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UM-900-04

Operating, Installation & Service Instructions

FOR

Model NT-900

NAVTEX RECEIVER

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Attention: Installation/Servicing Engineers

IMPORTANT NOTE

The equipment is normally wired for use with the preamplified antenna unit (active antenna unit). The center conductor of the rear panel coaxial connector is at +8V DC to power the preamplifier. *Care must be taken not to short the connector to ground when plugging or unplugging the antenna cable.*

To use a long wire antenna, the wiring must be changed as follows using two jumper plugs installed on the internal receiver board:

- Jumper JP1: Shift to "PAS" position (to cut off 8V supply to connector)
- Jumper JP2: Shift to "10Ω" position (to impedance-match wire antenna)

The location of the jumpers is shown in the receiver parts placement drawing on page 75. Refer to the relevant instructions in paragraph 6.5.

IMPORTANT NOTES

This manual applies to:

- serial numbers 300001 and greater for the Model DEBEG 2900, and
- serial numbers 227438 and greater for the Model NT-900

with software version 2002G1 and greater installed.

The following noticeable differences exist between the old model and the new model:

1. Start of Message Printing

   The new model starts printing NAVTEX text after completion of current message transmission. The old model starts printing text as soon as it is synchronized with current transmission.

2. Printout Direction
   The new model prints text so that the operator can read it at a glance as it comes out of the console. The old model issues printed text upside down with the start of text toward the operator.

3. Serial Output
   The new model is equipped with an RS–232C serial output port on the rear panel from which NAVTEX messages can be derived in ASCII text format for further processing with a PC or other applications. The old model does not have a serial output port.

---------- CAUTIONS ----------

1. The paper cutter (steel saw) on the front panel is sharp and could cause injury if you are careless. Be careful when handling the printer and the paper. Refer to operating instructions:
   "4.9 Loading Thermal Sensitive Roll Paper", page 35
2. The [PAPER] indicator will not glow if paper gets jammed or is forced to stop for any reason. However, the message ID will be stored in that case even if the equipment fails to print that message properly. To receive the same message again over next transmission, reset the system. Refer to paragraph
   "4.5.6 Clearing Memory (Resetting the System)"

   Each time a new roll of paper is installed, be sure to check if the paper feeds properly by repeatedly pressing the [LINE FEED] key or by invoking the self-diagnostic function (paragraph 4.5.4).
3. If the [EXT RX] indicator is lit, the equipment will not accept a NAVTEX signal unless the optional AF receiver unit is installed and audio frequency NAVTEX signal is fed from an external radio receiver. Refer to operating instructions:
   "4.5.7 Using External (AF) Receiver", page 33
4. Store the thermo-sensitive paper in a cool, dry place; liquid chemicals can damage the paper. Do not install wet paper, as it will tear and cause the printer to stop. Care must also be taken when handling printed paper. Refer to operating instructions:
   "4.1.2 Precautions for Handling the Printer Paper", page 17
5. Never throw the battery installed on the receiver microprocessor unit into a fire – it can explode. Always handle the battery with care; if it becomes cracked, the alkaline electrolyte in it can harm your skin and damage your clothes. Replace a leaking battery and clean up all related spillage very carefully.

1. PRINCIPAL FEATURES OF NAVTEX

1.1. Introduction

NAVTEX is a new international automated direct-printing broadcast service in the English language of search-and-rescue (SAR) information, navigational warnings, weather warnings and urgent information to ships. The information transmitted by NAVTEX stations is delivered directly to each ship. On the bridge, the NAVTEX receiver receives the messages, selects the types of message required for the ship and prints the selected messages automatically. An example of a NAVTEX message is given in Figure 1-1 below.

NAVTEX is one component of the Worldwide Navigational Warning Service (WWNWS) adopted by the IMO [Assembly resolution A.419(XI)], and one requirement of the GMDSS (Global Maritime Distress and Safety System). Figure 1-2 (next page) illustrates the NAVTEX concept.

NAVTEX transmitters cover a range of up to 400 nautical miles. Each transmitter typically broadcasts information intended only for that area. A number of countries are currently providing NAVTEX broadcast service to ships in coastal waters. Although all transmitters operate on the same frequency (518 kHz), broadcast times are coordinated so that the transmitters will not interfere with each other. When a ship leaves one NAVAREA (Figure 1-4) and enters another, it will automatically receive all the messages for that area during the next broadcast.

Figure 1-1 NAVTEX Message Sample Received

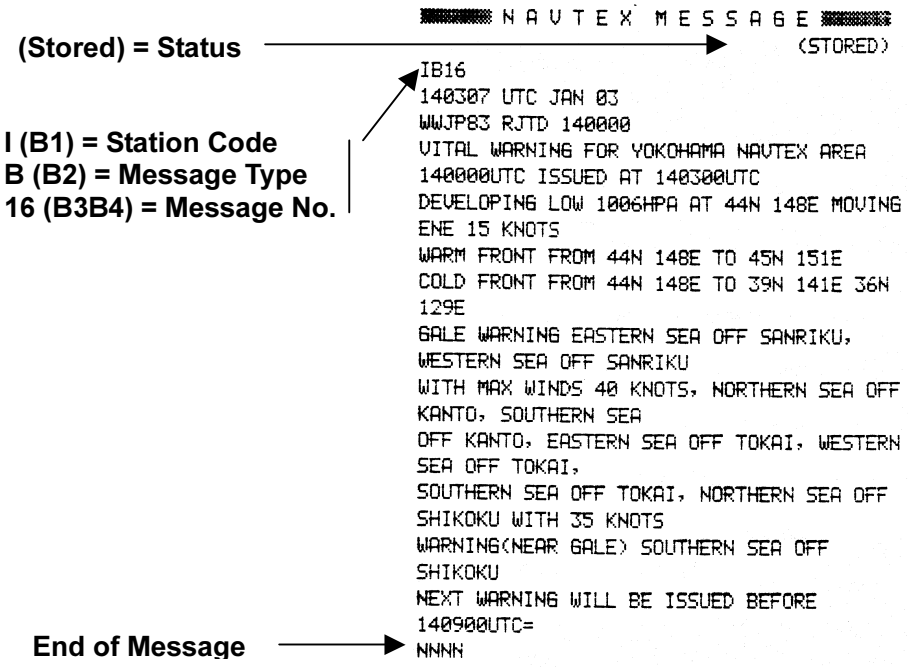
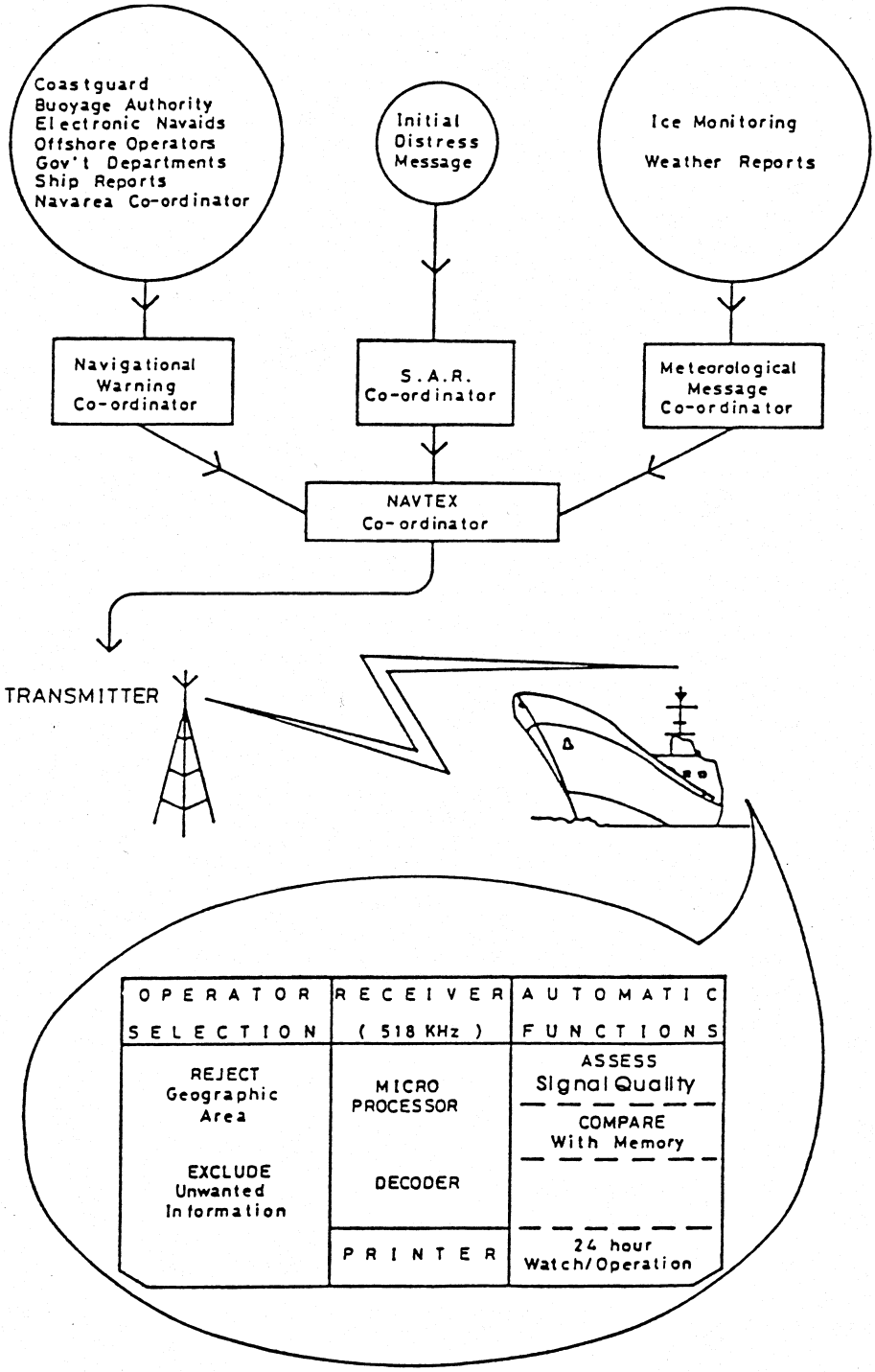


Figure 1-2 NAVTEX Concept



The automatic operation of the microprocessor in the NAVTEX receiver is as follows:

(1) Signal quality is assessed by the ratio of error characters to proper characters being received.

(2) The processor compares the message header with stored data: whether the message is transmitted from a rejected area, whether the message is identified as an excluded message, and whether the message has already been received.

(3) If the received NAVTEX message is to be printed, the processor enables the printer.

