

**DIRECTION FINDER**

**MODEL TD-L1550A**

**INSTRUCTION MANUAL**

**TAIYO MUSEN CO., LTD.**

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EDITION

6

# DIRECTION FINDER TD-L1550A

## INSTRUCTION MANUAL

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# Chapter I OPERATION MANUAL

## 1. OUTLINE

### 1.1 General Descriptions

TD-L1550A is an automatic direction finder, designed for reception and direction measurement of radio waves in international VHF band and U. S. weather channels (or Scandinavian fishing channels). Though it is light and handy in size, a large character display and a linear indicator are provided.

Its main functions and displays are :

- Quartz-locked synthesizer, controlled by a one-chip microprocessor, enables simple, precise and stable reception.
- Manual, spot and scan reception are selectable and all operations are made with keys its front panel.
- The channel number with the type of station, ship, coast or weather, can be stored in 100 addresses with two code numbers, from 00 to 99.
- The direction of incoming radio signal with respect to bow direction of own ship is shown with two displays, a linear indicator for quick recognition and a numeric display.
- H type Adcock antenna allows precise direction measurement with high sensitivity.
- As a power source, DC 10 V ~16 V is suitable and adapters are prepared for DC 10 V~16 V or AC (option).

## 1.2 Specifications

### (1) Antenna

Adcock antenna            H type 4-element Adcock antenna, EA-351A

### (2) Signal

Frequency            International VHF band (spot reception)  
                      U.S. weather channel (or Scandinavian fishing channel)  
                      Distress frequency, 121.5 MHz  
Wave form            F3E, A3E(121.5 MHz only)

### (3) Receiver

a. Reception type    Double superheterodyne with PLL synthesizer  
b. IF                21.4 MHz and 455 kHz  
c. Sensitivity        0.5  $\mu$ V/m (12 dB SINAD, except 121.5 MHz)  
d. Image ratio        55 dB or more(except 121.5 MHz)  
e. Selectivity        - 6 dB at  $\pm$  5 kHz and - 40 dB at  $\pm$  12.5 kHz

### (4) Display

a. Direction            Numeric display 1° step for direction  
                      It is also used for address number of memory  
b. Linear indicator    10° , 20° or 30 ° step and a green center light  
c. Channel            Numeric display  
d. Level indicator    6 steps for signal strength  
e. Type indicator    Ship, coast or weather, fishing, EPIRB (121.5MHz)  
f. Scan indicator    Red light

(5) Audio output        2 W (4 $\Omega$ )

### (6) Control

a. Memory            100 sets of channel and type of station  
b. Scanning           Max. 10 groups, each consisting of upto 10 channels

### (7) Power, size and environment

a. Power source        DC 10 V  $\sim$  16 V, minus side grounded  
                      (DC 10 V $\sim$  16 V or AC, option)  
b. Size                213(H) $\times$ 205(W) $\times$ 95(D) mm, 2.7 kg  
c. Environment        0 °  $\sim$  45 ° C

### 1.3 Composition

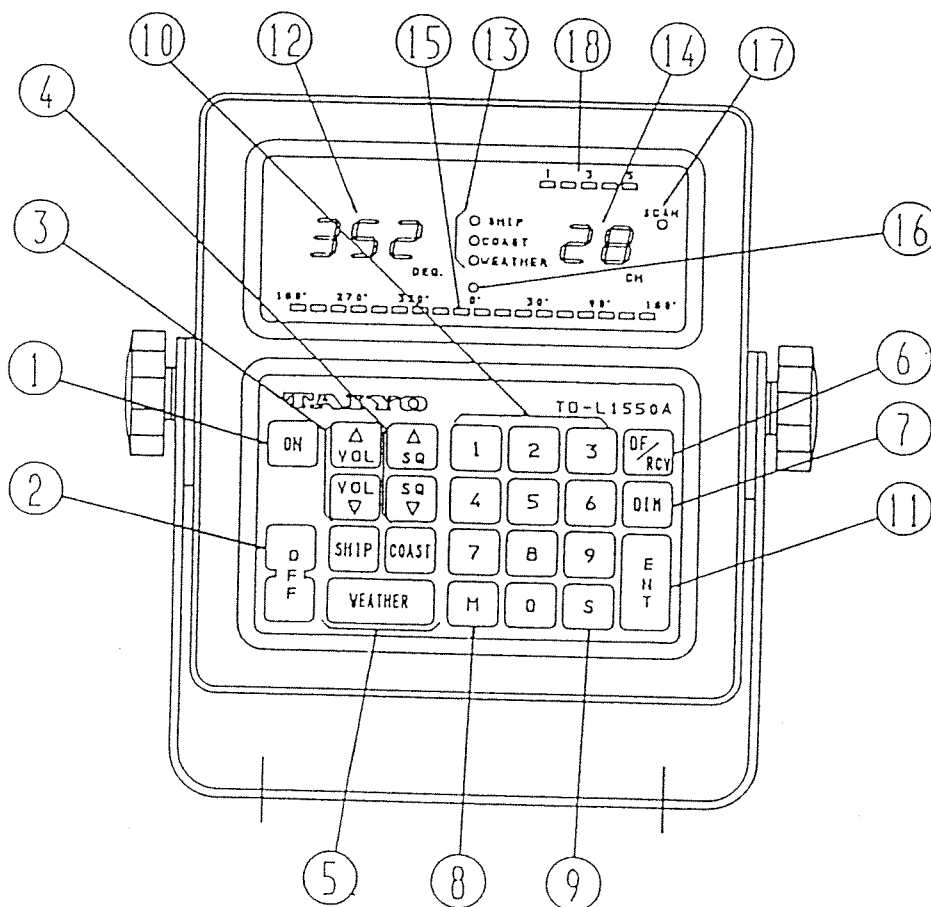
List of components supplied is shown below.

Components	Quantity	Remarks
Main Unit	1	
Adcock antenna	1	Rype EA-351A
Speaker box	1	4Ω, with cable and plug
Antenna cable	1 pair	With plugs Standard 10 m long
Power cable	3 m	
Operation manual	1	
Spare parts	1 set	Fuse (2A, 5.2 mm φ, 20mm)

## 2. QUICK REFERENCE

### 2.1 Layout of Operation Panel

Left figure shows  
its operation panel.



## 2.2 Functions of keys and displays

Following table gives names and function of keys and displays.

No.	Notation	Name	Function
①	ON	Power-On	Press to turn on power
②	OFF	Power-Off	Press upper and lower parts to turn off
③	VOL	Volume	To control loudness
④	SQ	Squelch	To control squelch, $\Delta$ : close $\nabla$ :open
⑤	TYPE	Type entry	To select SHIP, COAST or WEATHER
⑥	DF/RCV	Mode switching	Cyclic key to select DF or reception
⑦	DIM	Dimmer	Brightness control
⑧	M	Memory	Function key for memory
⑨	S	Scan start	To start scan reception or change memory
⑩	0~9	Numeric	Numeric key. Some of them are used as function key
⑪	ENT	Entry	Entry key to execute a function
⑫	DEG	Direction display	3 numerics for direction or memory address
⑬		Type indicator	3 LEDs to indicate SHIP, COAST or WEATHER
⑭	CH	Channel display	2 numerics to indicate international VHF channel from 01 to 88 and other channels WEATHER(U1, U2, U3, U4), FISHING(F1, F2, F3) and 121.5 MHz (EP)
⑮	SCAN	Linear indicator	To indicate direction
⑯		Bow indicator	Indicate the direction of tge bow as 0°
⑰		Scan indicator	A red lamp is lit while in scanning reception
⑱		Level indicator	To indicate the level of signal

## 2.3 Quick Reference for Operation

There are 3 modes of reception, i. e., "MANUAL", "SPOT" and "SCAN" reception. When "DF" is selected, the direction of incoming signal is displayed both by the numeric display and the linear indicator and its sound can be heard. However, the direction is not displayed when RCV (reception) is selected.

Following shows operation procedures as quick reference.

### (1) Manual reception

International VHF channels with types of stations and their frequencies have been stored in the microprocessor. Refer to the table on page OM6 for VHF channels. In manual mode, call up a frequency by the type of station and the channel number.

#### (a) International VHF channel (from 01 to 88)

[TYPE] → [CHANNEL NUMBER] → [ENT]

#### (a) Weather or emergency (WEATHER or FISHING should have been specified)

[WEATHER] → [1, 2, 3 or 4] → [ENT] (weather channel)

[WEATHER] → [1, 2 or 3] → [ENT] (fishing channel)

[SHIP] → [99] → [ENT] (ship station in distress)

### (2) Spot reception

#### (a) Enter a channel by following procedure to a memory with address number :

[TYPE] → [CHANNEL NUMBER] → [ENT] → [M] → [ADDRESS NUMBER] → [M]

#### (b) Recall a channel from a memory with an address number by following procedure :

[M] → [ADDRESS NUMBER] → [ENT]

#### (c) Delete stored memory by following procedure :

[9] → [7] → [M] → [ADDRESS NUMBER] → [M]

### (3) Scan reception

#### (a) Enter a channel by following procedure to a memory with address number :

[TYPE] → [CHANNEL NUMBER] → [ENT] → [M] → [ADDRESS NUMBER] → [M]

Then, Iterate the procedure for other channels as many as necessary.

#### (b) Start scan by following procedure.

[SQ △] → [M] → [GROUP NUMBER] → [S]

#### (c) Stop scan by following procedure.

[ENT]

#### (d) Scan pass by following procedure :

[9] → [9] → [S]

#### (e) Release scan pass by following procedure :

[9] → [8] → [S]



# VHF-MARINE RADOTELEPHONE CHANNELS

Channel Designation	Frequency (MHz)		Channel Designation	Frequency (MHz)	
	Ship	Coast		Ship	Coast
01	156.050	160.650	60	156.025	160.625
02	156.100	160.700	61	156.075	160.675
03	156.150	160.750	62	156.125	160.725
04	156.200	160.800	63	156.175	160.775
05	156.250	160.850	64	156.225	160.825
06	156.300	--	65	156.275	160.875
07	156.350	160.950	66	156.325	160.925
08	156.400	--	67	156.375	156.375
09	156.450	156.450	68	156.425	156.425
10	156.500	156.500	69	156.475	156.475
11	156.550	156.550	70	156.525	--
12	156.600	156.600	71	156.575	156.575
13	156.650	156.650	72	156.625	--
14	156.700	156.700	73	156.675	156.675
15	156.750	156.750	74	156.725	156.725
16	156.800	156.800	77	156.875	--
17	156.850	156.850	78	156.925	161.525
18	156.900	161.500	79	156.975	161.575
19	156.950	161.550	80	157.025	161.625
20	157.000	161.600	81	157.075	161.675
21	157.050	161.650	82	157.125	161.725
22	157.100	161.700	83	157.175	161.775
23	157.150	161.750	84	157.225	161.825
24	157.200	161.800	85	157.275	161.875
25	157.250	161.850	86	157.325	161.925
26	157.300	161.900	87	157.375	161.975
27	157.350	161.950	88	157.425	162.025
28	157.400	162.000			
Fishing 1	155.625		Weather 1	162.550	
2	155.775		2	162.400	
3	155.825		3	162.475	
Distress Frequency	121.500		4	161.650	

### 3. OPERATION

#### 3.1 Microprocessor and memory

##### (1) Functions

The microprocessor has functionkeys and numeric keys on the keyboard.

[S] : To start scan.

To increase the number of memory address when "SQ" is open

[M] : To store or recall memory address

(to clear its function, press [DIM] or [DF/RCV])

[ENT] : To execute a command

[SHIP], [COAST], [WEATHER] : "TYPE" key to select type of station so as to designate a VHF channel with numeric keys

[NUMERICS]: To select channel number or address code number

To select pattern of scan hold/auto start

To define function ("97": To delete memory, "98": To release scan pass, "99": To skip an address)

##### (2) VHF Marine Radiotelephone channels and other channels

VHF channels as shown in the table on page OM6 have been memorized in the microprocessor. When one of channels from 01 to 88 is retrieved, its type and channel number are displayed on the type indicator, SHIP or COAST, and the channel display.

When one of WEATHER channels is selected, one of following characters appears on the channel display.

WEATHER : U1, U2, U3, U4      FISHING : F1, F2, F3      121.5 MHz : EP

Note that WEATHER or FISHING should be selected by specification.

##### (3) Memory

Up to 100 channels can be memorized in memory addresses from 00 to 99. A group of addresses consists of 10 addresses and is represented by a group number as shown below.

Group number	0	1	2	3	• • •	7	8	9
Address number	00-09	10-19	20-29	30-39	• • •	70-79	80-89	90-99

Note : Data in the memory is protected with a built-in Lithium battery.

### 3.2 Details of Operation

When power is turned on, DF operation is set automatically and previous selection of channel appears at the type indicator and on the channel display.

#### 3.2.1 Manual channel selection

- (a) Select a type by pressing one of type keys, [SHIP], [COAST] and [WEATHER].
- (b) Press numeric keys so that the channel number appears on the channel display.
- (c) Press [ENT] to execute.

Above procedure is rewritten as

[TYPE] → [CHANNEL NUMBER] → [ENT]

For weather or emergency channel (WEATHER or FISHING has been specified),

[WEATHER] → [1, 2, 3 or 4] → [ENT] (weather channel)

[WEATHER] → [1, 2 or 3] → [ENT] (fishing channel)

[SHIP] → [99] → [ENT] (ship station in distress)

Note : Procedure (a) and/or (b) may be omitted when the type or channel number need not to be changed.

A short beep sound tells you erroneous input. Try to enter correct data.

Example : Set Channel 12 - Ship

[SHIP] → [1] → [2] → [ENT]

Press	DEG	CH
	● COAST	0 4
[SHIP]	● SHIP	0 4
[1]	● SHIP	4 1
[2]	● SHIP	1 2
[ENT]	● SHIP	1 2

Previous data

Completed and reception starts

## OPERATION FOR OPTIONAL CHANNELS

### 3.2.1 Manual channel selection – ADDENDAM –

#### 1. Selection of 156MHz

- a) Turn on the power of main unit.
- b) Press SHIP key to make the LED of SHIP blinks.
- c) Press 0 and 0 keys.
- d) Press ENT key to execute.

The LED of SHIP is turned OFF and “00” is shown in channel display.

#### 2. Selection of 121.875MHz

- a) Turn on the power of main unit.
- b) Press SHIP key to make the LED of SHIP blinks.
- c) Press 9 and 8 keys.
- d) Press ENT key to execute.

The LED of SHIP is turned OFF and “EH” is shown in channel display.

### 3.2.2 Store a channel in the memory

(a) Set a channel by 4.2.1 as

[TYPE] → [CHANNEL NUMBER] → [ENT]

(b) Press [M] and former address number appears in "DEG" display

(c) Enter new address number

(d) Press [M] to execute command

Above procedure is rewritten as

[TYPE] → [CHANNEL NUMBER] → [ENT] → [M] → [ADDRESS NUMBER] → [M]

Example : Store Channel 12 - Ship in Address 80

[SHIP] → [1] → [2] → [ENT] → [M] → [8] → [0] → [M]

Press	DEG	CH	
[SHIP] → [12] → [ENT]		● SHIP 1 2	Channel 12 has been set
[M]	7 6	● SHIP 0 4	
[8]	6 8	● SHIP 4 1	
[0]	8 0	● SHIP 1 2	
[M]	8 0	● SHIP 1 2	Completed and reception starts

### 3.2.3 Spot reception

Spot reception is made by calling up a channel by address number

(a) Press [M]. Former data, the address and the channel appear on the displays.

(b) Enter address number with numeric keys.

(c) Press [ENT] to execute.

Above procedure is rewritten as

[M] → [ADDRESS NUMBER] → [ENT]

Note : A short beep tells you that address is vacant. Select other address or store data to that address.

Example : Call Address 80 up where Channel 12 - Ship has been entered

[M] → [8] → [0] → [ENT]

Press	DEG	CH	
[M]	5 7	● COAST 0 4	Former data
[0]	7 8	● COAST 0 4	
[0]	8 0	● COAST 0 4	
[ENT]	8 0	● SHIP 1 2	Completed and reception starts

### 3.2.4 Delete memory

Memory can be deleted one by one or all. When whole memory is going to be annihilated by the latter procedure, written record on channels in addresses is recommended.

(1) Following procedure deletes one address.

[9] → [7] → [M] → [ADDRESS NUMBER] → [M]

Example : Delete memory in address 80.

[9] → [7] → [M] → [8] → [0] → [M]

Press	DEG	CH	
		● COAST 0 4	Former data
[9]		● COAST 4 9	
[7]		● COAST 9 7	
[M]	5 7	● COAST 9 7	57 is previous value
[9]	7 8	● COAST 9 7	
[7]	8 0	● COAST 9 7	
[ENT]	8 0	● SHIP 9 7	Completed and reception starts

Note : 97, 98 and 99 are not channel numbers but are machine words in the computer program.

(2) To delete whole memory.

- (a) Turn off power by pressing upper and lower part of [OFF] key.
- (b) Press [3] and [ON] keys simultaneously. Then, 555 appears on the left and 55 appears on the right and they blink.
- (c) Press [ENT]. Then, whole memory is cleared.

Above procedure is rewreitten as

[OFF] → [3] + [ON] → [ENT]

### 3.2.5 Scan reception

Channels which are going to be scanned should be memorized beforehand by the procedure given in 3.2.2. Iterate the procedure as many times as necessary.

[TYPE] → [CHANNEL NUMBER] → [ENT] → [M] → [ADDRESS NUMBER] → [M]

Then, go to the next procedure.

- (a) Press [SQ △] so as to close squelch and no sound can be heard.
- (b) Press [M] to call up address.
- (c) Press two group numbers.
- (d) Press [S] and scanning begins. Scan indicator is lit to indicate scanning.
- (e) When a signal is detected, scan stops automatically. (refer to 3.2.10)  
Press [S] to start scanning again.

Above procedure is rewritten as

[SQ△] → [M] → [FIRST GROUP NUMBER] → [LAST GROUP NUMBER] → [S]

Scan starts from the first group to the last group as shown in the following examples.

Example 1 [M] → [2] → [4] → [S] : Scanning from 20 to 49 and repeats.

Example 2 [M] → [0] → [8] → [S] : Scanning from 00 to 89 and repeats.

Example 3 [M] → [7] → [2] → [S] : Scanning from 70 to 99 and 00 to 29. Then repeats.

Note : Scan also stops when squelch opens. Then, press [S] and the address number increases by 1.

### 3.2.6 Scan stop

Scan is suspended when [S] is pressed while scanning.

### 3.2.7 Scan pass

To skip an address number while scanning, set "Scan pass". Then, that address is passed automatically from the next scan.

- (1) Confirm that scan stops. If not, stop scan.
- (2) Press [9] → [9], then 99 appears on the channel display.
- (3) Press [S] and scan pass is set. Scan starts again.

