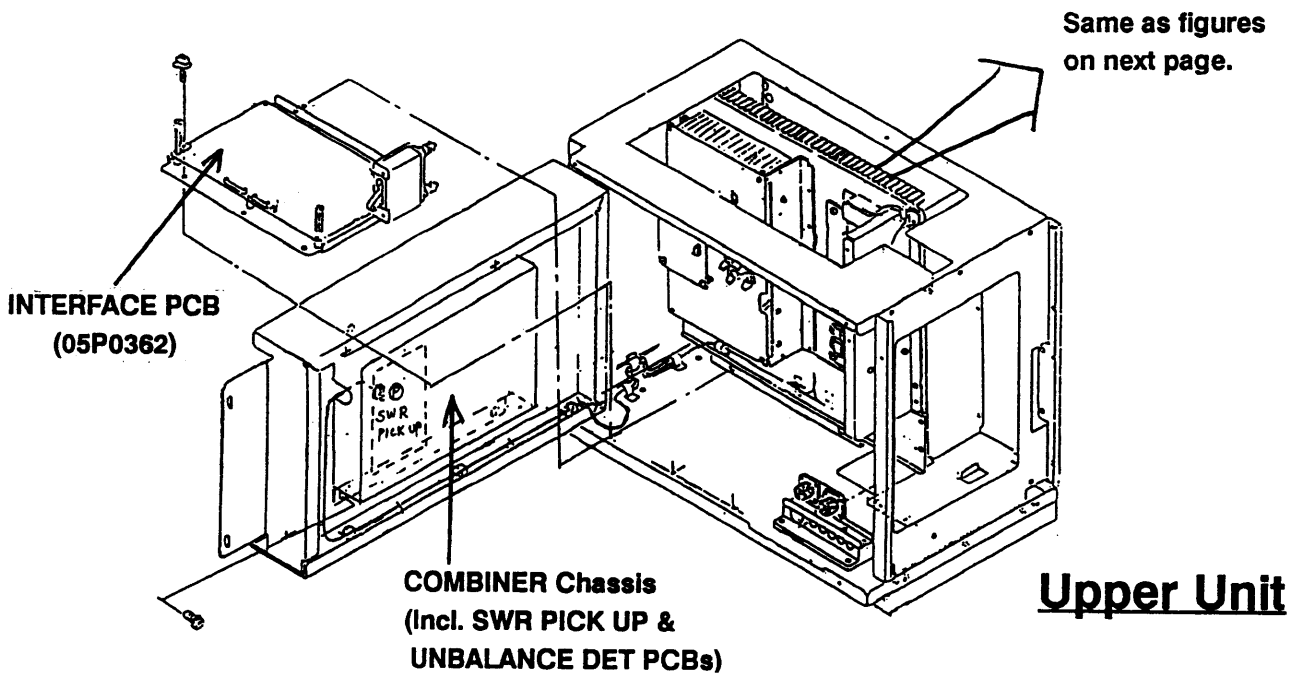
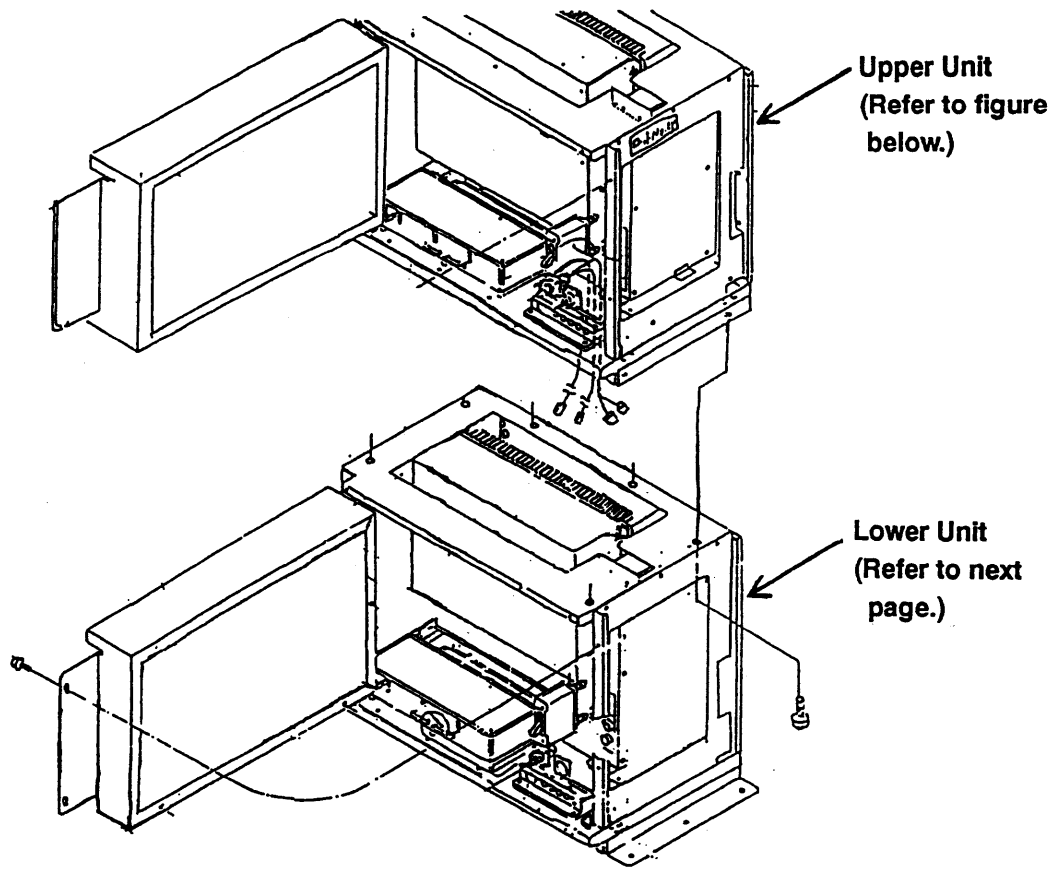
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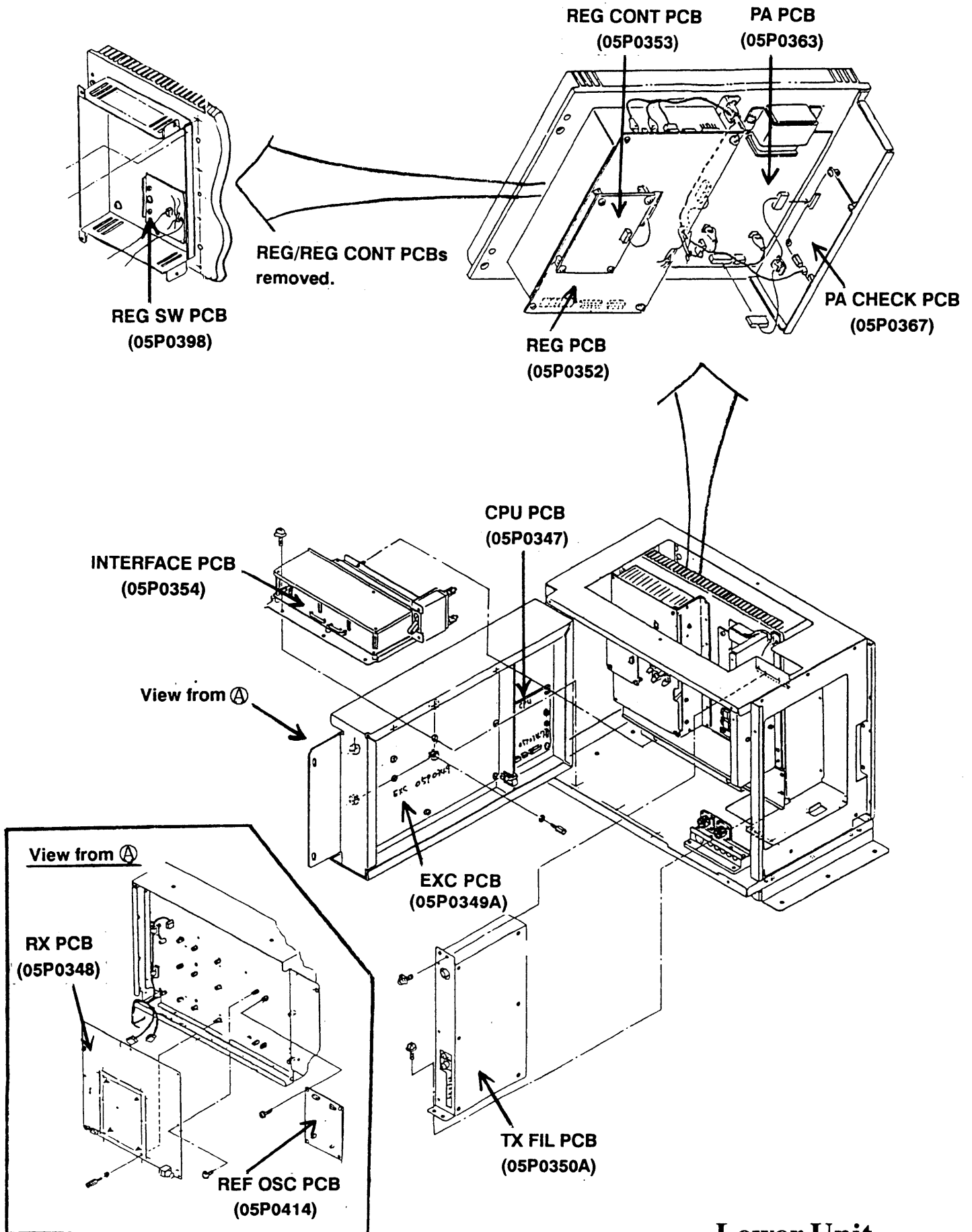
Test No.	Error No.	Error Message	Check Point
9912	15	No Mic signal from Control Unit on EXC	AF board, EXC board or Interconnection cable
	16	No Tx signal on EXC PCB	EXC board
	17	Unwanted Tx signal on EXC PCB	
	18	Insufficient source voltage	Low input voltage
	19	Insufficient PA Vc	REG Unit (+ 45V line voltage)
	20	Excessive PA idle current	PA board
	21	High temperature on PA	Temperature at PA board exceeds 90°C.
	22	Low source voltage (800W unit)	Low input voltage
	23	Low PA Vc (800W unit)	REG Unit (+ 45V line voltage)
	24	Excessive PA idle curr. (800W unit)	PA board
	25	High temperature on PA (800W unit)	Temperature at PA board exceeds 90°C.
	26	Unwanted Tx signal on PA or TX FIL PCB	PA board or TX FIL board
	27	Unwanted sig. on PA or TX FIL (800W)	
	28	Unwanted signal on Power Combiner	COMBINER board
	29	No Tx signal on PA or TX FIL PCB	PA board, TX FIL board or Interconnection cable
	30	No Tx sig. on PA or TX FIL (800W unit)	
	31	No Tx signal on Power Combiner	COMBINER board
	33	No Tx signal on PA	PA board
	34	No Tx signal on PA (800W unit)	
	35	No Tx signal on TX FIL PCB	TX FIL board
36	No Tx signal on TX FIL PCB (800W unit)		
9930	32	No acknowledge signal from Coupler	COUP board

(Note) The error message with " 800W unit " means the board of the upper unit in the transceiver unit.

PCB LOCATIONS (For qualified personnel)

1) Transceiver Unit





3. INSTALLATION (For qualified personnel)

GENERAL

This section provides information necessary for installation. Installation consists mainly of siting and mounting the units of the system, laying and connecting interconnection cables and power cable, erecting a suitable antenna and ground system and checking the unit for proper operation.

Proper installation is important for good performance and reliability. Antenna and ground connections must be made properly using corrosion resistant materials. Cable routing should be planned to protect cables from physical damage. Fabricate the armor and shield of cables according to the recommended procedure.

For duplex communication, be sure the receiving antenna and transmitting antenna are well separated from one another (5 meters or more) to prevent mutual interference. The coaxial cable used to make the connection between the Transceiver Unit and the receiving antenna should have a dual shield and armor.

The battery must be able to supply ample current so 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. To deliver power efficiently, the power cable must be at least 14 sq. (22 sq. cable is recommended).

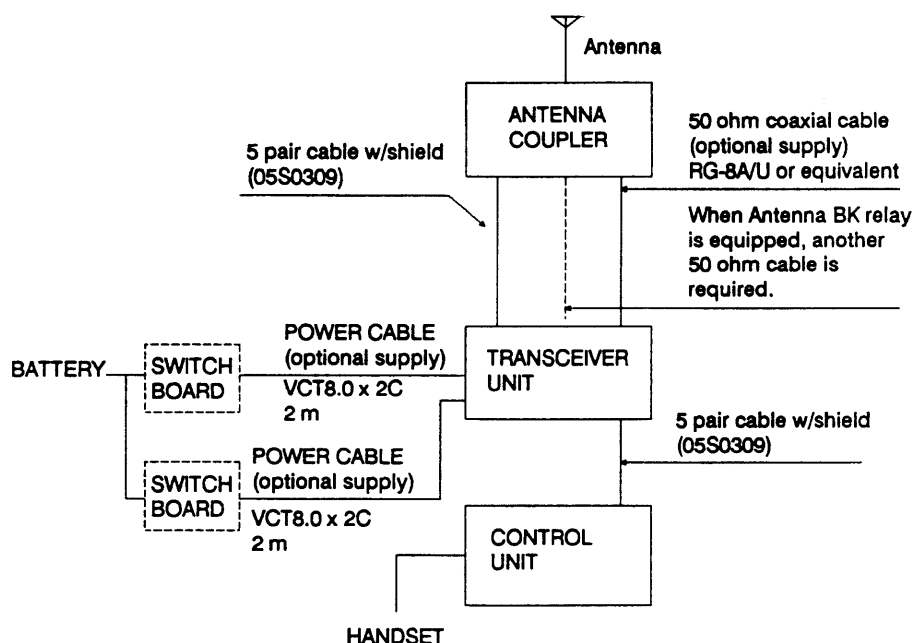
The maximum length of the interconnection cable between the Control Unit and Transceiver Unit and between the Transceiver Unit and Antenna Coupler is 50 meters. Keep this distance in mind when selecting a mounting location. Cables should not be routed with the cables of other equipment to prevent mutual interference.

When the ANT BK RELAY Board is installed (at the factory) but not used, detach it from the coupler to prevent damage to the board by transmission signal induction.

Observe the compass safe distances (the minimum distances the units of the FS-8000 system should be separated from compasses) shown below.

Unit	Standard (m)	Steering (m)
Control	0.9	0.7
Transceiver	2.3	1.8
Antenna Coupler	1.0	0.7
Rectifier	1.5	1.2

The figure below shows the standard connection method for simplex communication.



Note: Armored cables can be optionally supplied instead of 5 pair cable/coaxial cable. We recommend use of armored cables when the Antenna Coupler is installed outdoors, to prevent cable damage. Armored cables should be grounded at transceiver side. For cable fabrication at antenna coupler side, refer to page 3-17.

Fig. 3-1 Connection Method for Simplex Communication

INSTALLATION & COMMUNICATION

The method of installation depends on the type of communication required: simplex or duplex. For simplex communication the method depends what TX/RX frequencies are to be used.

Duplex Communication

Duplex communication requires a receiving antenna. For connecting a whip antenna to the coaxial cable, use a receiving antenna junction box and dual shield coaxial cable w/armor (local supply). Be sure to locate the receiving antenna at least 5 meters from the transmitting antenna (as far as possible). To reduce transmission noise, it is better to set AGC time and NB to "FAST" and "ON", respectively.

Note that the R ANT SEL Board (option) is available for duplex communications. For further details, refer to page 3-12b.

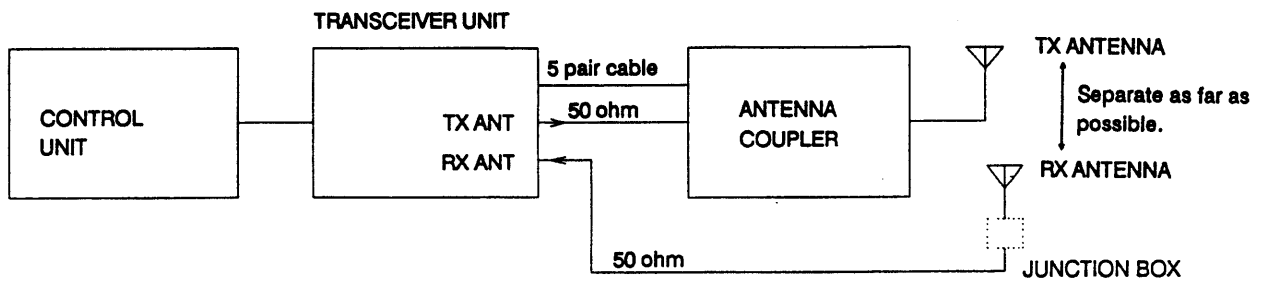


Fig. 3-2 Connections Required for Duplex Communication

Further, change the wiring in the Transceiver Unit as shown in Fig. 3-3. Remove the coaxial cable connected between two RX ANT terminals. Connect the receiving antenna to the RX ANT terminal of the lower unit in the Transceiver Unit.

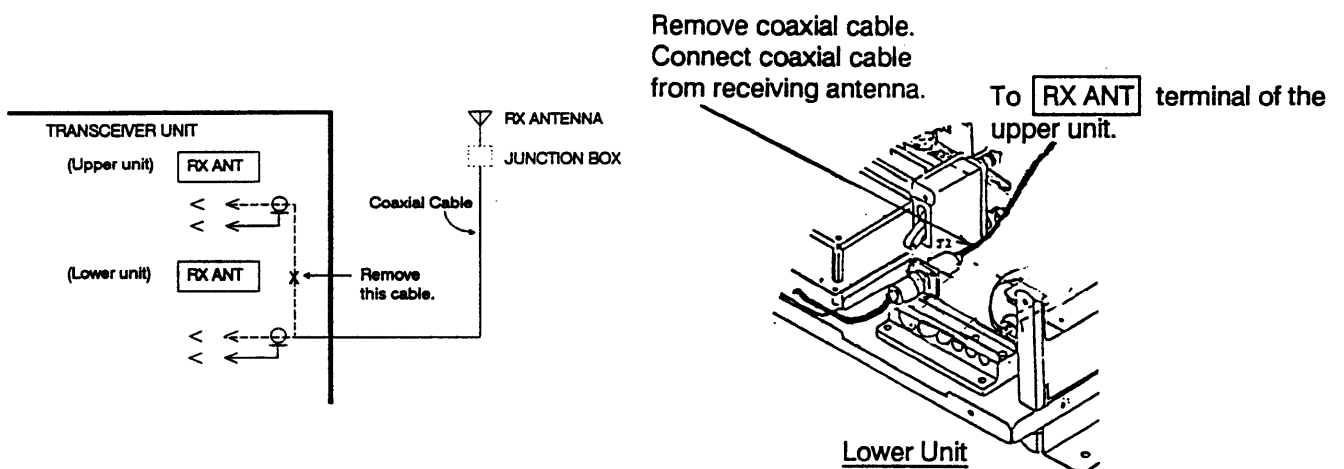


Fig. 3-3 Modifying the Transceiver Unit for Duplex Communication

Simplex Communication

The Transceiver Unit is equipped with a 50 ohm BK relay for switching the TX and RX lines.

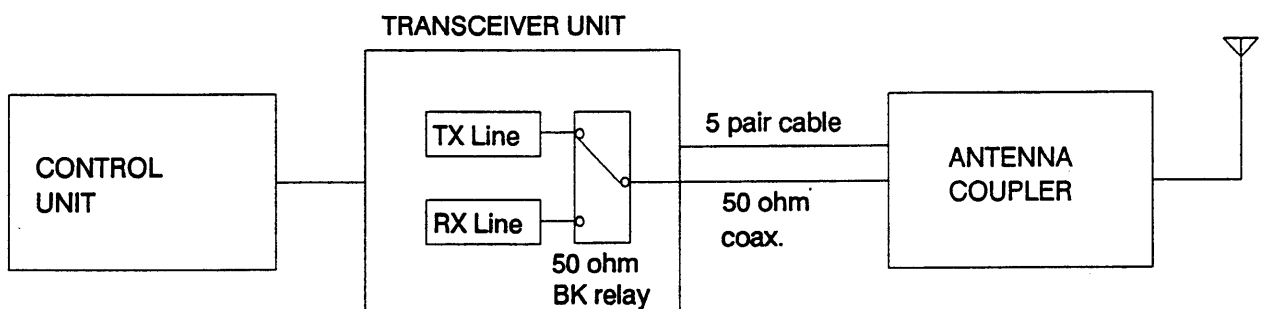


Fig. 3-4 BK Relay in the Transceiver Unit

MF Two-frequency Communication

When the frequencies of an MF band TX and RX frequency pair are dissimilar, loss of RX signal may result because the antenna coupler will be tuned for the TX frequency (in HF band, the difference between TX and RX freq. is comparatively small). To solve this problem, install the optional Antenna BK relay to get TX/RX switching at the base of the antenna.

Note: To install the Antenna BK relay, two coaxial cables must be run between the Antenna Coupler and the Transceiver Unit.

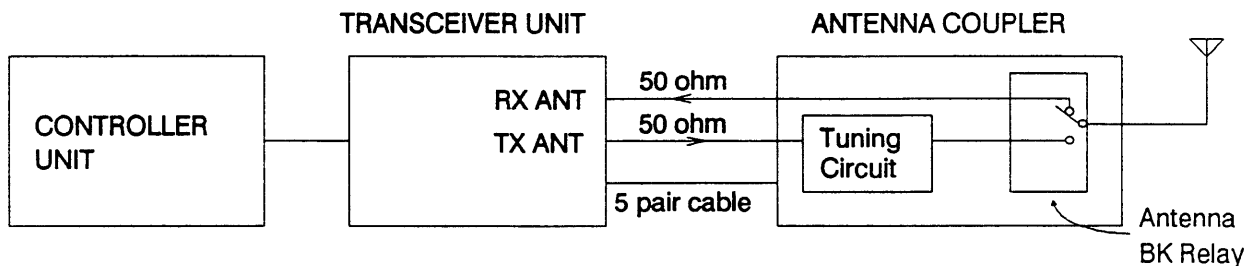


Fig. 3-5 Antenna BK Relay

Further, change the wiring in the Transceiver Unit as shown in Fig. 3-6. Remove the coaxial cable connected between the RX ANT terminals. Connect the coax. cable from the Antenna BK Relay board to the RX ANT terminal of the lower unit in the Transceiver Unit.