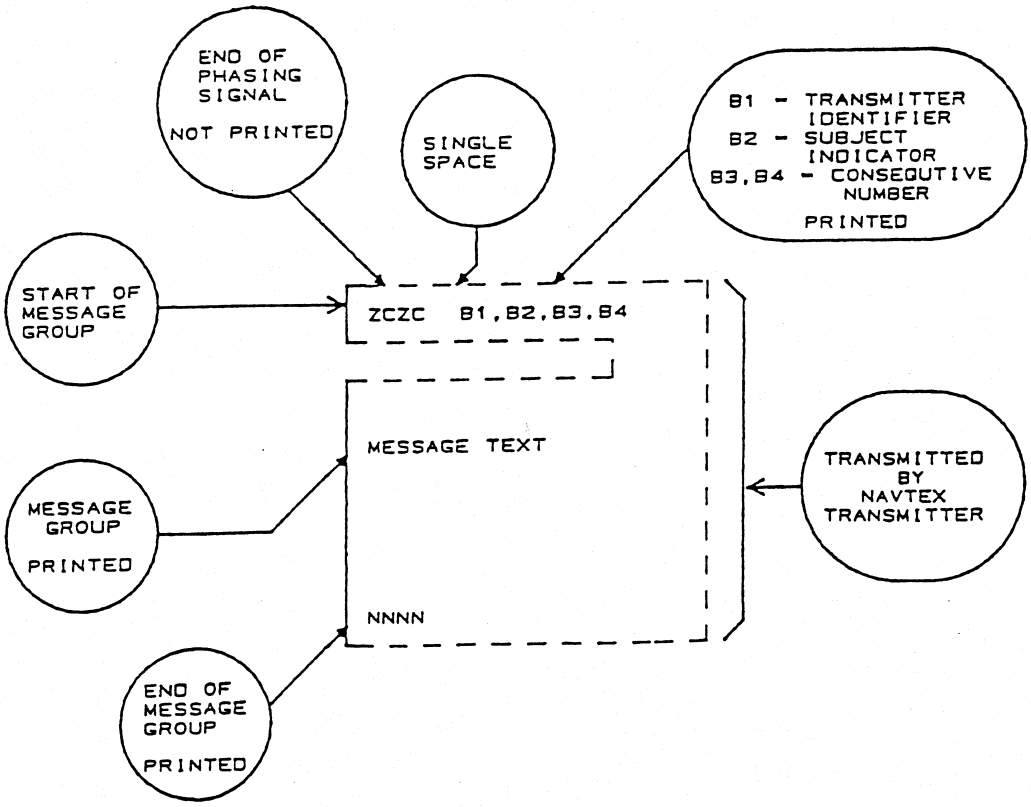
Because of automatic reception, it is possible to receive signals continually (24 hours a day)., unattended.

A header code (B1B2B3B4) which appears at the beginning of each message (see Figure 1-3) is used for selection as described above. If a message is repeated by another station, the original identification may be used to prevent the printing of a message already received.

1.2. NAVTEX Message Format

The format of all messages is as shown in Figure 1-3. Preceding the message trans-mission, the NAVTEX station transmits a phasing signal for about 10 seconds, which synchronizes the receiver to the signal.

Figure 1-3 NAVTEX Message Format



1.3. Allocation of NAVTEX Stations

The basic scheme for allocation of NAVTEX Transmitter Identification Characters for each NAVAREA worldwide by the IMO is shown below (Figure 1-4) In order to avoid reception of messages from two NAVTEX stations having the same B1 character, the station must have a wide geographic separation.

NAVTEX transmissions may be adjusted to provide a range of up to 400 nautical miles.

An example of Identification Characters used in Europe (NAVAREA Ⅰ and NAVAREA Ⅱ) in 1989 is illustrated in Figure 1-5 (next page).

Figure 1-4 Allocations of Transmitter Identification Characters

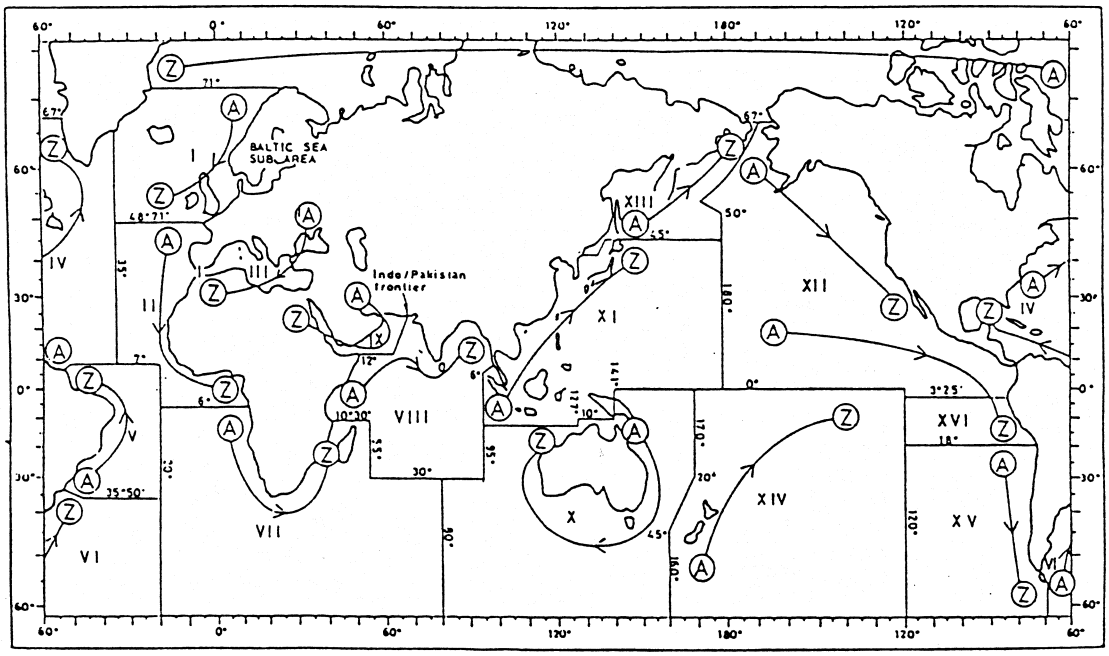
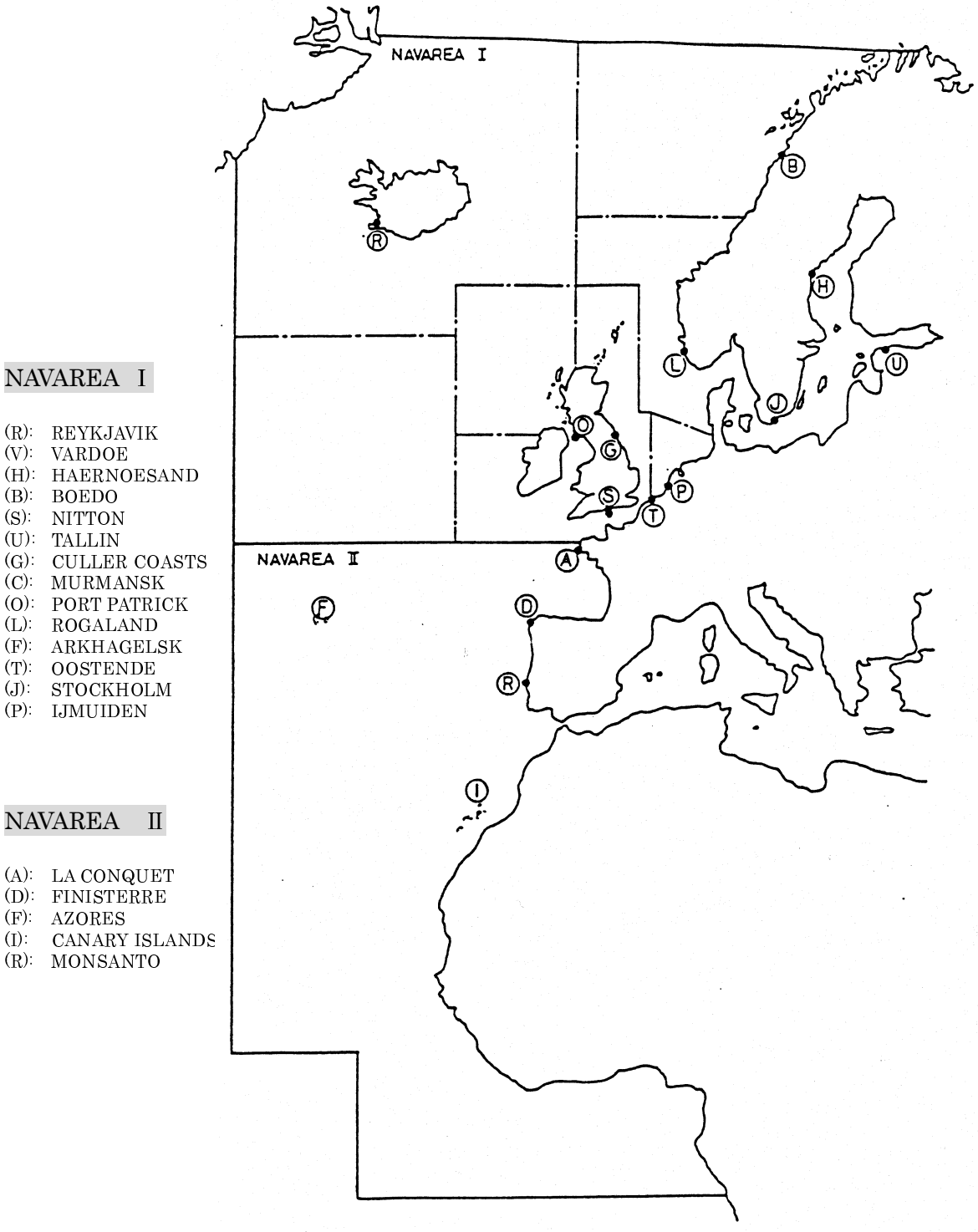


Figure 1-5 NAVTEX Station Allocation, Europe



1.4. NAVTEX Transmission Schedule

Transmission schedules take into account the relative geographical location of all NAVTEX stations within range, ensuring the least possible interference between trans-mitting stations.

Listed below is the transmission schedule for NAVAREAs IV and XII (1989). Each NAVTEX stations has a 10-minute transmission time allocated in every four hours. To permit the immediate broadcast of vital information, e.g. Search-and-Rescue (SAR) information, the frequency may remain unused at certain periods.

Table 1-1 Transmission Schedule in NAVAREAs IV and XII

NAVAREA IV

	Station Code	Broadcast Time (UTC)
United States		
Boston	F	0445, 1045, 1645, 2245
Miami	A	0000, 0600, 1200, 1800
Portsmouth	N	0130, 0730, 1330, 1930
New Orleans	G	0300, 0900, 1500, 2100
Suan Juan P.R.	R	0415, 1015, 1615, 2215
Canada		
Sydney, N.S.	K	0040, 0540, 0940, 1340 1740, 2140
Bermuda		
St. Georges	B	0100, 0700, 1300, 1900

NAVAREA XII

United States		
San Francisco	C	0400, 1000, 1600, 2200
Astoria	W	0130, 0730, 1330, 1930
Long Beach	Q	0445, 1045, 1645, 2245
Kodiak	J	0300, 0900, 1500, 2100
Honolulu	O	0040, 0640, 1240, 1840

1.5. Message Types

NAVTEX messages are grouped by subject for broadcast. Each group is allocated a unique B2 character, indicating the type of message. See the list (Table 1-2) below. The B2 character is also used to identify messages which, because of their importance, must not be rejected.