Above procedure is rewritten as

[9] → [9] → [S]

### 3.2.8 Release scan pass

- (1) Confirm that scan stops. If not, stop scan.
- (2) Press [9] → [8], then 98 appears on the channel display.
- (3) Press [S]. Then all scan pass is cleared and scan starts again.

Above procedure is rewritten as

[9] → [8] → [S]

### 3.2.9 Scan hold/auto start

Scan hold/auto start is available by pressing one of 5 numeric keys, 0, 1, 2, 3 and 4, while scanning (when scan indicator is lit).

- [0] : Scan is held while a signal is received. Scan indicator is put off.  
[1] : Scan is held for 1 sec after a signal is received and scanning starts again automatically. Scanning also starts when the signal stops.

Scan indicator is always lit even when a signal is received.

- [2] : Same as the case of [1] except holding time, 2 sec.  
[3] : Same as the case of [1] except holding time, 4 sec.  
[4] : Same as the case of [1] except holding time, 8 sec.



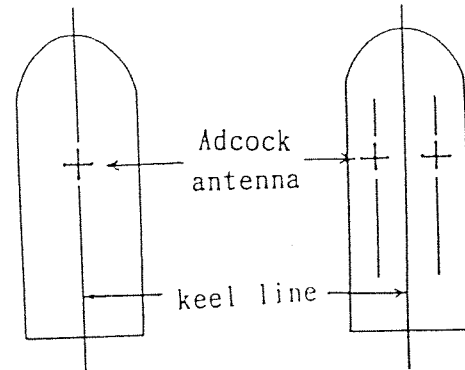
## Chapter II INSTALLATION MANUAL

### 1. ANTENNA

#### 1.1 Site Selection

Following conditions are recommended to install antenna for accurate measurement.

- 1) The best position is on the keel line.  
The separation of Adcock antenna and the keel line should be minimized.

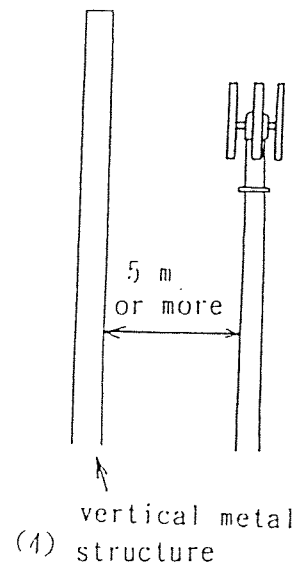
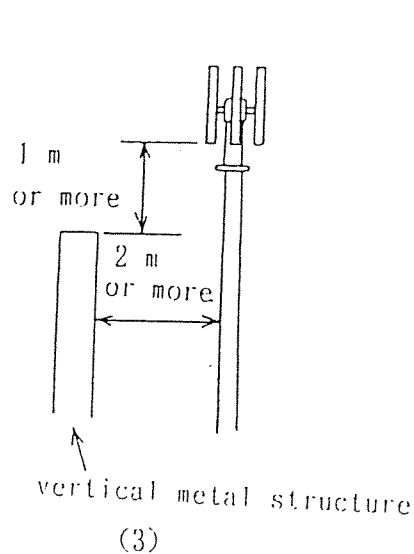


On the keel line      Off from keel line

- (2) Select the highest position whenever possible.

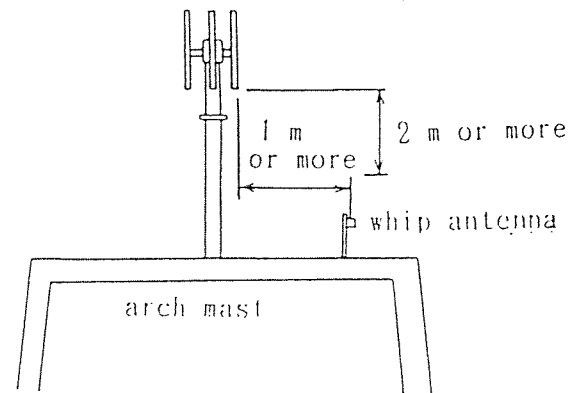
- (3) The antenna should be 1 m or higher from the top of vertical metal structure (e.g., mast, whip antenna, etc.)

Keep horizontal separation larger than 2 m from the structure.



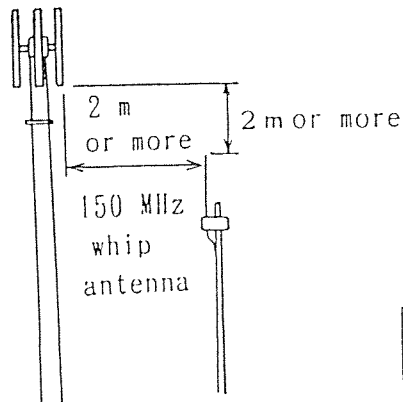
- (4) When vertical metal structure is high, keep a horizontal separation larger than 5 m.

- (5) When antenna is colocated on a arch mast with a whip antenna or like, keep separation of 2 m or more and a horizontal separation of 1 m or more.



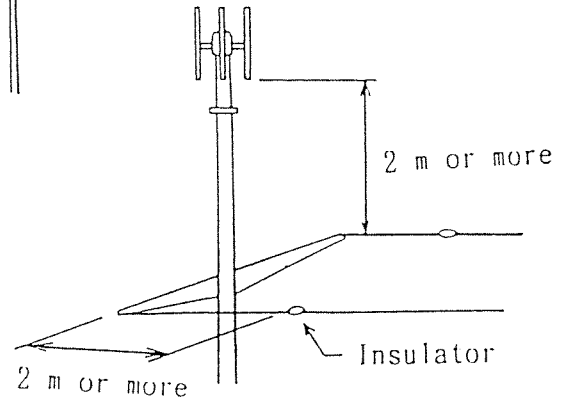
(5)

- (6) The antenna should be 2 m or higher than an antenna for international VHF communication.



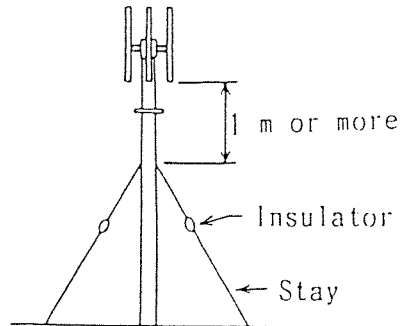
(6)

- (7) The antenna should be 2 m or higher than main communication antenna and also keep a horizontal separation larger than 2 m.



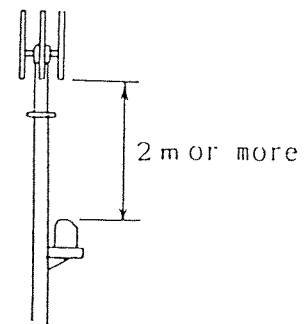
(7)

- (8) When wire is used as stay for a mast or stanchion to which the antenna is installed, the separation of the wire from the antenna should be larger than 1 m.



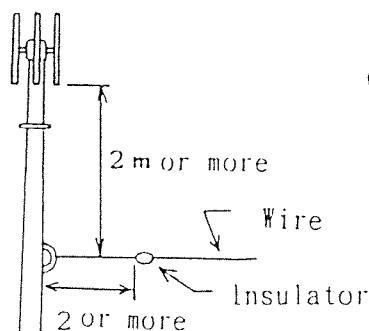
(8)

- (9) Keep a vertical separation of 2 m or more from a navigation lamp when the lamp and the antenna are installed to the same mast.



(9)

- (10) When masts are connected with a wire, keep a vertical separation larger than 2 m. Also, insert an insulator to keep 2m or more from a mast to which the Adcock antenna is installed.



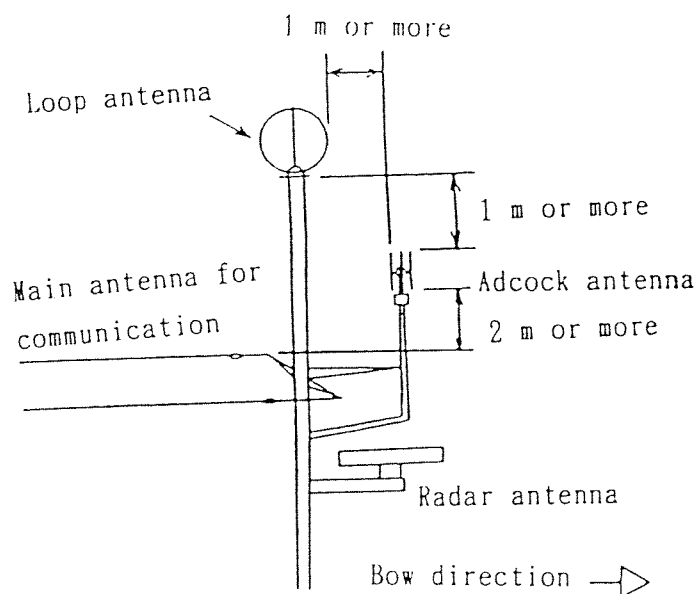
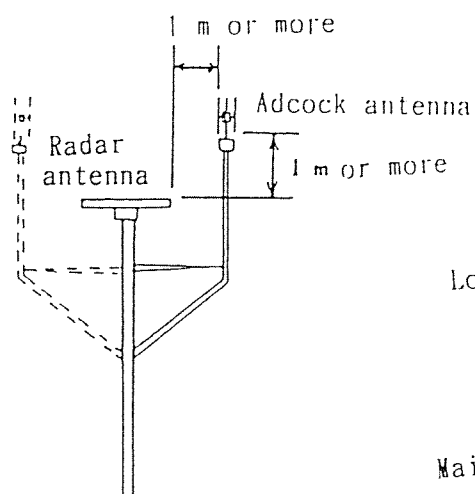
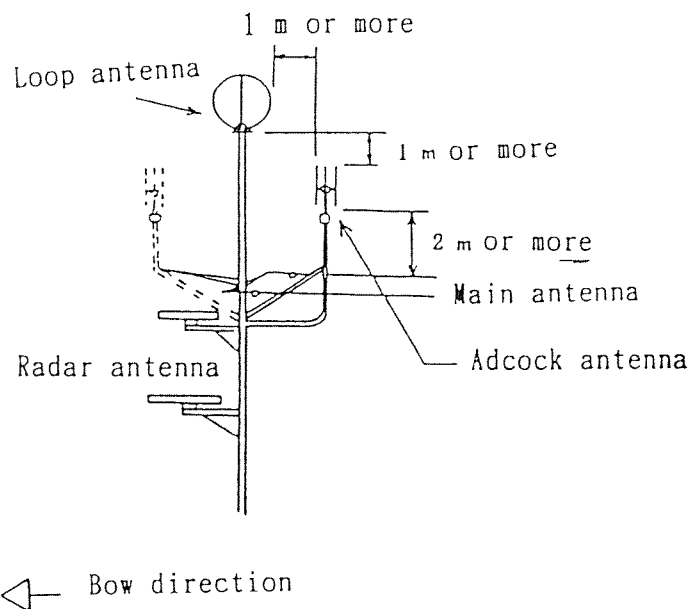
(10)

## 1.2 Examples of installation

When several antennas are installed on the same mast and 2 or more antenna may request the highest position.

The best position at the top of the mast may be given to a loop antenna for direction measurement in the HF range since it is vulnerable to resonance.

Figures on this page shows some examples. Dotted figures are alternatives.

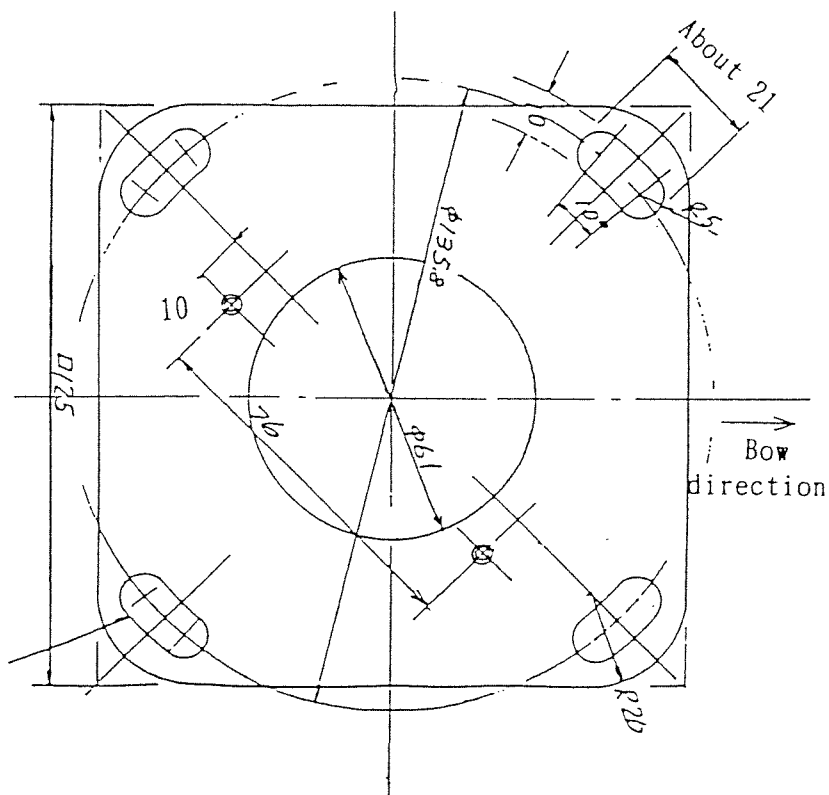
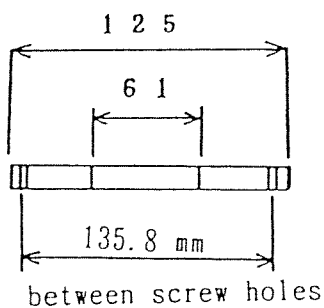
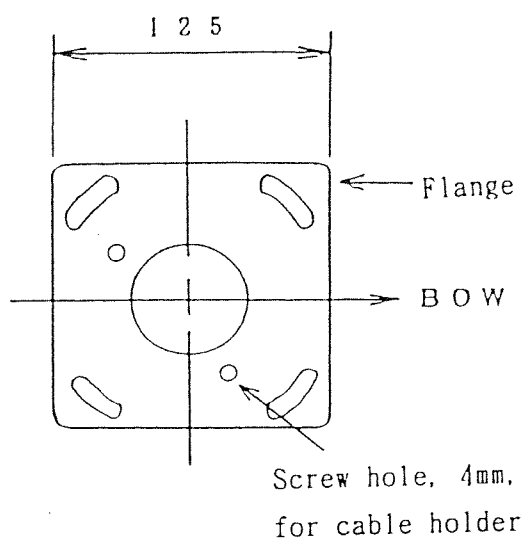


### 1.3 Flange

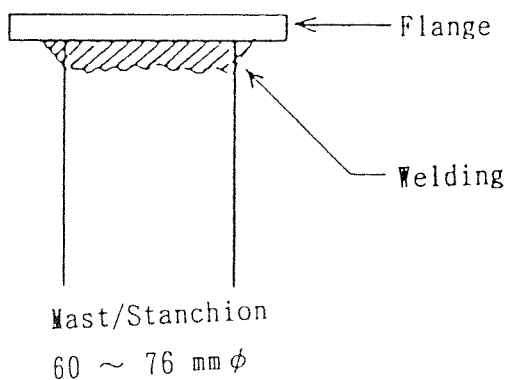
Weld the flange attached to the Adcock antenna to mast, stanchion or like.  
Or, when necessary, make a flange as shown in figures.

Note : (1) Pay attention to make the bow direction line parallel to the keel line.

(2) Antenna cable is not heat proof. Keep the cable away from heat while welding.



Size of flange un detail (mm)



## 1.4 Antenna Cable

### 1.4.1 Note for cable setting

Pay following attention to install antenna cable.

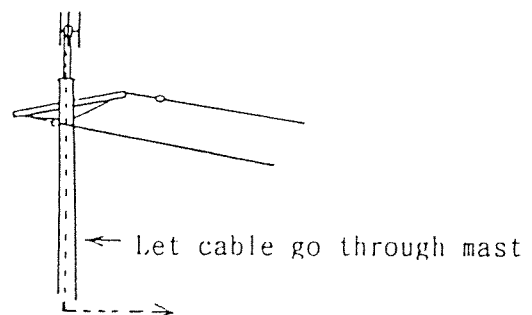
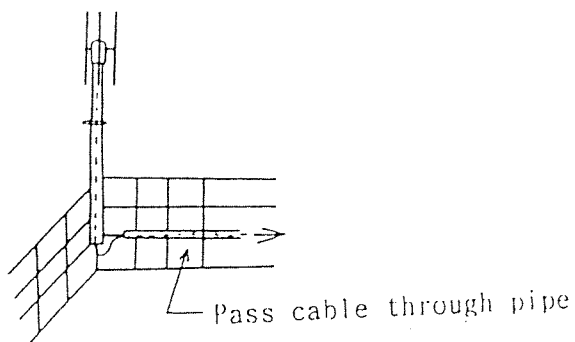
- (1) Cable is processed and shipped to a specified length when ordered. Avoid to cut or extend cable. When cable length should be changed, keep the length of two lines the same, at least within 10 mm.

Cable : RG - 58 A / U twin cable

(or, RG - 58 A / U armored twin cable)

Plug : BNC-P-55U plugs and M-203-P plug.

- (2) Protect cable from heat. Weld flange and others before setting cable.  
Pay special attention for welding when cable has been set.
- (3) Protect cable from mechanical damage. When mechanical damage is anticipated, Protect it with steel or plastic pipe. Otherwise, use armored cable.
- (4) Keep enough separation from cables for communication antenna, radar cable or power cable. Lay cable in metallic pipe, e.g., in steel mast, whenever possible as shown in figures on this page.
- (5) Avoid to extend antenna cable in the air or along stays or wires.

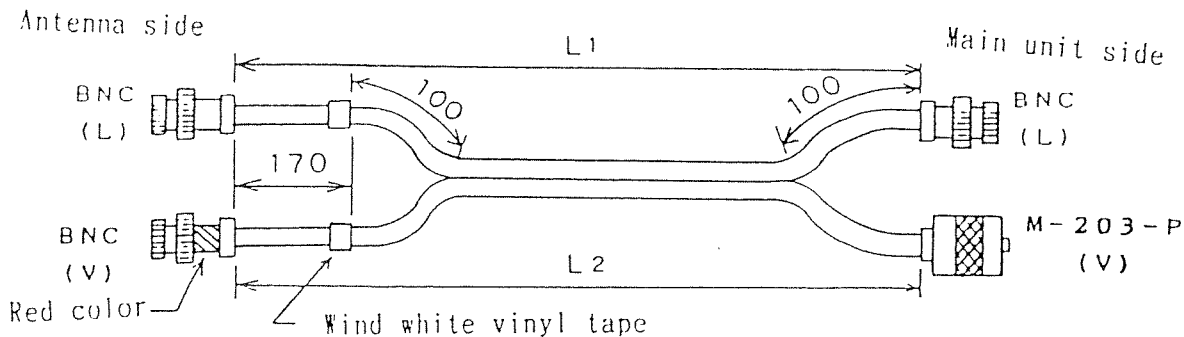


A. Antenna installed on the compass deck      B. Antenna installed to a mast

#### 1.4.2 Plugs

Antenna cable is shipped with plugs. Following shows procedure to connect plugs to antenna cable for your reference when necessary.