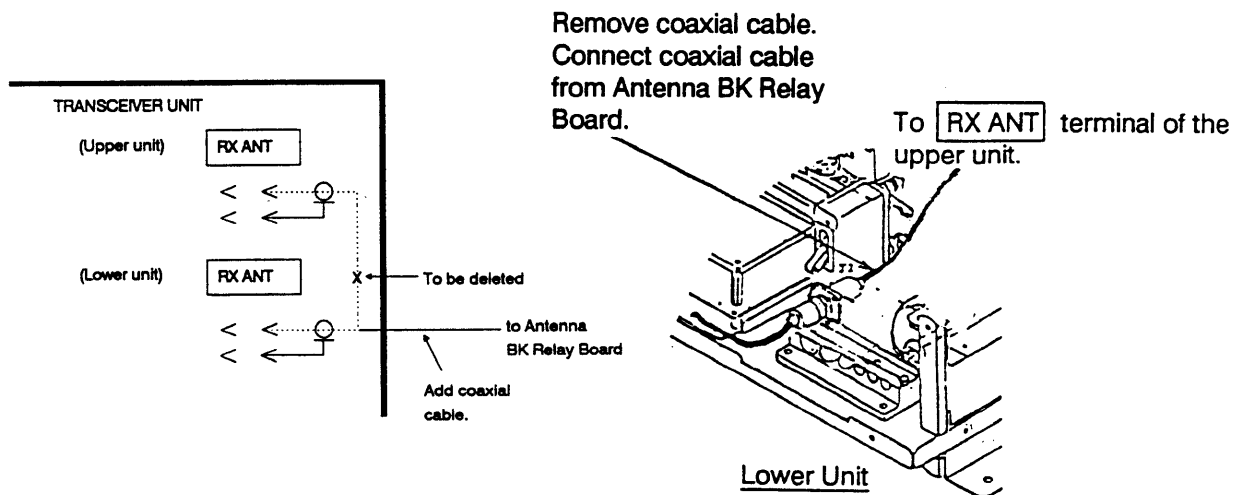


Fig. 3-6 Modification Required When Antenna BK Relay is Used

Note: If receiving antenna is connected in the same manner as for duplex communication, Antenna BK relay is not required.

ANTENNA

Transmitting Antenna

The transmitting antenna should satisfy the following requirements:

- Total antenna length is 7 to 18 meters.
- The length of the vertical portion should be longer than 4 meters, and the slant angle of that part should be within 5 degrees.
- Separate it as far as possible from:
 - stays
 - metallic objects
 - direction finder antenna
 - INMARSAT radome antenna
- Locate the insulator away from funnels, etc.
- If the Antenna Coupler is installed out of wheelhouse, use a lead-in insulator (Furuno type YA-256) to make the connection. If necessary use a high quality antenna switch and stand-off insulator.
- If the antenna is connected directly to the coupler, use a strain insulator to prevent insulator fatigue.

Receiving Antenna

A receiving antenna is required for duplex communication. Furuno can supply two types of receiving antennas: FAW-6R2 (six meter whip w/standard mounting bracket), or FAW-6R2A (six meter whip w/universal mount).

The receiving antenna should be separated at least 5 meters from the transmitting antenna (as far as possible).

Install a receiving antenna junction box at the base of the antenna. Run a dual shield coaxial cable w/armor between the antenna and the RX ANT terminal in the lower unit of the Transceiver Unit.

MOUNTING THE CONTROL UNIT

Mounting Considerations

The Control Unit may be mounted on the bulkhead, a tabletop or a panel (flush mounting). When selecting a mounting location, keep the following points in mind.

- Keep the unit free of water splash.
- Keep the unit out of direct sunlight.
- Select a location where the controls can be easily operated.
- Leave enough space on the sides of the unit to permit checking and maintenance.

*: *Slant mounting plate is optionally supplied. (Ref to page AP2-1.)*

Mounting (Refer to page D-2.)

1. Dismount the front panel by loosening four screws.

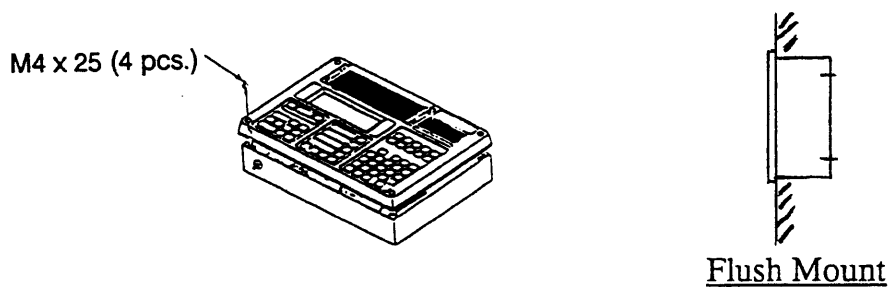


Fig. 3-7 Location of Front Panel Fixing Screws

2. Separate the bottom chassis from the top chassis by removing the two stoppers and two flat cables shown in Fig. 3-8.

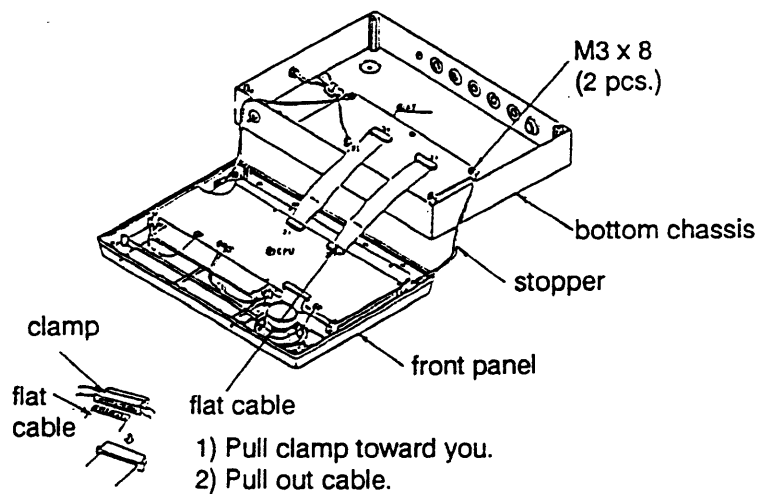


Fig. 3-8 Separating the Top and Bottom Chassis

3. Referring to the figure below, drill four pilot holes in the mounting location.

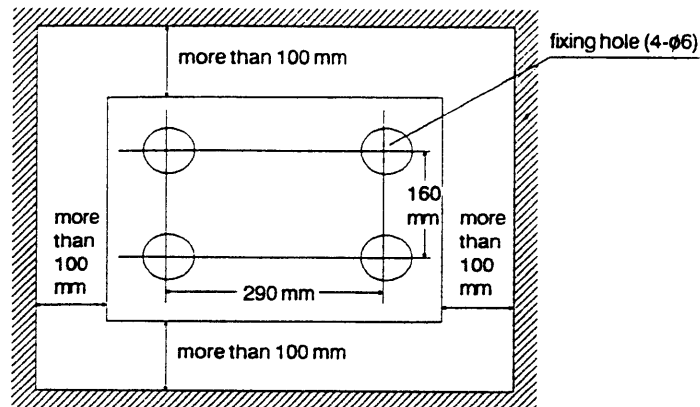


Fig 3-9 Mounting Dimensions of the Control Unit

4. Fix the bottom chassis to the mounting location with the tapping screws and washers supplied. *(The bottom chassis can be rotated 180° to facilitate cable routing.)*

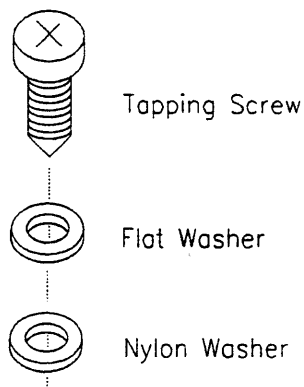


Fig. 3-10 Hardware for Mounting the Control Unit

Wiring

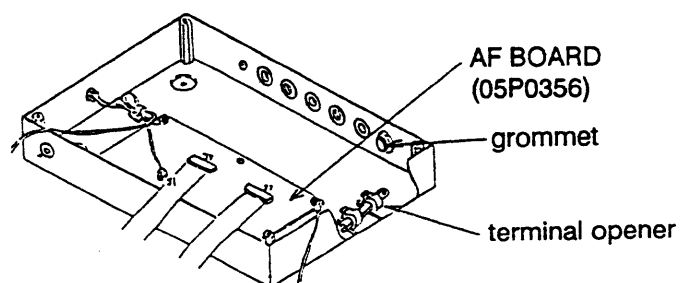
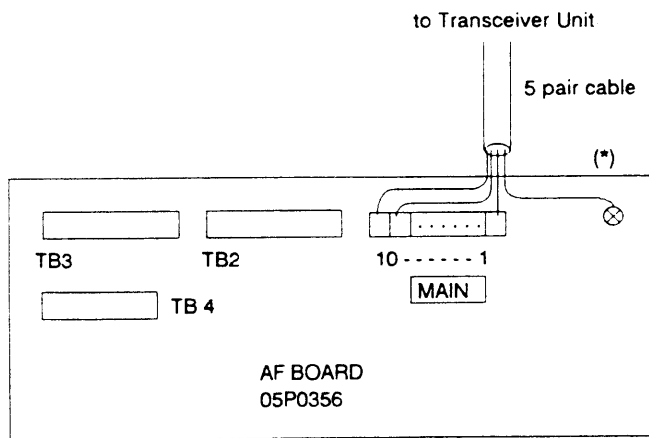


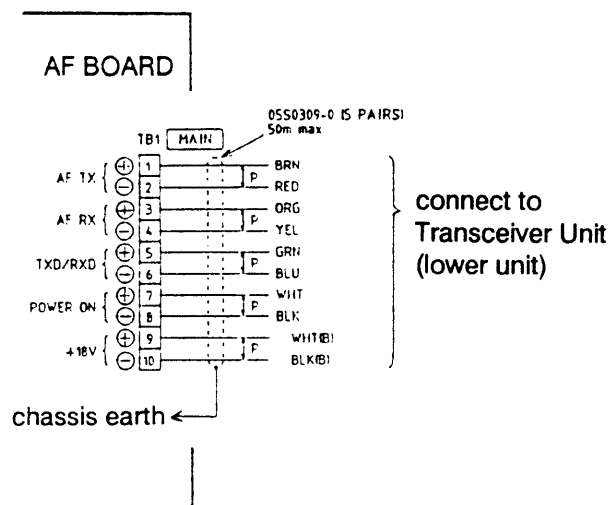
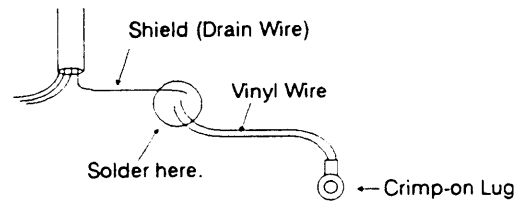
Fig. 3-11 Location of Parts Inside the Control Unit

Transceiver Unit

Connect the five pair cable to TB1 on the AF Board as shown in the figure below. Use the terminal opener to make the connection.

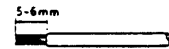


(*) Solder vinyl wire to shield, fit crimp-on lug to vinyl wire, fix vinyl wire to pcb fixing screw.

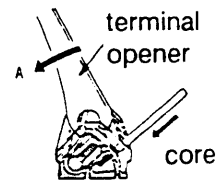


How to Use the Terminal Opener

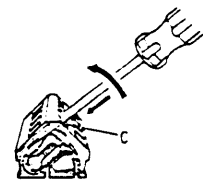
1. Remove the end of each core by 5-6 mm.



2. As shown in the figure, set the opener in a terminal. While pulling the opener downward, insert the core.



3. Release the opener. Tug on the core to confirm it is inserted properly.



4. If the opener is not available, use a small slotted-head screwdriver. Insert the screwdriver in the terminal and while pushing it upward, insert the core.

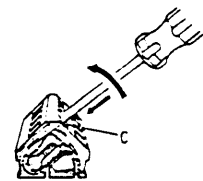


Fig. 3-12 Connecting the Cable from the Transceiver Unit to the AF Board

MIC Input Terminal

The handset is normally connected on the left side of the front panel, however it can also be connected on the upper side (A or C in Fig. 3-13) or the lower side (B in Fig. 3-13) of the unit.

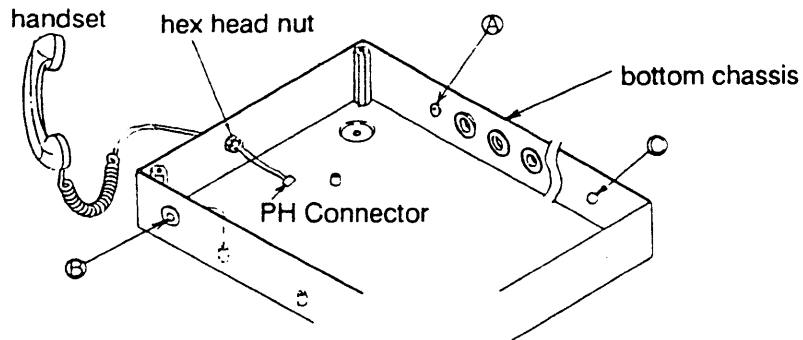


Fig. 3-13 Cable Entries for the Handset

Optional Equipment

Pass a grommet (supplied) onto the cables of optional equipment. Connect the cables to proper jacks on the AF Board, using the plugs, jacks and clamps supplied.

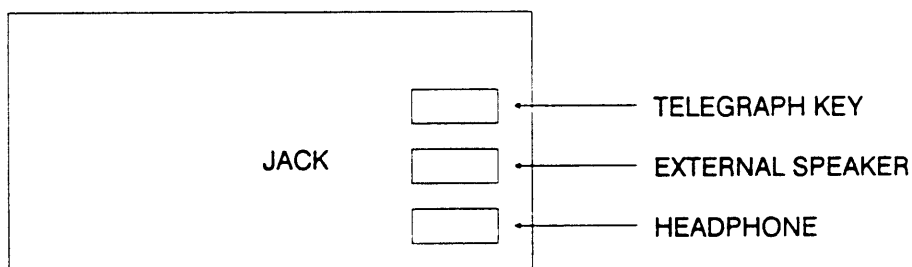


Fig. 3-14 AF Board, Showing Location of Jacks for Connecting Optional Equipment

Ground Connection

Making the length as short as practical, run a ground wire (IV-8 sq. or heavier, local supply) between the ground terminal on the Control Unit and the ship's superstructure or grounding bus.

MOUNTING THE TRANSCEIVER UNIT

Mounting Considerations

The Transceiver Unit is designed for indoor mounting. It can be mounted almost anywhere provided the location satisfies the following requirements.

- Vibration-free location
- Well-ventilated area
- Free of water splash
- Leave enough space around the sides of the unit to permit maintenance and checking.
- The mounting location must be able to support the weight of the unit (40 kg) under the condition of continued vibration normally encountered aboard the vessel.

Mounting

Fix the unit to the chosen location with 12 tapping screws and 12 washers (supplied).

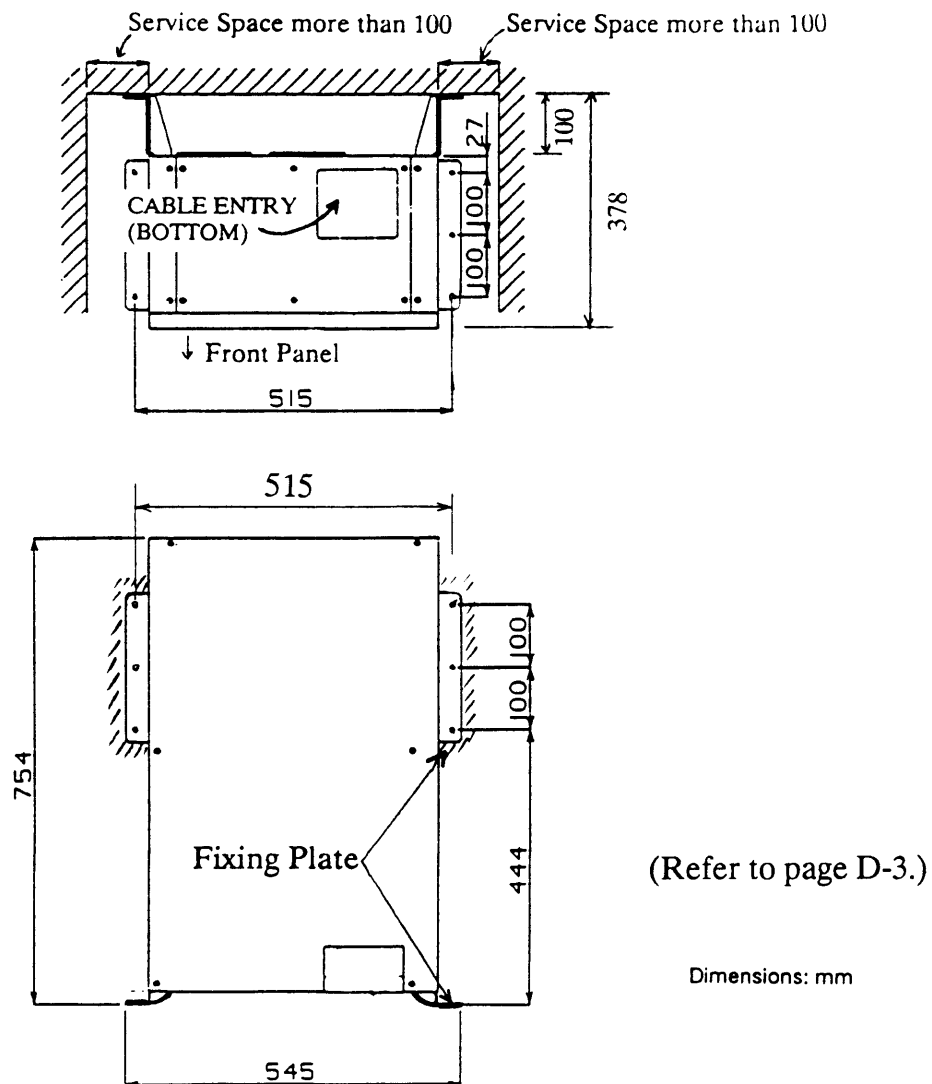


Fig. 3-15 Mounting Dimensions of the Transceiver Unit

Wiring

Five cables are terminated at the Transceiver Unit:

- 1) Two of Power Cables (optional supply)
- 2) Two of Five Pair Cables (from the Control Unit and Antenna Coupler)
- 3) Coaxial Cable (from the Antenna Coupler)

For connecting peripheral equipment:

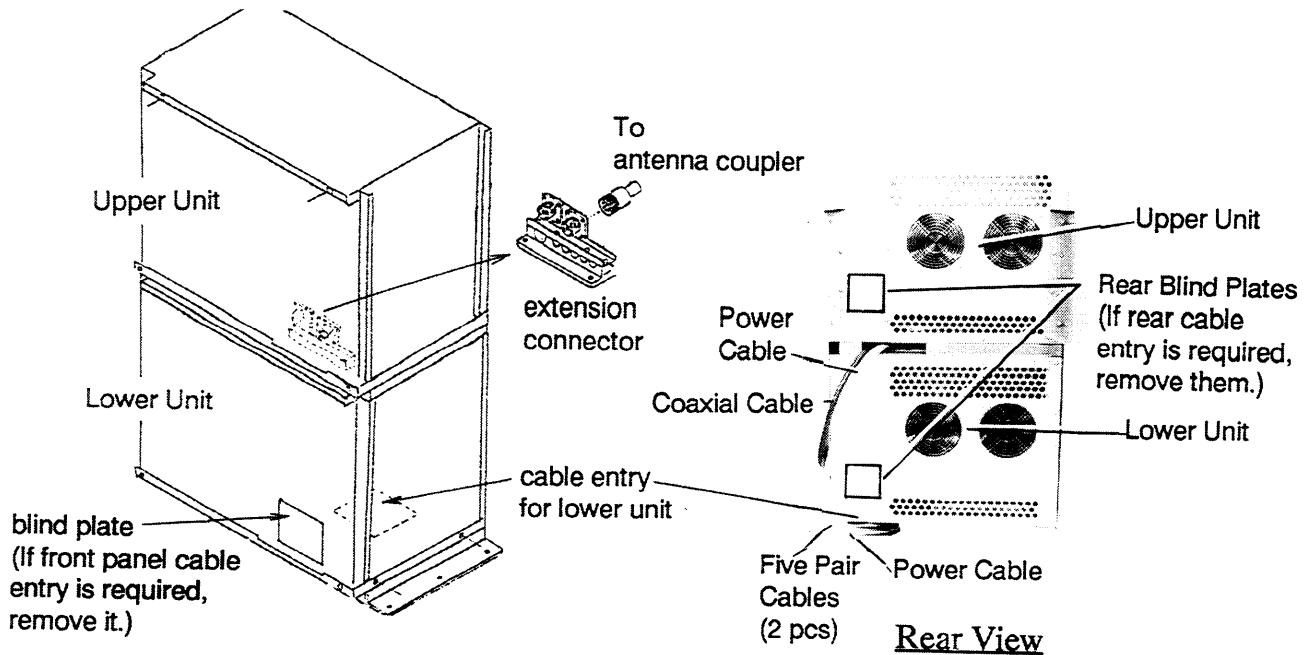
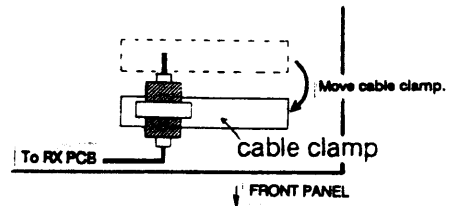
- 1) Cable for BK (break-in control)
- 2) One coaxial cable for duplex communication or "Antenna BK Relay".

For the wiring required for duplex communication, see page 3-2. And for Antenna BK relay connection, see pages 3-4 and 4-3.

The Transceiver Unit has a cable entry at its bottom, front and rear.

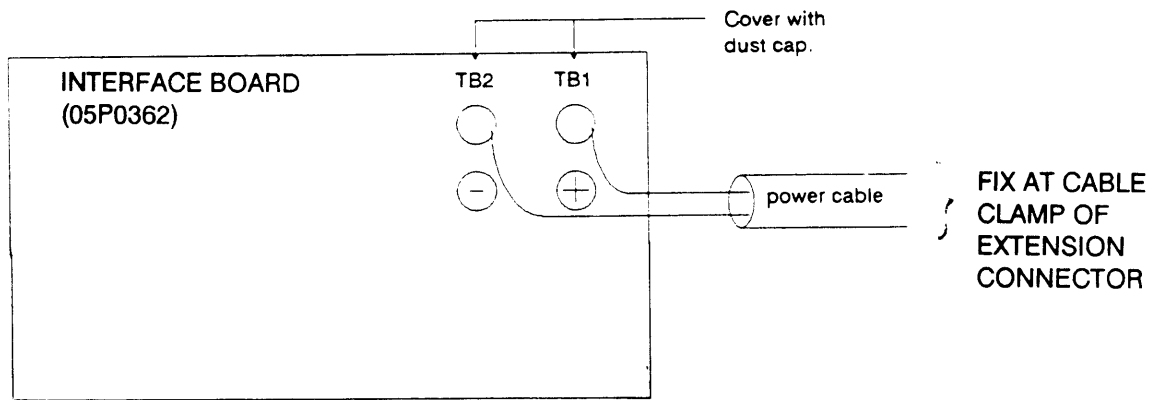
Cable Name	Connected to	Unit
Power Cable	Interface Board (05P362)	Upper Unit
Coaxial Cable	Extension Connector (TX ANT)	
Power Cable	Interface Board (05P0354)	Lower Unit
Five Pair Cables (2 pcs)		

For front panel cable entry, move the cable clamp in the lower unit forward.