Table 1-2 NAVTEX Message Types

Type (B2 Character)	Subject
A*	Navigational Warnings
B*	Meteorological Warnings
C	Ice Reports
D*	Search-and-Rescue (SAR) Information
E	Meteorological Forecasts
F	Pilot Service Messages
G	DECCA Message
H	LORAN Message
I	OMEGA Message
J	SATNAV Message
K	Other Electronic Navaid Message
L*	Navigational Warnings – addition to "A"
M to U	Reserved
V to Y	Reserved
Z	No message on Hand

**NOTE:* *These message types cannot be excluded.*

1.6. Message Numbering

Each NAVTEX message within a subject group (B2) is allocated a serial number (B3B4) from 01 to 99. Numbers in each subject group are allocated by the responsible NAVTEX co-ordinator. Certain messages may be allocated the B3B4 number. A message carrying this number, though its use may be strictly controlled, will always be printed. Therefore the number 00 will only be used for vital message such as an initial distress message. The message number, except for 00, is stored in memory, and is used to avoid printing a message that has been satisfactorily received.

1.7. Technical Description of the NAVTEX System

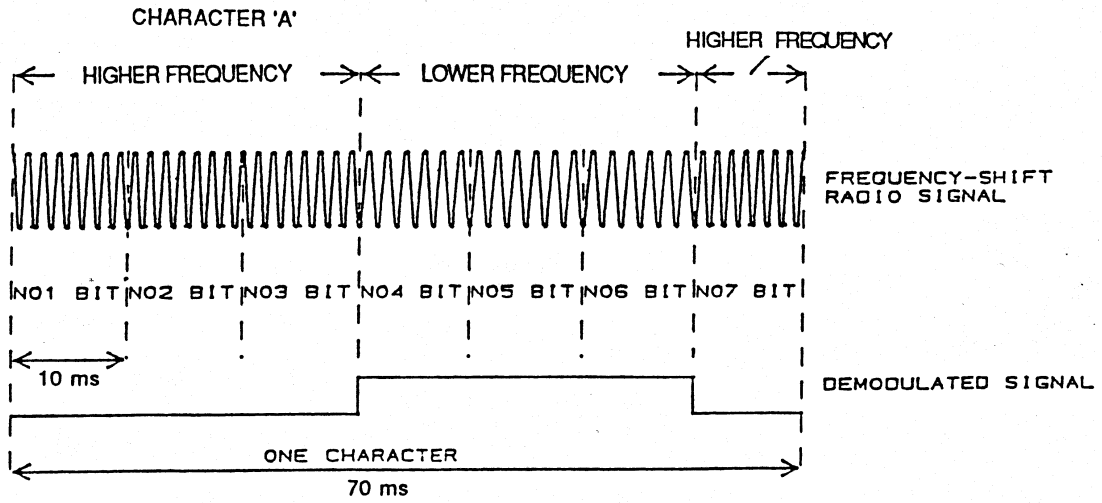
1.7.1. Transmission Mode

NAVTEX messages are transmitted using Forward Error Correction (FEC) mode for narrow band direct printing (NBDP) telegraph as specified in CCIR Recommendation 476-3. In order for the FEC mode to minimize character error at reception, each character in the message is transmitted twice.

The transmission of a character is followed by four other characters, after which the first character is transmitted again. By this double transmission of message characters, the receiver is able to identify correct characters or error characters, replacing error characters with the corresponding number of asterisks (*) when printing the received message.

Transmission speed is 100 baud (100 bits per second) but the effective speed becomes half that rate because characters are sent twice. One character is composed of seven bits as specified in the CCIR recommendation 476-3 (ANNEX I, 1982). See Figure 1-6 below. Frequency shift keying (FSK) is used to modulate message characters onto the 518 kHz RF carrier. The amount of frequency shift is ±85 Hz from the carrier frequency with the mark frequency (binary 1) at 517.915 kHz and the space (binary 0) at 518.085 kHz. The FSK-modulated RF signal is received, demodulated, and processed by the DEBEG 2900/NT-900.

Figure 1-6 NAVTEX Signal (Letter A)



2. DESCRIPTION OF THE DEBEG 2900/NT-900

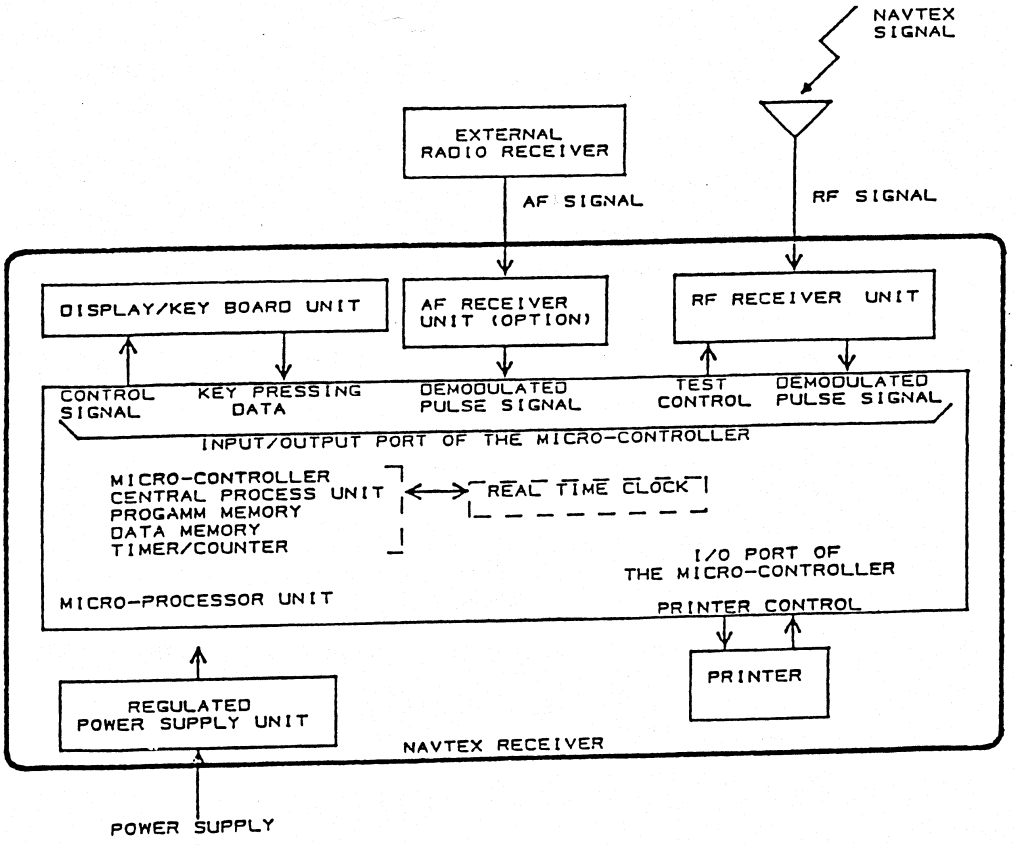
The flow chart that describes how the DEBEG 2900/NT-900 processes NAVTEX messages is shown on pages 10 and 11. The functional block diagram is illustrated in Figure 2-1 below.

The RF receiver unit receives the radio signal and demodulates it into a pulse signal (ones and zeros). The microprocessor decodes NAVTEX characters after synchronizing with the phasing signal and processes received messages as shown in the flow chart. It also controls the printer, the front panel indicator lamps, the external alarm box (option), and accepts operating instructions via the keypad.

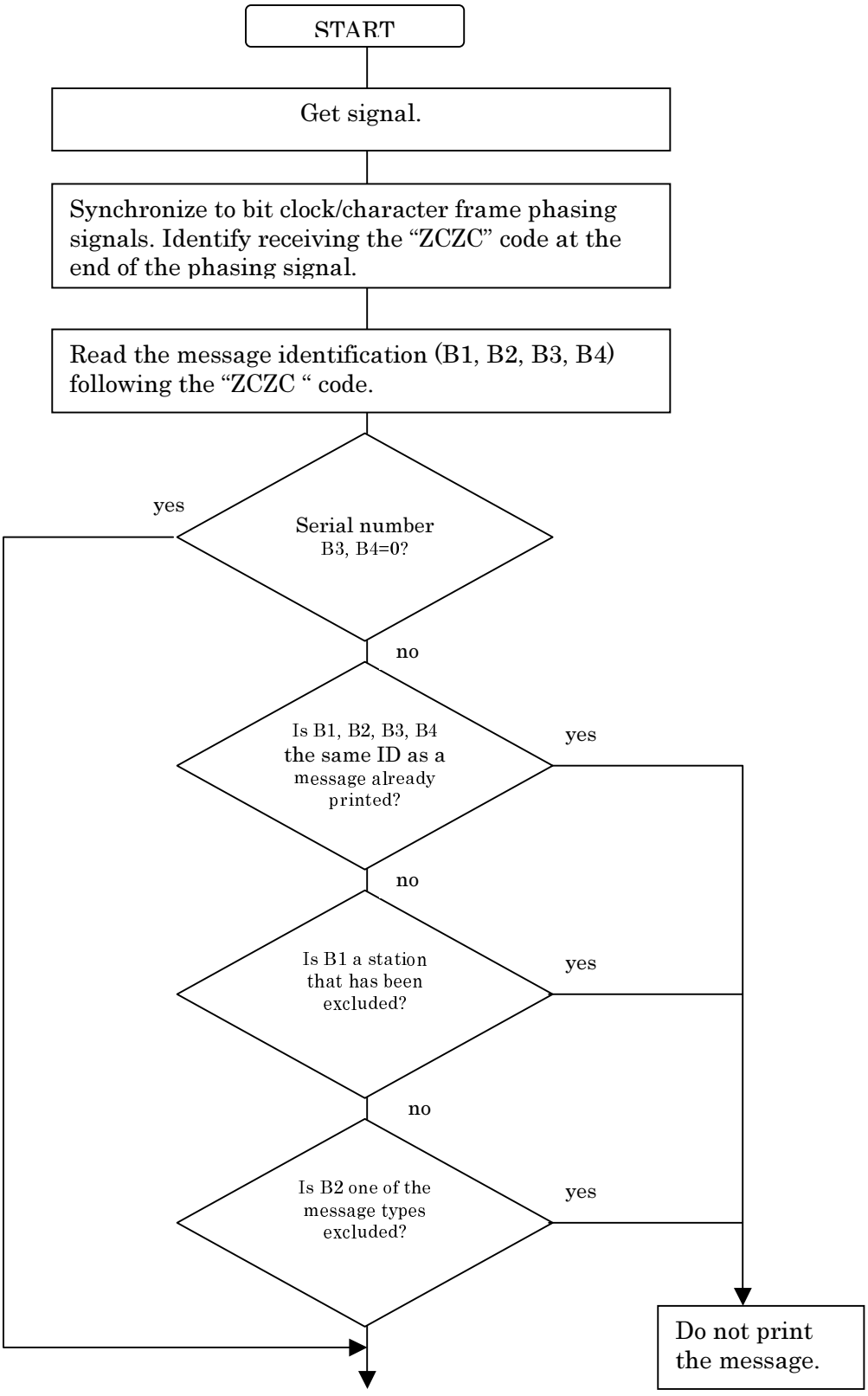
A switch-mode power supply regulates the ship's DC power to the other circuits. The power input "floats" from ground; that is, neither the "+" nor the "−" terminal is connected to ground. A signal generator and a self-test program are incorporated to test the receiver performance.

An optional AF receiver unit (interface board) converts the 1700 ± 85 Hz audio frequency, obtained from an external radio receiver, to the pulse signal needed by the microprocessor. This allows use of an external receiver or unit testing with a 1700 Hz audio output.