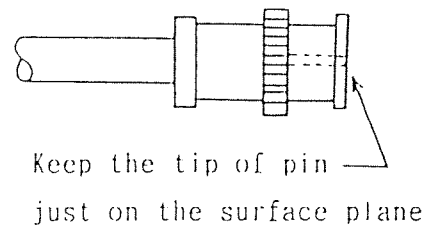
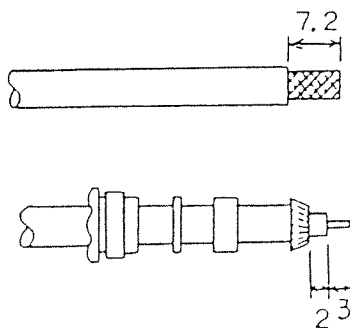
##### (1) Standard antenna cable RG-58A/U Twin cable



Note : Keep the difference of length of V-line (sense signal line) and L-line (Adcock signal line) smaller than 10mm.

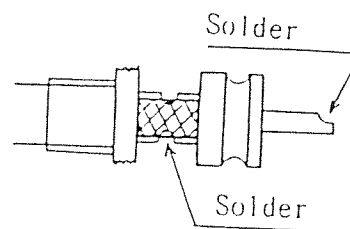
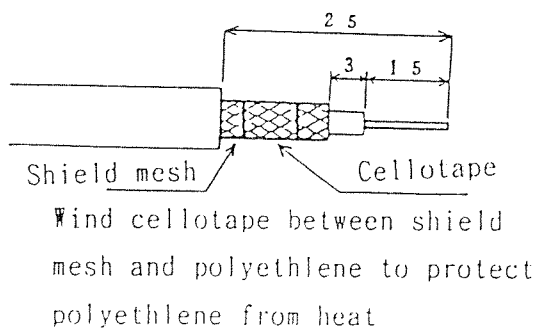
##### (2) BNC plug

Cut and remove, outer PVC layer by 7.2 mm, loosen armor shield. Remove inner insulator and solder to the pin.

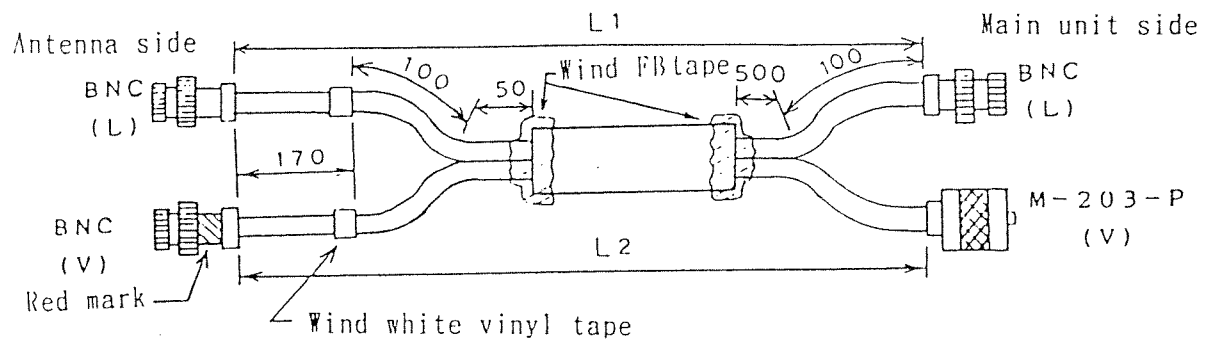


##### (3) M plug

Cut and remove, outer PVC layer by 25 mm, armor shield by 18 mm, inner polyethylene layer by 15 mm.



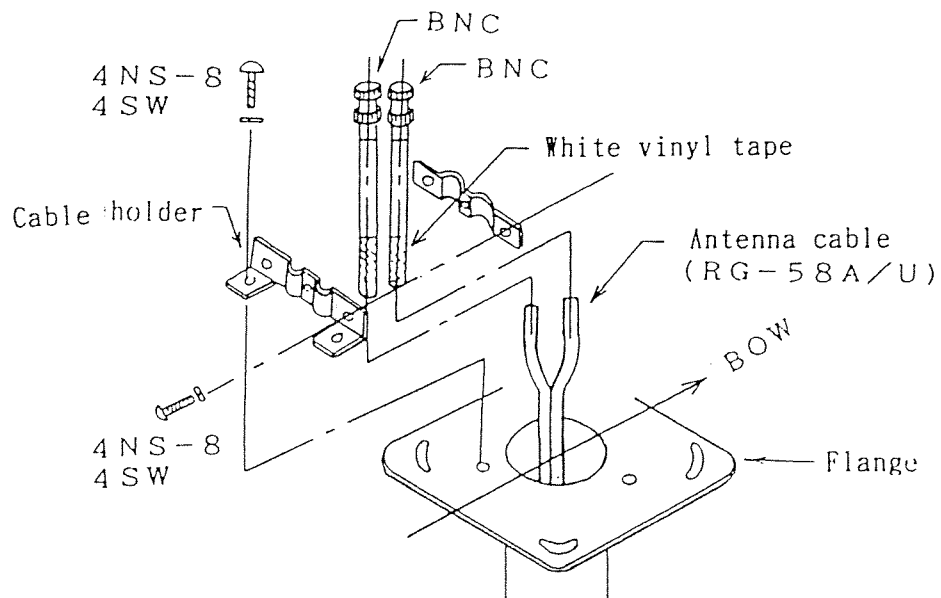
(4) Armored antenna cable RG-58A/U Armored twin cable (option)



Note : Keep the difference of length of V-line and L-line smaller than 10mm

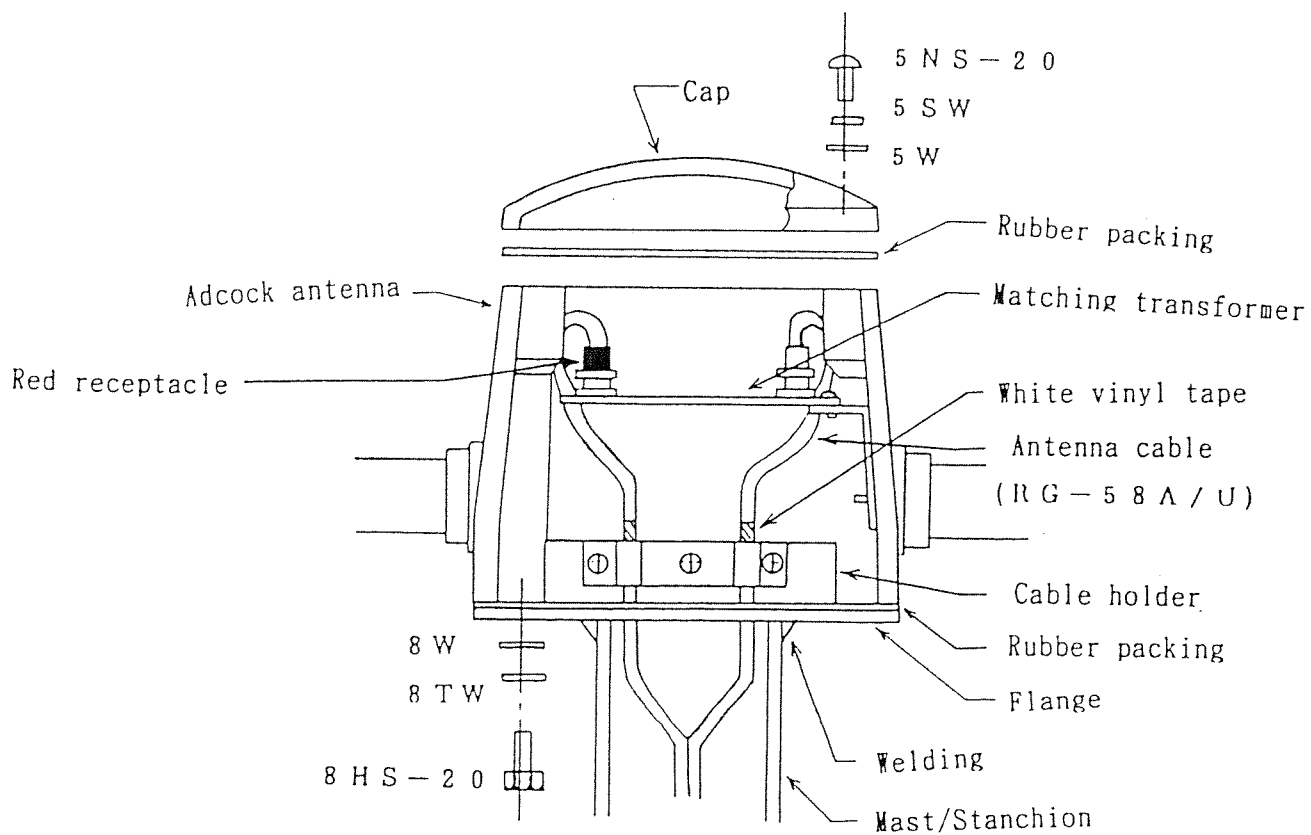
### 1.5 Installation of Adcock antenna

- (1) Fix antenna cable with cable holder. Then fasten the holder to the flange.

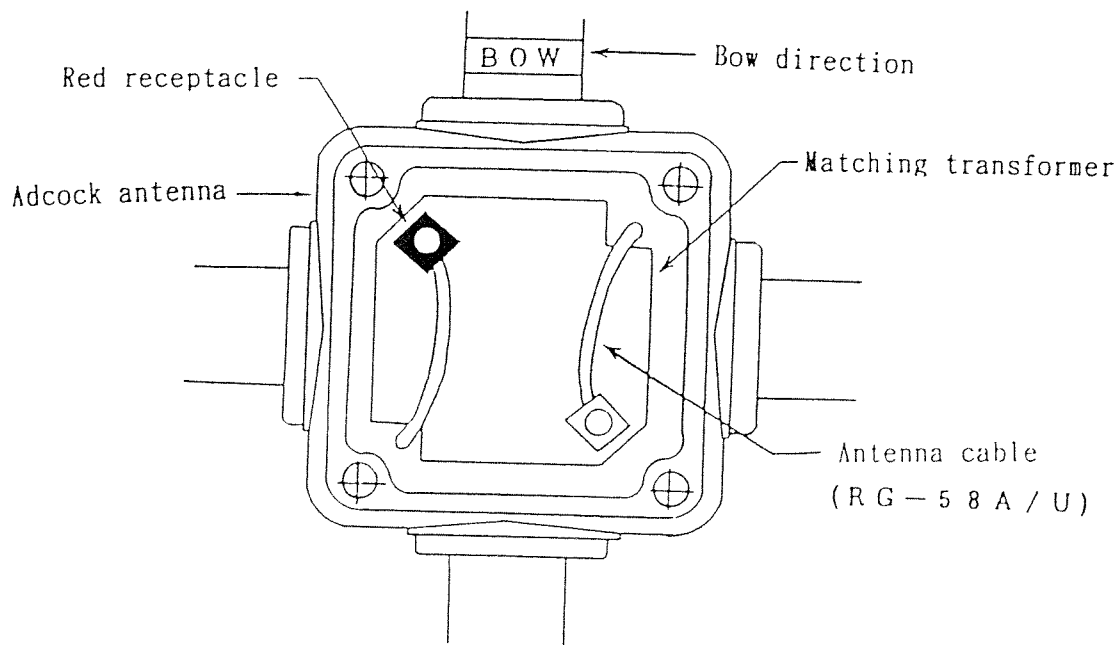


- (2) Fix antenna to the flange with bolts, nuts and washers.
- (3) Connect BNC plugs of antenna cable to receptacles. Confirm that line with red mark is connected to the red receptacle.
- (4) Confirm also the "BOW" mark direction is parallel to the keel line.

Note : Pay attention to rain or splash so as to avoid moisture or dust from entering inside.



Looking down



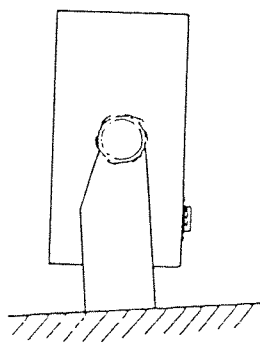
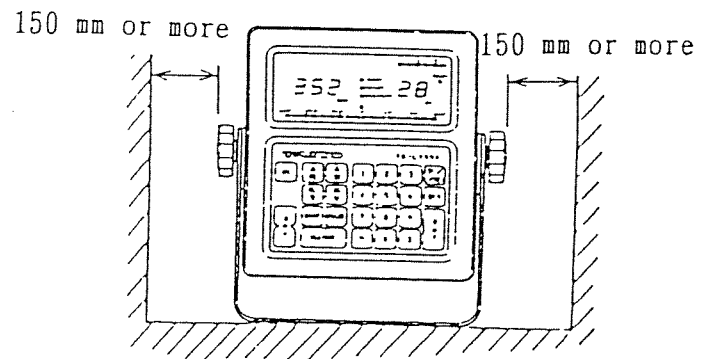
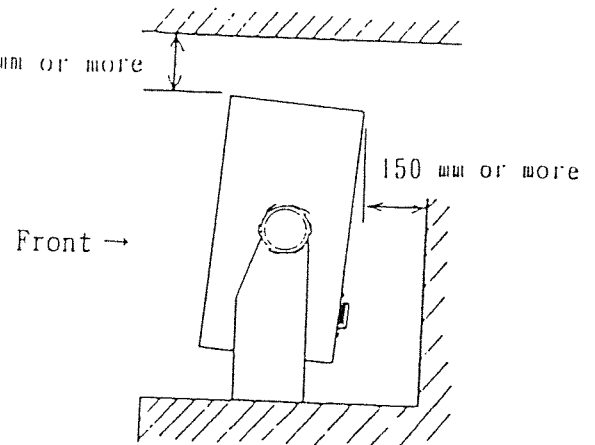


## 2 MAIN UNIT

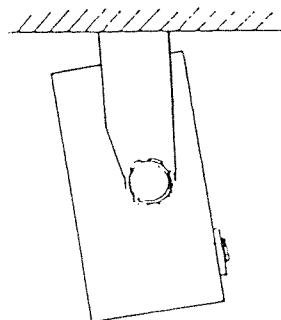
### 2.1 Position of main unit

Determine the position of main unit with attention to following conditions. 150 mm or more

- (1) Select a suitable location for the main unit to avoid direct sunshine, water splash, high temperature and strong vibration.
- (2) Ample space for operation and maintenance and good ventilation as shown on the right is recommended.
- (3) Keep good separation from noise sources such as radio transmitter, inverter, radar, etc.
- (4) Hanging installation to ceiling is also possible. Use a plate with enough strength to reinforce the ceiling so as not to drop the unit.



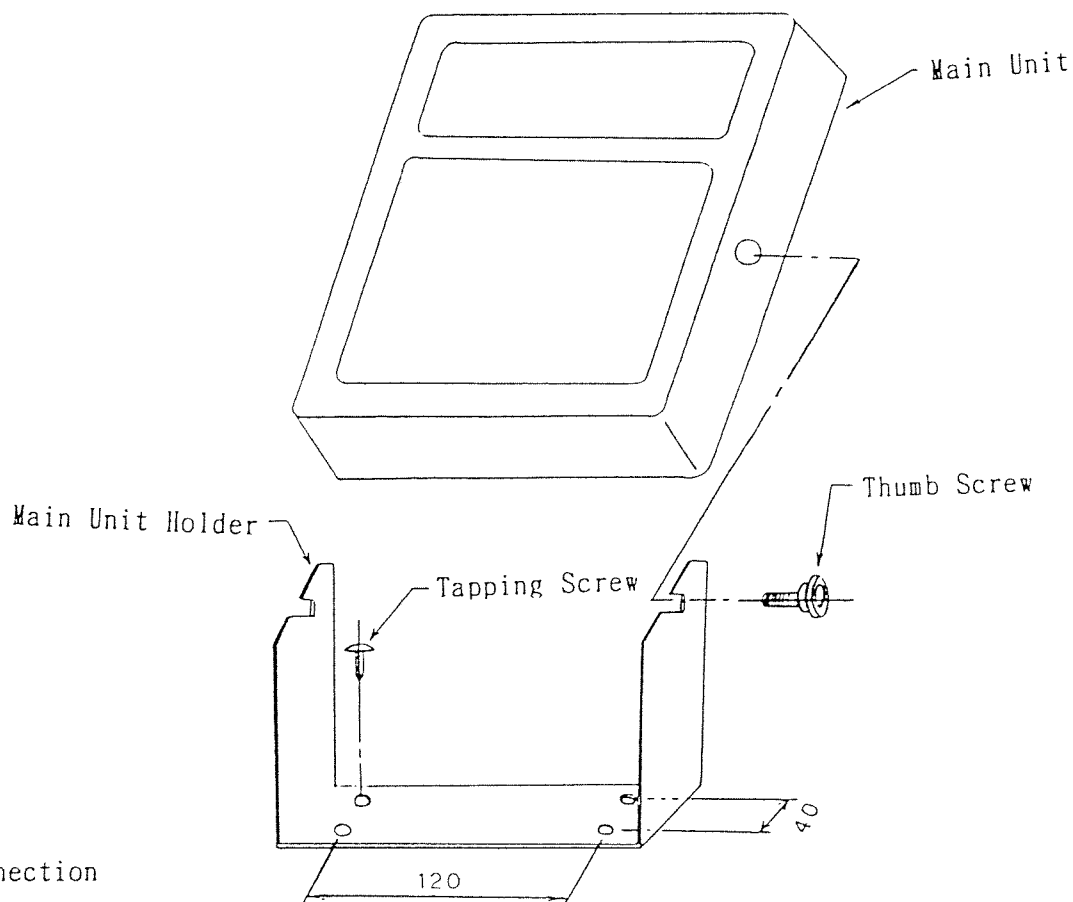
Installation on table



Hanging installation

## 2.2 Installation

- (1) Loosen two thumb screws which have connected the main unit and unit holder and separate them.
- (2) Fasten the unit holder to a chosen spot, e. g., table, ceiling with 4 tapping screws.
- (3) Connect the main unit and the unit holder with thumb screws.



## 2.3 Cable connection

### 2.3.1 Power

#### (1) Power cable

Power cable is supplied with a connector, 16P-2F.