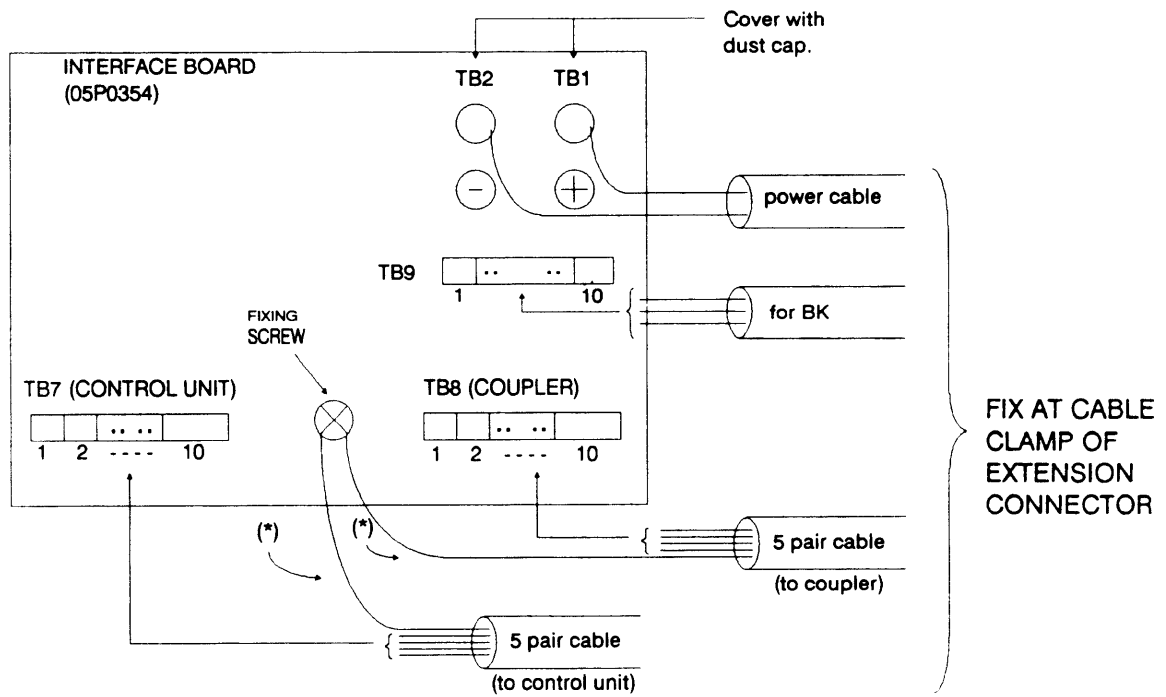
Note: For connection to the terminal board, use the terminal opener provided.

Fig. 3-16 Transceiver Unit



In the Upper Unit

In the Lower Unit



(*) Solder vinyl wire to shield, fix crimp-on lug to vinyl wire, fix crimp-on lug to pcb fixing screw.

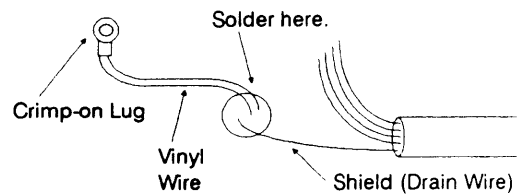
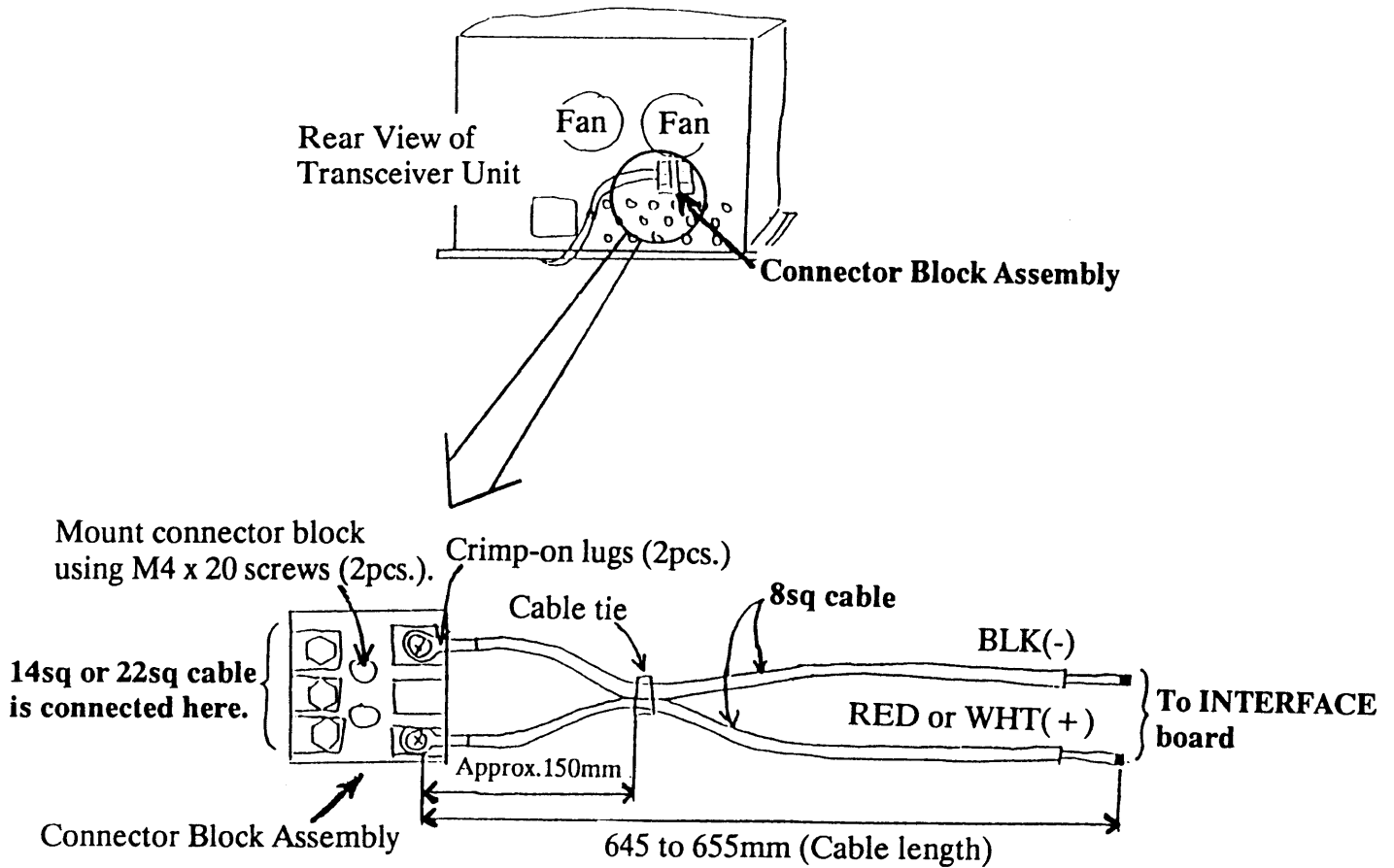


Fig. 3-17 Cable Connections on the Interface Board

OPTIONAL SUPPLY OF CONNECTOR BLOCK ASSEMBLY (Terminal Board for Power Supply)

The 14sq or 22sq cable is available for power supply by using the connector block assembly which is mounted on the rear panel of the transceiver unit.



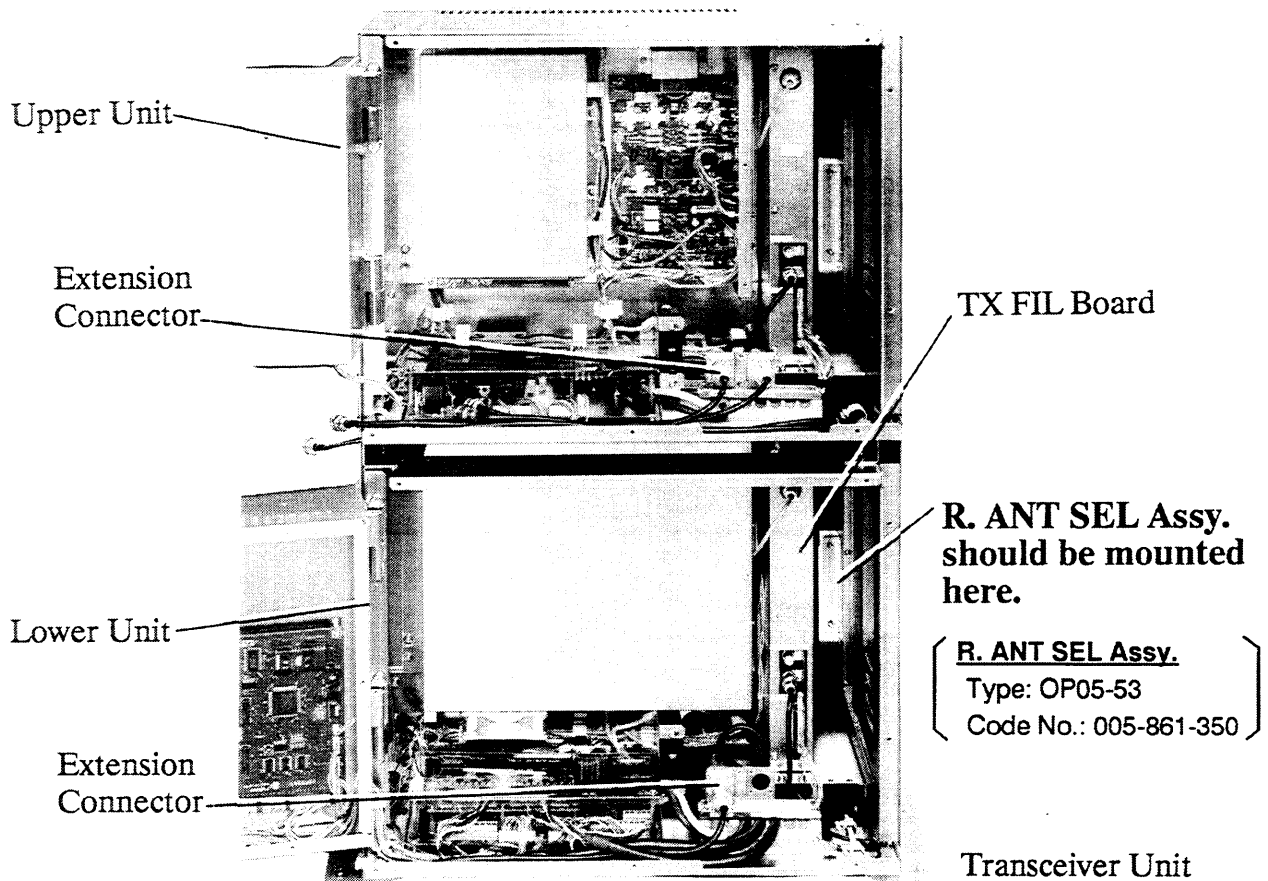
Model	Type	Code No.
FS-5000	OP05-49	005-841-200
FS-8000	OP05-48	005-841-190

INSTALLATION OF R. ANT SEL BOARD (Option)

(To use duplex receiving antenna only for duplex mode.)

For duplex operation, a 6 to 7 meter whip antenna and a receiving antenna with a junction box are installed. The received signal is fed to the transceiver unit through coaxial cable. The receiving antenna, however, is not so sensitive for MF simplex and semi-duplex operations due to insufficient length of antenna and incorrect impedance matching.

The R. ANT SEL Assembly is prepared to choose the best antenna for reception.

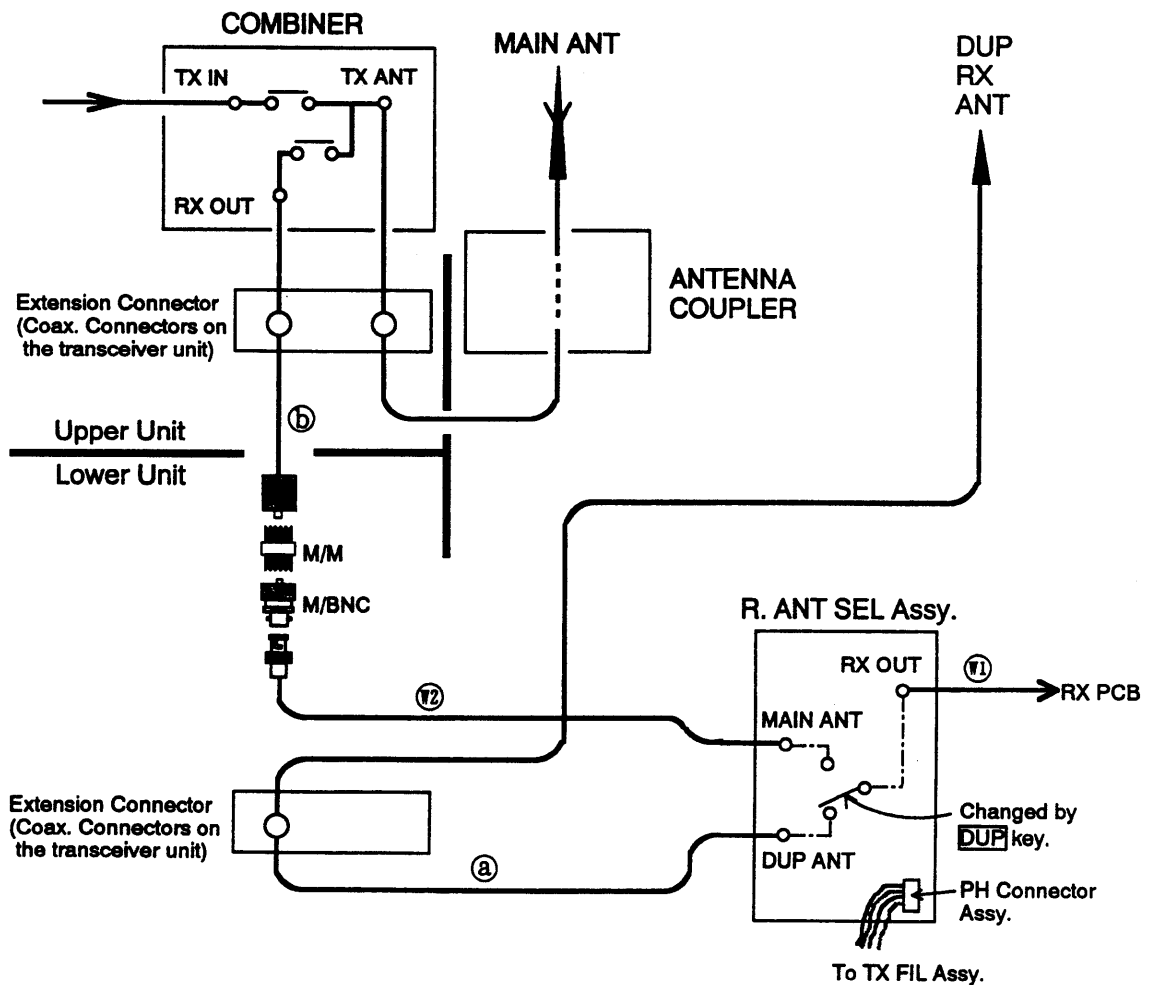
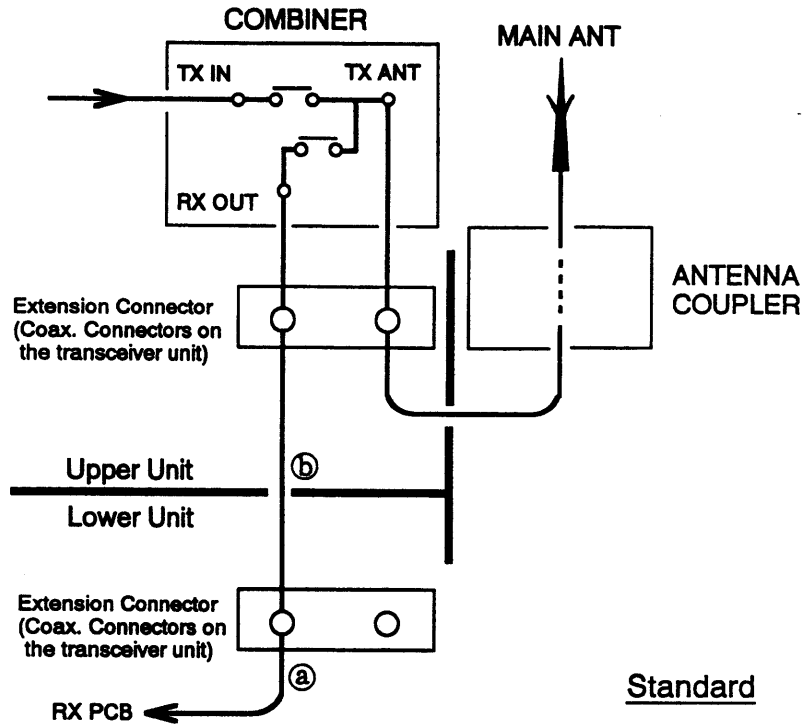


T. Photo No.1157

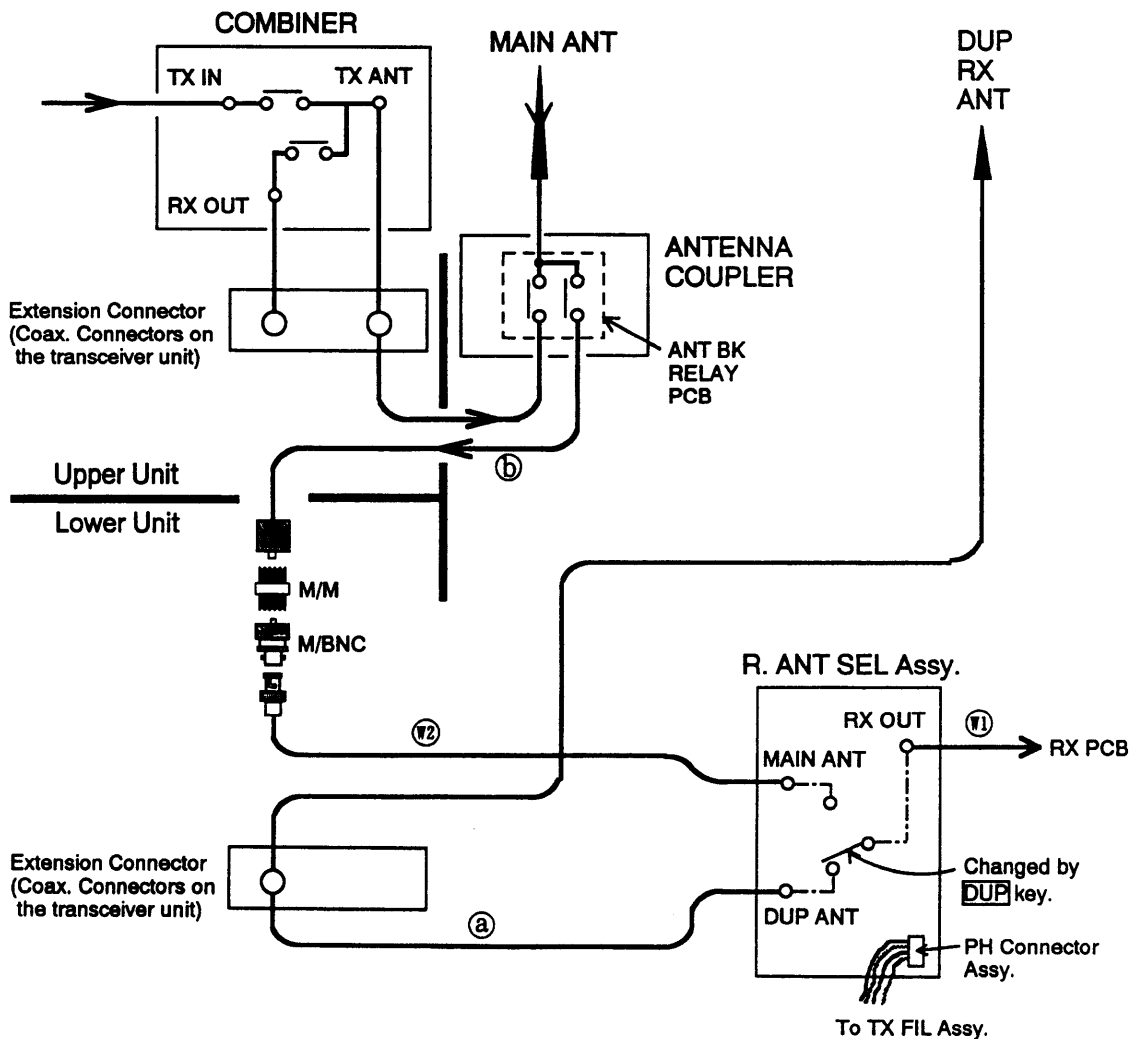
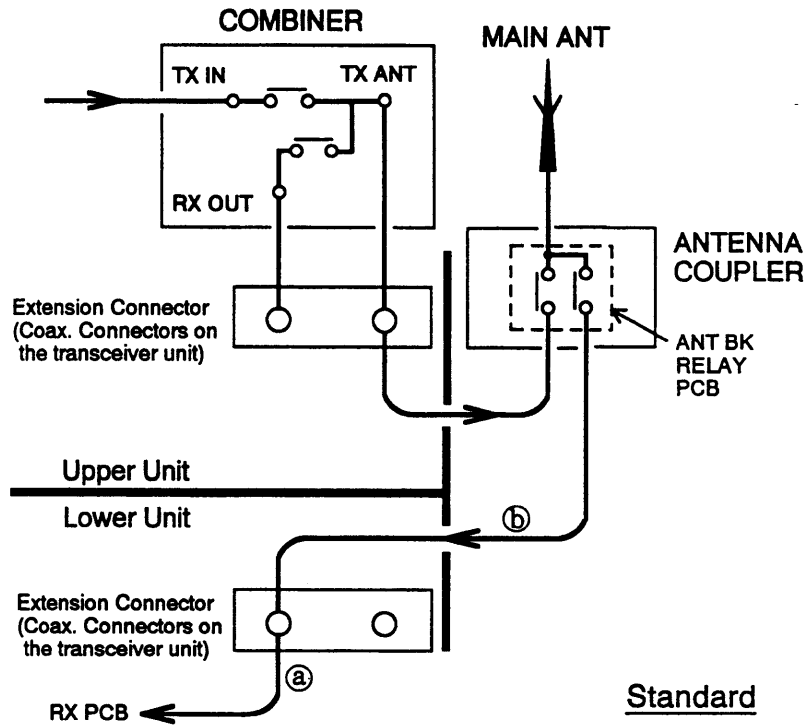
Installation Materials

1. BNC — (W1) — BNC Cable
2. BNC — (W2) — BNC Cable
3. BNC-M Conversion Connector
4. M-M Coax. Connector
5. PH Connector Assy. (1 set)
6. Screws (4 pcs.)