Figure 2-1 Functional Block Diagram

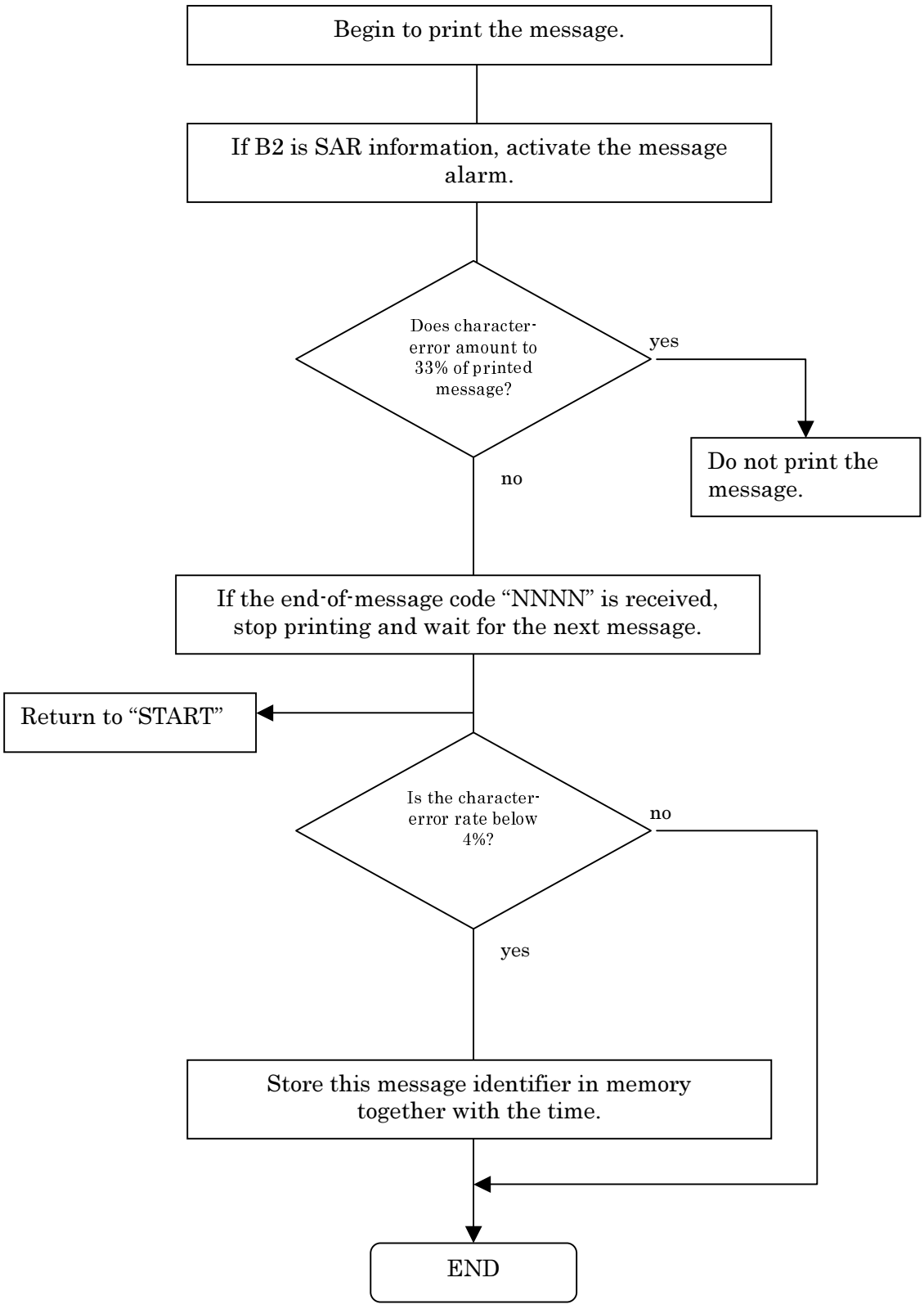


Flow-Chart of NAVTEX Message Receiving Process



(continued on next page)

Flow-Chart of NAVTEX Message Receiving Process (continued)



3. SPECIFICATIONS

General requirements for this equipment conform to IMO Resolution A.525(13) and ITU-R Recommendations 476-5, 625-3 B-mode and 540.

3.1. Operation

3.1.1. Acceptance of NAVTEX Messages

After synchronization to the phasing signal, the equipment begins to accept the message and illuminates the '**LOCK**' indicator lamp. After receiving the "ZCZC" code and "B1B2B3B4" characters without an error, printing begins. Upon exceeding a character error rate of approximately 33% in the message, the equipment will abort the current message printing and print the following message:

CORRUPT MESSAGE

3.1.2. Avoiding Printing the Same Message

When the character error rate is less than 4% in a received message, its identification is stored to avoid printing the same message again. If a message with the same ID is transmitted again on next broadcasting schedule, the equipment will print only the following message:

MESSAGE ALREADY RECEIVED

NOTE: The above message printout can be avoided by switching the equipment on while holding down the [**EXCLUDE**] *key. Repeating this keypress sequence will restore the message printing function.*

3.1.3. Message Identification Storage Capacity

The equipment is capable of storing up to 128 message identifications.

3.1.4. Erasing Stored Message Identifications

(1) When the number of stored message identifications exceeds 128, the oldest one will be erased.

(2) The time limit for storing message identifications is approximately 65 hours. At the end of that time, the identification will be erased automatically. The 65-hour time limit includes both "power-on" and "power-off" periods.

3.1.5. Printing Message with B3B4 Number =00

A message assigned serial number "00" will always be printed.

3.1.6. Character Error Indication

The equipment prints an asterisk (*) when a character error is detected in a received message.

3.1.7. Rejectable Message Types

The equipment can be programmed to reject all messeage types except for the following:

A: Navigational Warning
B: Meteorological Warning
D: Search-and-Rescue (SAR) Information
L: Additional Warnings to 'A'

3.1.8. Selectable and Rejectable Stations

The equipment can be programmed to select/reject all stations (from A to Z).

3.1.9. Alarms

The front panel indicator lamps (LEDs) and an audible alarm provide visual and audible indication of message status and printer conditions:

(1) Message Alarm: The "ALARM" indicator illuminates when a type D message (SAR information) is received. The alarm indicator on the optional external alarm box is also turned on. The audible alarm may also be deactivated, if desired.

(2) Printer Alarm: The "**PAPER**" indicator is activated if the print head accidentally stops printing, if paper supply becomes too low, or if the print head fails to return to its home position (extreme right position) within a specified time period.

< WARNING>

THE "**PAPER**" INDICATOR DOES NOT COME ON IF PAPER FEED STOPS FOR ANY REASON, ALLOWING THE ID OF THE MESSAGE CURRENTLY BEING RECEIVED TO BE STORED IN MEMORY EVEN IF THE EQUIPMENT FAILS TO PRINT THAT MESSAGE PROPERLY. IN ORDER TO PRINT THAT MESSAGE AGAIN ON NEXT TRANSMISSION, RESET THE EQUIPMENT, CLEARING THE MEMORY AFTER CORRECTING THE PAPER FEED PROBLEM.

3.1.10. Stopping an Alarm

(1) The "**ALARM**" indicator, external alarm box and audible alarm may be reset by pressing the "**ALARM STOP**" key on the front panel. The audible alarm stops automatically after a few seconds.

(2) The "**PAPER**" indicator cannot be extinguished until paper is replaced, until paper is installed correctly or until the failure-to-return-to-home position problem is corrected.

3.1.11. Automatic Line Feed

The microprocessor automatically inserts a “line feed (LF) ” code into a NAVTEX message when a line is full. One of the following will then take place:

(1) When the group of characters at the end of a line includes a space or punctuation mark (as shown below), an LF will occur before the characters that appear after the space or punctuation mark.

space	word (LF) word	colon	word:(LF) word
period	word.(LF) word	semicolon	word;(LF) word
comma	word,(LF) word	parenthesis	word((LF) word
			word((LF) word

(2) When a word consisting of 42 characters or more is received, the equipment will automatically feed one line after printing the symbol “↵” at the end of the 41st character, and will then print the rest of the characters in the new line.

(3) When a word consisting of 14 characters or more being printed is to exceed the 42nd character position in the current line, the equipment will automatically feed one line after inserting the ↵ symbol at that position, and print the rest of the characters in the new line.

(4) When a word consisting of 13 characters or less being printed is to exceed the 42nd character position in the current line, the equipment will automatically feed one line before printing that word, and then print the whole word in the new line.

3.2. Specifications

3.2.1. Receiving Frequency

518 kHz

3.2.2. Type of Reception

F1B, narrow band direct printing in forward error correction (FEC) mode in accordance with ITU-R recommendations 476-5, 625-3 B mode, and 540-2

3.2.3. Sensitivity

Less than 2 μV (emf) for 50Ω antenna (whip)
Less than 5 μV (emf) for a 10Ω-150 pF antenna (long wire)

3.2.4. Selectivity

6 dB bandwidth: greater than 300 Hz
60 dB bandwidth: less than 2 kHz

3.2.5. Leakage Emission

Less than 2 nW

3.2.6. Input Protection

Capable of withstanding 30V rms of RF signal

3.2.7. Self-Test Functions

Receiver:	Performance test, from front end to demodulator end
Microprocessor:	Memory and peripheral device tests via MCU I/O port
Printer:	Test printing
Other Tests:	Indicator lamp test and audible alarm test

3.2.8. Backup of User Settings

Backup Period:	3 days for User setting

3.2.9. Printer Specifications

Type:	Thermal moving head (EPT2025S4L)
Number of Characters:	42 characters/line
Character Font Size:	7×5 dot-matrix, 2.4mm (H), 1.4mm(W)
Printing Speed:	Approximately 0.7 lines/second
Recording Paper:	Thermo-sensitive, 112mm×25m/roll
	More than 250,000 characters printable /roll

3.2.10. Environmental

Temperature Range:	-15 to 55° C (5° to 131° F) for operating
	-20 to 80° C (-4° to 176° F) for storage
Humidity:	Up to 93% RH at 40° C (104° F), no condensation
Vibration:	Up to 50 Hz, 1G

3.2.11. Power Requirements

10 to 40 volts DC, 1.5 amps. maximum, 6 watts average, floating ground

3.2.12. Printer Paper

Type:	Thermo-sensitive
Size:	112mm×25m (4.4"× 82')
Recommended Type:	TF50KS-E2 , TP 4482 or equivalent

3.2.13. Active Antenna Specifications

Type:	Whip antenna, 1.5m (4.9 ft) long, with preamplifier
Tuned Frequency:	518 kHz
Preamplifier Gain:	Approx. 7dB (under 50Ω termination)
Input Protection:	30V rms RF maximum
Power Requirements:	8 volts DC, approx. 10 mA
Cable (standard):	RG-58/U, 30m for DEBEG 2900, 10m for NT-900
Temperature Range:	-20 to 60° C (-4° to 140° F) for operating
	-20 to 80° C (-4° to 176° F) for storage

3.2.14. AF Receiver Unit (option) 9345-9-2A

Function:	Demodulates audio frequency NAVTEX signal from external SSB receiver (USB mode), and feeds de-modulated signal into audio stage of built-in receiver for NAVTEX message printout.
Frequency:	1700±85 Hz
Input Level:	0 to 10 dBm
Input Impedance:	600Ω (nominal)

3.2.15. Serial Output

Output Message:	Receiving NAVTEX message text (ASCII)
Data Length:	7 bits
Parity bit:	None
Stop Bit:	1 bit

4. OPERATING INSTRUCTIONS

4.1. General

4.1.1. Printer Paper

Be sure to use the correct type of paper roll specified in paragraph 3.2.12.