1 → (-) DC 10V ~ 16V  
2 → (+)

Looking from  
soldering direction

## (2) Power connection

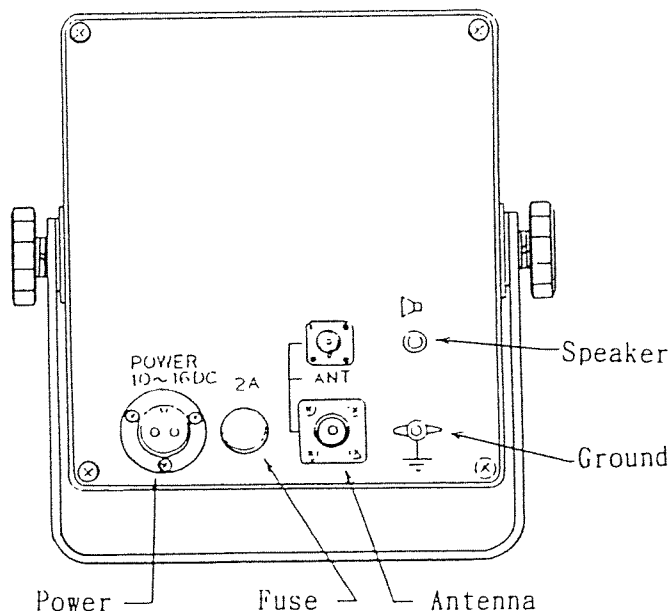
Connect to a DC source 10 V ~ 16V. Minus side is grounded inside the main unit.

Avoid higher voltage or the main unit may be damaged.

Other power source should be specified at the time of order and DC adapter or AC power source should be used (option).

### 2.3.2 Main unit connections

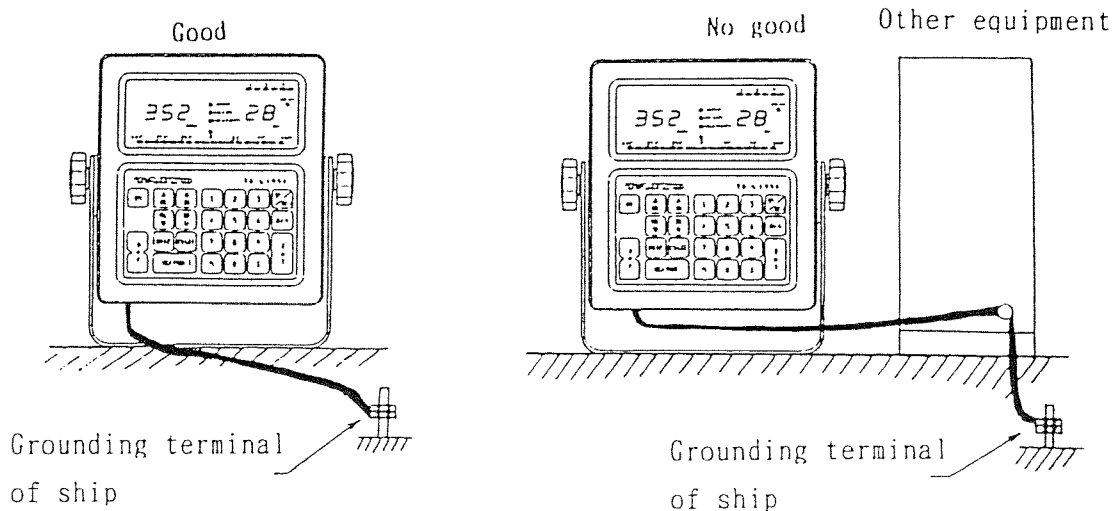
Connect antenna cable, power cable, speaker cord and ground cable to receptacles on the rear panel of the main unit.



### 2.3.3 Grounding

Grounding influences to the sensitivity and noise suppression and hence, good grounding is required to the hull for steel ship with shortest dedicated grounding line (KIV copper belt, 30mm wide and 0.5 mm thick) and ship grounding terminals are required.

In case of non-metallic ship, FRP or wood, provide a copper plate, 300 mm × 450 mm or larger at the bottom of ship for grounding.



### 3. CHECK AFTER INSTALLATION

#### 3.1 Antenna

- (1) The antenna is far from an antenna of a transmitter, whip antenna, radar antenna, stays, cables, etc.
- (2) Check that the N S direction of the antenna is correct and parallel to the keel line.
- (3) Check that connectors are well fabricated.
- (4) Check conduction and insulation of the antenna cable.
- (5) Check that cable holder is fastened to the flange tightly.
- (6) Are BNC connections on the antenna side correct ? Check red mark.
- (7) Check assembly and confirm that antenna elements are well fastened.
- (8) Check that cable is not laid in the air but laid along poles and rails with cable bands.
- (9) Check that the loop antenna cable is not parallel to other cables and lines.
- (10) The antenna cable is not exposed to high temperature.
- (11) The antenna cable is protected from mechanical damage with pipe.
- (12) Check that the inlet of the antenna cable is watertight.

#### 4.2 Main Unit

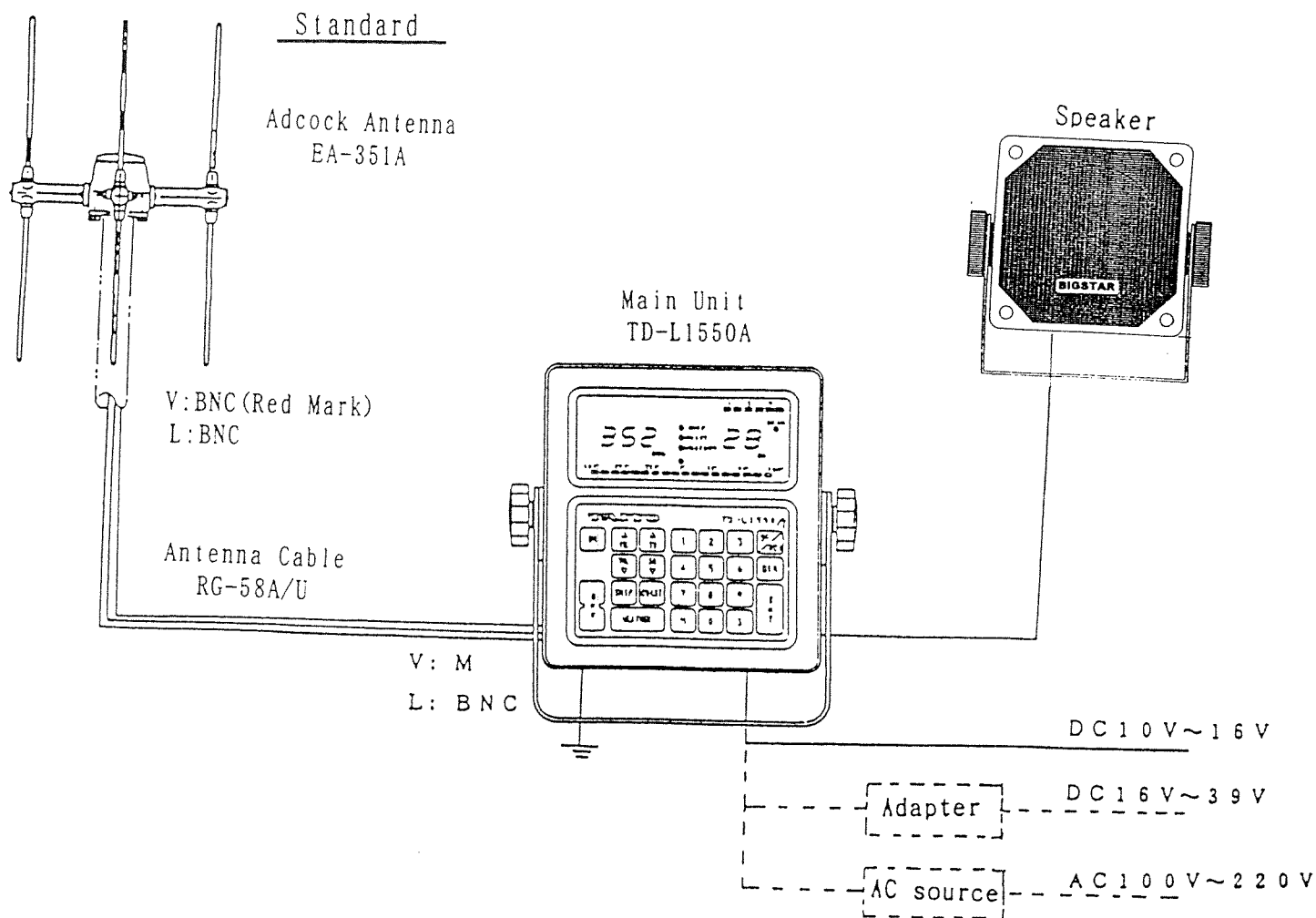
- (1) Check that the ground terminal of the main unit is directly connected to the grounding point of the ship with copper belt ?
- (2) Check that the end of the cable have been processed according to the installation manual.
- (3) Check the position of the main unit.
  - (a) not exposed to direct sunshine, heat radiation
  - (b) not close to heat source.
  - (c) kept off from splash, rain fall, dew or high humidity and strong vibration.
  - (d) installed at a position where its display is easily visible and ample space is provided for operation and maintenance.
- (4) Connection of cables are all right and there are enough margin in their length for check.
  - (a) Power cable
  - (b) antenna cable
  - (c) Speaker cable
  - (d) Grounding line

### 3.3 Performance Check

- (1) Measure and make error correction curve.
- (2) Check functions
  - (a) spot reception of VHF channels
  - (b) volume control
  - (c) squelch control
  - (d) scan reception
- (3) Mutual interference with other electronic equipment as shown below is small enough.
  - (a) Radio transmitter
  - (b) Receivers
  - (c) Radar
  - (d) Sonar
  - (e) Other navigation equipment

## 4. DIAGRAMS

Diagram 1 Connection Diagram



Recommend to use following Antenna Cable depending on required length in order to avoid from attenuation.

Antenna Cable: Twin Coaxial Cable.

16m or shorter: RG-58A/U

17~29m : 5D-2V

30m or longer : 8D-2V

Remark: When using 5D-2V or 8D-2V, additional joint cables for both Cable ends are required as those have larger diameter than that of RG58A/U.