WITHOUT ANT BK RELAY PCB



WITH ANT BK RELAY PCB



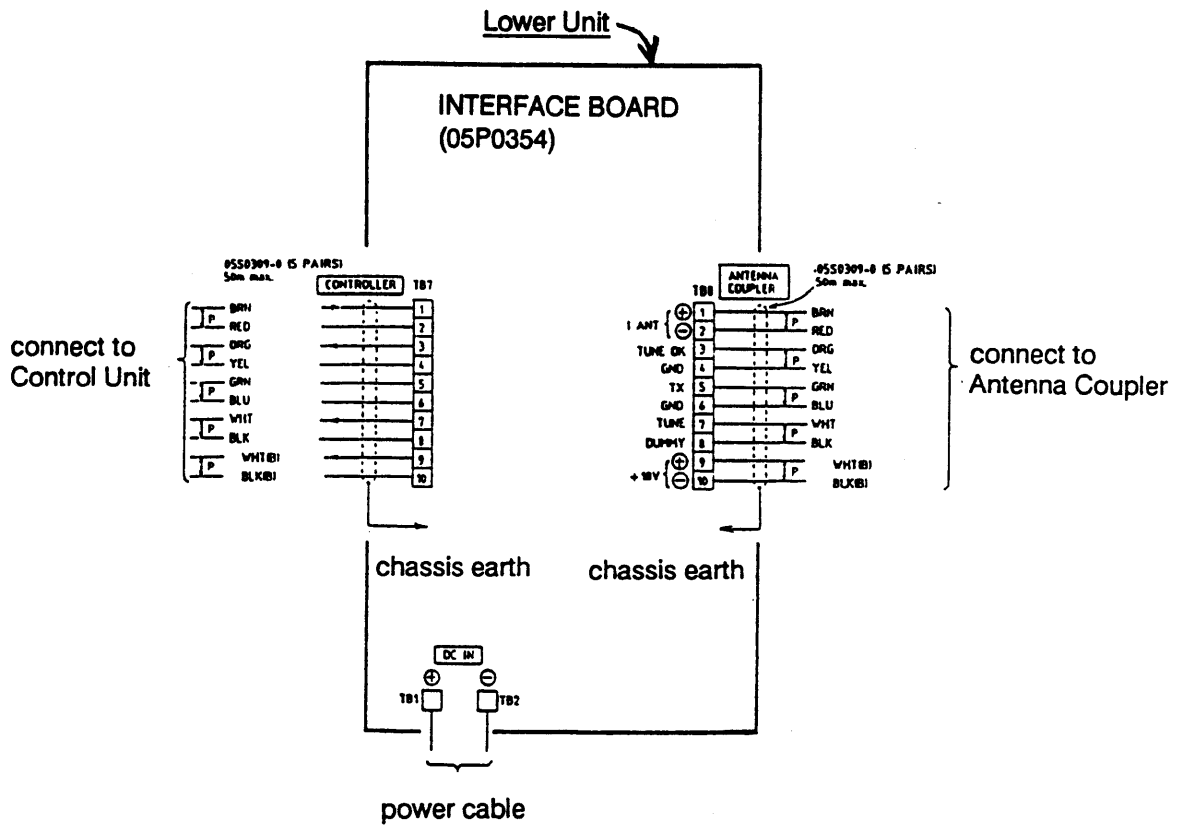


Fig. 3-18 Wiring on the Interface Board

After wiring the Transceiver Unit, seal the cable entry with putty.

Ground Connection

Loosen the two screws fixing the cable clamp. Making the length as short as possible, run a copper strap of 50 mm width (option) between the cable holder and the ship's superstructure or grounding bus. Be sure to ground both lower and upper units.

In case of Lower Unit

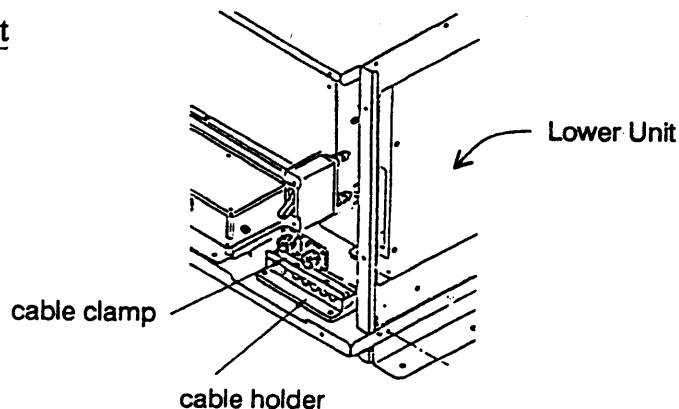


Fig. 3-19 Making the Ground Connection on the Transceiver Unit

MOUNTING THE ANTENNA COUPLER

Mounting Considerations

Outdoor Installation

- The Antenna Coupler is water resistant, however it is not designed to take a continual soaking. If necessary, seal any opening in the top or sides with silicone sealant.
- All wires from the coupler to the antenna radiate radio energy. They should be kept 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 as near to the ground as possible.
- The length of the vertical portion of the antenna should be as long as practical.
- Leave enough space around the sides of the unit to permit maintenance and checking.

Indoor Installation (bulkhead or ceiling)

- Locate the unit away from GPS and NNSS receivers, radio equipment, etc. to avoid mutual interference.
- The lead-in wire should be as near to the unit as possible.
- Select a place where the unit can be easily maintained, but where it will not interfere with crew or passengers.
- Select a location where the earth connection can be made at the front of the unit.

Mounting (Refer to page D-4.)

Mounting Dimensions

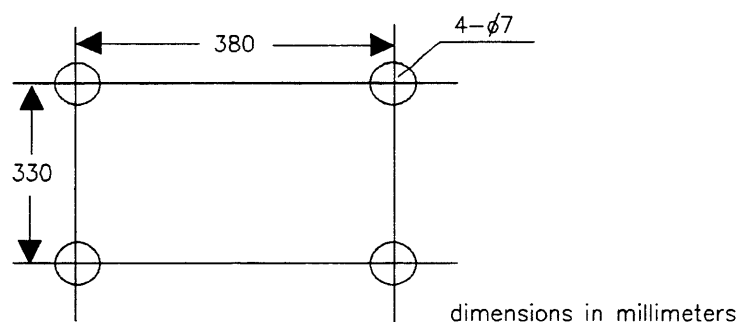


Fig. 3-20 Mounting Dimensions of the Antenna Coupler

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 3-21), one at the rear and one at the bottom. A vent tube is mounted at the position **A** shown below. For horizontal installation, remove the vent tube from **A** and fix it to **B**. Cover **A** with the blind seal (supplied), from inside the coupler. For ceiling mount, make a hole ($\phi 8.5$) on the front panel and mount the vent tube. These measures should be done before mounting the unit.

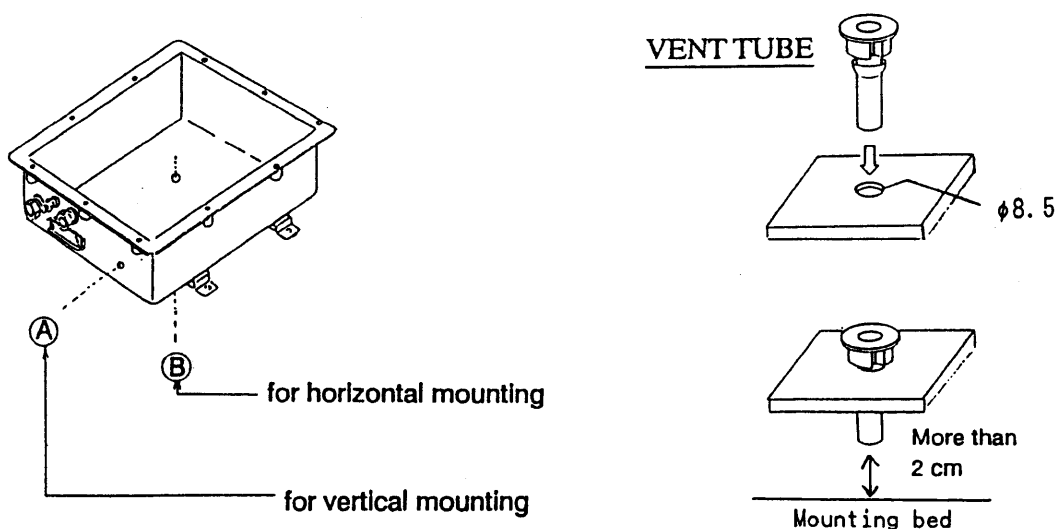


Fig. 3-21 Location of Vent Holes in the Antenna Coupler

Outdoor Installation

Fix the Antenna Coupler to a bulkhead of the bridge, mast, handrail, etc. For mounting on the mast, select a location which is within the total length of the antenna. Weld suitable mounting fixtures (local supply) to the mast and bolt the coupler there.

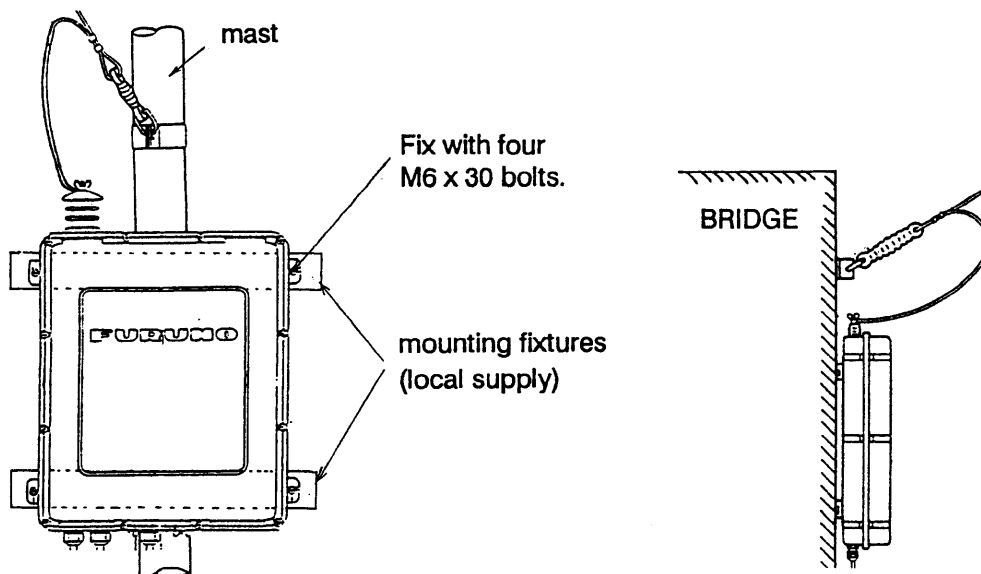


Fig. 3-22 Installing the Antenna Coupler Outdoors

Indoor Installation

Fix the Antenna Coupler to a bulkhead on the bridge, selecting a location where the distance between the lead-in insulator and the coupler is as short as possible.

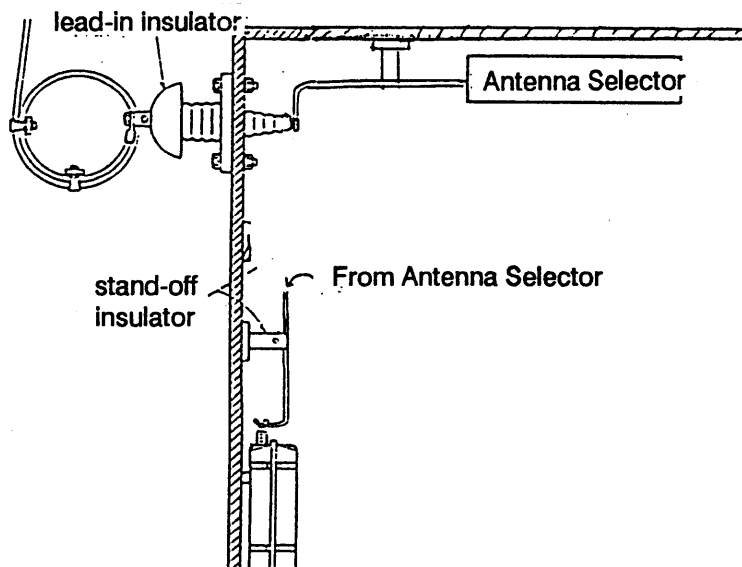


Fig. 3-23 Mounting the Coupler Indoors

Wiring

Three cables are terminated at the Antenna Coupler: the five pair cable and coaxial cable from the Transceiver Unit and the antenna wire. For the connection between the antenna wire and Antenna Coupler, use an insulator so as not to put stress on the connector at the insulator of the Antenna Coupler. For outdoor installation, the use of armored cables is recommended for avoidance of damage of cables.

1. Dismount the front cover of the Antenna Coupler by loosening twelve fixing screws.
2. Locate the Coupler Board. Connect the coaxial cable to the TX ANT terminal on TB1, locating the shield inside the cable clamp to ground the cable.

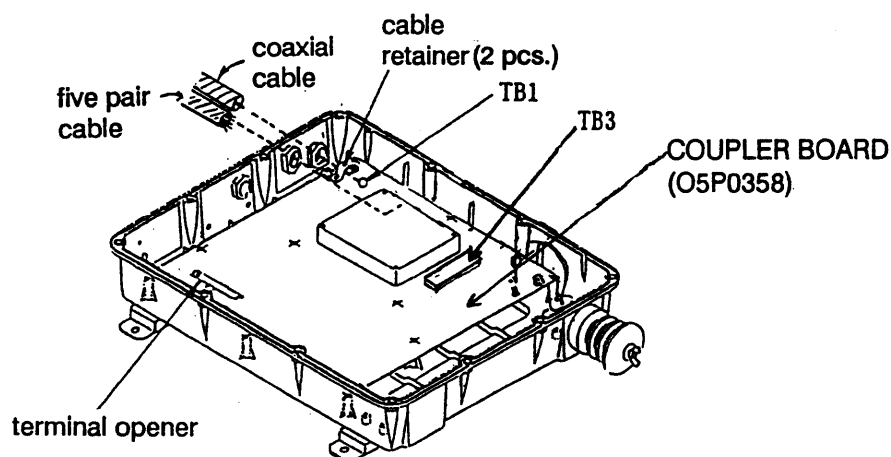
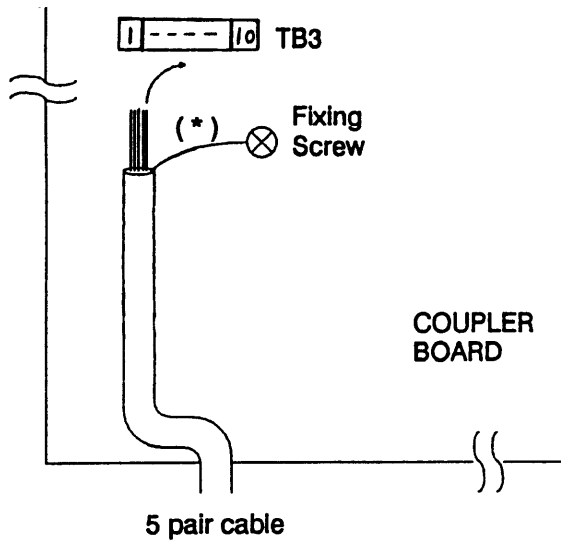
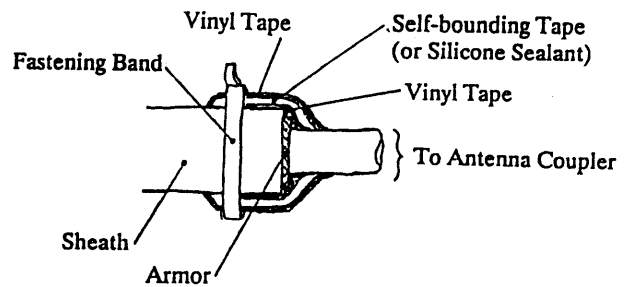
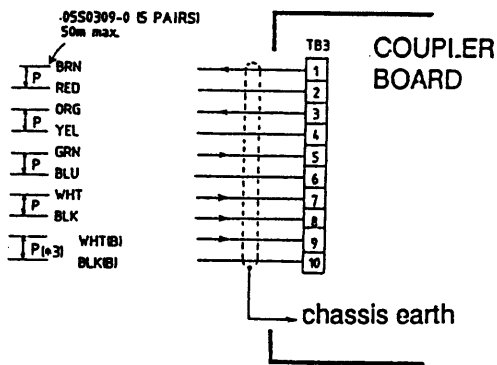
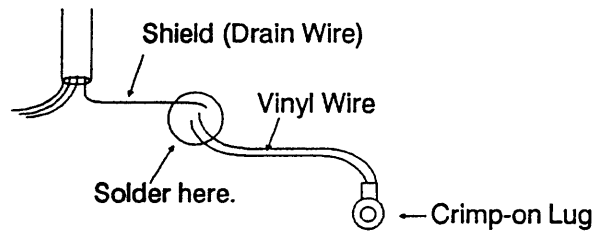


Fig. 3-24 Antenna Coupler, Front Cover Opened

3. Using the terminal opener, connect the five pair cable to TB3.



(*) Solder vinyl wire to shield, fix crimp-on lug to vinyl wire, fix crimp-on lug to pcb fixing screw.



Fabrication of Armored Cable

Fig. 3-25 Connections on the Coupler Board

Ground Connection

As the ground connection of a transmitter is part of the total antenna system, it is of the utmost importance that the ground connection to the Antenna Coupler is constructed to have the lowest possible RF-impedance. Losses in the ground connection reduce communication distance.

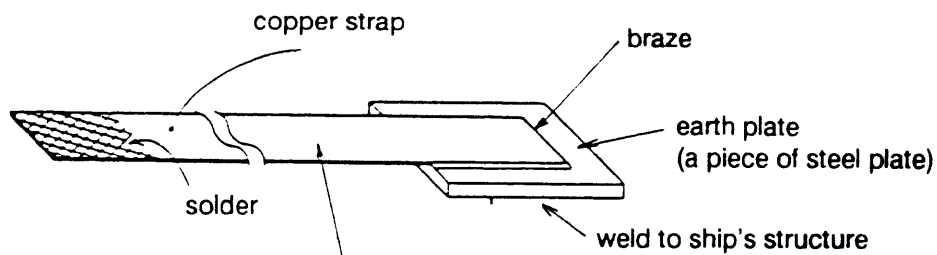
CAUTION

Ground the equipment.

Ungrounded equipment can give off or receive electromagnetic interference or cause electrical shock.

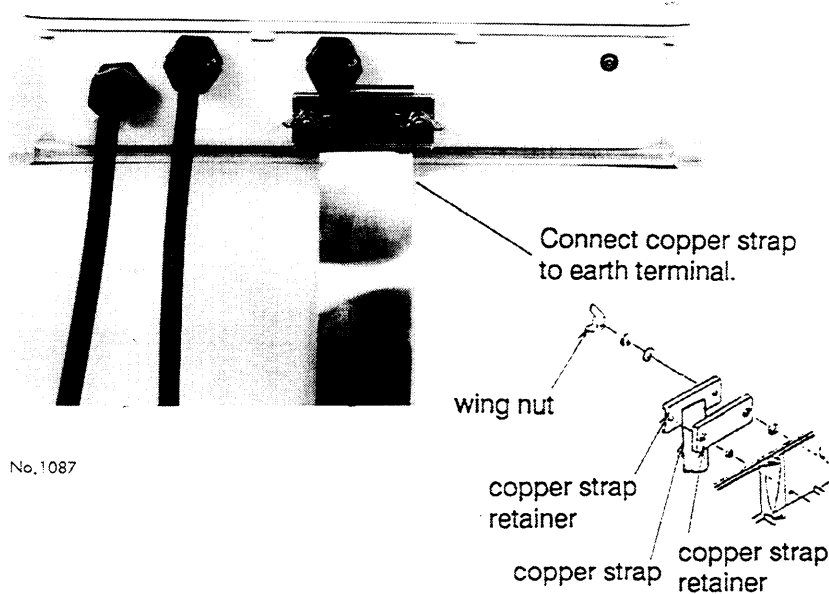
For vessels constructed of conducting materials, run a copper strap of least 50 mm width (option) between the ground terminal at the base of the Antenna Coupler and the ship's superstructure.

For vessels constructed of non-conducting materials, the width of the copper strap should be at least 100 mm.



For outdoor installation, apply a coat of paint to prevent rust.

Recommended Grounding Strap



T Photo No.1087

Fig. 3-26 Grounding the Antenna Coupler

MOUNTING THE RECTIFIER UNIT PR-850A (option)

Mounting Considerations (2 sets should be mounted.)

- Select a location which provides adequate ventilation.
- The location should be clean and dry.
- The mounting location must be able to support the weight of the unit (35 kg) under the continued conditions of vibration normally encountered aboard the vessel.

Mounting (Refer to page D-5.)

The mounting dimensions of the Rectifier Unit are shown in Fig. 3-27.

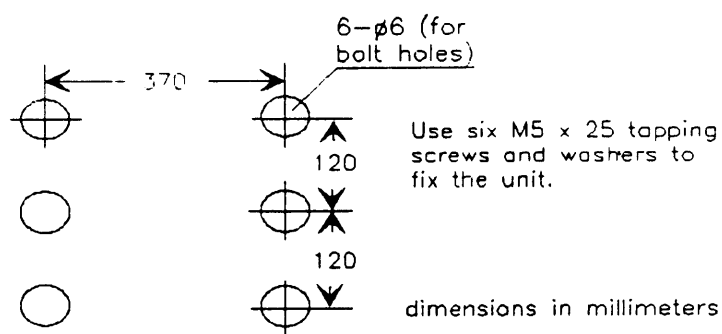


Fig. 3-27 Mounting Dimensions of the Rectifier Unit

Wiring

Connect cables to the input terminal on the front panel, using crimp-on lugs. Run an earth wire between the earth terminal on the unit and the ship's superstructure or grounding bus. For connections to output terminals, bend crimp-on lugs so they do not contact the terminal board cover.

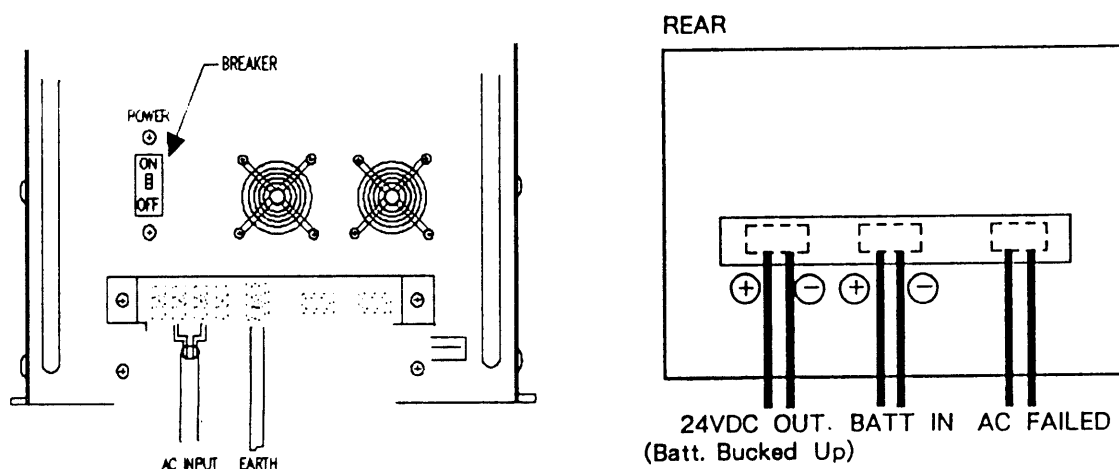


Fig. 3-28 Connections on the Rectifier Unit

Selection of Input Voltage

The input voltage is adjustable for 100/110/120/200/220/240 VAC, and is factory-set for 220 VAC. To select other input voltages, open the top cover and change the wiring according to the figure below. After changing the input voltage, correct the front panel sticker accordingly.