< WARNINGS >

1. INSTALLING A PAPER ROLL OTHER THAN THE SPECIFIED ONE MAY CAUSE THE PAPER TO BE JAMMED, DAMAGING THE PRINT HEAD.

2. THE [PAPER] INDICATOR WILL NOT COME ON OR NO AUDIBLE OR VISUAL ALARM WILL BE TRIGGERED IF THE PAPER FEED STOPS, THUS ALLOWING THE CURRENT PRINTING TO CONTINUE AND STORE THE MESSAGE ID UPON SUCCESSFUL COMPLETION OF CURRENT MESSAGE RECEPTION.

TO PREVENT THIS PROBLEM, PRESS THE [MENU] KEY TO CHECK TO BE SURE THAT THE PAPER FEEDS CORRECTLY EACH TIME A MENU ITEM IS PRINTED. AFTER INSTALLING A ROLL OF PAPER OR WHENEVER THE PAPER GETS JAMMED. CORRECT ANY PROBLEM BEFORE ALLOWING THE OPERATION TO CONTINUE.

< CAUTION >

The appearance of a red line marking on the right edge of the paper indicates that there is less than 1 meter of paper remaining.

4.1.2. Printer Paper Handling Precautions

The thermo-sensitive paper has a chemical coating on one side that reacts to the heat of the print head to mark the paper. Because of this property, the following precautions should be observed when storing or handling rolls of unused paper or paper that has been printed:

(1) Do not place it near a direct heat source.

(2) Do not place it near chemical liquids such as alcohol or paint.

(3) Place it in an area where the ambient temperature is below 50° C (122° F).

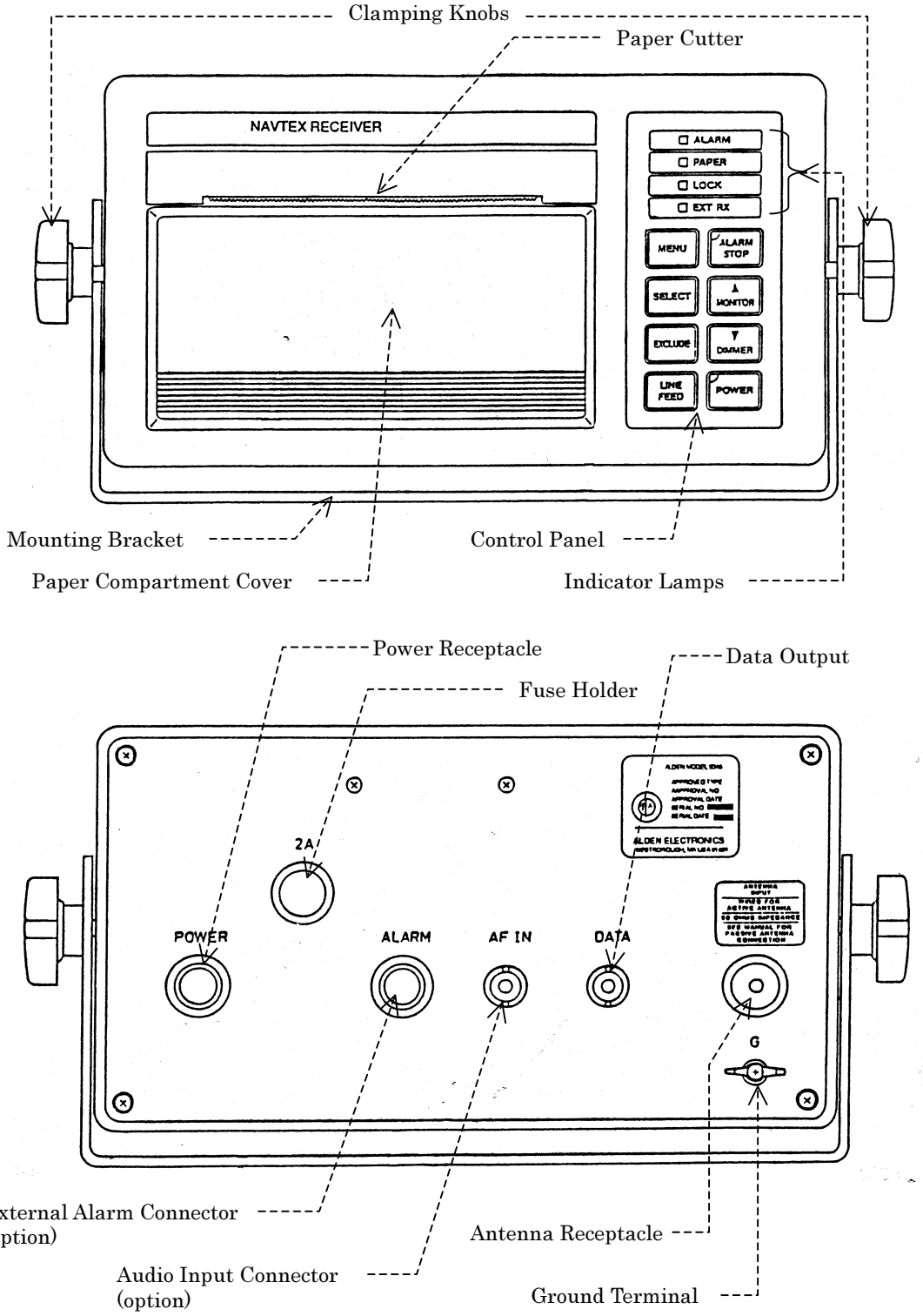
(4) Do not expose it to direct sunlight for prolonged periods of time. Unused paper will become gray; markings on paper will fade.

(5) Exercise care when using adhesive paste or tape containing organic compounds; they will cause printed areas to fade.

(6) Use a ballpoint pen, pencil, fountain pen or stamp pad to write/mark on paper. Chemical ink will cause printed letters to fade.

(7) If the equipment is operated with wet paper installed, the print head will tear it, which will cause the printer to stop. If that happens, do not use the [**PAPER FEED**] key to remove the paper; draw the paper out by hand.

Figure 4-1 Front and Rear Views of Receiver Console

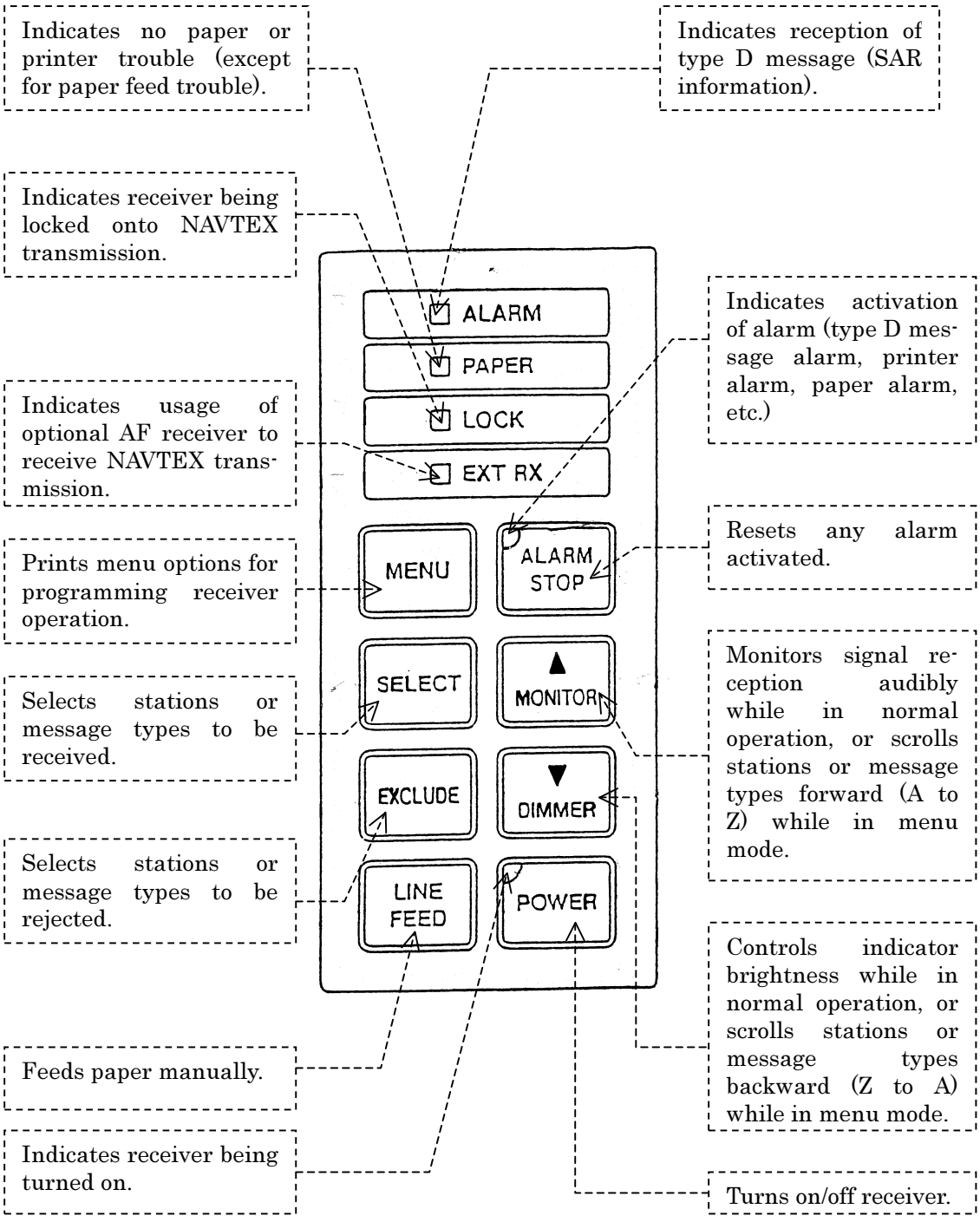


* *The present hardware does not support connection of any device through this hole.*

4.1.3. Controls (Keys) and Indicators

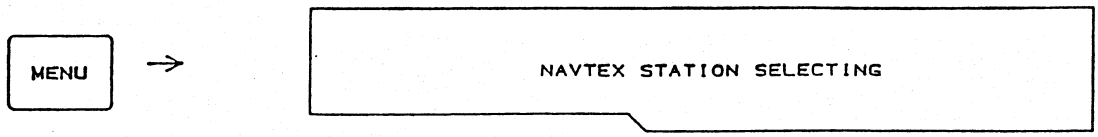
Figure 4-2 below shows the equipment's control panel with a brief description of the control keys and indicator lamps.