# Option

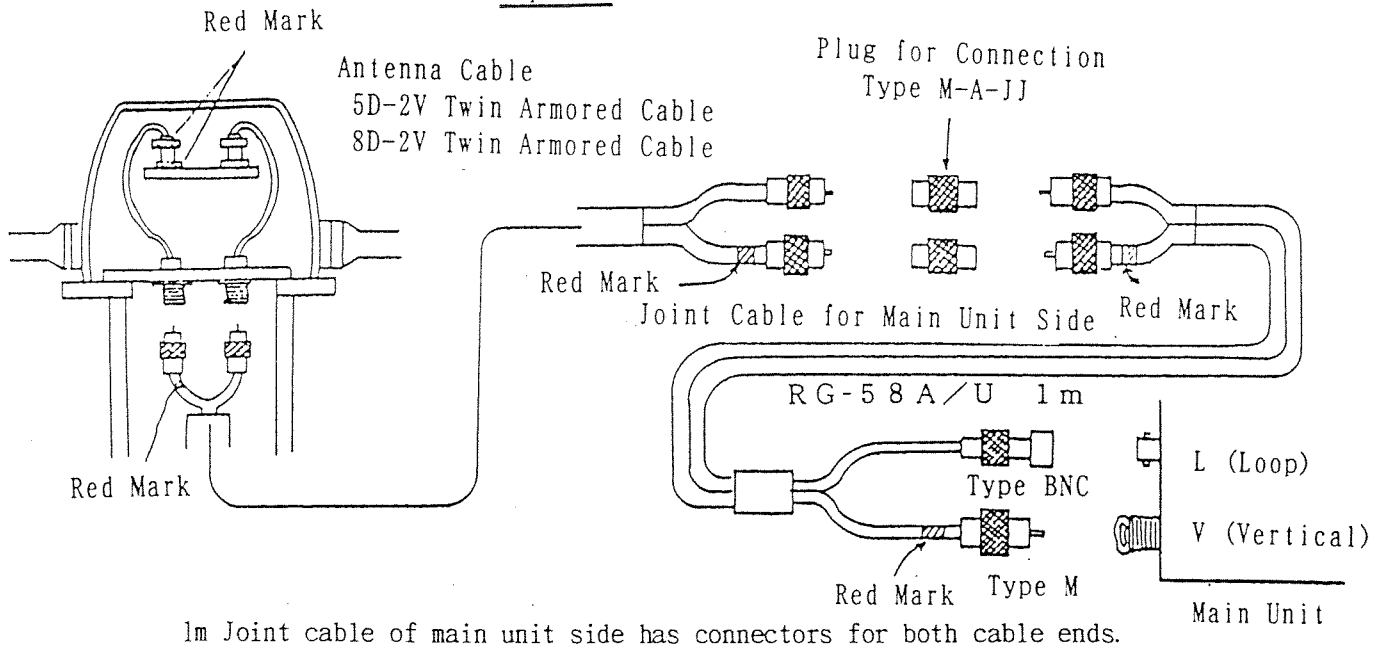


Diagram 2 Main Unit

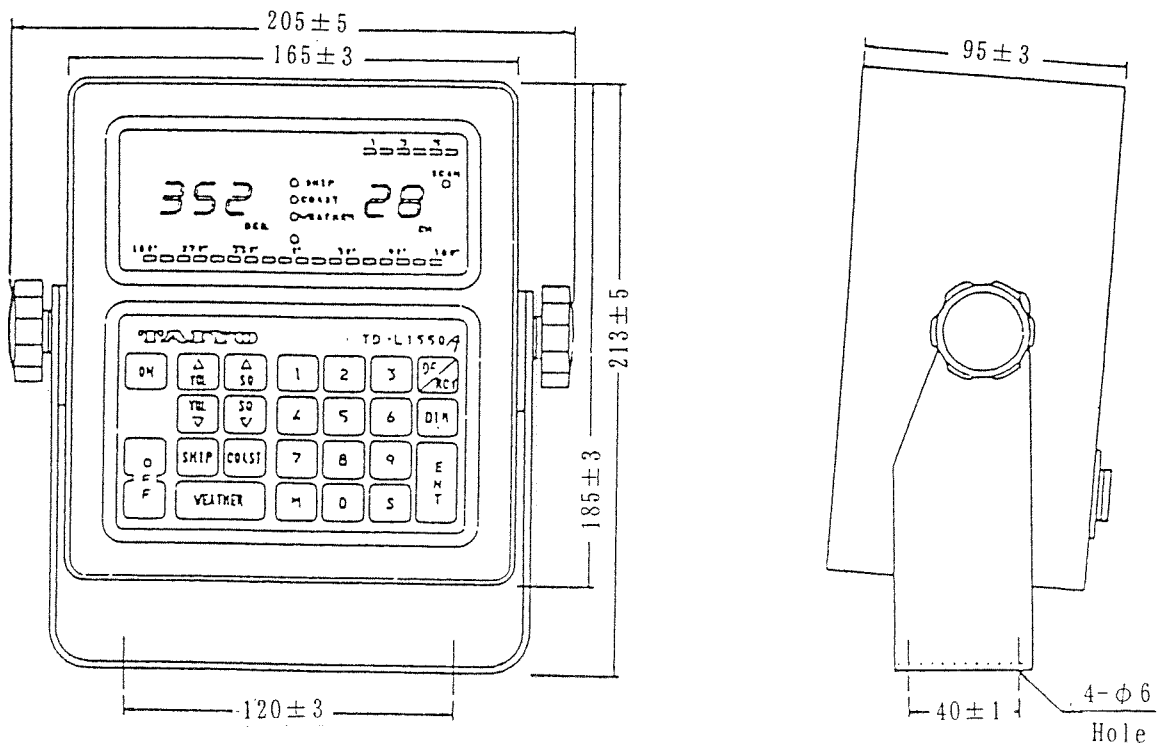


Diagram 3 Antenna Unit

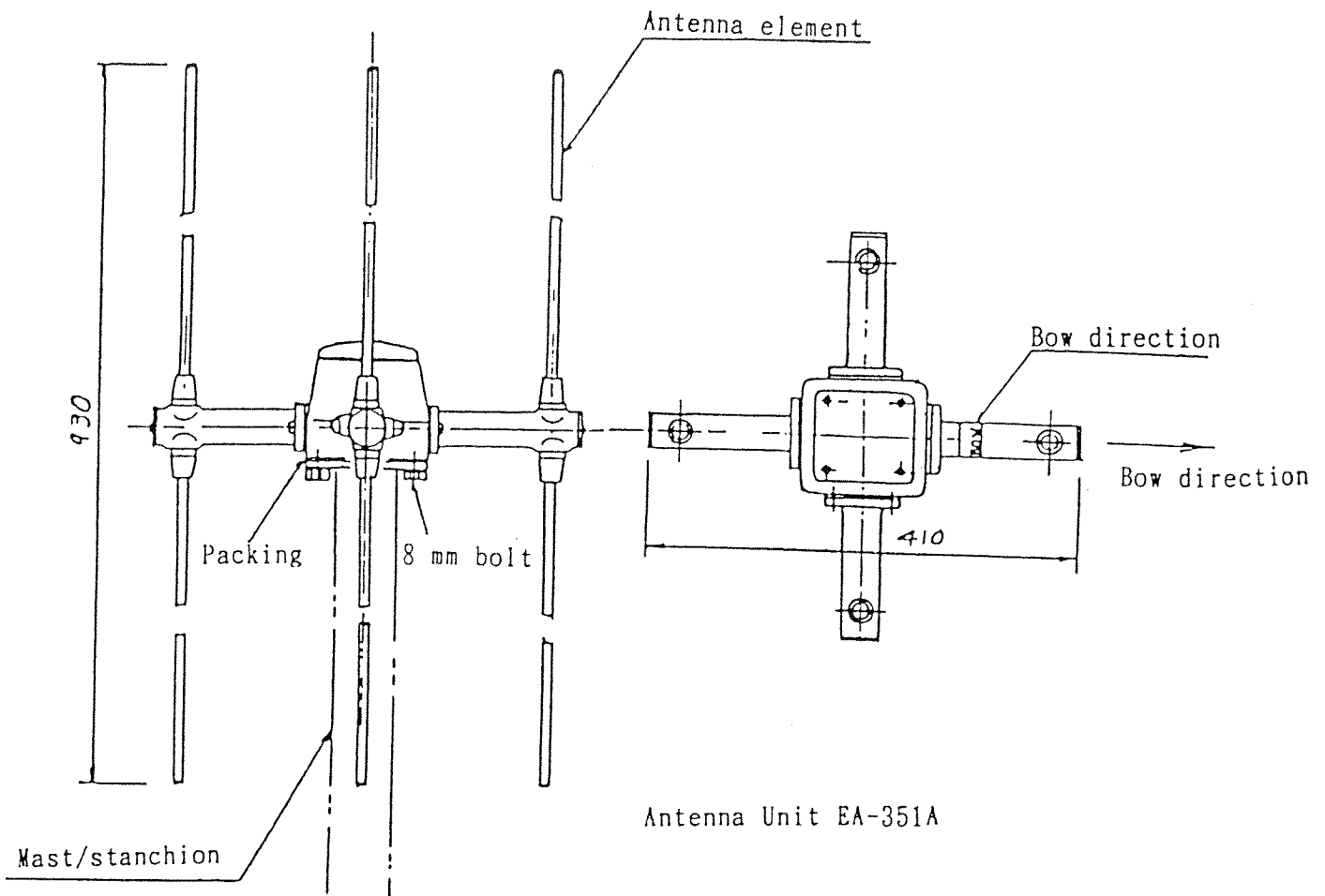
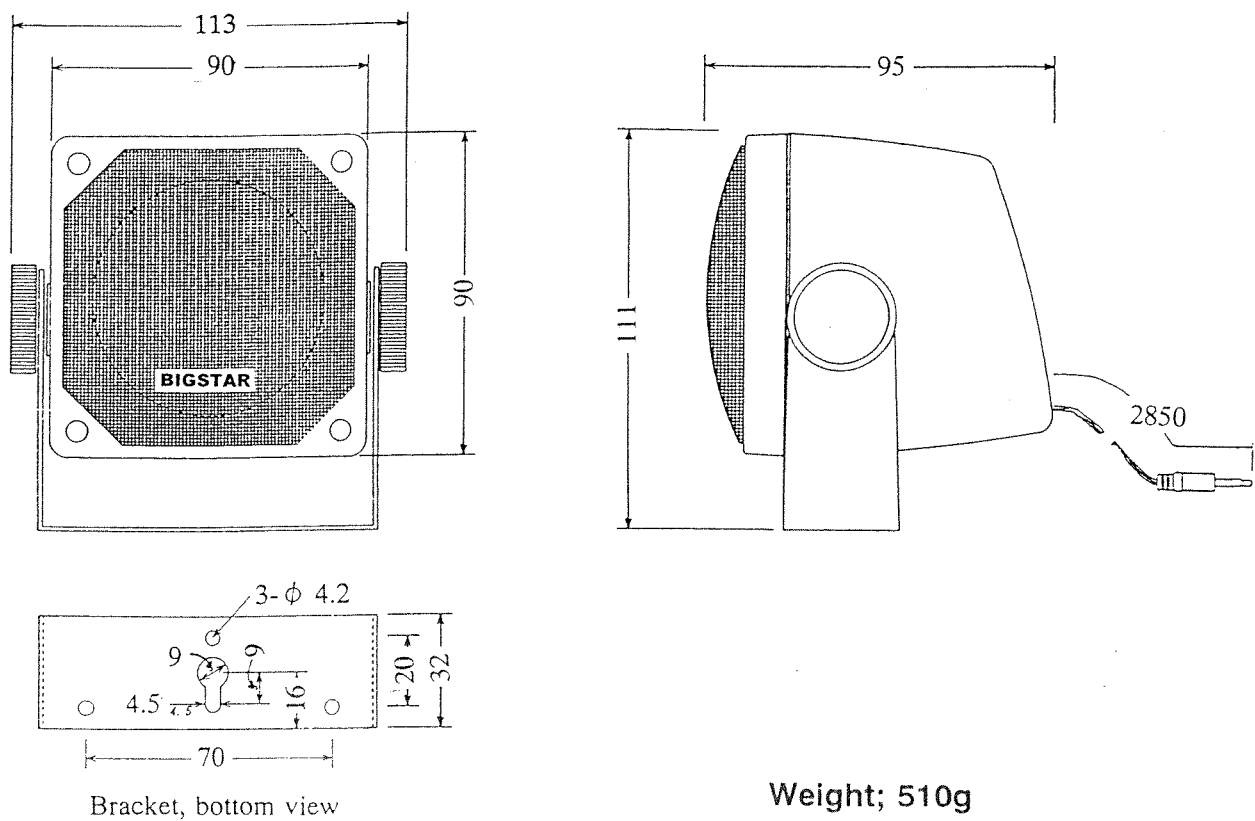


Diagram 4 Speaker Unit





## Chapter III MAINTENANCE

### 1. CIRCUITS

#### 1.1 Description of printed circuit boards

The block diagram of the circuit is shown in diagrams and functions of printed circuit boards in the circuit are explained in the following table.

PB No.	Drawing No.	Name and Functions
A 3594	320393	Receiver Unit, Antenna circuit, RF amp., IF amplifiers, Synthesized local oscillator, detector, AF amp.
A 3595	320292	Microprocessor Unit, data processing
A 3596	330462	Display Unit
A 5280		Keyboard Unit

### 2. PERFORMANCE TEST

#### 2.1 Test Equipment

Following test equipment should be provided for test.

- (1) Signal generator (abbreviated as SG) : covering VHF frequency
- (2) Dummy antenna (antenna simulator, abbreviated as DUMMY : TM-643
- (3) Frequency counter : covering VHF frequency
- (4) Multimeter

#### 2.2 Test

##### 2.2.1 Sensitivity

###### (1) Arrangement

SG : No modulation

Main Unit : RCV mode, SQ minimum (open). SG signal to M connector

Measure output at speaker terminals with AF voltmeter

DUMMY to BNC connector.

- (2) Set SG at 156.025 MHz, main unit at SHIP-60.  
 Make SG output off and adjust volume to make output 1 V (noise).  
 Make SG output on. Read SG when speaker output is 0.1 V (-20 dB)  
 : OK when SG reading is 6 dBm or smaller.
- (3) Set SG at 157.425 MHz, main unit at SHIP-88.  
 Read SG when speaker output is 0.1 V (-20 dB)  
 : OK when SG reading is 6 dBm or smaller.
- (4) Set SG at 162.550 MHz, main unit at WEATHER-1.  
 Read SG when speaker output is 0.1 V (-20 dB)  
 : OK when SG reading is 6 dBm or smaller.
- (5) Set SG at 121.500 MHz, main unit at SHIP-99 (EP).  
 Arrange SG to AM 1 KHz, 30% modulation.  
 Make SG output on and adjust volume to make output 0.3 V.  
 Make SG modulation off. Read SG when speaker output is 0.15 V (-6 dB).  
 : OK when SG reading is 10 dBm or smaller.

### 2.2.2 Level indicator

- (1) Arrangement  
 SG : No modulation, 157.425 MHz.  
 DUMMY : Feed output to the DUMMY. Turn V signal (Adcock signal) on.  
 Main Unit : RCV mode, SQ minimum (open), SHIP-88
- (2) Adjust SG output to make one LED of the level indicator on.  
 : OK when input is  $(-2 \pm 5)$  dB  $\mu$ V/m. Since there is a loss of 36 dB in the dummy circuit, the SG reading should be  $(34 \pm 5)$  dB  $\mu$ V/m.
- (3) Adjust SG output to make all LEDs (6) of the level indicator on.  
 : OK when input is  $(52 \pm 5)$  dB  $\mu$ V/m (SG reading :  $88 \pm 5$  dB  $\mu$ V/m).

### 2.2.3 Voice level

- (1) SG : 157.425 MHz, FM 1 kHz modulation, 3 kHz deviation,  
 60 dB  $\mu$ V/m  
 Main Unit : RCV mode, SQ minimum (open), SHIP-88  
 Make volume control maximum and read output voltage at speaker terminals  
 : OK when reading is 3.5 V or more.
- (2) SG : 121.500 MHz, AM 1 kHz 70% modulation, 60 dB  $\mu$ V/m  
 Main Unit : RCV mode, SQ minimum (open), SHIP-99 (EP)  
 DUMMY : Feed output to the DUMMY. Turn V signal on.  
 Make volume control maximum and read output voltage at speaker terminals  
 : OK when reading is 3.0 V or more.

## 2.2.4 Squelch

- (1) SG : 156.025 MHz, FM 1 kHz modulation, 3 kHz deviation  
Main Unit : RCV mode, SQ minimum (open), SHIP-60, volume maximum.  
DUMMY : Feed SG output to the DUMMY. Turn V signal on.  
Make SG off and adjust SQ key so that noise begins to cease.  
Make SG on and read SG output when sound becomes audible.  
: OK when input is  $3\text{dB}\mu\text{V/m}$  or less. (SG output  $39\text{dB}\mu\text{V/m}$  or less).
- (2) SG : 156.025 MHz, FM 1 kHz modulation, 3 kHz deviation  
Main Unit : RCV mode, SQ minimum (open), SHIP-60, volume maximum.  
DUMMY : Feed SG output to the DUMMY. Turn V signal on.  
Make SG off and adjust SQ key so that the level indicator is at the maximum. Then, supply SG signal and read input when sound is heard.  
: OK when input is  $12\text{dB}\mu\text{V/m}$  or less. (SG output  $48\text{dB}\mu\text{V/m}$  or less).

## 2.2.5 Direction measurement

- (1) Arrangement  
SG : No modulation,  $60\text{dB}\mu\text{V/m}$   
Main Unit : DF mode,  
DUMMY : Feed SG output to the DUMMY.
- (2) Set SG at 156.025 MHz, Main Unit at SHIP-60  
Set DUMMY NS and V on : OK when direction reading is  $0^\circ \pm 3^\circ$   
NS, EW and V on : OK when direction reading is  $45^\circ \pm 3^\circ$   
EW and V on : OK when direction reading is  $90^\circ \pm 3^\circ$
- (3) Set SG at 157.425 MHz, Main Unit at SHIP-88  
Set DUMMY NS and V on : OK when direction reading is  $0^\circ \pm 3^\circ$   
NS, EW and V on : OK when direction reading is  $45^\circ \pm 3^\circ$   
EW and V on : OK when direction reading is  $90^\circ \pm 3^\circ$
- (4) Set SG at 152.550 MHz, Main Unit at WEATHER-1  
Set DUMMY NS and V on : OK when direction reading is  $0^\circ \pm 3^\circ$   
NS, EW and V on : OK when direction reading is  $45^\circ \pm 3^\circ$   
EW and V on : OK when direction reading is  $90^\circ \pm 3^\circ$

(5) Set SG at 121.500 MHz, Main Unit at SHIP-99 (EP)

Set DUMMY NS and V on : OK when direction reading is  $0^{\circ} \pm 3^{\circ}$   
NS, EW and V on : OK when direction reading is  $45^{\circ} \pm 3^{\circ}$   
EW and V on : OK when direction reading is  $90^{\circ} \pm 3^{\circ}$

## 2.2.6 Sensitivity for direction measurement

### (1) Arrangement

SG : No modulation

Main Unit : DF mode

DUMMY : Feed SG output

(2) Set SG at 156.025 MHz, main unit at SHIP-60.

Read SG output when direction indicator shows a stagger of  $5^{\circ}$   
: OK when input is  $-6 \text{ dB } \mu\text{V/m}$  or less. (SG output  $30 \text{ dB } \mu\text{V/m}$  or less).

(3) Similar test at 157.425 MHz, main unit at SHIP-88, at 162.550 MHz, main unit at WEATHER-1.

(4) Set SG at 121.500 MHz, main unit at SHIP-99.

Read SG output when direction indicator shows a stagger of  $5^{\circ}$   
: OK when input is  $0 \text{ dB } \mu\text{V/m}$  or less. (SG output  $36 \text{ dB } \mu\text{V/m}$  or less).

## 2.2.7 Function check

(1) Power : Check power on-off

(2) LEDs

(a) Turn on power while pressing [1] key. : OK when "3" appears for all numeric displays.

(b) Then, press [ENT] key. After 10 seconds, numerics are updated with pip sounds. Beep sound in place of pips indicates trouble in RAM.

(3) Check sum

Turn on power while pressing [DF/RCV] key. : OK when blinking check sum number appears on the channel display after several seconds.

(4) Check keys

(a) Press numeric keys, type keys and function keys. : OK when pip sound is heard.

(b) [DIM] key : OK when brightness changes cyclically.

(c) [SHIP], [COAST] and [WEATHER] key : OK when corresponding LED is lit at the channel display.

- (d) [Vol] and [SQ] keys : OK when LED bar MOVES at direction indicator.  
 $\triangle$  key towards right and  $\nabla$  key towards left except two bars on the right which do not lit.
  - (e) [SHIP]→[99]→[ENT] : OK when channel LEDs are put out and "EP" appears.
  - (f) [WEATHER] key : OK when weather LED is lit and weather of fishing channels can be set. "U" is for weather and "F" is for fishing.
  - (g) [ENT] key : OK when pip sound for correct input and beep sound for erroneous input.
  - (h) [M] key key : OK when memory address number blinks. Another press restores direction display.
  - (i) [S] key : OK when SCAN LED is lit and SCAN starts.  
 When pressing is continued, bar LED is put out.
  - (j) [DF/RCV] key : DF or RCV mode takes place in turn. In RCV, both direction displays are put out.
- (5) SCAN Auto start/stop
- (a) Prepare for SCAN reception by entering channels and make SQ maximum. Start SCAN by pressing [S] and confirm function with SCAN LED. Check auto start/stop with [1], [2], [3] and [4] by tuning to an arbitrary channel.
  - (b) Check that SCAN stops when one of following keys, [SHIP], [COAST], [WEATHER], [M] and [ENT]< is pressed.
- (6) Confirm that a channel is write-in by [M] → [CHANNEL NUMBER] → [M]
- (7) Confirm that a channel is retrieved by [M] → [CHANNEL NUMBER] → [ENT]
- (8) Turn power off and turn on to check that memory is back-upped.
- (9) Check memory delete
- (a) Check that an address can be deleted by [97] → [M] → [ADDRESS] → [M]
  - (b) Turn on power while pressing [3] key and then press [ENT] : OK when "5" appears for all numeric displays and whole memory is cleared.  
 Note : Take note of address-channel before deletion.
- (10) Scan pass and its release
- (a) Check that Scan is suspended by scan pass : [99] → [S]
  - (b) Check that Scan pass is released by scan pass release : [99] → [S]

### 3. ADJUSTMENT

#### 3.1 Stabilizer

Adjust and check DC stabilized voltage in PB-A3594.

- (1) Adjust RV5 to make voltage at J9-2 to be  $9.0 \pm 0.1$  V.
- (2) Confirm that the voltage at J8-3 to be  $5.0 \pm 0.2$  V.
- (3) Confirm that the voltage at U2-4 (2001) to be  $5.0 \pm 0.2$  V.
- (4) Confirm that the voltage at U11-14 (4001) to be  $5.0 \pm 0.2$  V.
- (5) Confirm that the voltage at U4-4 (3359D) to be  $6.2 \pm 0.5$  V.

#### 3.2 Synthesizer

Adjust and check the lock voltage in PB-A3594.

- (1) Arrange to receive WEATHGER-1. Adjust L6 to make voltage at TP-8 to be  $3.5 \pm 0.1$  V.
- (2) Arrange to receive SHIP-01. Check that the voltage at TP-8 to be  $2.2 \sim 2.5$  V.
- (3) Arrange to receive SHIP-99 (EP). Check that the voltage at TP-8 to be  $3.8 \pm 0.2$  V.
- (4) Arrange to receive SHIP-01. Adjust CV2 to have a frequency at TP-2 to be  $134.650 \text{ MHz} \pm 100 \text{ Hz}$ .
- (5) Fix CV2 with paraffine.

#### 3.3 Second IF frequency

Adjust the second IF circuit to tune at 455 kHz in PB-A3594.

- (1) Supply SG output, 455 kHz 1 kHz 70% modulation  $50 \text{ dB} \mu\text{V/m}$ , to TP-3.
- (2) Adjust T10 and T11 to make the output at R99 (4.7k) maximum (about 40 mV)
- (3) Then, supply SG output, 455 kHz 1 kHz 70% modulation  $70 \text{ dB} \mu\text{V/m}$ , to TP-12.
- (4) Adjust T12 to make the output at TP-7 maximum (about 25 mV).

#### 3.4 Second local oscillator

Adjust the frequency of the second local oscillator to get the second IF of 455 kHz in PB-A3594.

- (1) Supply SG output, 21.4 MHz CW  $50 \text{ dB} \mu\text{V/m}$ , to TP-1.
- (2) Adjust CV-1 to make the output at TP-4 is 455.00 kHz is  $455 \text{ kHz} \pm 50 \text{ kHz}$

### 3.5 RF and IF

Adjust RF and IF circuits to have optimum frequency characteristics in PB-A3954.

- (1) Supply SG output, 162.000 MHz 1 kHz 70% modulation 20 dB $\mu$ V/m, to J2 and terminate J1 with 47 $\Omega$ . Set Main Unit to RCV mode and arrange to receive COAST-28. Measure output at TP-7 and make it maximum by adjusting T8, T7, T6, T5, T4, T3, T13 and T2.
- (2) Set SG to 121.500 MHz, 1 kHz 70% modulation, 20 dB $\mu$ V/m, and supply output to J2. Set Main Unit to RCV mode and arrange to receive SHIP-99 (EP). Make the voltage at TP-7 maximum by adjusting CV8, CV7, CV6, CV5 and CV4.
- (3) Set SG to 162.000 MHz, 1 kHz 70% modulation, 20 dB $\mu$ V/m, and supply output to J1 and terminate J2 with 47  $\Omega$ . Set Main Unit to DF mode and arrange to receive COAST-28. Make the voltage at TP-7 maximum by adjusting T1.
- (4) Set SG to 121.500 MHz, 1 kHz 70% modulation, 20 dB  $\mu$ V/m, and supply output to J1 and terminate J2 with 47  $\Omega$ . Set Main Unit to DF mode and arrange to receive SHIP-99 (EP). Make the voltage at TP-7 maximum by adjusting CV3.
- (5) Repeat (1) and (3).

### 3.6 AGC

Check AGC function in A3594.

- (1) Supply SG output, 157.425 MHz 1 kHz 70% modulation 80 dB $\mu$ V/m, to J2 and terminate J1 with 47 $\Omega$ . Set Main Unit to RCV mode and arrange to receive SHIP-88. Measure output at R99 (4.7 k $\Omega$ ) AM OUT. Its value is about 75 mV.

### 3.7 FM detection and volume control.

Adjust FM detection circuit and AM circuit in PB-A3594.

- (1) Supply SG output, 157.425 MHz 1 kHz 70% modulation 20 dB $\mu$ V/m, to J2 and terminate J1 with 47 $\Omega$ . Set Main Unit to RCV mode and arrange to receive SHIP-88. Turn RV-1 to 1/4 rotation. Measure output at J5-1 and make it maximum by adjusting T9.
- (2) Make the level indicator maximum by controlling SG output. Adjust RV1 so that the output at J5-1 is  $3.0 \pm 0.2$  V.