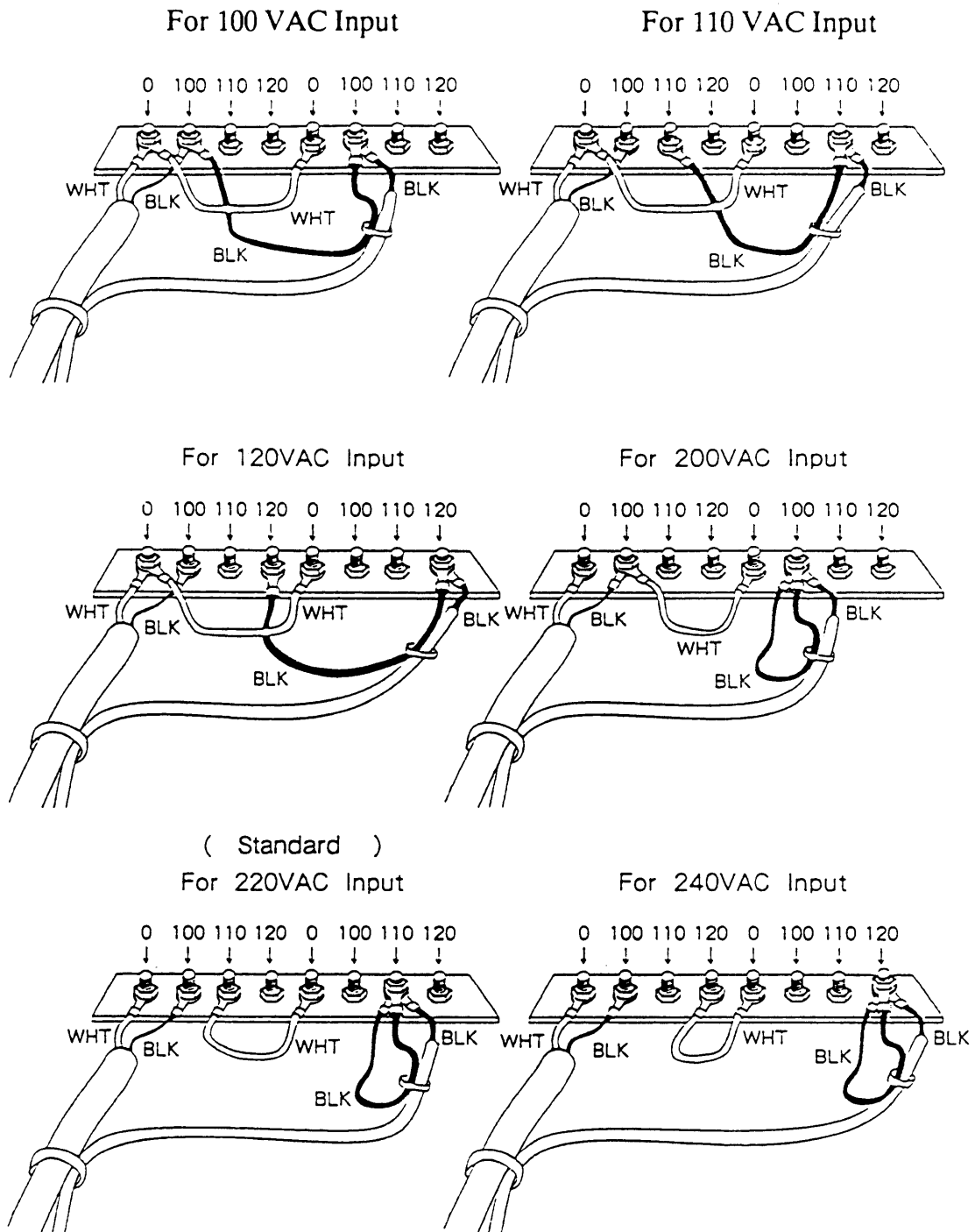


Fig. 3-29 Selection of Input Voltage on the Rectifier Unit

Ground

Connect a ground wire between ship's superstructure and fixing hole on the PR-850A.

POST INSTALLATION CHECKS AND ADJUSTMENTS

Visual Checks

Before turning the Control Unit on, visually check each unit for proper installation.

Antenna Coupler

- 1) Is the unit grounded?
- 2) Is the length of the ground wire as short as possible?
- 3) Is the vent hole open? (A vent tube is mounted at delivery.)
- 4) Are all wirings made correctly?

Transceiver Unit

- 1) Is the cable entry sealed with putty or similar material?
- 2) Are input power terminals TB1/TB2 covered with dust caps?
- 3) Are all connections on terminal boards in good order?

Control Unit

- 1) Are flat cables connected? Stoppers returned to normal position?
- 2) Are connections on terminal boards in good order?

Input Voltage Check

Open the front cover and front doors of the Transceiver Unit to access the breakers (60A). Confirm that each input voltage at TB1/TB2 is 24/32 VDC, +30%, -10%. Turn the breakers on.

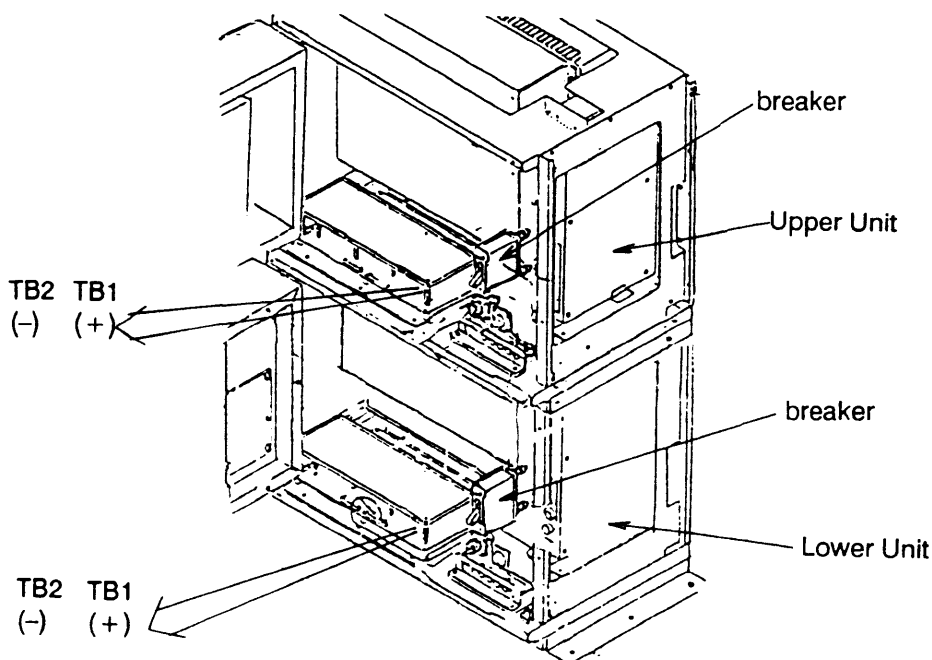


Fig. 3-30 Location of Breakers Inside the Transceiver Unit

Control Unit Check

- 1) Conduct the self-tests described on page 2-3.
- 2) Check the unit for proper operation.

Receiver Check

Control Settings:

Speaker:	ON	Squelch	OFF
AGC:	SLOW	Sensitivity:	Max.

Confirm that a signal can be received on each band. If there is noise or a signal is weak, check the antenna lead-in section, coaxial cable connections on the Transceiver Unit and ground connections.

Transmitter Check

1. Select a TX frequency then press the PTT switch. Confirm that the antenna is tuned within 15 seconds.
2. Press and release the **TX TUNE** key several times, confirming that the antenna is tuned each time (OK appears on the LCD) the key is released. If TX Tuning Error appears, recheck antenna length.
3. Communicate with the handset, confirming that antenna current (IA) changes with voice level.
4. For duplex communication, confirm that a transmit signal does not mask the receiving signal. You may reduce transmission noise by setting AGC time and noise blanker to "FAST" and "ON", respectively.

Operation Check

Refer to Chapter 1 to make the following checks.

- 1) Recall ITU channels
- 2) Store and recall user channels
- 3) Check scan and sweep functions for proper operation
- 4) Set timer and wake-up timer

Adjustment of Noise Blanker Level

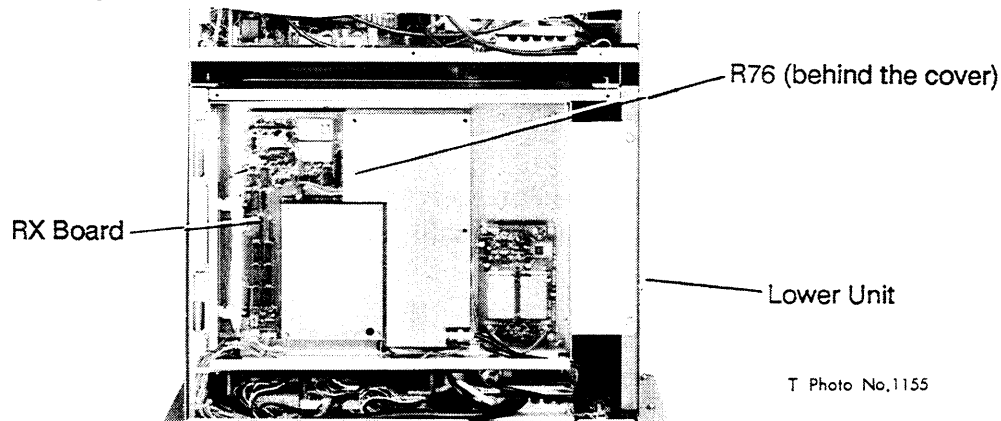
The threshold level of the noise blanker (NB) is adjusted by the potentiometer R76 (NB LEVEL) on the RX board (05P0348) in the lower unit of the Transceiver Unit.

The NB becomes sensitive when the potentiometer is turned counterclockwise; however, do not turn excessively to prevent signal distortion. The potentiometer is so adjusted that noise is effectively decreased with minimum signal distortion.

For reference; Potentiometer setting

Factory set ----- Mid. point (12 o'clock)

Signal will be distorted at ----- 10 to 11 o'clock



Manual 2182kHz Tuning Preset

International regulations require that 2182kHz be tunable both automatically and manually. The setup to enable manual tuning, in the event the antenna tuner system fails, is made with the DIP switches in the Antenna Coupler.

1. Remove the top cover of the Antenna Coupler. Set toggle switch S1 (Coupler Board) to AUTO.

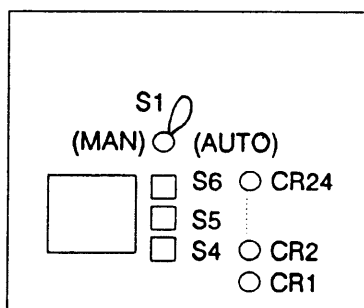


Fig. 3-31 AUTO/MANUAL 2182kHz Switch on the Coupler Board

2. Turn the Control Unit on.
3. Press the **2182** key.
4. Press the **TX TUNE** key. TX TUNING appears on the LCD. OK appears when tuning is completed. Record the status (on or off) of LEDs CR1-CR23.
5. Set S1 to MAN 2182.
6. Set DIP Switches S4 thru S6 according to LED status recorded in step 4.

DIP Switch		LED
S4	#8	CR1
	7	CR2
	6	CR3
	5	CR4
	4	CR5
	3	CR6
	2	CR7
	1	CR8
S5	#8	CR9
	7	CR10
	6	CR11
	5	CR12
	4	CR13
	3	CR14
	2	CR15
	1	CR16
S6	#8	CR17
	7	CR18
	6	CR19
	5	CR20
	4	CR21
	2	CR22
		CR23

Be sure that S6 #1 is set to "OFF" any time.

7. Return S1 to AUTO, confirming that LEDs do not change. If different, repeat step 6.
8. Set S1 to MAN 2182 kHz.
9. Press the **CHECK METER** key on the Control Unit to display antenna current.
10. Making sure it is not silent time, communicate with the handset. Confirm that IA changes with voice level.
11. Set S1 to AUTO. Close the cover of the Antenna Coupler.

Note: Note that frequencies other than 2182 kHz also can be transmitted manually. Similar to the above procedure, record the status of LEDs CR1-CR23 during automatic tuning of an often-used frequency and set DIP Switches S4 to S6 according to LED status.

ALTERATION OF SUPPLY VOLTAGE SETTING

Change the jumper wire on the two REG CONT Boards and two INTERFACE Boards according to ship's mains (24 or 32 VDC).

1 Modification of REG CONT Board ----- For both lower & upper units.

Example for Lower Unit

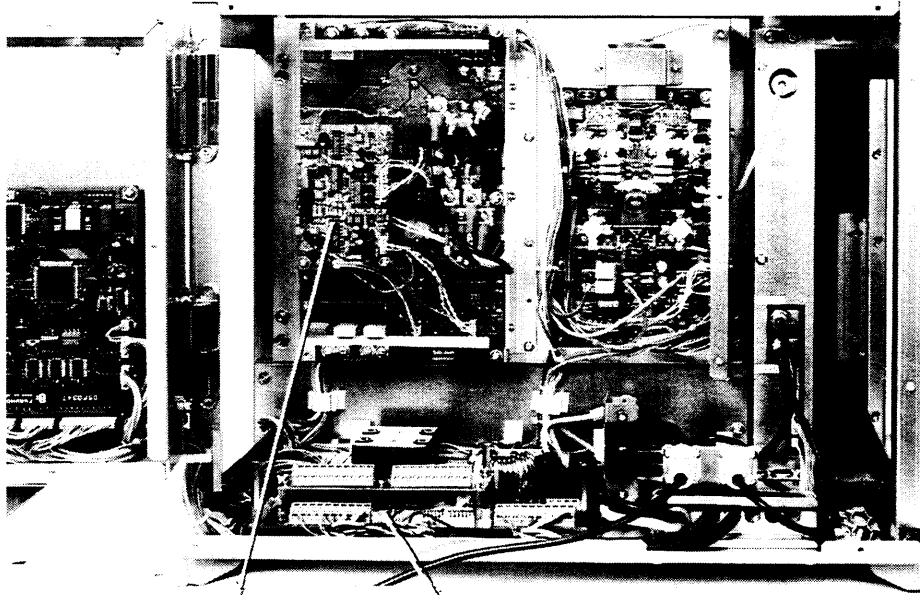
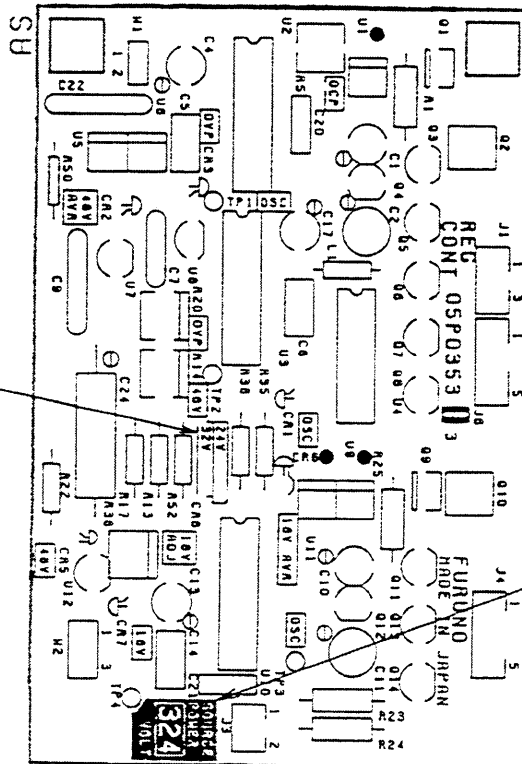


Photo No. 1197

INTERFACE Board

REG CONT Board

Jumper Wire
 { 24 VDC: open.
 { 32 VDC: short



Input power displayed here.

24 VDC: 3 2 4
 32 VDC: 3 2 4

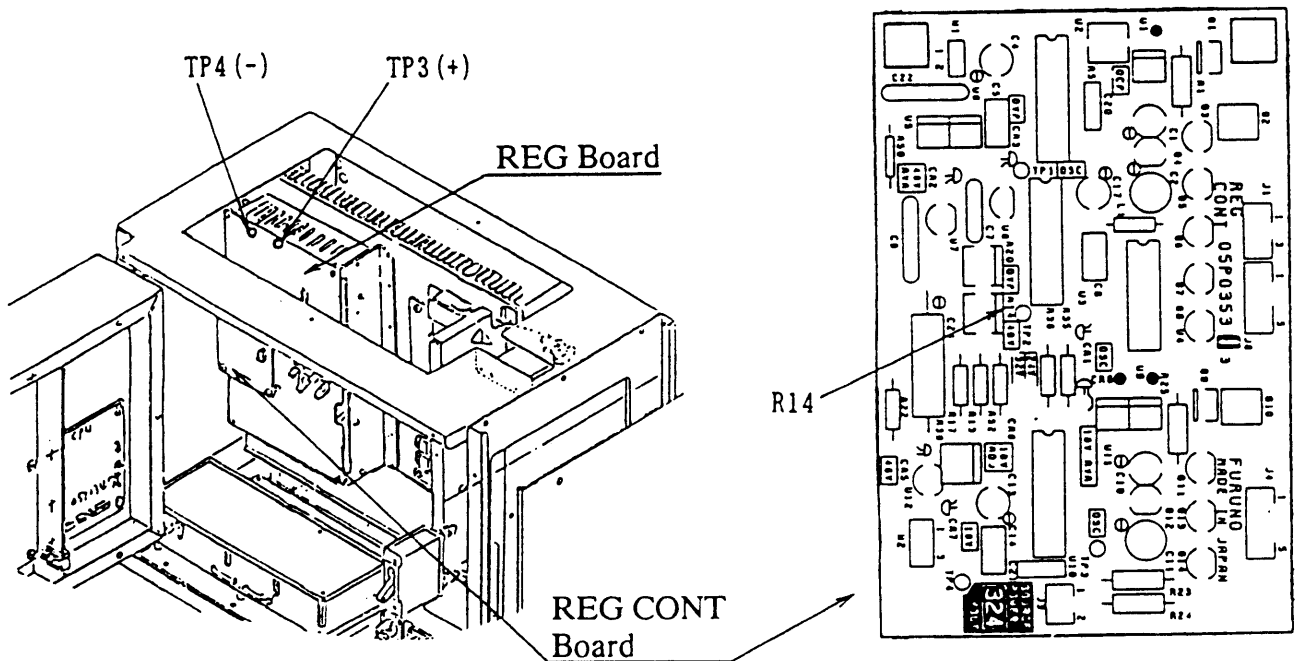
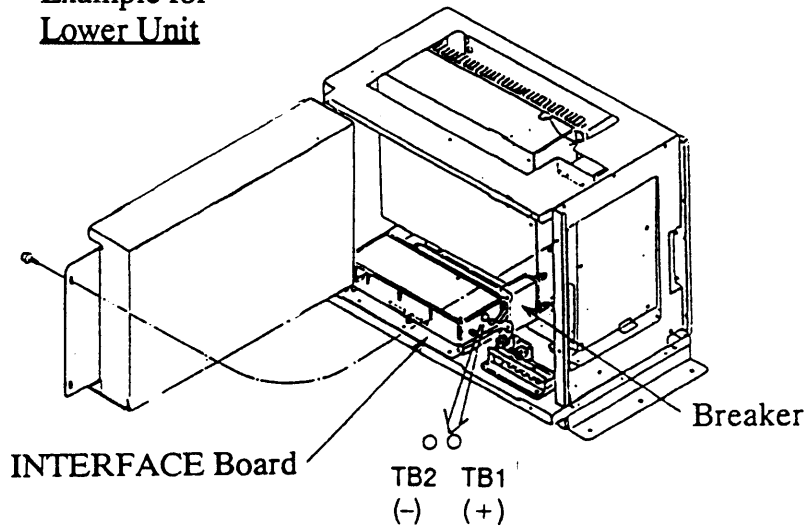
Black out a digit to show voltage.

Checking Voltage (for both lower & upper units)

Measure input voltage and the 48 V line under receiving condition. If the voltage of 48 V line is not within the rating shown in the table below, adjust it with R14 on the REG CONT Board.

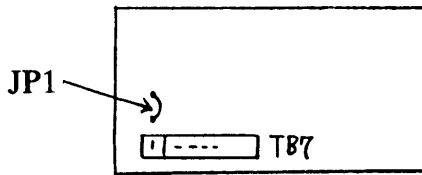
Ship's Mains	Input Voltage		48 V Line Voltage		
	Measuring Point	Rating	Measuring Point	Rating	Adjuster
24VDC	INTERFACE Board	21.6 – 31.2 V	REG Board	45 V (± 0.1 V) (at 24V supply)	REG CONT Board
32VDC	TB1 (+) TB2 (-)	28.8 – 41.6 V	TP3 (+) TP4 (-)	44 V (± 0.1 V) (at 32V supply)	R14

Example for
Lower Unit

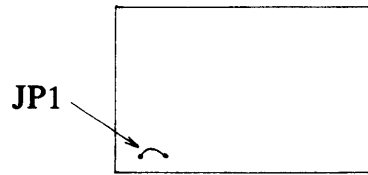


② **Modification of INTERFACE Board** ----- For both lower & upper units.
 (Overvoltage Setting)

Ship's Mains	Jumper Setting (JP1)
24 VDC	Short
32 VDC	Open



05P0354
 (Lower Unit)



05P0362
 (Upper Unit)

After modification, overvoltage value is automatically set as follows.