Figure 4-2 Control Panel



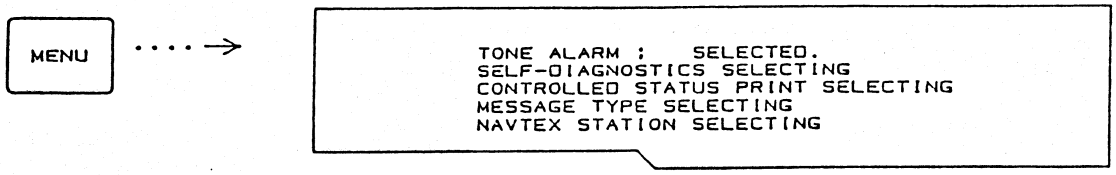
4.1.4. General Instructions

When you press a key to perform a function, the printer will immediately print its operating status message. In this manual, an illustration of the function key is shown on the left and the status message is given on the right, as in the example below.



The above example shows that when you press the [**MENU**] key, the control message for selecting a station is printed.

To select a function, you should press the [**MENU**] key repeatedly until the function that you wish to perform is printed. For example, if you want to select the "Self-Diagnostics Test," you should press the key repeatedly until the following message is printed. A new line is printed each time the key is pressed.



NOTES:

(1) When the printer is busy printing, the processor will sound a warning tone to signal you to wait before pressing any key.

*(2) When the "***LOCK***" indicator is lit, the receiver will refuse your key operation except for the* [**MONITOR**] *and* [**DIMMER**] *keys. However, if you want to override that condition, press and hold down the* [**MENU**] *key for about 3 seconds. The processor will stop its reception and go into the control menu mode.*

(3) If a key that is unrelated to the current operating sequence is pressed, the processor will ignore its command and sound a warning beep.

4.1.5. Completing Entry Instructions

While the receiver goes into a control operation with the [**MENU**] key, the receiver will continue to receive NAVTEX signal, but will not begin to print a message because the signal processor is busy processing the control menu.

To complete the operation:

(1) Press the [**PAPER FEED**] key.

(2) If you want to perform another function, press the [**MENU**] key and make the selection.

(3) If you selected either the controlled status printing, the self-diagnostics test or the memory clear, press the [**EXCLUDE**] key.

(4) A few minutes after the operation you selected has been completed, the system will automatically print the following message, and will then revert to the signal reception mode.

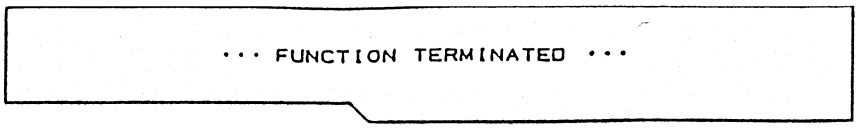
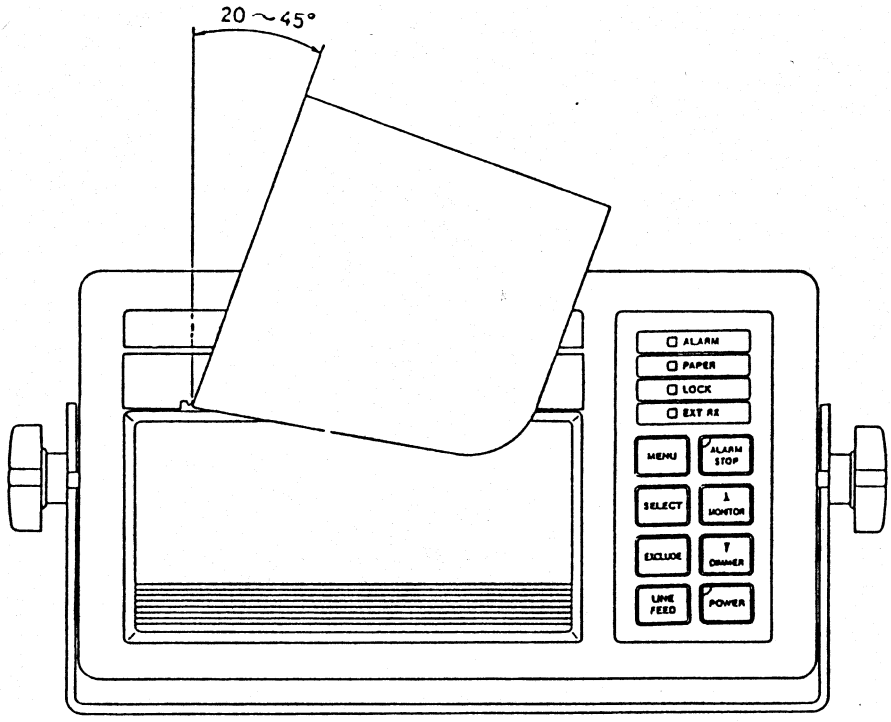


Figure 4-3 Removing Printed Paper



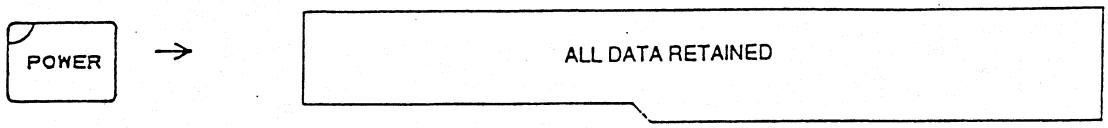
4.1.6. Removing Printed Paper

First, pull out the printed paper until there is at least a 3 cm (1 inch) margin between the end of the message and the paper cutter (cutting edge). Then, hold the paper at an angle as shown in the above figure, and pull the paper upward at a steady, moderate speed. *Pulling too fast or too slow may cause an uneven cut line.*

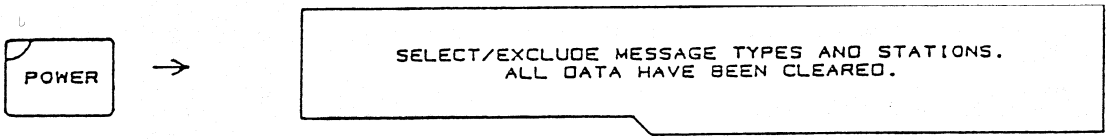
4.2. Turning Power On and Off

4.2.1. Power On

The equipment may be switched on by pressing the [**POWER**] key. The green indicator lamp in the [**POWER**] key illuminates along with the sounding of a short audible alarm, indicating that power is on properly. At a normal start, data stored in memory remains there and the following message is printed:

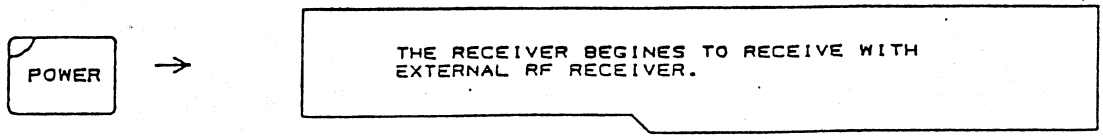


If data has been volatilized due to prolonged switched-off periods or at first-time power up (after initial installation), the printed message is as follows:



The equipment requires a warm-up time of about 30 seconds. If data is retained in the memory at power up, the receiver begins to receive under the same operating conditions as it did before being switched off. Message IDs stored are also retained. However, IDs stored over 65 hours including switched off time will be soon erased. The control-status settings stored in memory can be easily read. Refer to "4.5.3 Checking Control Status." It is impossible to access the message ID stored in memory.

If the optional AF Receiver Unit was receiving NAVTEX signal before being switched off, it will continue to do so and the power-on message changes as follows:



4.2.2. Switching Off

To turn the equipment off, press and hold down the [**POWER**] key until the indicator lamp in the [**POWER**] key stops flickering and a short audible alarm is heard. DO NOT release the [**POWER**] key while the lamp is flickering.

4.3. Message Types and NAVTEX Stations

The NAVTEX system is designed to be flexible. Messages, which are transmitted on predetermined schedules from the NAVTEX stations in each NAVAREA, are divided into approximately 17 classes. Your NAVTEX receiver can be programmed to receive and process specific classes of messages while all others are ignored. The only exception is navigational and meteorological warnings and search-and-rescue (SAR) information (message types A, B, D and L) which are transmitted at any time and cannot be rejected at the receiver. You can also program your equipment to select the NAVTEX stations from which you wish to receive messages. The next section (paragraph 4.4) tells you how the unit receives and prints NAVTEX messages, and the section following that (paragraph 4.5) describes the operating instructions you will use to select or exclude messages types and stations.

4.4. Receiving and Printing NAVTEX Messages

4.4.1. NAVTEX Signal Acquisition

The illuminated "**LOCK**" indicator lamp indicates that the receiver is synchronized with the phasing signal sent in advance of the message. If the signal strength becomes weak or if the equipment receives strong interference, the character error rate will increase. When the error rate exceeds a certain level, the receiver terminates printing after printing "**CORRUPT MESSAGE**" and the "**LOCK**" lamp will be extinguished.
.

4.4.2. Printing NAVTEX Message and Storing Message ID

After acceptance of the ID code of a selected message, the printer begins to print the message. Upon receiving the end-of-message code "NNNN," the reception is completed. After printing the NAVTEX message, its ID code is stored in memory. However, if the character errors exceed 4% of the received characters, its ID will not be stored to allow reception of the same message on next transmission.

Your equipment is capable of storing 128 message IDs. When the 129th message is stored, the oldest one will be erased. Also, the stored IDs are erased after they have been in memory for approximately 65 hours. Those IDs are compared against those of new messages being received, thereby avoiding printing a message that has already been received.

If the printing of a NAVTEX message is not completed because the paper supply has run out or the print head accidentally stops functioning, the ID number for that message will not be stored.

< WARNING>

IF THE PAPER GETS JAMMED, THE PAPER ALARM WILL NOT BE TRIGGERED, THUS ALLOWING THE ID OF THE CURRENT MESSAGE TO BE STORED. IN ORDER TO PRINT THAT MESSAGE AGAIN ON NEXT TRANSMISSION, RESET THE EQUIPMENT, CLEARING THE MEMORY AFTER CORRECTING THE PAPER FEED PROBLEM.

4.4.3. Interruption of NAVTEX Message Reception

The receiver will stop receiving under either of the following conditions:

(1) When the character error rate becomes more than 33% of the received characters.

(2) When the "**PAPER**" alarm sounds. The alarm sounds when the paper supply is nearly exhausted, and then the receiver continues to print a few more line before stopping the printer.

< WARNING>

THE PAPER ALARM WILL NOT SOUND IF THE PAPER GETS JAMMED OR IS FORCED TO STOP FEEDING FOR ANY REASON. IF THAT TROUBLE OCCURS, THE ID OF THE CURRENT MESSAGE WILL BE STORED EVEN IF THE MESSAGE CANNOT BE PRINTED PROPERLY. TO PRINT THAT MESSAGE AGAIN ON NEXT TRANSMISSION, RESET THE EQUIPMENT FIRST AFTER CORRECTING THE PAPER FEED PROBLEM.

4.4.4. Urgent NAVTEX Message Alarm

Upon reception of an SAR message (type "D"), the "**ALARM**" lamp illuminates and the audible alarm is activated. The optional remote alarm lamp, if connected to your equipment, is also illuminated at the same time.

The audible alarm, which is an off-and-on whistling tone, automatically stops after approximately 10 seconds, but the visual alarm remains lit until the [**ALARM STOP**] key is pressed. Refer to paragraph "4.5.5 Controlling Audible Alarm," if you wish to silence the audible alarm.