### 3.8 Adjustment of level indicator

Adjust level indicator circuit in PB-A3594.

- (1) Supply SG output, 157.425 MHz CW.

Set the main unit to receive SHIP-88.

Connect dummy antenna and set NS and V on. Supply SG signal of 34dB  $\mu$ V/m.

Adjust RV-3 to have one LED of the level indicator is lit.

- (2) Adjust RV-4 so that all LEDs are lit at an SG output of 88dB  $\mu$ V/m.
- (3) Iterate (1) and (2) so that SG output is within 2 dB of above-cited values.

### 3.9 Adjustment for direction measurement

- (1) Supply SG output, 157.425 MHz CW, 60dB  $\mu$ V/m.

Set the main unit to receive SHIP-88.

Connect dummy antenna and set NS and V on and EW off.

Adjust RV-2 to have a direction display of 0° and 1° alternatively.

- (2) Make V, NS and EW on and confirm that the display is  $45^\circ \pm 3^\circ$ .
- (3) Make V and EW on and NS off. Confirm that the display is  $90^\circ \pm 3^\circ$ .
- (4) Repeat (1), (2) and (3) for SHIP-60 (156.025 MHz) and W-1 (162.550 MHz) and confirm that it is within an error of  $\pm 3^\circ$ .
- (5) Repeat (1), (2) and (3) for EP (121.500 MHz) and confirm that it is within an error of  $\pm 5^\circ$ .

### 3.9 Wave check of balanced modulation

- (1) Supply SG output, 156.025 MHz CW, 60dB  $\mu$ V/m.

Set the main unit to receive SHIP-60.

Connect dummy antenna and set V, NS and EW on.

- (2) Observe and check balanced modulation wave at TP-4 in IF circuit.
- (3) Repeat (2) for COAST-60 (160.025 MHz) and W-1 (162.550 MHz).



# VHF ADF TEST SHEET

Model : TD-L 1550A

Serial No. :

## 1. Sensitivity ("RCV" mode)

Signal	Channel	Frequency	Sensitivity	Criteria	Result
FM	SHIP-60	156.025MHz	dB	$\leq 6$ dB	
FM	SHIP-88	157.425MHz	dB	$\leq 6$ dB	
FM	WEATHER 1	162.550MHz	dB	$\leq 6$ dB	
AM	EP	121.500MHz	dB	$\leq 10$ dB	

## 2. Bearing Accuracy ("DF" mode)

Signal	Channel	Frequency	0°	45°	90°	Criteria	Result
FM	SHIP-60	156.025MHz				$\pm 3^\circ$	
FM	SHIP-88	157.425MHz				$\pm 3^\circ$	
FM	WEATHER 1	162.550MHz				$\pm 3^\circ$	
AM	EP	121.500MHz				$\pm 3^\circ$	

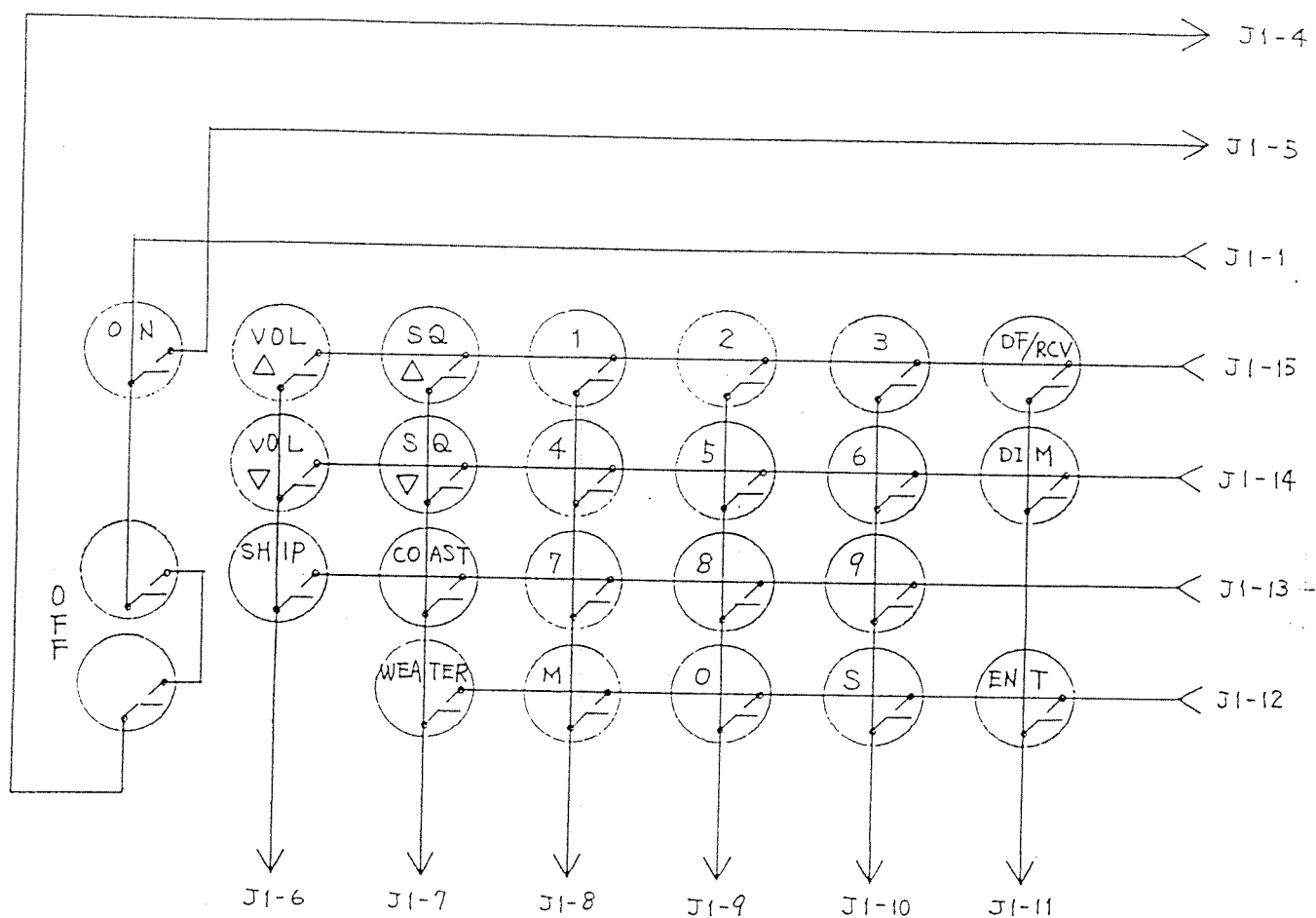
## 3. Function check

- (1) LED
- (2) Check keys
- (3) Scan
- (4) Memory
- (5) Scan pass

Tested on 19

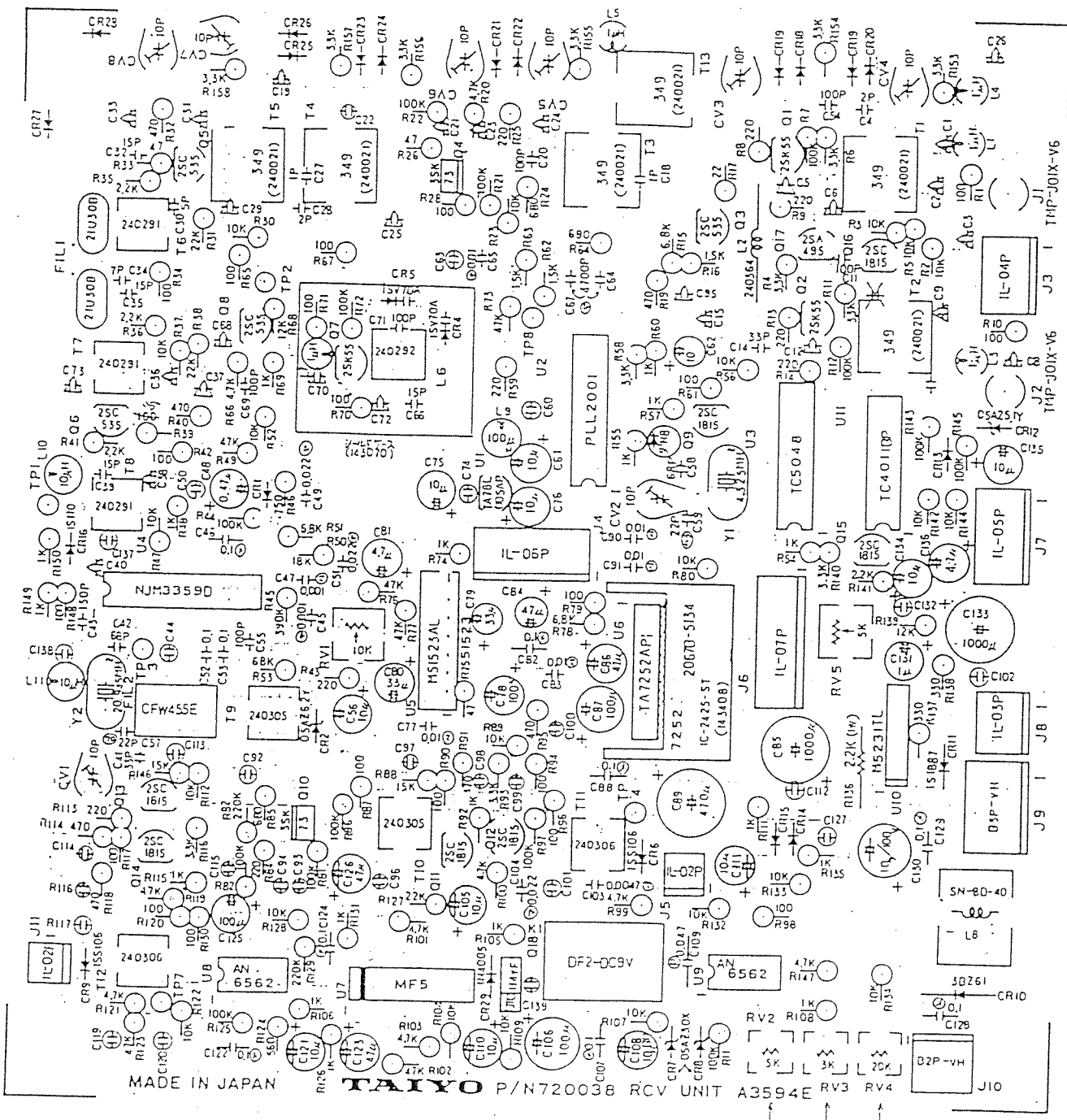
Tested by :

Inspected by :

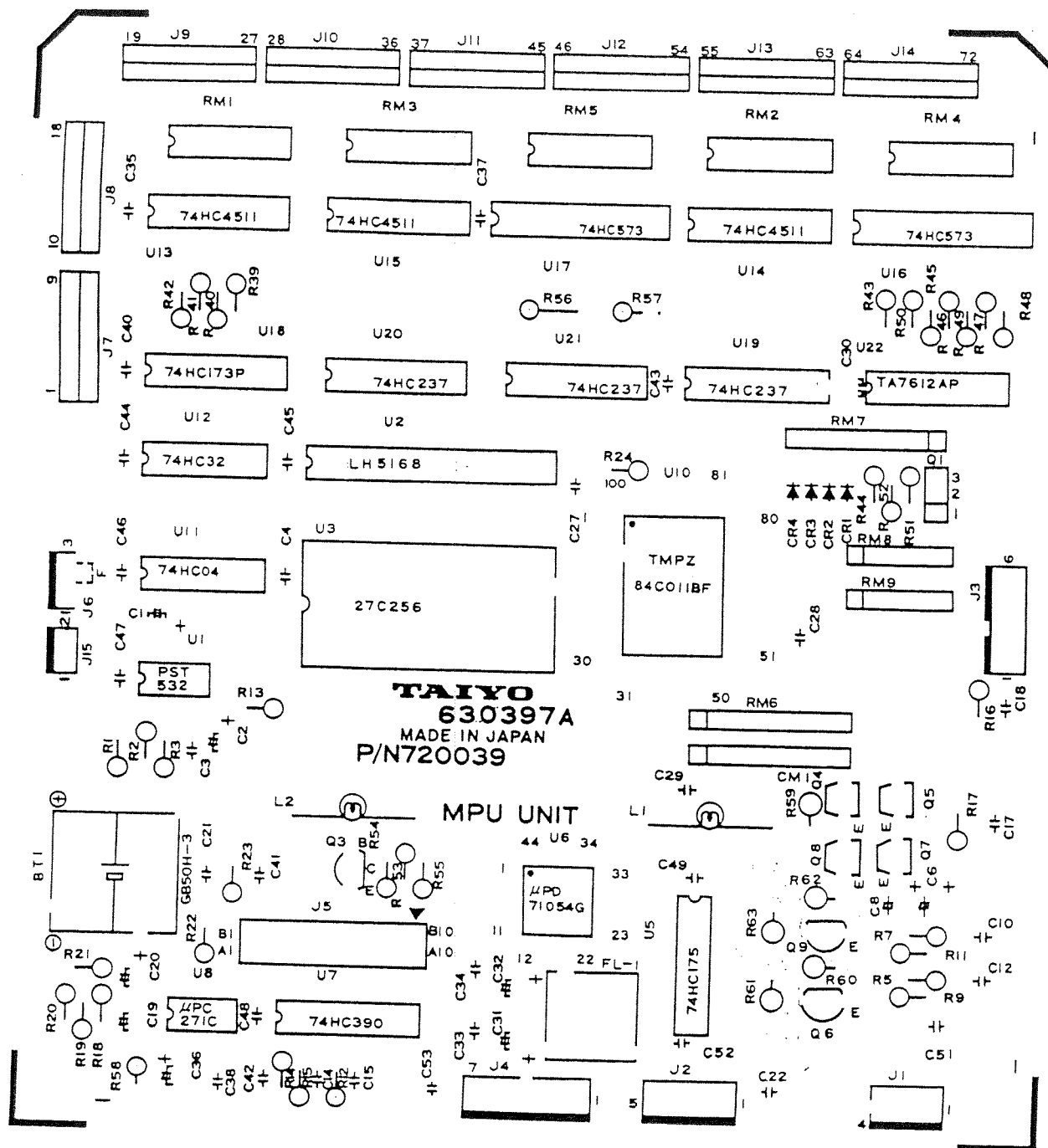


DIVISION	5.2 CONNECTION DIAGRAMS
TITLE	PB-A3597 KEYBOARD UNIT
DRAWING NO	3 4 0 6 8 1
TAIYO MUSEN CO., LTD.	

### 5. 3. LAYOUT DIAGRAMS



DIVISION	5. 3 LAYOUT DIAGRAMS
TITLE	PB-A3594 RECIVER UNIT
DRAWING NO	7 2 0 0 3 8
T A I Y O M U S E N C O . , L T D .	



DIVISION	5.3 LAYOUT DIAGRAMS
TITLE	PB-A3595 MPU UNIT
DRAWING NO	7 2 0 0 3 9
TAIYO MUSEN CO., LTD.	

# PARTS LIST

PB-1 (A3594)

No.	Name	Description	No.	Name	Description
C 1	Ceramic capacitor	1000pF, 50V	C 2	Ceramic capacitor	1000pF, 50V
C 3	Ceramic capacitor	1000pF, 50V	C 4	Ceramic capacitor	2pF, 50V
C 5	Ceramic capacitor	1000pF, 50V	C 6	Ceramic capacitor	1000pF, 50V
C 7	Ceramic capacitor	1000pF, 50V	C 8	Ceramic capacitor	1000pF, 50V
C 9	Ceramic capacitor	1000pF, 50V	C 10	-----	-----
C 11	Ceramic capacitor	100pF, 50V	C 12	Ceramic capacitor	1000pF, 50V
C 13	-----	-----	C 14	Ceramic capacitor	33pF, 50V
C 15	Ceramic capacitor	1000pF, 50V	C 16	Ceramic capacitor	2pF, 50V
C 17	Ceramic capacitor	1000pF, 50V	C 18	Ceramic capacitor	1pF, 50V
C 19	Ceramic capacitor	1000pF, 50V	C 20	Ceramic capacitor	100pF, 50V
C 21	Ceramic capacitor	1000pF, 50V	C 22	Ceramic capacitor	0.01 $\mu$ F, 50V
C 23	Ceramic capacitor	1000pF, 50V	C 24	Ceramic capacitor	33pF, 50V
C 25	Ceramic capacitor	1000pF, 50V	C 26	Ceramic capacitor	1000pF, 50V
C 27	Ceramic capacitor	1pF, 50V	C 28	Ceramic capacitor	2pF, 50V
C 29	Ceramic capacitor	1000pF, 50V	C 30	Ceramic capacitor	5pF, 50V
C 31	Ceramic capacitor	1000pF, 50V	C 32	Ceramic capacitor	15pF, 50V
C 33	Ceramic capacitor	1000pF, 50V	C 34	Ceramic capacitor	7pF, 50V
C 35	Ceramic capacitor	15pF, 50V	C 36	Ceramic capacitor	1000pF, 50V
C 37	Ceramic capacitor	1000pF, 50V	C 38	Ceramic capacitor	1000pF, 50V
C 39	Ceramic capacitor	15pF, 50V	C 40	Ceramic capacitor	1000pF, 50V
C 41	Ceramic capacitor	33pF, 50V	C 42	Ceramic capacitor	68pF, 50V
C 43	Ceramic capacitor	33pF, 50V	C 44	Ceramic capacitor	0.01 $\mu$ F, 50V
C 45	Miler capacitor	0001 $\mu$ F, 50V	C 46	Metallized cap.	0.1 $\mu$ F, 100V
C 47	Miler capacitor	0001 $\mu$ F, 50V	C 48	Electrolytic cap.	1pF, 50V
C 49	Miler capacitor	0022 $\mu$ F, 50V	C 50	Ceramic capacitor	0.01 $\mu$ F, 50V
C 51	Miler capacitor	0022 $\mu$ F, 50V	C 52	Ceramic capacitor	0.1 $\mu$ F, 25V
C 53	Ceramic capacitor	0.1 $\mu$ F, 25V	C 54	Ceramic capacitor	100pF, 50V
C 55	Ceramic capacitor	100pF, 50V	C 56	Electrolytic cap.	10 $\mu$ F, 16V
C 57	Ceramic capacitor	22pF, 50V	C 58	Ceramic capacitor	68pF, 50V
C 59	Ceramic capacitor	22pF, 50V	C 60	Ceramic capacitor	0.01 $\mu$ F, 50V