Ship's Mains	Overvoltage value
24 VDC	34 VDC
32 VDC	44 VDC

4. INSTALLATION OF OPTIONAL EQUIPMENT (For qualified personnel)

DUMMY LOAD

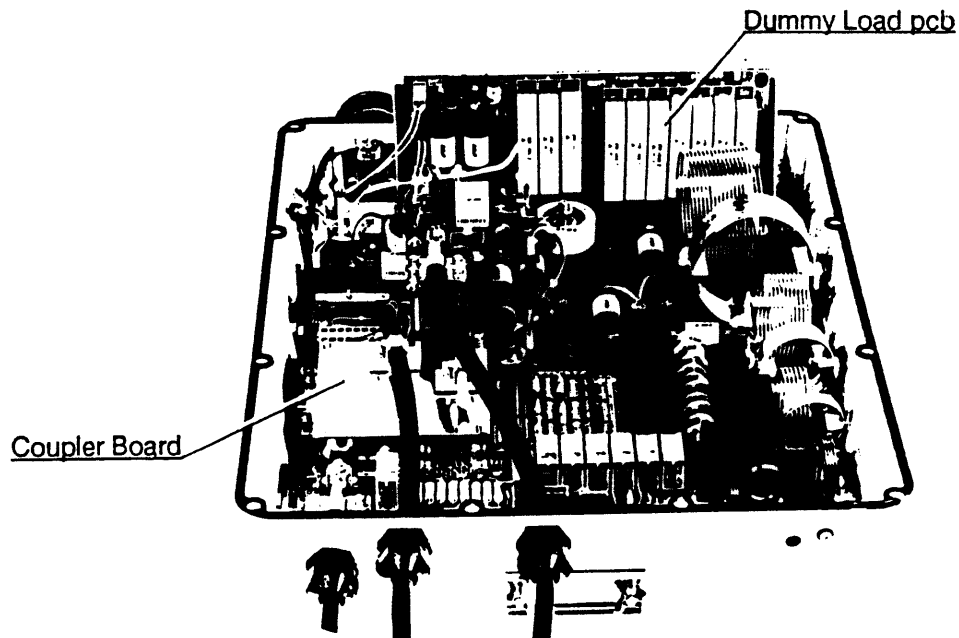
A SOLAS dummy load (10 ohm + 250 pF. Continuous transmission for less than 1 minute at 200 W average, MF only) is optionally available.

Parts

Name	Type	Code No.
Dummy Load (pcb assy.)	OP05-34	005-925-830

Procedure

1. Loosen the 12 screws securing the top cover of the Antenna Coupler.
2. Install the dummy load pcb assy. as shown in Fig. 4-1.



T Photo No.1257

Fig. 4-1 Antenna Coupler, Top Cover Removed

- Using the connectors supplied (2P/3P/4P), electrically connect the Dummy Load Board (05P0360) to the Coupler Board (05P0358) as shown in Fig. 4-2.

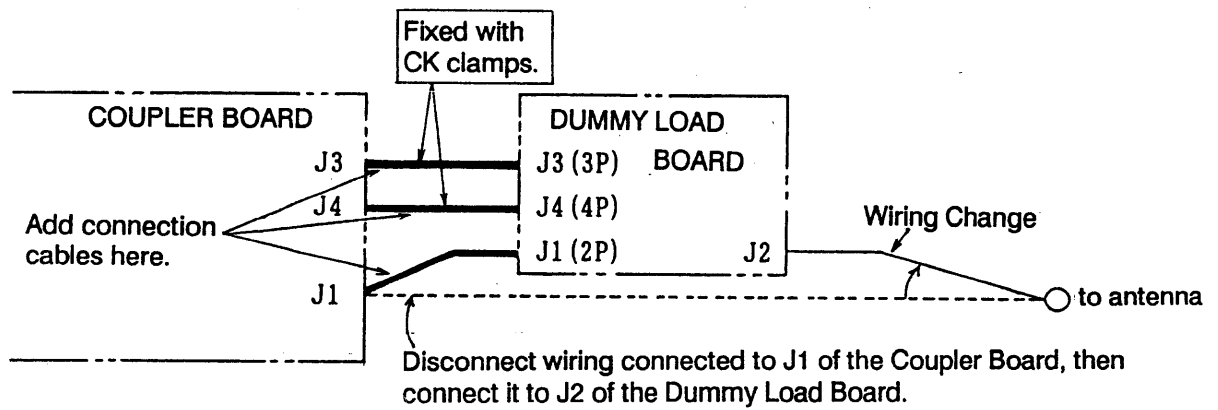
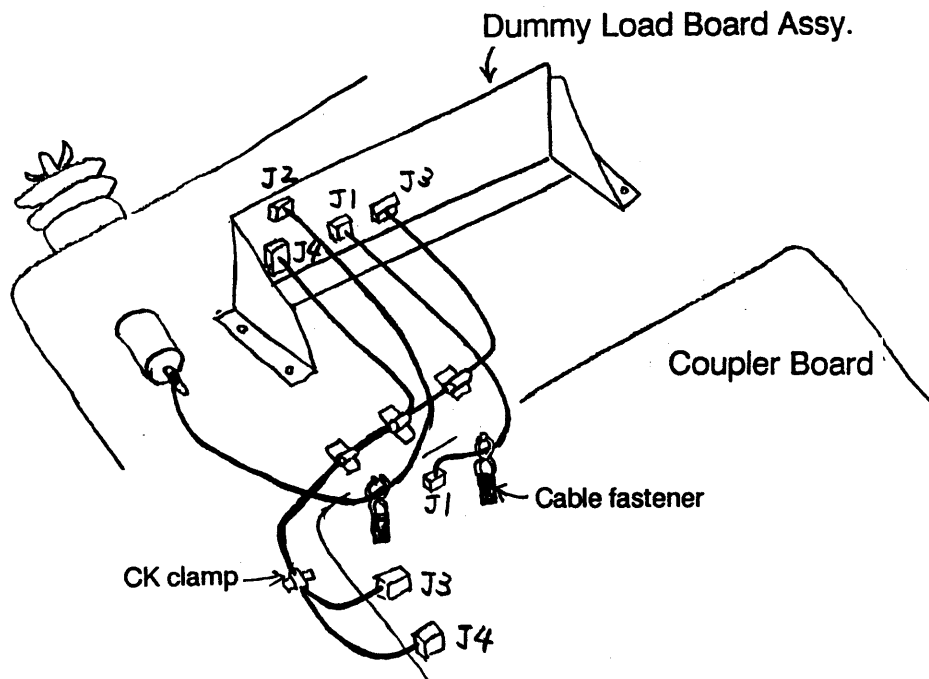


Fig. 4-2 Wiring for Installation of Dummy Load

- To prevent leaks on the high voltage, separate each cable as far as possible by passing each through CK clamps and cable fasteners as shown below.



- Change the specifications referring to page 1-17. (STO 9923)

ANTENNA BK RELAY

When the frequencies of an MF band TX and RX frequency pair are dissimilar, a practice common in Europe, loss of RX signal may result because RX signal passes through the tuning circuit, since it is adjusted for the TX frequency. Loss of RX signal may also occur when switching to another frequency band, since the tuning circuit remains tuned to the previous band. (The PTT switch or TX TUNE key must be pressed to tune the antenna.) Accordingly, if the unit is used mostly for receiving, install a Antenna BK Relay in the Antenna Coupler to prevent loss of RX signal sensitivity. With the Antenna BK relay installed, a receive signal is fed directly to the Transceiver Unit, bypassing the tuning circuit. The connection between the Antenna Coupler and the Transceiver Unit is made with a coaxial cable. Use coaxial cable type RG-8A/U or the equivalent.

Parts

Name	Type	Code No.
Antenna BK Relay (pcb)	OP05-35-H	000-056-878
Coaxial Cable	RG-8A/U (lengths in multiples of 10 m, max. 50 m)	000-106-052 (10 m) : 000-106-056 (50 m)

Procedure

1. Open the Antenna Coupler. Install the Antenna BK Relay as shown in Fig. 4-4.

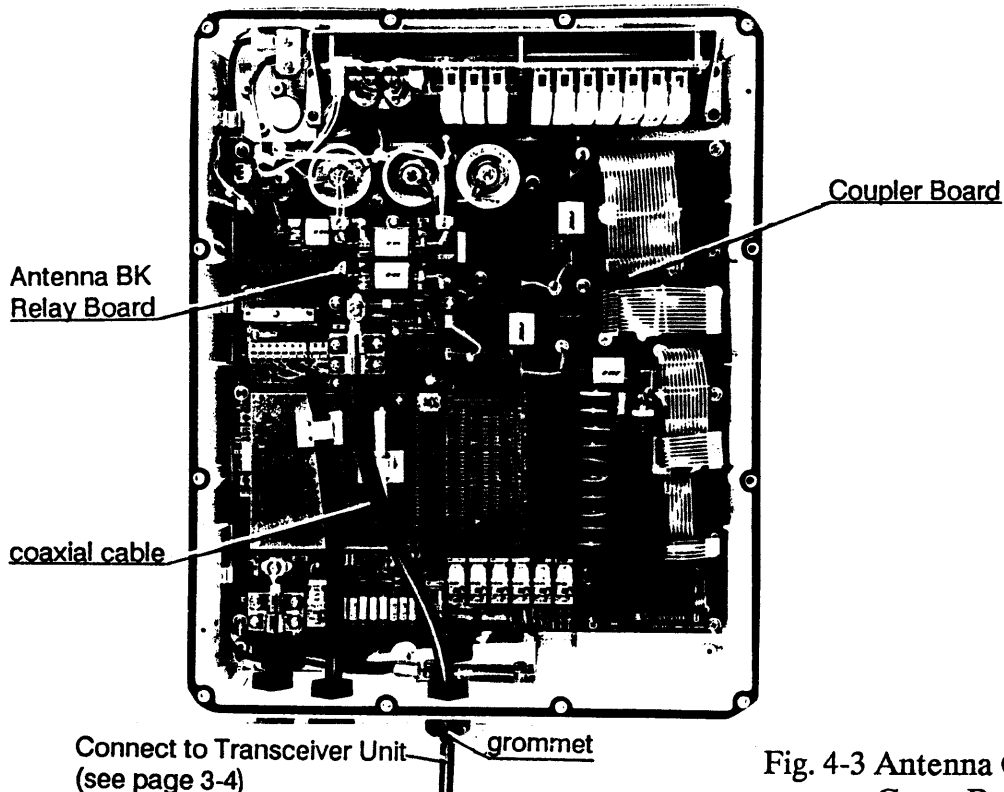


Fig. 4-3 Antenna Coupler, Cover Removed

2. Remove the waterproofing material from the grommet on the Antenna Coupler. Pass the coaxial cable through the grommet and connect it to the Antenna BK Relay Board. Connect the other end of the cable to the Transceiver Unit, referring to Fig. 3-6 on page 3-4.
3. Connect the Antenna BK Relay Board to the Coupler Board, using the connectors (2P/3P) supplied.

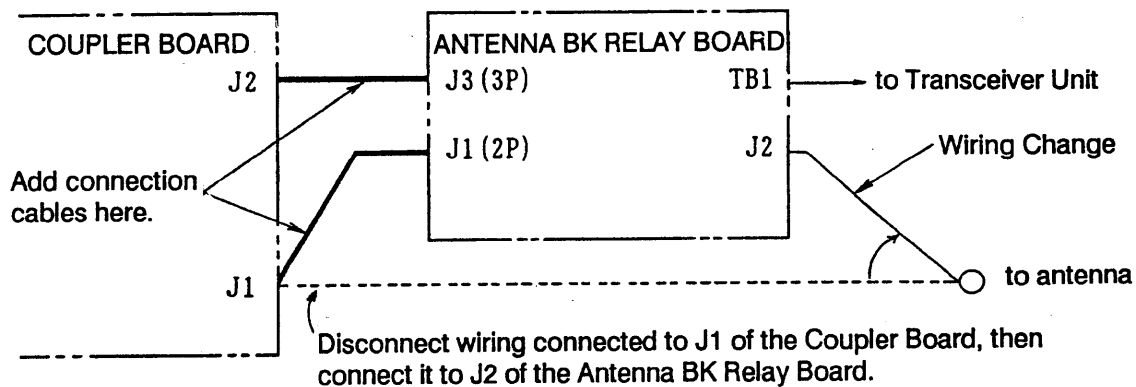
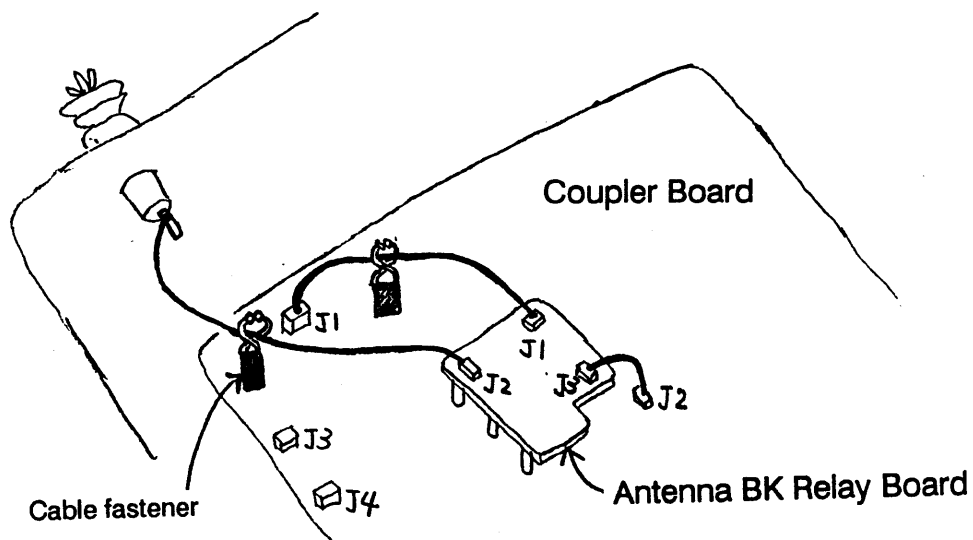


Fig. 4-4 Wiring for Installation of Antenna BK Relay

Note: Be sure to pass the wire from J2 of the Antenna BK Relay Board through a Cable fastener on the Coupler Board.



DUMMY LOAD & ANTENNA BK RELAY

If the dummy load and antenna BK relay are to be installed together the wiring required is different than for separate installation.

Connect the Coupler Board, Antenna BK Relay Board and Dummy Load Board as shown in Fig. 4-5.

Parts

Name	Type	Code No.
Dummy Load	OP05-34-H	000-056-876
Antenna BK Relay	OP05-35-H	000-056-878
Coaxial Cable	RG-8A/U or equivalent (max. length 50 m)	

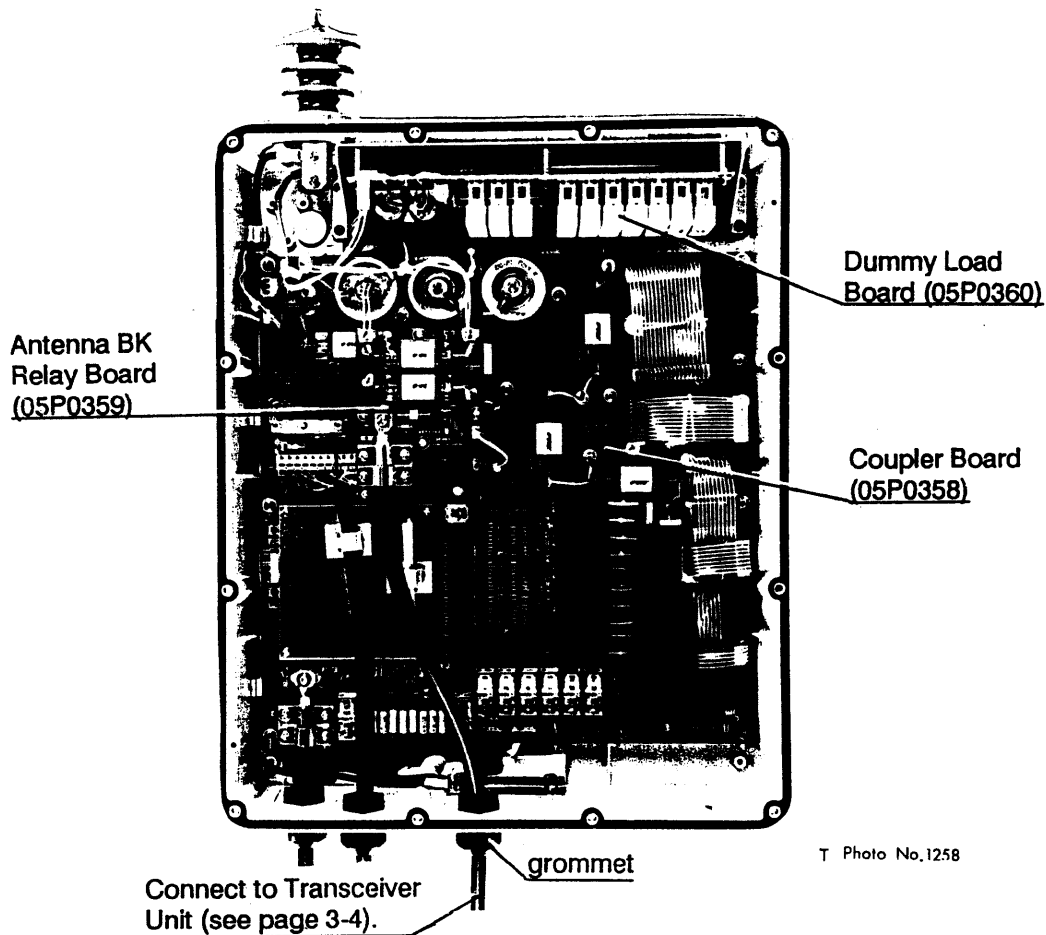


Fig. 4-5 Antenna Coupler, Inside View

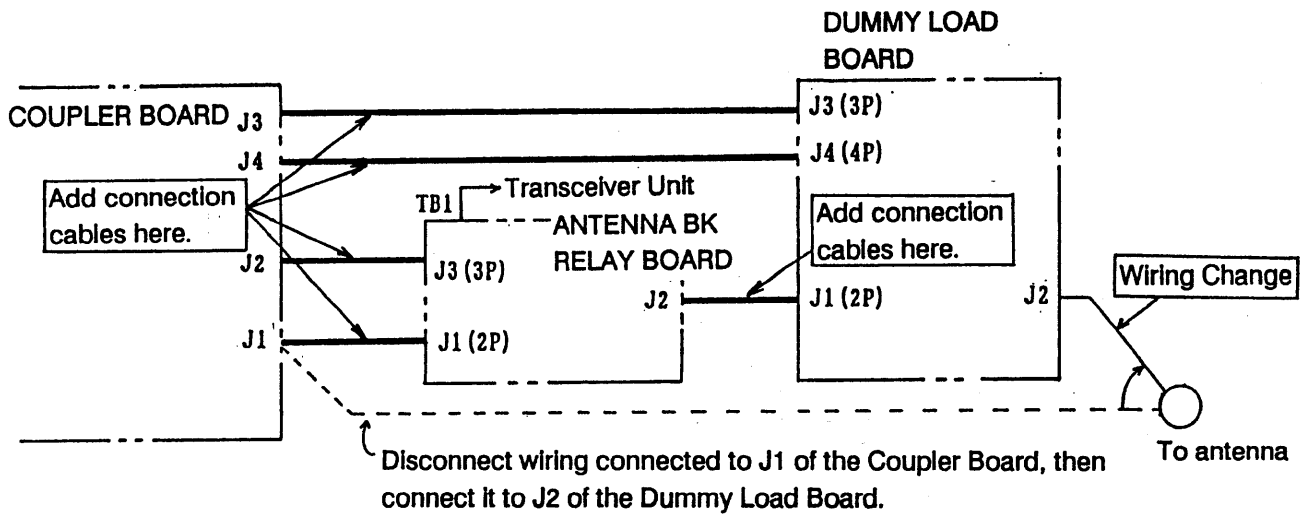
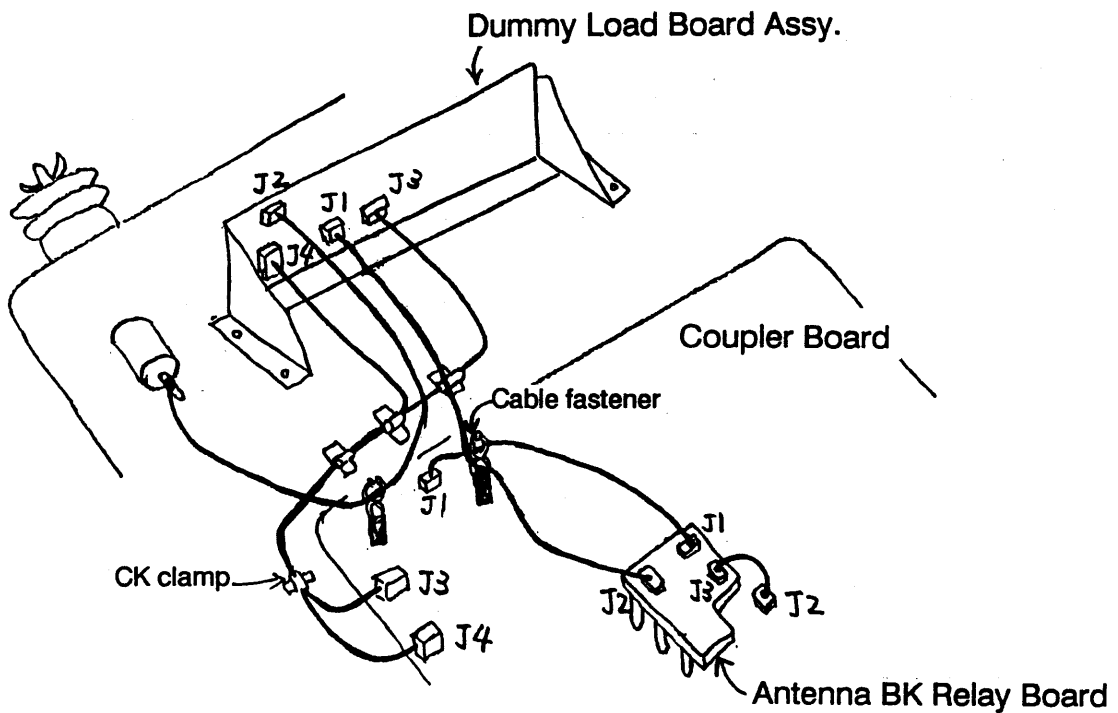


Fig. 4-6 Wiring for Installation of BK and Dummy Load

Note 1. To prevent leaks on the high voltage, separate each cable as far as possible by passing each through CK clamps and Cable fasteners as shown below.



Note 2. Change the specifications referring to page 1-17 (STO 9923).

#2 CONTROL UNIT

A #2 Control Unit may be installed, and priority may be assigned to #1 or #2 Control Unit. (Refer to page 1-17.) Note that the mounting location must be within 50 m of the Transceiver Unit.