4.4.5. Paper and Printer Alarms

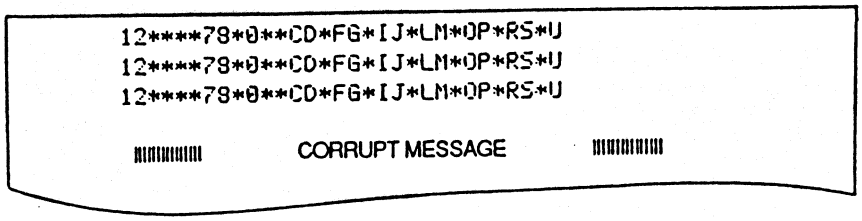
When either an end-of-paper or accidental printer stoppage is detected, the "**PAPER**" lamp will illuminate and the audible alarm will be activated. The alarm is a long tone that sounds for approximately 10 seconds.

When the alarm is due to a depleted paper supply, install a new roll of paper. Refer to "4.9 Loading Thermo-Sensitive Paper." for instructions.

If the alarm is due to print head stoppage, turn the equipment off, and check the printer and the paper. After correcting the malfunction, be sure that the print head will move over the paper smoothly. Turn the receiver on again. The "**PAPER**" lamp will be extinguished and that the alarm will be reset.

4.4.6. Character Error

If the processor detects a character error in the message currently being received, the error character will be replaced with an asterisk (*) on the printed copy, as in the example below.



NOTE: Unprintable codes, such as carriage return, line feed, and upper/lower case shift will also be printed as asterisks when they are received incorrectly.

4.5. Operating the Receiver in Control Menu Mode

The following operating functions are available in the control menu mode by repeatedly pressing the [**MENU**] key.

(1) NAVTEX station selecting

(2) Message type selecting

(3) Controlled status print selecting

(4) Self-diagnostics selecting

(5) Tone Alarm; selected

(6) AF receiver unit selecting*

(7) Memory clear selecting

* *When the optional AF Receiver Unit (9345-9-2A) is installed, the printout will read:*

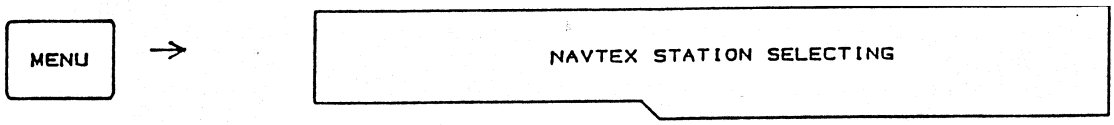
"External receiver; excluded"

To access a specific function, continue pressing the [**MENU**] key until the desired function appears on the printed paper.

NOTE: If you do not begin the selected operating function within a few minutes, the control menu mode will be cancelled automatically and the message **FUNCTION TERMINATED**" *will be printed. The operating instructions for each control menu mode function are given in the following paragraphs (4.5.1 through 4.5.7)*

4.5.1. Selecting NAVTEX Stations

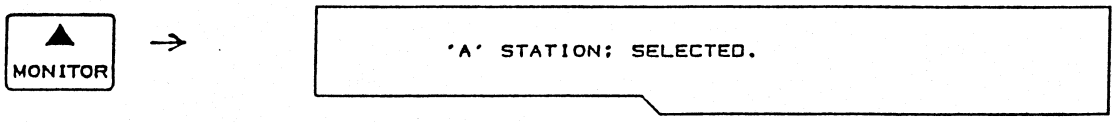
As shown in the preceding paragraph, the function available the first time you press the [**MENU**] key is the selection of NAVTEX stations.



In this display, the [**▲/MONITOR**] key allows you to move upward through the alphabet (from A to Z) to select the ID characters of various stations.

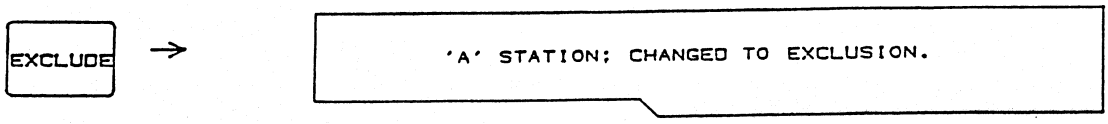
The [**▼/DIMMER**] key allows you to reverse the order of selection (from Z to A).

Enter the first NAVTEX station to be selected:



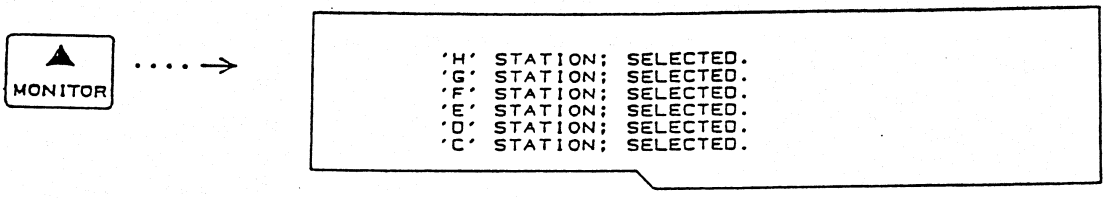
The above example shows that the station identified as "A" is selected.

When a NAVTEX message is transmitted from station "A," the message will be printed. If you are not interested in transmission from station "A," press the [**EXCLUDE**] key:

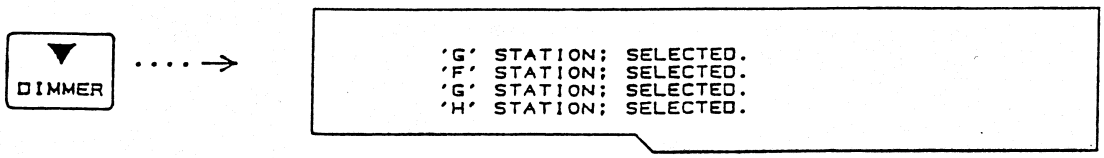


To shift to the next station, "B":

To select the "H" station:

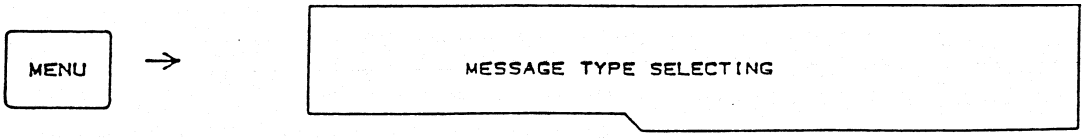


To back up alphabetically:



4.5.2. Selecting Message Types

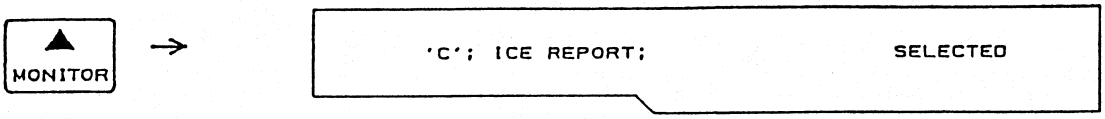
After selecting stations, shift to the next control menu mode:



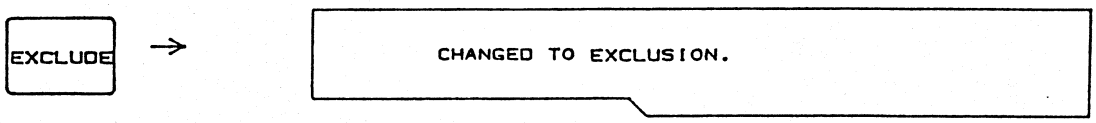
The second control menu function is the selection of message types. Note that you are allowed to exclude any of the 26 types of messages listed below, except for types "A," "B," "D," and "L," which are shown with an asterisk (*).

*Type A:	Navigational Warnings
*Type B:	Meteorological Warnings
Type C:	Ice Reports
*Type D:	Search-and-Rescue (SAR) information
Type E:	Meteorological Forecasts
Type F:	Pilot Service Messages
Type G:	Decca Messages
Type H:	Loran-C Messages
Type I:	Omega Messages
Type J:	Satnav Messages
Type K:	Other Electronic Navaid Messages
*Type L:	Navigational Warnings – addition to type "A"
Types M to Y:	Reserved
Type Z:	No Message on Hand

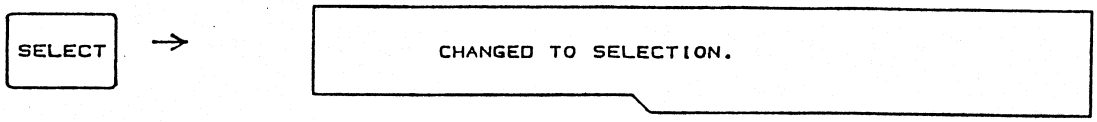
Press the **[▲/MONITOR]** key. The printer will print the first selectable message, type "C" (Ice Reports), together with its controlled status , as in the example below.



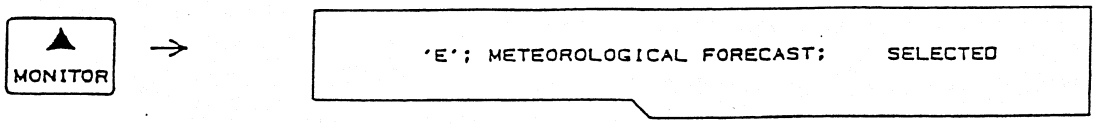
Type "C" messages are currently selected. When the equipment receives a type "C" message, the printer will print it. To reject type "C" messages:



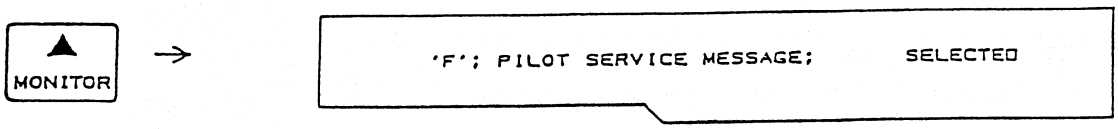
To change from "exclude" status to "select" status:



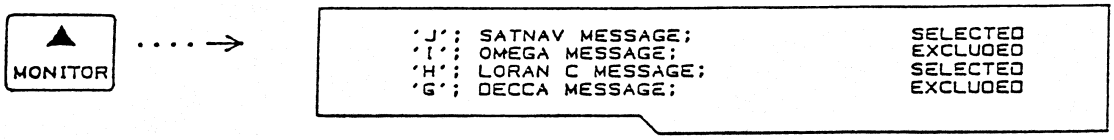
To advance to the next selection type, "E," "Meteorological Forecast:"



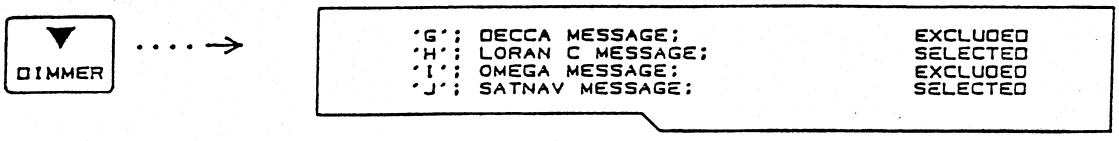
Type "E" is selected. Press the [**EXCLUDE**] key if you wish to reject type "E" messages. If not, move to the next selectable message:



If you want to change the control status for type "J" messages:



If you want to back up alphabetically to type "G" messages:



Press the [**LINE FEED**] key when message selection is complete. The equipment will begin to receive the messages you have selected as they are transmitted. If you want to check the selected/excluded stations or messages, proceed to the next paragraph "4.5.3 Checking Control Status."