## PB-1 (A3594) continued

No.	Name	Description	No.	Name	Description
C 61	Electrolitic cap.	10 $\mu$ F, 16V	C 62	Electrolytic cap.	10 $\mu$ F, 16V
C 63	Ceramic capacitor	0.01 $\mu$ F, 50V	C 64	Miler capacitor	4700pF, 50V
C 65	Ceramic capacitor	0.01 $\mu$ F, 50V	C 66	Ceramic capacitor	15pF, 50V
C 67	Miler capacitor	4700pF, 50V	C 68	Ceramic capacitor	1000pF, 50V
C 69	Ceramic capacitor	100pF, 50V	C 70	Ceramic capacitor	1000pF, 50V
C 71	Ceramic capacitor	100pF, 50V	C 72	Ceramic capacitor	1000pF, 50V
C 73	Ceramic capacitor	1000pF, 50V	C 74	Ceramic capacitor	0.01 $\mu$ F, 50V
C 75	Electrolitic cap.	10 $\mu$ F, 16V	C 76	Electrolytic cap.	10 $\mu$ F, 16V
C 77	Miler capacitor	0.01 $\mu$ F, 50V	C 78	Electrolytic cap.	100 $\mu$ F, 16V
C 79	Electrolitic cap.	33 $\mu$ F, 16V	C 80	Electrolytic cap.	33 $\mu$ F, 16V
C 81	Electrolitic cap.	4.7 $\mu$ F, 25V	C 82	Metallized cap.	0.1 $\mu$ F, 100V
C 83	Miler capacitor	0.01 $\mu$ F, 50V	C 84	Electrolytic cap.	47 $\mu$ F, 16V
C 85	Electrolytic cap.	1000 $\mu$ F, 16V	C 86	Electrolytic cap.	47 $\mu$ F, 16V
C 87	Electrolytic cap.	100 $\mu$ F, 16V	C 88	Metallized cap.	0.1 $\mu$ F, 100V
C 89	Electrolytic cap.	470 $\mu$ F, 16V	C 90	Miler capacitor	0.01 $\mu$ F, 50V
C 91	Miler capacitor	0.01 $\mu$ F, 50V	C 92	Ceramic capacitor	0.01 $\mu$ F, 50V
C 93	Ceramic capacitor	0.01 $\mu$ F, 50V	C 94	Ceramic capacitor	0.01 $\mu$ F, 50V
C 95	-----	-----	C 96	Ceramic capacitor	0.01 $\mu$ F, 50V
C 97	Ceramic capacitor	0.01 $\mu$ F, 50V	C 98	Ceramic capacitor	0.01 $\mu$ F, 50V
C 99	Ceramic capacitor	0.01 $\mu$ F, 50V	C100	Ceramic capacitor	0.01 $\mu$ F, 50V
C101	Ceramic capacitor	0.01 $\mu$ F, 50V	C102	Ceramic capacitor	0.01 $\mu$ F, 50V
C103	Miler capacitor	4700pF, 50V	C104	Miler capacitor	0.022 $\mu$ F, 50V
C105	Electrolytic cap.	10 $\mu$ F, 16V	C106	Electrolytic cap.	100 $\mu$ F, 16V
C107	Metallized cap.	0.1 $\mu$ F, 100V	C108	Electrolytic cap. (non-polarization)	10 $\mu$ F, 16V
C109	Polypropylene cap.	0.047 $\mu$ F, 50V	C110	Electrolytic cap.	10 $\mu$ F, 16V
C111	Electrolytic cap.	10 $\mu$ F, 16V	C112	Ceramic capacitor	0.01 $\mu$ F, 50V
C113	Ceramic capacitor	0.01 $\mu$ F, 50V	C114	Ceramic capacitor	0.01 $\mu$ F, 50V
C115	Ceramic capacitor	0.01 $\mu$ F, 50V	C111	Ceramic capacitor	0.01 $\mu$ F, 50V
C117	Ceramic capacitor	0.01 $\mu$ F, 50V	C118	-----	-----
C119	Ceramic capacitor	0.01 $\mu$ F, 50V	C120	Ceramic capacitor	0.01 $\mu$ F, 50V

PB-1 (A3594) continued

No.	Name	Description	No.	Name	Description
C121	Electrolytic cap.	10 $\mu$ F, 16V	C122	Metallized cap.	0.1 $\mu$ F, 100V
C123	Electrolytic cap.	47 $\mu$ F, 16V	C124	Metallized cap.	0.1 $\mu$ F, 100V
C125	Electrolytic cap.	100 $\mu$ F, 16V	C126	Electrolytic cap.	47 $\mu$ F, 16V
C127	Ceramic capacitor	0.01 $\mu$ F, 50V	C128	Metallized cap.	0.1 $\mu$ F, 100V
C129	Metallized cap.	0.1 $\mu$ F, 100V	C130	Electrolytic cap.	10 $\mu$ F, 100V
C131	Electrolytic cap.	1 $\mu$ F, 100V	C132	Ceramic capacitor	0.01 $\mu$ F, 50V
C133	Electrolytic cap.	1000 $\mu$ F, 16V	C134	Electrolytic cap.	10 $\mu$ F, 16V
C135	Electrolytic cap.	1 $\mu$ F, 16V	C136	Electrolytic cap.	4.7 $\mu$ F, 25V
C137	Ceramic capacitor	0.01 $\mu$ F, 50V	C138	Ceramic capacitor	0.01 $\mu$ F, 50V
C139	Ceramic capacitor	0.01 $\mu$ F, 50V	C140	Ceramic capacitor	1pF, 50V
C141	Ceramic capacitor	5pF, 50V	C142	Ceramic capacitor	47pF, 50V

No.	Name	Description	No.	Name	Description
CR 1	Diode	1S1555 TOSHIBA	CR 1	Zener diode	05AZ6.2Y TOSHIBA
CR 3	LED	GL3PR8 SHARP	CR 4	Varic. diode	1SV70A HITACHI
CR 5	Varic. diode	1SV70A HITACHI	CR 6	Diode	1SS106 HITACHI
CR 7	Zener diode	05AZ3.0X TOSHIBA	CR 8	Zener diode	05AZ3.0X TOSHIBA
CR 9	Diode	1SS106 HITACHI	CR10	Diode	3BZ61 TOSHIBA
CR11	Diode	1S1887 TOSHIBA	CR12	Zener diode	05AZ5.1Y TOSHIBA
CR13	Diode	1S1555 TOSHIBA	CR14	Diode	1S1555 TOSHIBA
CR15	Diode	1S1555 TOSHIBA	CR16	Diode	1SS110 HITACHI
CR17	Diode	1S1555 TOSHIBA	CR18	Diode	1S1555 TOSHIBA
CR19	Diode	1S1555 TOSHIBA	CR20	Diode	1S1555 TOSHIBA
CR21	Diode	1S1555 TOSHIBA	CR22	Diode	1S1555 TOSHIBA
CR23	Diode	1S1555 TOSHIBA	CR24	Diode	1S1555 TOSHIBA
CR25	Diode	1S1555 TOSHIBA	CR26	Diode	1S1555 TOSHIBA
CR27	Diode	1S1555 TOSHIBA	CR28	Diode	1S1555 TOSHIBA
CR29	Diode	1N4005 TOSHIBA			

No.	Name	Description	No.	Name	Description
CV 1	Ceramic Trimmer	10PF	CV 2	Ceramic Trimmer	10PF
CV 3	Ceramic Trimmer	10PF	CV 4	Ceramic Trimmer	10PF
CV 5	Ceramic Trimmer	10PF	CV 6	Ceramic Trimmer	10PF
CV 7	Ceramic Trimmer	10PF	CV 8	Ceramic Trimmer	10PF

PB-1 (A3594) continued

No.	Name	Description	No.	Name	Description
FIL1	Crystal filter	21.4MHz (pair)	FIL2	Ceramic filter	455kHz

No.	Name	Description	No.	Name	Description
J 1	Coaxial connector	JMP-J01X-V6	J 1	Coaxial connector	JMP-J01X-V6
J 3	IL connector	IL-04P-S3EN2	J 4	IL connector	IL-06P-S3EN2
J 5	IL connector	IL-02P-S3EN2	J 6	IL connector	IL-07P-S3EN2
J 7	IL connector	IL-05P-S3EN2	J 8	IL connector	IL-03P-S3EN2
J 9	VH connector	B3P-VH	J10	VH connector	B2P-VH
J11	IL connector	IL-02P-S3EN2			

No.	Name	Description	No.	Name	Description
K 1	Relay	DF2-DC9V			

No.	Name	Description	No.	Name	Description
L 1	Inductor	1 $\mu$ H	L 2	Inductor	0.2 $\mu$ H
L 3	Inductor	1 $\mu$ H	L 4	Inductor	1 $\mu$ H
L 5	Inductor	1 $\mu$ H	L 6	Inductor	Oscil. (292)
L 7	Inductor	1 $\mu$ H	L 8	Inductor	80 $\mu$ H
L 9	Inductor	100 $\mu$ H	L10	Inductor	10 $\mu$ H
L11	Inductor	10 $\mu$ H			

No.	Name	Description	No.	Name	Description
Q 1	Transistor	2SK55E HITACHI	Q 2	Transistor	2SK55E HITACHI
Q 3	Transistor	2SC535C HITACHI	Q 4	Transistor	3SK73GR TOSHIBA
Q 5	Transistor	2SC535C HITACHI	Q 6	Transistor	2SC535C HITACHI
Q 7	Transistor	2SK55E HITACHI	Q 8	Transistor	2SC535C HITACHI
Q 9	Transistor	2SC18150 TOSHIBA	Q10	Transistor	3SK73GR TOSHIBA
Q11	Transistor	2SC18150 TOSHIBA	Q12	Transistor	2SC18150 TOSHIBA
Q13	Transistor	2SC18150 TOSHIBA	Q14	Transistor	2SC18150 TOSHIBA
Q15	Transistor	2SC18150 TOSHIBA	Q16	Transistor	2SC18150 TOSHIBA
Q17	Transistor	2SA495-0 TOSHIBA	Q18	Transistor	DTC114Y(F) ROHM



## PB-1 (A3594) Continued

No.	Name	Description	No.	Name	Description
R 1	Carbon resistor	100 $\Omega$ , 1/4W	R 2	Carbon resistor	10k $\Omega$ , 1/4W
R 3	Carbon resistor	10k $\Omega$ , 1/4W	R 4	Carbon resistor	3.3k $\Omega$ , 1/4W
R 5	Carbon resistor	10k $\Omega$ , 1/4W	R 6	Carbon resistor	3.3k $\Omega$ , 1/4W
R 7	Carbon resistor	100k $\Omega$ , 1/4W	R 8	Carbon resistor	220 $\Omega$ , 1/4W
R 9	Carbon resistor	220 $\Omega$ , 1/4W	R 10	Carbon resistor	100 $\Omega$ , 1/4W
R 11	Carbon resistor	3.3k $\Omega$ , 1/4W	R 12	Carbon resistor	100k $\Omega$ , 1/4W
R 13	Carbon resistor	220 $\Omega$ , 1/4W	R 14	Carbon resistor	220k $\Omega$ , 1/4W
R 15	Carbon resistor	6.8k $\Omega$ , 1/4W	R 16	Carbon resistor	1.5k $\Omega$ , 1/4W
R 17	Carbon resistor	22 $\Omega$ , 1/4W	R 18	-----	-----
R 19	Carbon resistor	470 $\Omega$ , 1/4W	R 20	Carbon resistor	4.7k $\Omega$ , 1/4W
R 21	Carbon resistor	100k $\Omega$ , 1/4W	R 22	Carbon resistor	100k $\Omega$ , 1/4W
R 23	Carbon resistor	10k $\Omega$ , 1/4W	R 24	Carbon resistor	680 $\Omega$ , 1/4W
R 25	Carbon resistor	220 $\Omega$ , 1/4W	R 26	Carbon resistor	47 $\Omega$ , 1/4W
R 27	-----	-----	R 28	Carbon resistor	100 $\Omega$ , 1/4W
R 29	-----	-----	R 30	Carbon resistor	10k $\Omega$ , 1/4W
R 31	Carbon resistor	22k $\Omega$ , 1/4W	R 32	Carbon resistor	470 $\Omega$ , 1/4W
R 33	Carbon resistor	47 $\Omega$ , 1/4W	R 34	Carbon resistor	100 $\Omega$ , 1/4W
R 35	Carbon resistor	2.2k $\Omega$ , 1/4W	R 36	Carbon resistor	2.2k $\Omega$ , 1/4W
R 37	Carbon resistor	100k $\Omega$ , 1/4W	R 38	Carbon resistor	22k $\Omega$ , 1/4W
R 39	Carbon resistor	10k $\Omega$ , 1/4W	R 40	Carbon resistor	470 $\Omega$ , 1/4W
R 41	Carbon resistor	2.2k $\Omega$ , 1/4W	R 42	Carbon resistor	100 $\Omega$ , 1/4W
R 43	Carbon resistor	220 $\Omega$ , 1/4W	R 44	Carbon resistor	100k $\Omega$ , 1/4W
R 45	Carbon resistor	390k $\Omega$ , 1/4W	R 46	Carbon resistor	750 $\Omega$ , 1/4W
R 47	Carbon resistor	10k $\Omega$ , 1/4W	R 48	Carbon resistor	1k $\Omega$ , 1/4W
R 49	Carbon resistor	47k $\Omega$ , 1/4W	R 50	Carbon resistor	18k $\Omega$ , 1/4W
R 51	Carbon resistor	6.8k $\Omega$ , 1/4W	R 52	Carbon resistor	10k $\Omega$ , 1/4W
R 53	Carbon resistor	68k $\Omega$ , 1/4W	R 54	Carbon resistor	1k $\Omega$ , 1/4W
R 55	Carbon resistor	1k $\Omega$ , 1/4W	R 56	Carbon resistor	10k $\Omega$ , 1/4W
R 57	Carbon resistor	1k $\Omega$ , 1/4W	R 58	Carbon resistor	3.3k $\Omega$ , 1/4W
R 59	Carbon resistor	220 $\Omega$ , 1/4W	R 60	Carbon resistor	1k $\Omega$ , 1/4W
R 61	Carbon resistor	100 $\Omega$ , 1/4W	R 62	Carbon resistor	1.5k $\Omega$ , 1/4W
R 63	Carbon resistor	1.5k $\Omega$ , 1/4W	R 64	Carbon resistor	680 $\Omega$ , 1/4W
R 65	Carbon resistor	100 $\Omega$ , 1/4W	R 66	Carbon resistor	4.7k $\Omega$ , 1/4W
R 67	Carbon resistor	100 $\Omega$ , 1/4W	R 68	Carbon resistor	12k $\Omega$ , 1/4W
R 69	Carbon resistor	1k $\Omega$ , 1/4W	R 70	Carbon resistor	100 $\Omega$ , 1/4W

## PB-1 (A3594) Continued

No.	Name	Description	No.	Name	Description
R 71	Carbon resistor	100 $\Omega$ , 1/4W	R 72	Carbon resistor	100k $\Omega$ , 1/4W
R 73	Carbon resistor	47k $\Omega$ , 1/4W	R 74	Carbon resistor	1k $\Omega$ , 1/4W
R 75	Carbon resistor	47 $\Omega$ , 1/4W	R 76	Carbon resistor	47k $\Omega$ , 1/4W
R 77	Carbon resistor	47k $\Omega$ , 1/4W	R 78	Carbon resistor	6.8k $\Omega$ , 1/4W
R 79	Carbon resistor	100 $\Omega$ , 1/4W	R 80	Carbon resistor	10k $\Omega$ , 1/4W
R 81	Carbon resistor	100k $\Omega$ , 1/4W	R 82	Carbon resistor	100k $\Omega$ , 1/4W
R 83	Carbon resistor	220k $\Omega$ , 1/4W	R 84	Carbon resistor	220 $\Omega$ , 1/4W
R 85	Carbon resistor	680 $\Omega$ , 1/4W	R 86	Carbon resistor	100k $\Omega$ , 1/4W
R 87	Carbon resistor	100 $\Omega$ , 1/4W	R 88	Carbon resistor	15k $\Omega$ , 1/4W
R 89	Carbon resistor	10k $\Omega$ , 1/4W	R 90	Carbon resistor	100 $\Omega$ , 1/4W
R 91	Carbon resistor	470 $\Omega$ , 1/4W	R 92	Carbon resistor	1k $\Omega$ , 1/4W
R 93	Carbon resistor	3.3k $\Omega$ , 1/4W	R 94	Carbon resistor	100 $\Omega$ , 1/4W
R 95	Carbon resistor	470 $\Omega$ , 1/4W	R 96	Carbon resistor	100 $\Omega$ , 1/4W
R 97	Carbon resistor	100k $\Omega$ , 1/4W	R 98	Carbon resistor	100 $\Omega$ , 1/4W
R 99	Carbon resistor	4.7k $\Omega$ , 1/4W	R100	Carbon resistor	4.7k $\Omega$ , 1/4W
R101	Carbon resistor	4.7k $\Omega$ , 1/4W	R102	Carbon resistor	47k $\Omega$ , 1/4W
R103	Carbon resistor	4.7k $\Omega$ , 1/4W	R104	Carbon resistor	10k $\Omega$ , 1/4W
R105	Carbon resistor	1k $\Omega$ , 1/4W	R106	Carbon resistor	1k $\Omega$ , 1/4W
R107	Carbon resistor	10k $\Omega$ , 1/4W	R108	Carbon resistor	1k $\Omega$ , 1/4W
R109	Carbon resistor	10k $\Omega$ , 1/4W	R110	Carbon resistor	100k $\Omega$ , 1/4W
R111	Carbon resistor	1k $\Omega$ , 1/4W	R112	Carbon resistor	10k $\Omega$ , 1/4W
R113	Carbon resistor	220 $\Omega$ , 1/4W	R114	Carbon resistor	470 $\Omega$ , 1/4W
R115	Carbon resistor	1k $\Omega$ , 1/4W	R116	Carbon resistor	3.3k $\Omega$ , 1/4W
R117	Carbon resistor	100 $\Omega$ , 1/4W	R118	Carbon resistor	470 $\Omega$ , 1/4W
R119	Carbon resistor	47k $\Omega$ , 1/4W	R120	Carbon resistor	100 $\Omega$ , 1/4W
R121	Carbon resistor	4.7k $\Omega$ , 1/4W	R122	Carbon resistor	10k $\Omega$ , 1/4W
R123	Carbon resistor	4.7k $\Omega$ , 1/4W	R124	Carbon resistor	560 $\Omega$ , 1/4W
R125	Carbon resistor	100k $\Omega$ , 1/4W	R126	Carbon resistor	1k $\Omega$ , 1/4W
R127	Carbon resistor	22k $\Omega$ , 1/4W	R128	Carbon resistor	10k $\Omega$ , 1/4W
R129	Carbon resistor	220k $\Omega$ , 1/4W	R130	Carbon resistor	100 $\Omega$ , 1/4W
R131	Carbon resistor	1k $\Omega$ , 1/4W	R132	Carbon resistor	10k $\Omega$ , 1/4W
R133	Carbon resistor	10k $\Omega$ , 1/4W	R134	Carbon resistor	10k $\Omega$ , 1/4W
R135	Carbon resistor	1k $\Omega$ , 1/4W	R136	Metallic resist.	2.2k $\Omega$ , 1/4W
R137	Carbon resistor	330 $\Omega$ , 1/4W	R138	Carbon resistor	330 $\Omega$ , 1/4W
R139	Carbon resistor	12k $\Omega$ , 1/4W	R140	Carbon resistor	3.3k $\Omega$ , 1/4W