Parts

Name	Type	Code No.
#2 Control Unit	FS-5000C-OP-80K	000-056-791
Control Unit SW Board	OP05-33	005-925-900
Installation Materials (incl. five pair cable)	CP05-03780 (10 m)	000-056-755
	CP05-03781 (20 m)	000-056-756
	CP05-03782 (30 m)	000-056-757
	CP05-03783 (40 m)	000-056-758
	CP05-03784 (50 m)	000-056-759

Procedure

1. Install the Control Unit SW Board (05P0368) in the lower unit of the Transceiver Unit.

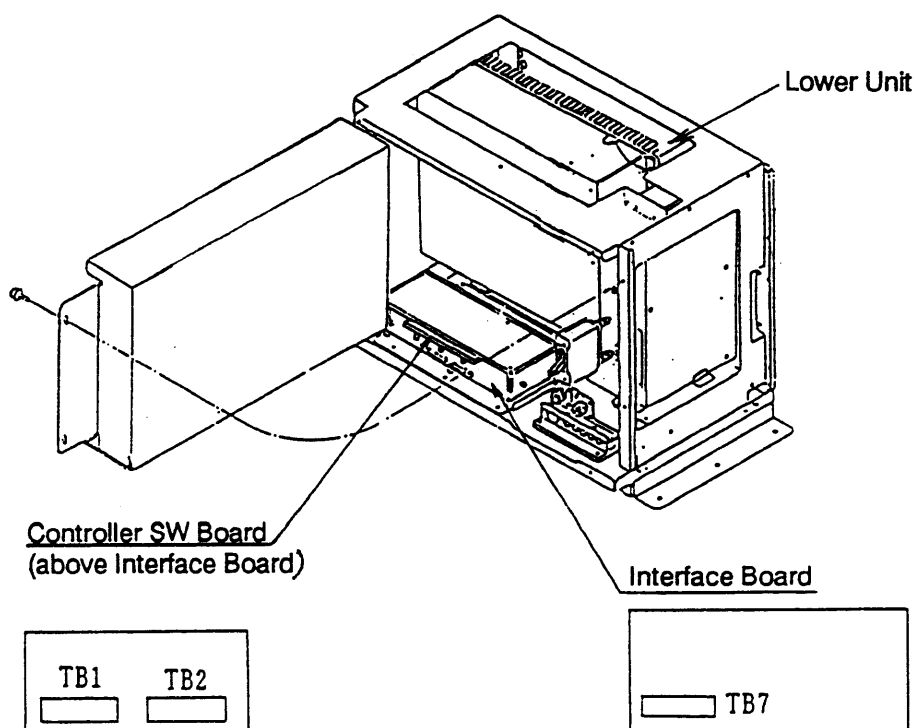


Fig. 4-7 Lower Unit (Transceiver Unit), Front Door Opened

2. Connect the #2 Control Unit to terminal board TB2 on the Control Unit SW Board.
Connect the #1 Control Unit to terminal board TB1.

If a #1 Control Unit is already installed, remove the wiring connected to TB7 on the Interface Board and connect the #1 Control Unit to TB1 on the Control Unit SW Board.

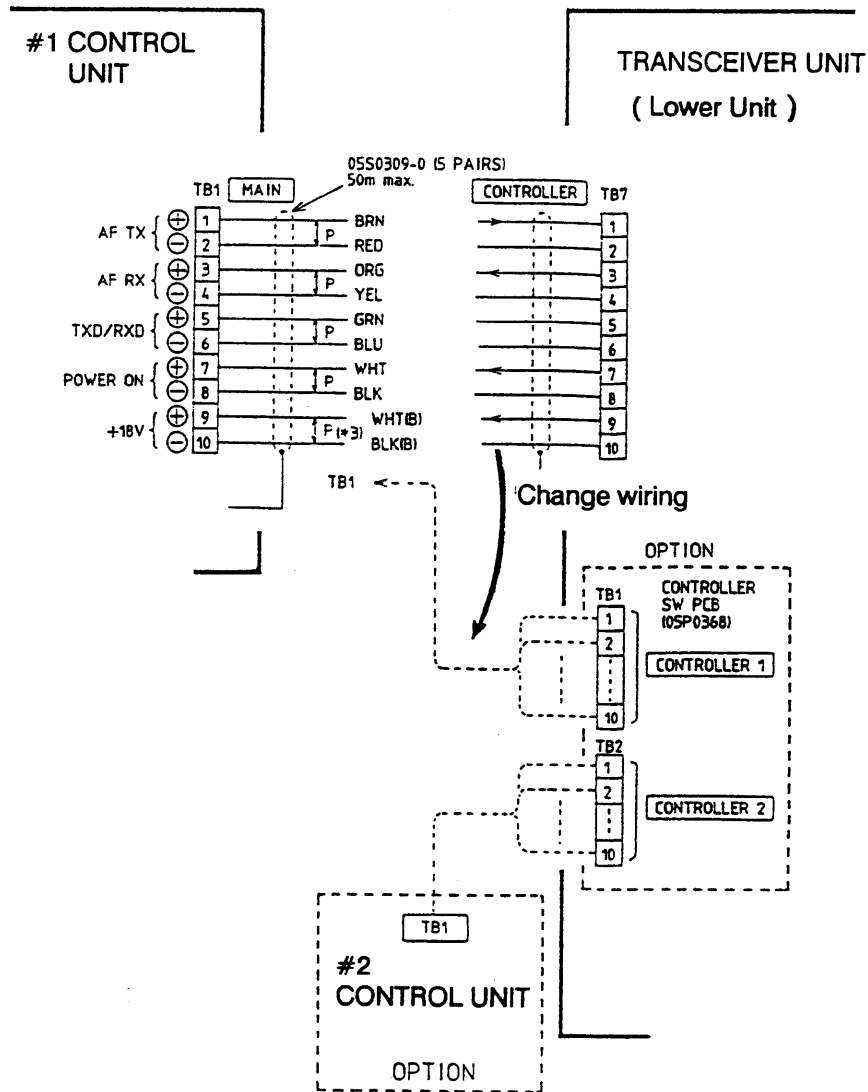


Fig. 4-8 Wiring for Installation of #2 Control Unit

5. CONNECTION OF EXTERNAL EQUIPMENT

BK CONNECTION

The BK of external equipment is connected to terminal board TB9 on the Interface Board of the lower unit in the Transceiver Unit. For connection of BK Interface (BK-300) with the FS-8000, refer to Installation manual of BK Interface(IMC-50830) .

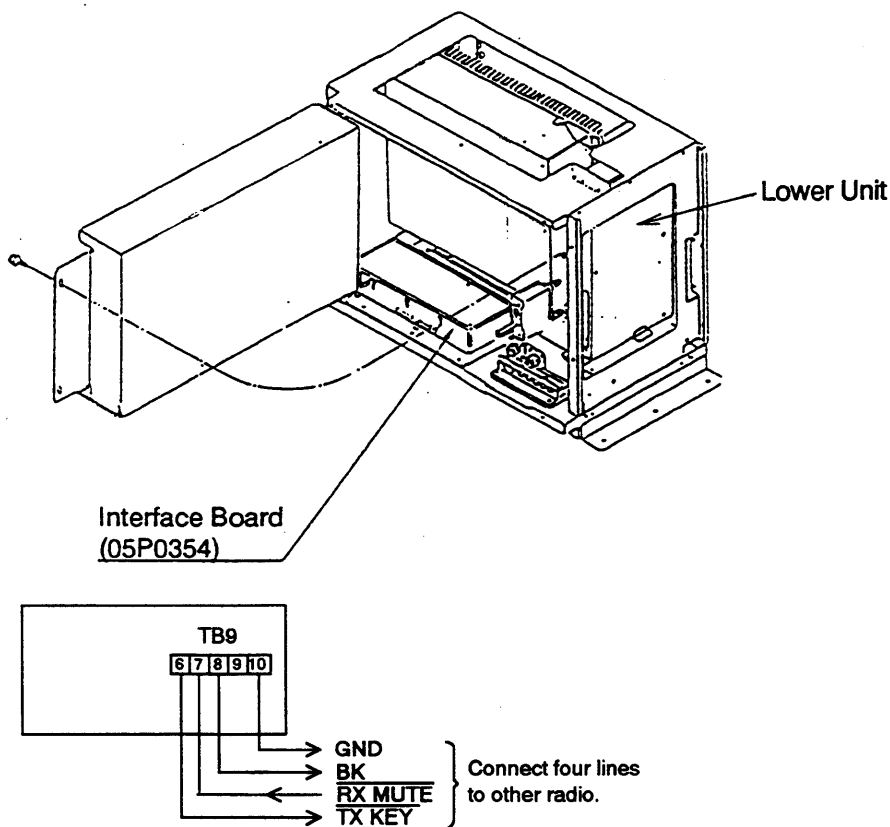


Fig. 5-1 Lower Unit (Transceiver Unit), Showing Location of TB9

Terminal No.	Signal Name	Function	Objective
6	$\overline{\text{TX KEY}}$	Gets low during transmission.	BK control for external receiver.
7	$\overline{\text{RX MUTE}}$	RX is muted when this line gets low.	BK control from another transmitter.
8	BK	Output: +18 V or +24 V. (See note 1 on the next page.)	Power for relay of other radio.
9/10	GND	GND	0V

Note 1: The +18 V or +24 V can be supplied by changing the plug connection (J15/J16/J17) on the Interface Board in the lower unit as shown in Fig. 5-3. Note that the +24 V can not be used when the ground line (signal ground) of the other radio is connected to the chassis, since the ground line of TB9 #10 on the Interface Board is directly connected to the battery.

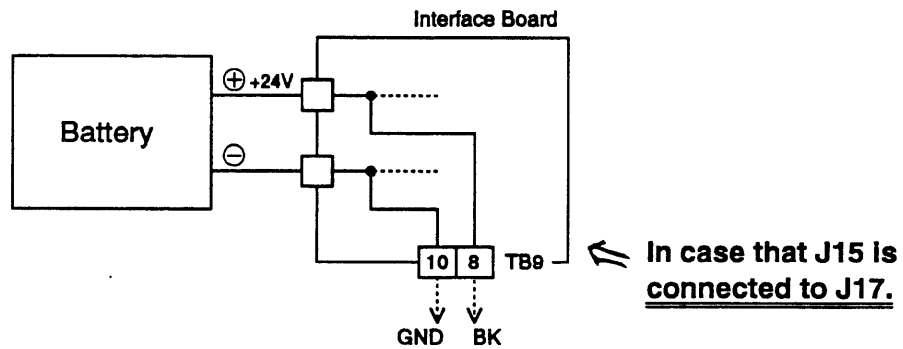


Fig. 5-2

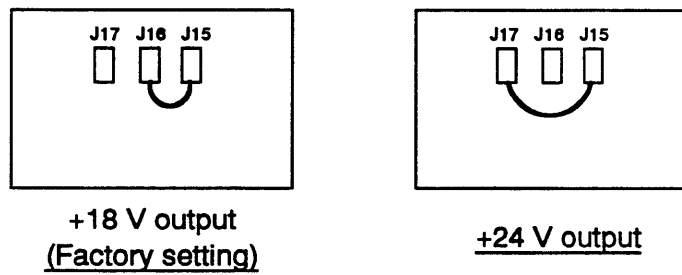


Fig. 5-3 Interface Board (05P0354)

Minus BK Line Control

Most Japanese specification radiotelephones made by Furuno are equipped with a mutual BK system (minus BK system). This type of BK enables mutual control of the BK of both own transmitter and another transmitter and receivers, with a dual conductor cable.

To enable the -BK control on this radiotelephone, put jumper as shown below. During duplex communications, the software of the FS-8000 is so made that the RX MUTE signal input is disregarded.

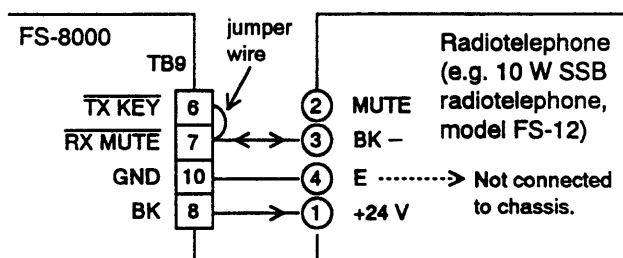


Fig. 5-4 Wiring Required to Enable -BK Line Control

CIF/NMEA CONNECTION

CIF or NMEA output from a navigation device is connected to terminal board TB4 on the AF Board of the Control Unit. Of this data the FS-8000 reads ship's L/L position and time data.

For the connection between the navigation device and the Control Unit, use a twisted-pair cable.

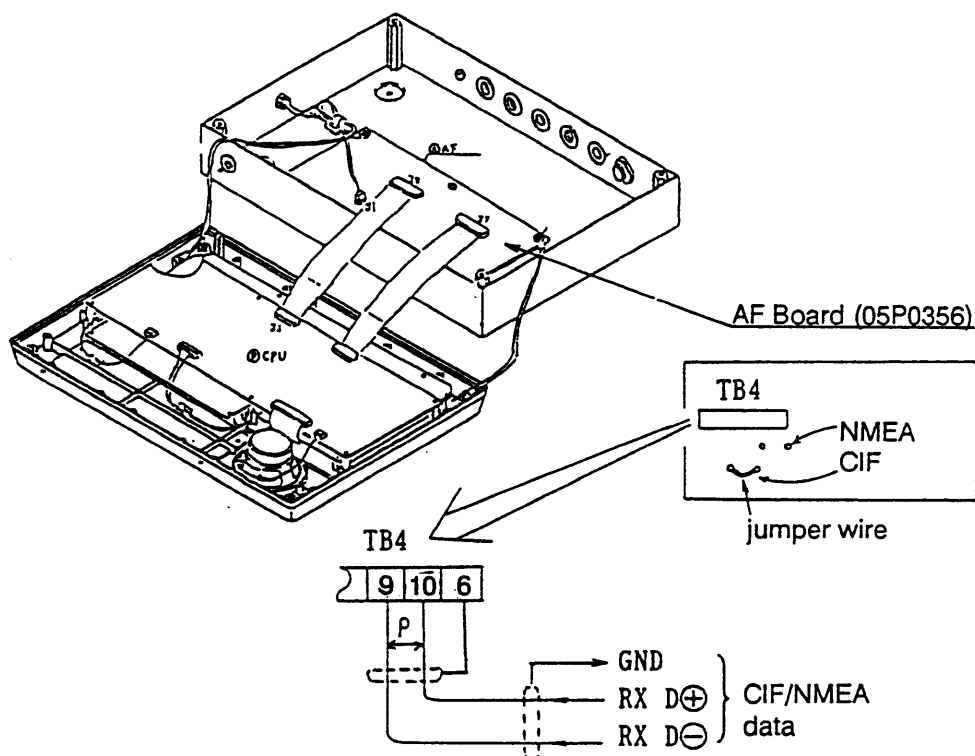


Fig. 5-5 Control Unit, Inside View

A jumper wire on the AF Board determines which data format is to be read, CIF or NMEA, and is set at the factory for CIF. For NMEA, connect the jumper to NMEA. Further, call up the system setting screen to confirm that the data input format selected is valid.

Procedure

1. Press **STO**, **9**, **9**, **3**, **3** and **ENT** in that order.
2. As the prompt indicates press **2** for CIF or **3** for NMEA and hit the **ENT** key.

NBDP TERMINAL, DSC TERMINAL, INTERSHIP FAX & SELCALL

The above devices are connected to terminal boards TB2 and TB3 on the AF Board of the Control Unit.

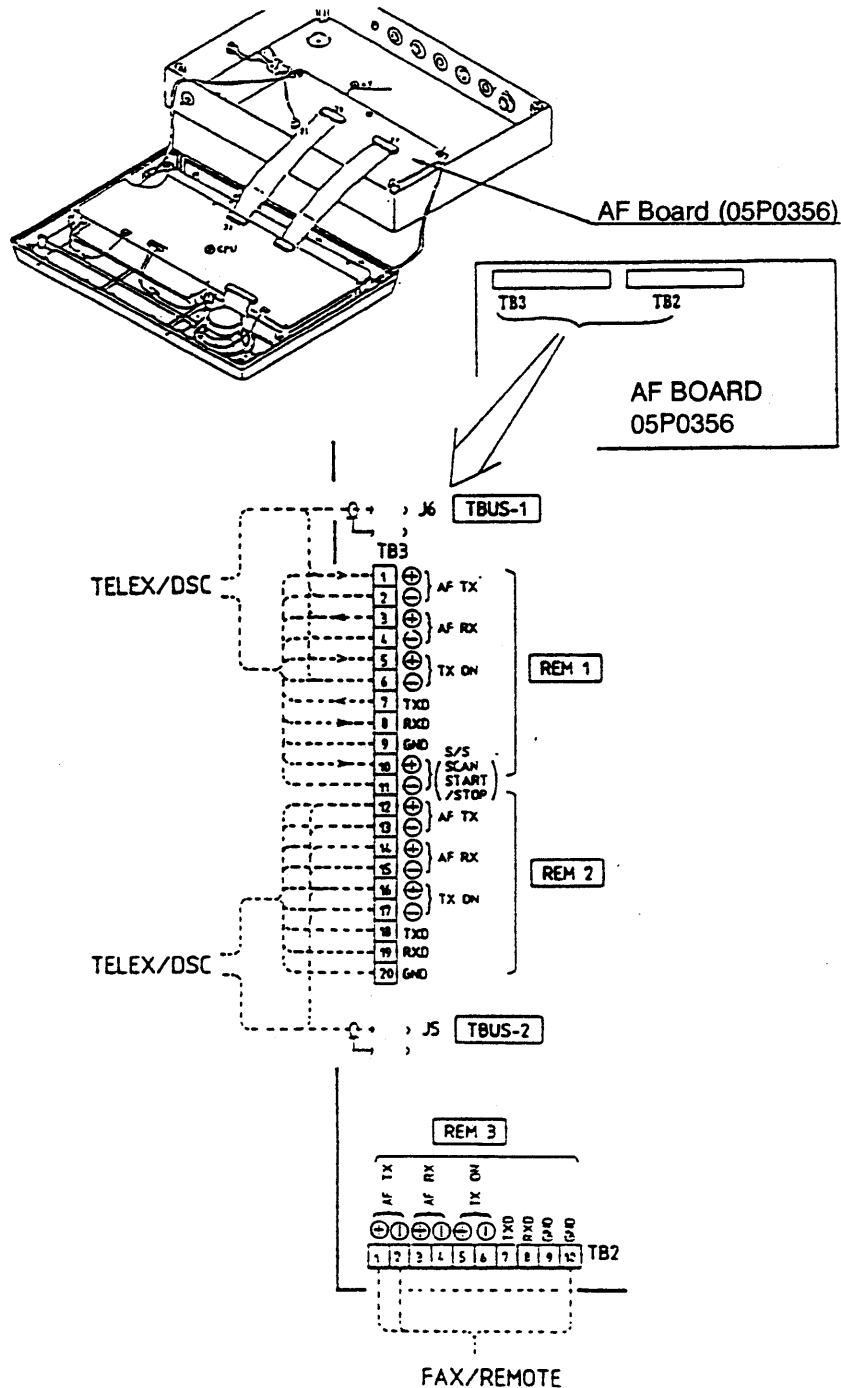
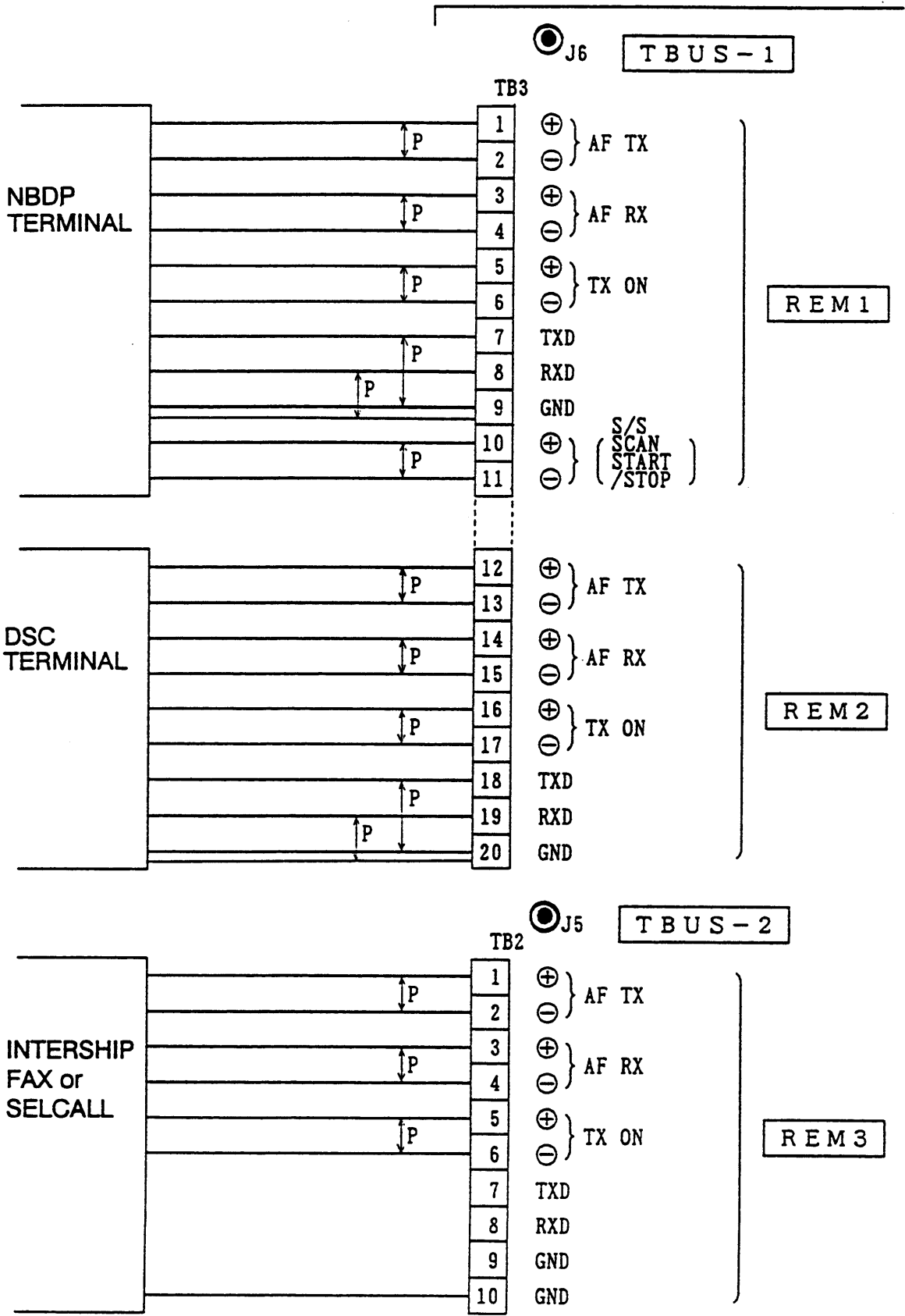


Fig. 5-6 Wiring for Connection of NBDP, DSC, FAX and SELCALL

For further details, refer to Operator's Manuals of NBDP Terminal and DSC Terminal.



These units may be connected to either REM1, REM2 or REM3. Namely, a fax for ship-to-ship communication can be connected to REM1.

However, for connection of Thrane & Thrane's DSC terminal or NBDP, use J6 (Thrane & Thrane's TBUS-1 bus line) or J5 (TBUS-2) instead of TXD, RXD and S/S.

The table below gives the name and meaning of each signal.

Signal Name	Meaning
AF TX	AF Input signal. 0 dBm/600 ohms
AF RX	AF Output signal. 0dBm/600 ohms
TX ON	BK signal from device connected.
TXD RXD	Data exchange between FS-8000 and device connected. RXD reads data from external equipment. TXD is for data output (for example, frequency, class of emission).
S/S	SCAN START/STOP signal. For units whose RXD line does not have a scan signal, this signal enables control of scanning by external equipment.

For connection of Furuno make DSC terminal (DSC-6) or NBDP (DP-6), see the operator's or installation manual.

NOTE:

1. For weather facsimile connection use the AF RX terminal.
2. To change the class of emission automatically when equipment connected to REM1, REM2 or REM3 is keyed, change the specifications as follows. (After keying, the class of emission is not restored to previous status.)

RCL, 9, 9, , , ENT

	Class of emission for;	0	1	2	3
9934	REM1	No change	SSB	AM	TELEX
9935	REM2	No change	SSB	AM	TELEX
9936	REM3	No change	SSB	AM	TELEX

(EX) Selcall is connected to REM1 ----- RCL, 9, 9, 3, 4, ENT, 2, ENT

3. If you wish to change the class of emission only while the selcall is transmitted and to restore it automatically to previous status after transmission, set the channel Nos. 9934 and 9937 to "0" (No change) and "2" (AM), respectively.

	Temporary class of emission for;	0	1	2	3
9937	REM1	No change	SSB	AM	TELEX
9938	REM2	No change	SSB	AM	TELEX
9939	REM3	No change	SSB	AM	TELEX

Remarks on Connection to NBDP

Confirm that the BFO frequency of the FS-8000 is set to 1700Hz. (Refer to page 1-16.)

(1) System setting of FS-8000

TX delay time should be set to 10 ms.

STO 9913 ENT 10 ENT

(2) System setting of NBDP

① When DP-6 is connected ("Terminal" menu setting)

Slave Delay	:	5ms
BK Timing Pre tone	:	10ms
Post tone	:	0ms
Mute Timing Pre BK	:	0ms
Post BK	:	0ms

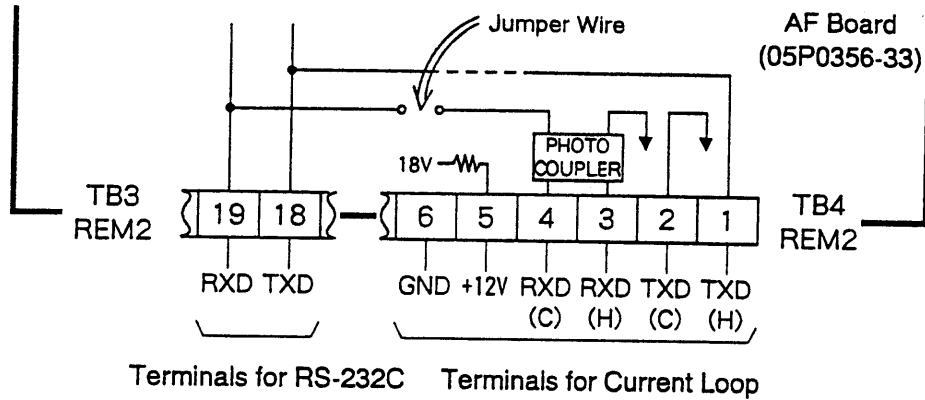
② When TT-1600 is connected

Receiver Post Mute	:	0×1.25ms
Transmitter Pre Key	:	8×1.25ms
Transmitter Post Key	:	0×1.25ms
Slave Delay	:	8×1.25ms

RB-500 CONNECTION

Connect the RB-500 to the AF board (Ver. -33 and after) in the control unit, referring to the interconnection diagram shown below.

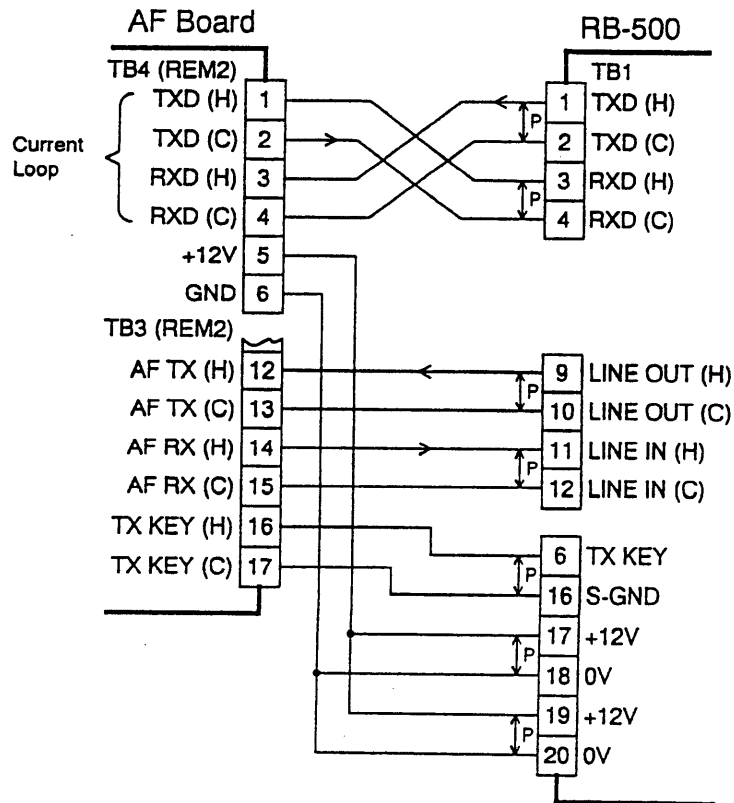
Squelch function is available at the RB-500 for the AF board having suffix number -33. (Data format between the RB-500 and the AF board is "MIF current loop".)



Terminals for RS-232C Terminals for Current Loop

To RB-500

Jumper Wire	Format
Short	Current Loop
Open (factory setting)	RS-232C



6. EQUIPMENT LIST

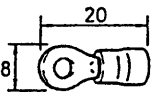
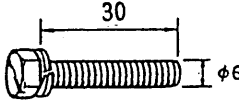
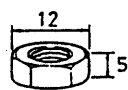

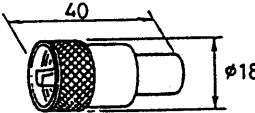
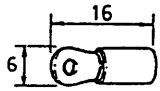
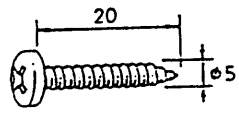

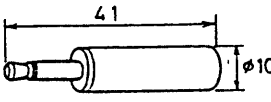
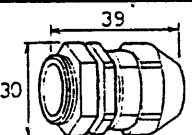
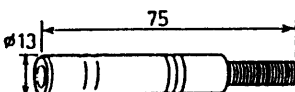
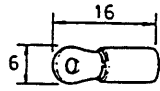
COMPLETE SET

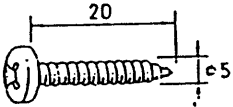


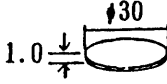
No.	Name	Type	Code No.	Wt. (kg)	Qty	Remarks
1	Control Unit	FS-5000C-50K FS-5000C-50U FS-5000C-50S		2.5	1	To Japan To USA Except Japan & USA
2	Transceiver Unit	FS-8000T-2 FS-8000T-3		40	1	For 24 VDC For 32 VDC
3	Antenna Coupler	AT-5000-H		5.4	1	Stainless steel
		AT-5000-HS (Option)		7		
4	Installation Materials				1 set	p. 6-2, p. 6-3
5	Accessories	FP05-03010	000-056-734		1 set	p. 6-4

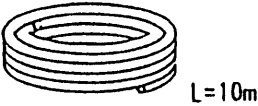




OPTIONAL SUPPLY

No.	Name	Type	Code No.	Remarks
1	Rectifier Unit	PR-850A	000-057-233	see outline drawing (2 sets)
2	#2 Control Unit	FS-5000C-OP		w/connection cable
4	Receiving Antenna Junction Box	AJB1-1A	000-870-284	select one, for use with duplex receiving antenna
		ARD-1	005-921-850	
5	External Speaker	HCB100D	000-113-352	see outline drawing
6	Installation Materials for Transmitting Antenna			p. 6-5, p. 6-6
7	Optional Installation Materials			p. 6-7, p. 6-9
8	Optional Accessories			p. 6-8
9	Dummy Load	OP05-34	005-925-830	installed at the factory if ordered before delivery
10	Antenna BK Relay	OP05-35	005-925-840	
11	Mounting Plate of Control Unit	OP05-37	005-931-760	AP2-1
12	Connector Block Assy.	OP05-48	005-841-190	2pcs. supply. Mount them to rear panel of transceiver unit
13	R. ANT SEL Board Assy.	OP05-53	005-861-350	
14	BK Interface	BK-300		

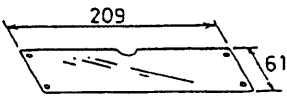
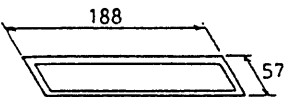
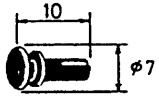
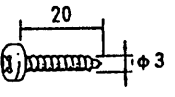
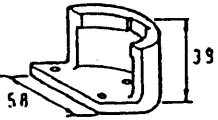

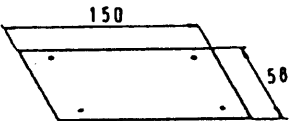
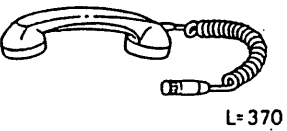
INSTALLATION MATERIALS

番号 No.	名称 NAME	略図 OUTLINE	型名 / 規格 DESCRIPTIONS	数量 Q'TY	用途 / 備考 REMARKS
1	圧着端子 CRIMP-ON LUG		FV1.25-4	1	FOR ANT. COUPLER
			CODE No. 000-538-114		
2	六角セムスAスリ割 HEX. BOLT (SLOTTED, WASHER HEAD)		M6×30 SUS304	4	FOR ANT. COUPLER
			CODE No. 000-800-054		
3	六角ナット 1種 HEX. NUT		M6 SUS304	4	FOR ANT. COUPLER
			CODE No. 000-863-109		
4	ミガキ平座金 FLAT WASHER		M6 SUS304	8	FOR ANT. COUPLER
			CODE No. 000-864-129		
5	コネクタ CONNECTOR		M-P-7	3	FOR XCVR UNIT
			CODE No. 000-500-512		
6	圧着端子 CRIMP-ON LUG		FV1.25-3 RED	2	FOR XCVR UNIT
			CODE No. 000-538-113		
7	⊕ナベタッピンUIネジ TAPPING SCREW		5×20 SUS304	6	FOR XCVR UNIT
			CODE No. 000-800-488		
8	ミガキ平座金 FLAT WASHER		M5 SUS304	6	FOR XCVR UNIT
			CODE No. 000-864-128		
9	プラグ US PLUG		PJ-2240-P	3	FOR KEY, EXT SP, HEADPHONE
			CODE No. 000-110-961		
10	スーパーシール CABLE GLAND		NW-12M	2	FOR CONTROL UNIT
			CODE No. 000-116-434		
11	インラインジャック INLINE JACK		T-07051	2	FOR HEADPHONE
			CODE No. 000-121-824		
12	圧着端子 CRIMP-ON LUG		FV1.25-3 赤 RED	2	FOR CONTROL UNIT
			CODE No. 000-538-113		

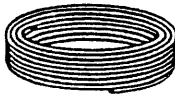
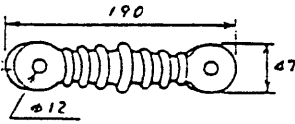
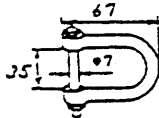
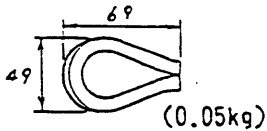
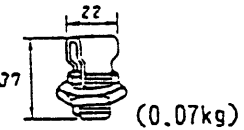
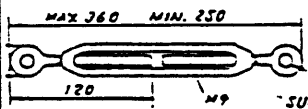

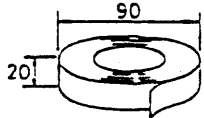
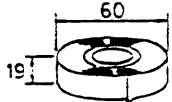
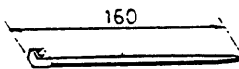
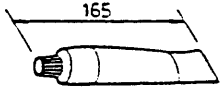
番号 No.	名 称 N A M E	略 図 O U T L I N E	型 名 / 規 格 D E S C R I P T I O N S	数 量 Q ' T Y	用 途 / 備 考 R E M A R K S
13	⊕ナベタッピンUIネジ TAPPING SCREW		5 × 20 SUS304	4	コントローラ用 FOR CONTROL UNIT
			CODE No. 000-800-488		
14	ミガキ平座金 FLAT WASHER		M5 SUS304	4	コントローラ用 FOR CONTROL UNIT
			CODE No. 000-864-128		
15	ナイロンワッシャ NYLON WASHER		5M φ10×T0.8	4	コントローラ用 FOR CONTROL UNIT
			CODE No. 000-864-971		
16	メクラ蓋 BLIND CAP		05-039-6325-0	1	アンテナカブラ用 FOR ANT. COUPLER
			CODE No. 100-164-380		

1	複合5対ケーブル 5P TWISTED PAIR CABLE		05S0309-0 *10m*	<input type="checkbox"/>	選択品 標準10m 2本 それ以上の時は、 必要長を指定のこと (10m 単位)
			CODE No. 000-106-043		
2	複合5対ケーブル 5P TWISTED PAIR CABLE		05S0309-0 *20m*	<input type="checkbox"/>	STANDARD 10m, 2 ROLLS. SPECIFY LENGTH IF LONGER CABLE IS REQUIRED. (10m STEPS)
			CODE No. 000-106-044		
3	複合5対ケーブル 5P TWISTED PAIR CABLE		05S0309-0 *30m*	<input type="checkbox"/>	
			CODE No. 000-106-046		
4	複合5対ケーブル 5P TWISTED PAIR CABLE		05S0309-0 *40m*	<input type="checkbox"/>	
			CODE No. 000-106-047		
5	複合5対ケーブル 5P TWISTED PAIR CABLE		05S0309-0 *50m*	<input type="checkbox"/>	
			CODE No. 000-106-048		

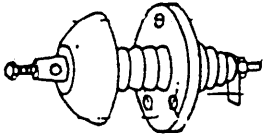
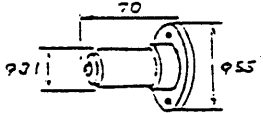


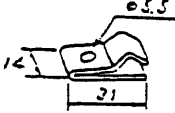
ACCESSORIES

番号 No.	名 称 N A M E	略 図 O U T L I N E	型 名 / 規 格 D E S C R I P T I O N S	数 量 Q ' T Y	用 途 / 備 考 R E M A R K S
1	カードホルダー CARD HOLDER		05-039-6212-0	1	
			CODE No. 100-121-490		
2	周波数カード FREQUENCY TABLE		05-039-6213-0	2	
			CODE No. 100-121-500		
3	ナイロンプッシュリベット NYLON PUSH RIVET		FNRP 3x6.5 黒 BLK	4	
			CODE No. 000-865-859		
4	バインドタッピンネジ TAPPING SCREW		3x20 SUS304 ポリソール クロ 1種	6	
			CODE No. 000-801-662		
5	ハンガ－ HANDSET HANGER		05-024-1001-1	2	
			CODE No. 100-095-691		
6	押 え バ ネ STOPPER		05-024-1002-1	1	
			CODE No. 100-095-701		
7	テンプレート TEMPLATE		05-024-1003-1	1	
			CODE No. 100-095-711		
8	ハンドセット HANDSET		HS-6000FZ5	1	
			CODE No. 000-112-623		

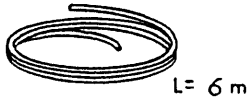
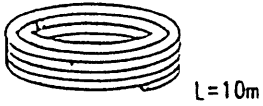
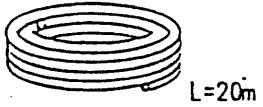



WIRE ANTENNA MATERIALS (option)

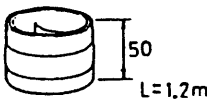
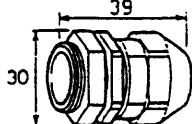
番号 No.	名称 NAME	略 図 OUTLINE	型名 / 規格 DESCRIPTIONS	数量 Q'TY.	用途 / 備考 REMARKS
1	アンテナ線 ANTENNA WIRE		14sq. ビニール被膜銅線	60m	
			CODE No.		
2	波形碍子 STRAIN INSULATOR		YT-180	10	
			CODE No.		
3	シャックル SHACKLE		M4S SUS	20	
			CODE No.		
4	シンブル THIMBLE		No.14S SUS	16	
			CODE No.		
5	ボルトコネクタ WIRE CLIP		PBC-4	30	
			CODE No.		
6	ターンバックル TURN-BACKLE		TB-E/E Max. 360/250	2	
			CODE No.		
7	銅管ラグ COPPER TUBE LUG		φ10用 4-110753	2	
			CODE No.		
8	エフコテープ VALCANIZING TAPE		0.5×20×10000	3	
			CODE No.		
9	ビニールテープ VINYL TAPE		0.2×19×10000, 7D	3	
			CODE No.		
10	コンベックス CABLE TIE			20	
			CODE No.		
11	シリコンゴム SILICONE SEALANT			1	
			CODE No.		

ANTENNA LEAD-IN KIT (option)

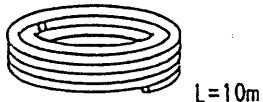
番号 No.	名称 NAME	略 図 OUTLINE	型名 / 規格 DESCRIPTIONS	数量 Q'TY	用途 / 備考 REMARKS
1	傘 型 碍 子 LEAD-IN INSULATOR		YA-256	1	
			CODE No. 000-571-433		
2	台 碍 子 STAND-OFF INSULATOR		PG-70 フレミグラス	7	
			CODE No. 000-109-751		
3	銅 パ イ プ COPPER TUBE		$\phi 6 \times 5m$	1	
			CODE No. 000-595-204		
4	銅 管 ラ グ COPPER TUBE LUG		$\phi 6$ 用 4-110753	6	
			CODE No. 000-572-258		
5	ケ ー ブ ル ホ ル ダ CABLE HOLDER		4-173175	7	
			CODE No.		

OPTIONAL INSTALLATION MATERIALS (p.6-7 and p.6-9)

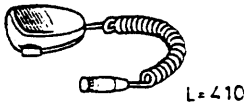
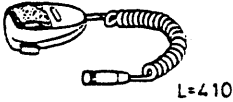
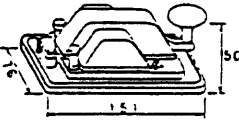
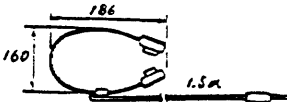
番号 No.	名 称 N A M E	略 図 OUTLINE	型名 / 規格 DESCRIPTIONS	数量 Q'TY	用途 / 備考 R E M A R K S
1	電源ケーブル POWER CABLE	 L=6m	VCT-8.0 × 2C	*	
			CODE No. 000-106-049		
2	同軸ケーブル COAXIAL CABLE	 L=10m	RG-8A/U, 10m	*	
			CODE No. 000-106-052		
3	同軸ケーブル COAXIAL CABLE	 L=20m	RG-8A/U, 20m	*	
			CODE No. 000-106-053		
4	同軸ケーブル COAXIAL CABLE	 L=30m	RG-8A/U, 30m	*	
			CODE No. 000-106-054		
5	同軸ケーブル COAXIAL CABLE	 L=40m	RG-8A/U, 40m	*	
			CODE No. 000-106-055		
6	同軸ケーブル COAXIAL CABLE	 L=50m	RG-8A/U, 50m	*	
			CODE No. 000-106-056		

1	アース銅板 COPPER STRAP	 50 L=1.2m	0.4 × 50 × 1200	*	
			CODE No. 000-810-249		
2	スーパーシール GROMMET	 39 30	NW-12M	*	
			CODE No. 000-116-434		

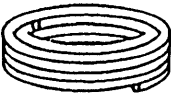
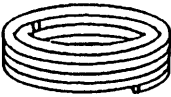








INSTALLATION MATERIALS FOR #2 CONTROL UNIT (option)

1	複合5対ケーブル 5P TWISTED PAIR CABLE	 L=10m	05S0309-0 *10m*	*	Max. 50m (Refer to page 6-3.)
			CODE No. 000-106-043		

OPTIONAL ACCESSORIES

番号 No.	名 称 N A M E	略 図 OUTLINE	型名 / 規格 DESCRIPTIONS	数量 Q'TY	用途 / 備考 R E M A R K S
1	カールコードマイク CURL CORD MIC.		DM1620FZ1	*	
			CODE No. 000-112-622		
2	ノイズキャンセラマイク NOISE CANCELLER MIC.		M112D45099	*	
			CODE No. 000-116-487		
3	電 鍵 TELEGRAPH KEY		HK-707	*	
			CODE No. 000-589-102		
4	ヘッドホン HEADPHONE		ST-90	*	
			CODE No. 000-580-302		

OPTIONAL INSTALLATION MATERIALS

番号 No	名 称 N A M E	略 図 O U T L I N E	型 名 / 規 格 D E S C R I P T I O N S	数量 Q'TY	用途 / 備考 R E M A R K S
1	複合5対ケーブル 5P TWISTED PAIR CABLE WITH ARMOR	 L-10m	05S0793-0 *10M*	1	鍍装付 WITH ARMOR
			CODE NO. 000-125-984		
1	複合5対ケーブル 5P TWISTED PAIR CABLE WITH ARMOR	 L-20m	05S0793-0 *20M*	1	鍍装付 WITH ARMOR
			CODE NO. 000-125-986		
1	複合5対ケーブル 5P TWISTED PAIR CABLE WITH ARMOR	 L-30m	05S0793-0 *30M*	1	鍍装付 WITH ARMOR
			CODE NO. 000-125-987		
1	複合5対ケーブル 5P TWISTED PAIR CABLE WITH ARMOR	 L-40m	05S0793-0 *40M*	1	鍍装付 WITH ARMOR
			CODE NO. 000-125-988		
1	複合5対ケーブル 5P TWISTED PAIR CABLE WITH ARMOR	 L-50m	05S0793-0 *50M*	1	鍍装付 WITH ARMOR
			CODE NO. 000-125-989		
1	同軸ケーブル COAX. CABLE WITH ARMOR	 L-10m	RG-10/U-Y *10M*	1	鍍装付 WITH ARMOR
			CODE NO. 000-125-999		
1	同軸ケーブル COAX. CABLE WITH ARMOR	 L-20m	RG-10/U-Y *20M*	1	鍍装付 WITH ARMOR
			CODE NO. 000-563-044		
1	同軸ケーブル COAX. CABLE WITH ARMOR	 L-30m	RG-10/U-Y *30M*	1	鍍装付 WITH ARMOR
			CODE NO. 000-563-048		
1	同軸ケーブル COAX. CABLE WITH ARMOR	 L-40m	RG-10/U-Y *40M*	1	鍍装付 WITH ARMOR
			CODE NO. 000-126-000		
1	同軸ケーブル COAX. CABLE WITH ARMOR	 L-50m	RG-10/U-Y *50M*	1	鍍装付 WITH ARMOR
			CODE NO. 000-126-001		