## PB-1 (A3594) Continued

No.	Name	Description	No.	Name	Description
R141	Carbon resistor	2.2 $\Omega$ , 1/4W	R142	Carbon resistor	10k $\Omega$ , 1/4W
R143	Carbon resistor	100k $\Omega$ , 1/4W	R144	Carbon resistor	10k $\Omega$ , 1/4W
R145	Carbon resistor	100k $\Omega$ , 1/4W	R146	Carbon resistor	15k $\Omega$ , 1/4W
R147	Carbon resistor	4.7k $\Omega$ , 1/4W	R148	Carbon resistor	100 $\Omega$ , 1/4W
R149	Carbon resistor	1k $\Omega$ , 1/4W	R150	Carbon resistor	1k $\Omega$ , 1/4W
R151	-----	-----	R152	-----	-----
R153	Carbon resistor	3.3k $\Omega$ , 1/4W	R154	Carbon resistor	3.3k $\Omega$ , 1/4W
R155	Carbon resistor	3.3k $\Omega$ , 1/4W	R156	Carbon resistor	3.3k $\Omega$ , 1/4W
R157	Carbon resistor	3.3k $\Omega$ , 1/4W	R158	Carbon resistor	3.3k $\Omega$ , 1/4W

No.	Name	Description	No.	Name	Description
RV 1	Variable resistor	10k $\Omega$	RV 2	Variable resistor	5k $\Omega$
RV 3	Vatiable resistor	3k $\Omega$	RV 4	Variable resistor	20k $\Omega$
RV 5	Variable resistor	5k $\Omega$			
T 1	HF transformer	150MHz (349)	T 2	HF transformer	150MHz (349)
T 3	HF transformer	150MHz (349)	T 4	HF transformer	150MHz (349)
T 5	HF transformer	150MHz (349)	T 6	HF transformer	21.4MHz (291)
T 7	HF transformer	212.4Hz(291)	T 8	HF transformer	21.4MHz (291)
T 9	IF transformer	455kHz(305)	T10	IF transformer	455kHz (305)
T11	IF transformer	455kHz(305)	T12	IF transformer	455kHz (305)
T13	HF transformer	150MHz(349)			
TP1	Check terminal	LC-2G(yellow)	TP2	Check terminal	LC-2G(yellow)
TP3	Check terminal	LC-2G(yellow)	TP4	Check terminal	LC-2G(yellow)
TP5	Check terminal	LC-2G(yellow)	TP6	Check terminal	LC-2G(yellow)
TP7	Check terminal	LC-2G(yellow)	TP8	Check terminal	LC-2G(yellow)

No.	Name	Description	No.	Name	Description
U 1	IC	TA78L005AP TOSHIBA	U 2	IC	PLL2001 NPC
U 3	IC	TC5048P TOSHIBA	U 4	IC	NJM3359D JRC
U 5	IC	M51523AL MITSUBISHI	U 6	IC	TA72152P TOSHIBA
U 7	IC	MF5CN NS	U 8	IC	AN6562 MATSUSHITA
U 9	IC	AN6562AL MATSUSHITA	U10	IC	M5231TL MITSUBISHI
U11	IC	TC4011BP TOSHIBA			
Y1	Q'z Osc.	4.325MHz HC43/U	Y2	Q'z Osc.	20.945MHz HC43/U
PB1	Print Bd.			Heat Sink	IC-2425ST
	Cool seat	2067B-5134		Shield c.	143070A

## PB-2 (A3595) Continued

No.	Name	Description	No.	Name	Description
C 1	Electrolytic cap.	10 $\mu$ F, 16V	C 2	Electrolytic cap.	4.7 $\mu$ F, 25V
C 3	Ceramic capacitor	0.01 $\mu$ F, 50V	C 4	Ceramic capacitor	0.01 $\mu$ F, 50V
C 5	-----	-----	C 6	Electrolytic cap.	100 $\mu$ F, 16V
C 7	-----	-----	C 8	Electrolytic cap.	100 $\mu$ F, 16V
C 9	-----	-----	C 10	Ceramic capacitor	0.01 $\mu$ F, 50V
C 11	-----	-----	C 12	Ceramic capacitor	0.01 $\mu$ F, 50V
C 13	-----	-----	C 14	Ceramic capacitor	0.01 $\mu$ F, 50V
C 15	Ceramic capacitor	1000pF, 50V	C 16	-----	-----
C 17	Ceramic capacitor	0.01 $\mu$ F, 50V	C 18	Ceramic capacitor	0.01 $\mu$ F, 50V
C 19	Electrolytic cap.	10 $\mu$ F, 16V	C 20	Electrolytic cap.	33 $\mu$ F, 16V
C 21	Ceramic capacitor	1000pF, 50V	C 22	Ceramic capacitor	1000pF, 50V
C 23	-----	-----	C 24	-----	-----
C 25	-----	-----	C 26	-----	-----
C 27	Ceramic capacitor	0.01 $\mu$ F, 50V	C 28	Ceramic capacitor	0.01 $\mu$ F, 50V
C 29	Ceramic capacitor	0.01 $\mu$ F, 50V	C 30	Ceramic capacitor	0.01 $\mu$ F, 50V
C 31	Electrolytic cap.	100 $\mu$ F, 16V	C 32	Electrolytic cap.	100 $\mu$ F, 16V
C 33	Ceramic capacitor	0.01 $\mu$ F, 50V	C 34	Ceramic capacitor	0.01 $\mu$ F, 50V
C 35	Ceramic capacitor	0.01 $\mu$ F, 50V	C 36	Electrolytic cap.	33 $\mu$ F, 16V
C 37	Ceramic capacitor	0.01 $\mu$ F, 50V	C 38	Ceramic capacitor	0.01 $\mu$ F, 50V
C 39	-----	-----	C 40	Ceramic capacitor	0.01 $\mu$ F, 50V
C 41	Ceramic capacitor	100pF, 50V	C 42	Ceramic capacitor	0.01 $\mu$ F, 50V
C 43	Ceramic capacitor	0.01 $\mu$ F, 50V	C 44	Ceramic capacitor	0.01 $\mu$ F, 50V
C 45	Ceramic capacitor	0.01 $\mu$ F, 50V	C 46	Ceramic capacitor	0.01 $\mu$ F, 50V
C 47	Ceramic capacitor	0.01 $\mu$ F, 50V	C 48	Ceramic capacitor	0.01 $\mu$ F, 50V
C 49	Ceramic capacitor	0.01 $\mu$ F, 50V	C 50	Ceramic capacitor	0.01 $\mu$ F, 50V
C 51	Ceramic capacitor	1000pF, 50V	C 52	Ceramic capacitor	1000pF, 50V
C 53	Ceramic capacitor	1000pF, 50V			
CM 1	Module capacitor	1000pF 50V $\times$ 8			
CR 1	Diode	1S1555TOSHIBA	CR 2	Diode	1S1555TOSHIBA
CR 3	Diode	1S1555TOSHIBA	CR 4	Diode	1S1555TOSHIBA
FL 1	Line filter	BNX 002-001			

No.	Name	Description	No.	Name	Description
J 1	IL connector	IL-04P-S3EN2	J 2	IL connector	IL-05P-S3EN2
J 3	IL connector	IL-06P-S3EN2	J 4	IL connector	IL-07P-S3EN2
J 5	PS connector	PS-20PE-D4T1-PN1	J 6	PS connector	PS-3PF-S4T1-PKL1
J 7	Post header	1740759-9	J 8	Post header	1740759-9IL
J 9	Post header	1740759-9	J10	Post header	1740759-9IL
J11	Post header	1740759-9	J12	Post header	1740759-9IL
J13	Post header	1740759-9	J14	Post header	1740759-9IL
J15	IL connector	IL-02P-S3EN2			
L 1	Lamp	12V, 60mA	L 2	Lamp	12V, 60mA
Q 1	Digital transistor	DTC-114YSA-TP	Q 2	Not use	
Q 3	Transistor	2SC982-TM TOSHIBA	Q 4	Transistor	2SC2710-0 TOSHIBA
Q 5	Transistor	2SA1150-0 TOSHIBA	Q 6	Transistor	2SC1815-0 TOSHIBA
Q 7	Transistor	2SA1150-0 TOSHIBA	Q 8	Transistor	2SC2710-0 TOSHIBA
Q 9	Transistor	2SC1815-0 TOSHIBA			
R 1	Carbon resistor	22k $\Omega$ , 1/4W	R 2	Carbon resistor	47 $\Omega$ , 1/4W
R 3	Carbon resistor	1k $\Omega$ , 1/4W	R 4	Carbon resistor	Not use
R 5	Carbon resistor	100 $\Omega$ , 1/4W	R 6	Carbon resistor	Not use
R 7	Carbon resistor	100 $\Omega$ , 1/4W	R 8	Carbon resistor	Not use
R 9	Carbon resistor	4.7k $\Omega$ , 1/4W	R10	Carbon resistor	Not use
R11	Carbon resistor	4.7k $\Omega$ , 1/4W	R12	Carbon resistor	1k $\Omega$ , 1/4W
R13	Carbon resistor	10k $\Omega$ , 1/4W	R14	Carbon resistor	1.5k $\Omega$ , 1/4W
R15	Carbon resistor	68k $\Omega$ , 1/4W	R16	Carbon resistor	1k $\Omega$ , 1/4W
R17	Carbon resistor	47k $\Omega$ , 1/4W	R18	Carbon resistor	33k $\Omega$ , 1/4W
R19	Carbon resistor	15k $\Omega$ , 1/4W	R20	Carbon resistor	33k $\Omega$ , 1/4W
R21	Carbon resistor	33k $\Omega$ , 1/4W	R22	Carbon resistor	2.2k $\Omega$ , 1/4W
R23	Carbon resistor	100k $\Omega$ , 1/4W	R24	Carbon resistor	1k $\Omega$ , 1/4W
R25		Not use			
~		~			
R38		Not use			
R39	Carbon resistor	470 $\Omega$ , 1/4W	R40	Carbon resistor	470 $\Omega$ , 1/4W
R41	Carbon resistor	470 $\Omega$ , 1/4W	R42	Carbon resistor	470 $\Omega$ , 1/4W
R43	Carbon resistor	15k $\Omega$ , 1/4W	R44	Carbon resistor	10k $\Omega$ , 1/4W
R45	Carbon resistor	220 $\Omega$ , 1/4W	R46	Carbon resistor	220 $\Omega$ , 1/4W
R47	Carbon resistor	220 $\Omega$ , 1/4W	R48	Carbon resistor	220 $\Omega$ , 1/4W
R49	Carbon resistor	220 $\Omega$ , 1/4W	R50	Carbon resistor	220 $\Omega$ , 1/4W
R51	Carbon resistor	56k $\Omega$ , 1/4W	R52	Carbon resistor	10k $\Omega$ , 1/4W
R53	Carbon resistor	4.7k $\Omega$ , 1/4W	R54	Carbon resistor	22k $\Omega$ , 1/4W
R55	Carbon resistor	33 $\Omega$ , 1/4W	R56	Carbon resistor	220 $\Omega$ , 1/4W
R57	Carbon resistor	220 $\Omega$ , 1/4W	R58	Carbon resistor	1k $\Omega$ , 1/4W
R59	Carbon resistor	4.7k $\Omega$ , 1/4W	R60	Carbon resistor	4.7k $\Omega$ , 1/4W
R61	Carbon resistor	10k $\Omega$ , 1/4W	R62	Carbon resistor	4.7k $\Omega$ , 1/4W
R63	Carbon resistor	10k $\Omega$ , 1/4W			
RM1	Module resistor	150 $\Omega$ $\times$ 7	RM2	Module resistor	150 $\Omega$ $\times$ 7
RM3	Module resistor	150 $\Omega$ $\times$ 7	RM4	Module resistor	150 $\Omega$ $\times$ 7
RM5	Module resistor	150 $\Omega$ $\times$ 7	RM6	Module resistor	150 $\Omega$ $\times$ 7
RM7	Module resistor	4.7k $\Omega$ $\times$ 8	RM8	Rudder resistor	25k $\Omega$ , 4 bit
RM9	Rudder resistor	25k $\Omega$ , 4 bit			

## PB-2(A3595) continued

No.	Name	MAKER	Description	No.	Name	MAKER	Description
U 1	IC	MITSUMI	PST532A	U 2	IC	SHARP	LH5168D-10L
U 3	IC	HITACHI	HN27C256G-20	U 4	Not use		
U 5	IC	TOSHIBA	TC74HC175AP	U 6	IC	NEC	$\mu$ PD71054C
U 7	IC	TOSHIBA	TC74HC390AP	U 8	IC	NEC	$\mu$ PC271C
U 9	Not use			U10	IC	TOSHIBA	TMPZ84C011B
U11	IC	TOSHIBA	TC74HC04AP	U12	IC	TOSHIBA	TC74HC32AP
U13	IC	TOSHIBA	TC74HC4511AP	U14	IC	TOSHIBA	TC74HC4511AP
U15	IC	TOSHIBA	TC74HC4511AP	U16	IC	TOSHIBA	TC74HC573AP
U17	IC	TOSHIBA	TC74HC573AP	U18	IC	TOSHIBA	TC74HC173AP
U19	IC	TOSHIBA	TC74HC237AP	U20	IC	TOSHIBA	TC74HC237AP
U21	IC	TOSHIBA	TC74HC237AP	U22	IC	TOSHIBA	TA7612AP
BT1	Battery		GB-50H-3X, 3.6V	XV3	IC socket		DICF-28CS-E, 28pins
	P-ROM blind		140533A	PB1	Print Bd.		

PB-3 (A3596) Continued

No.	Name	Description	No.	Name	Description
C 1	Ceramic capac.	0.01 $\mu$ F, 50V			
CR 1	LED	TLS362T TOSHIBA	CR 2	LED	TLS362T TOSHIBA
CR 3	LED	TLS362T TOSHIBA	CR 4	LED	TLS362T TOSHIBA
CR 5	LED	TLS362T TOSHIBA	CR 6	LED	GL-106M-12 SHARP
CR 7	LED	GL-106R-12 SHARP	CR 8	LED	GL-106N-12 SHARP
CR 9	LED	GL-106R-12 SHARP	CR10	LED	GL-3PR8 SHARP
CR11	LED	GL-3PR8 SHARP	CR12	LED	GL-3PR8 SHARP
CR13	LED	GL-3PR8 SHARP	CR14	LED	GL-3EG8 SHARP
P 1	-----	-----	P 2	-----	-----
P 2	-----	-----	P 4	-----	-----
P 5	-----	-----	P 6	-----	-----
P 7	Receptacle	174074-9	P 8	Receptacle	174074-9
P 9	Receptacle	174074-9	P10	Receptacle	174074-9
P11	Receptacle	174074-9	P12	Receptacle	174074-9
P13	Receptacle	174074-9	P14	Receptacle	174074-9
Q 1	Transistor	2SB596 TOSHIBA	Q 2	Transistor	2SA495 TOSHIBA
Q 3	Digital Tr.	DTC114YF ROHM			

No.	Name	Description	No.	Name	Description
R 1	Carbon resistor	220 $\Omega$ , 1/4W	R 2	Carbon resistor	100 $\Omega$ , 1/4W
R 3	Carbon resistor	220 $\Omega$ , 1/4W	R 4	Carbon resistor	680 $\Omega$ , 1/4W
R 5	Carbon resistor	6.8k $\Omega$ , 1/4W	R 6	Carbon resistor	22k $\Omega$ , 1/4W
	Printed Board	A3596A			

# Chassis

No.	Name	Description	No.	Name	Description
J101	Socket	Power, 16R-2M	J102	Coax. socket	Antenna, M201R
J103	Coax. socket	Antenna, BNC-R	J104	Jack	Speaker
Q 1	Transistor	2SB-754TOSHIBA	CR1	IC	TA78005AP TOSHIBA
P101	Coax. plug	TMP-P01X-A1	P101	Coax. plug	TMP-P01X-A1
P103	Socket housing	IL-G-04S-S3CN	P104	Socket housing	IL-G-06S-S3CN
P105	Socket housing	IL-G-02S-S3CN	P106	Socket housing	IL-G-07S-S3CN
P107	Socket housing	IL-G-05S-S3CN	P108	Socket housing	IL-G-03S-S3CN
P109	Socket housing	VHR-3N	P110	Socket housing	VHR-2N
P111	Socket housing	IL-G-02S-S3CN			
P201	Socket housing	IL-G-04S-S3CN	P202	Socket housing	IL-G-05S-S3CN
P203	Socket housing	IL-G-06S-S3CN	P204	Socket housing	IL-G-07S-S3CN
P205	Cable assembly	PS-A20CN-10X2A	P206	Socket housing	IL-G-02S-S3CN
FH	Fuse holder	F7155		Fuse	MF51NR 250V 2A
	Panel S assem.	A5280, 131075A			
C 1	Capacitor	4700 $\mu$ F,25V	C 2	Capacitor	3300 $\mu$ F,25V
L 1	Choke coil	80 $\mu$ H	C 3	Metallized cap.	0.047 $\mu$ F,50V

## Cable harness

No.	Name	Description
Harness a	Lead line with IL pins	AWG#24 330429
Harness b	Lead line with IL pins	AWG#22 330429
Harness c	Lead line with IL pins	AWG#26 330429
Harness d	Lead line with IL pins	AWG#26 330429
Harness e	Lead line with IL pins	AWG#26 330429
Harness f	Lead line with IL pins	AWG#26 330429
Harness g	Lead line with IL pins	AWG#26 330429
Harness h	Shield cable with VH pins	HC-3B1 332076
Harness i	Coaxial cable with plug	1.5D-XVS 332076
Harness j	Coaxial cable with plug	1.5D-XVS 332076
Harness k	Lead line, 40mm	AWG#22 332076
Harness l	Lead line with cap.	AWG#22 332076
Harness m	Lead line with IL pins	AWG#26 330429
Harness n	Shield cable, 100mm	HC-3B1 332076



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Overseas Trading Dept.

**TAIYO MUSEN Co., Ltd.**

**2-20-7, Ebisu-Nishi, Shibuya-ku**

**Tokyo JAPAN 150-0021**

TEL: 81-3-3780-3225

FAX: 81-3-3496-3677