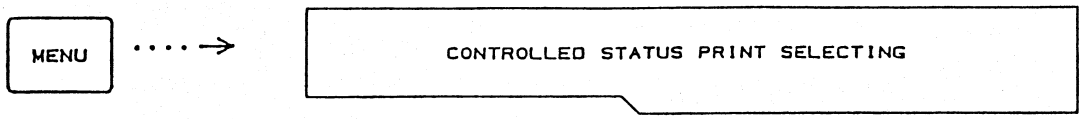
4.5.3. Checking Control Status

Excluded message types, rejected stations and other control status settings stored in memory are listed on a printout that is available in the third control menu function:

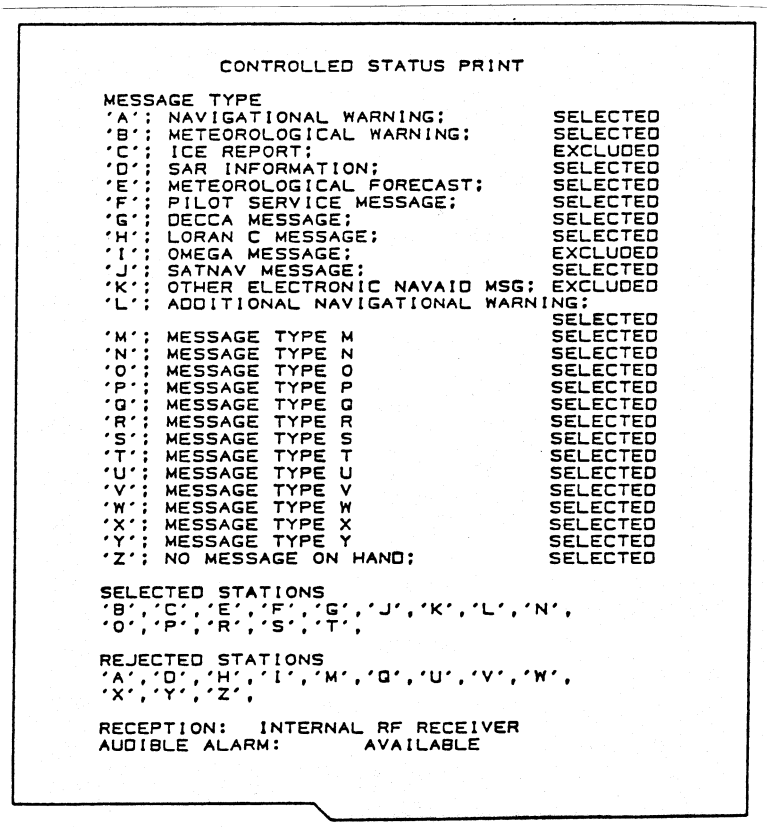
"CONTROLLED STATUS PRINT SELECTING"

In this menu mode, the receiver prints a control status list in either of two ways. One way prints out a complete list of all message types and stations that have been selected and excluded; the other is a simplified version that lists only the excluded message types and stations.

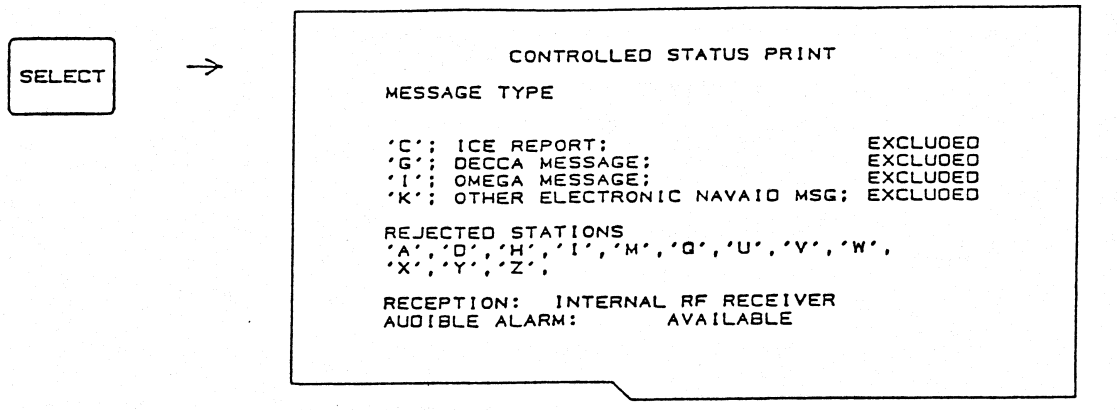
Press the [**MENU**] key three times until the following control note is printed:



If the full version is active, here is what will be printed when the [**SELECT**] key is pressed:

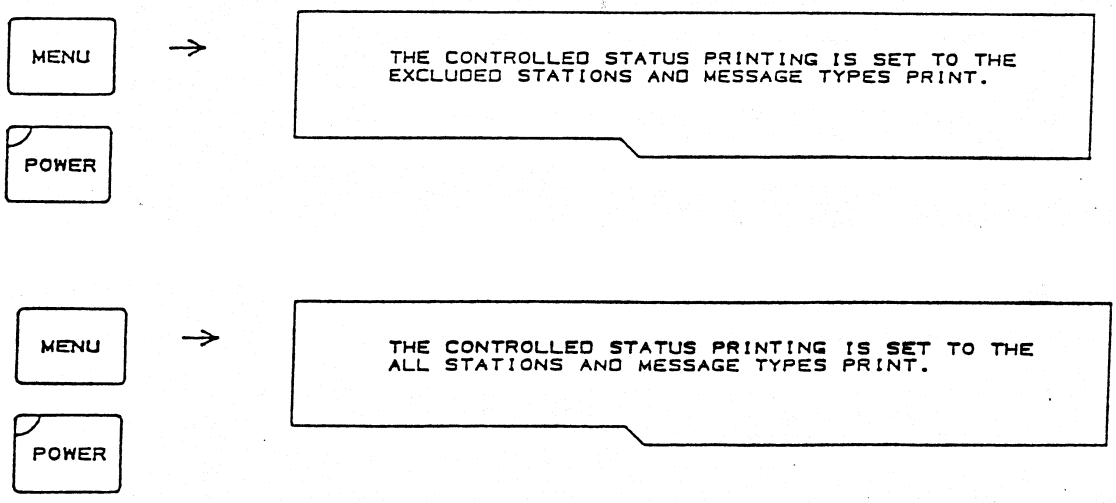


If the simplified version is in effect, here is what will be printed when the [**SELECT**] key is pressed:



Changing Printing Mode:

The printing mode is alternately changed from one printout version to the other by turning the power on and off again with the [**MENU**] key depressed. Start from the power-off condition and press the [**MENU**] and [**POWER**] keys *at the same time*. The following illustrations are examples of what will be printed when you perform the power-off/power-on steps correctly.



IMPORTANT: After changing the printing mode, you must press the [**MENU**] and [**SELECT**] keys again in order to print out a new control status list.

4.5.4. Self-Diagnostic Tests

This control menu function mode provides the following self-diagnostic tests:

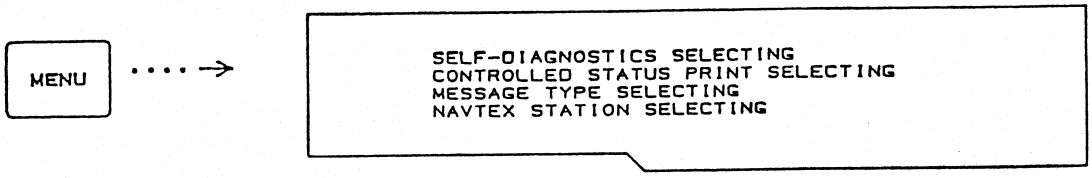
(1) Memory test for ROM (checks data stored) and RAM (checks read/write function)

(2) Receiver test — from front-end to demodulator end — and includes tests of RF signal interface with peripheral devices on microprocessor unit.

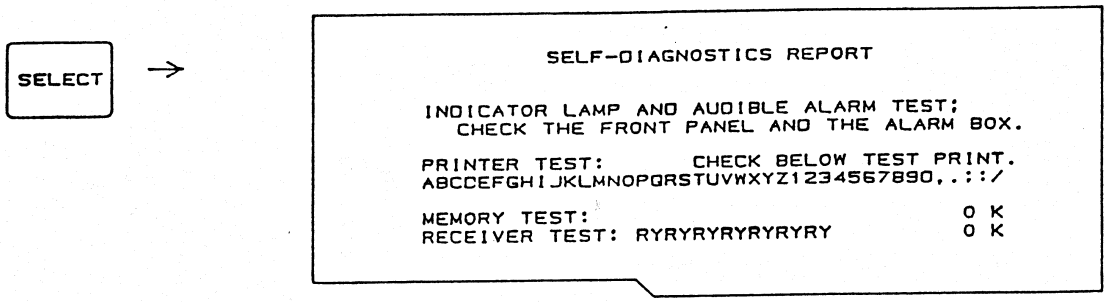
(3) Printer test, printing out all alphanumerical characters and.

(4) Lamp and audible alarm tests (on/off test for all visual indicators and sound check for audible alarm

Selection of the self-diagnostic mode is the same as for the other control menu function modes. Press the [**MENU**] key until the name of the function is printed:



Press the [**SELECT**] key. The test will start and the results will be printed:



The test report is printed at the end of the "receiver" and "memory" tests. If a result is not "**OK**," its report will change to "**FAIL**."

Observe the operation of the printer; listen to the printer and visually examine the alphanumerical characters produced for the "printer test" and check for the following:

(1) The movement of the print head is normal (not too slow).

(2) If one of the thermal elements on the print head is defective, its dot line will not be printed.

(3) If the thermal elements are worn, printing will fade.

(4) If the printer paper is too humid, or the thermal elements have become worn, printing will be poor.

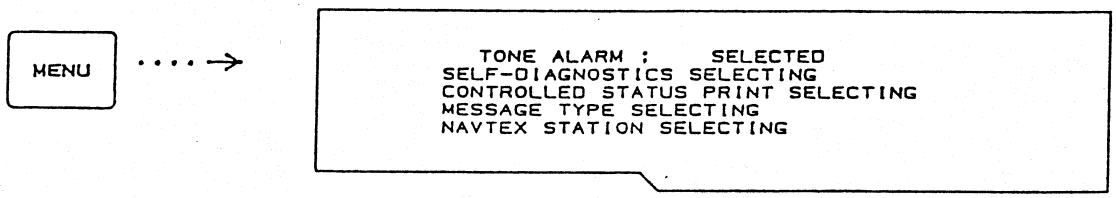
During the last part of the **PRINTER TEST**, the diagnostic function checks the LED indicators and piezo-electric buzzer. Check that all indicator lamps are blinking on and off. Also be sure that the alarm tone can be heard.

After finishing the self-diagnostic test, the equipment willl go into NAVTEX signal reception automatically. Pressing the [**EXCLUDE**] key will cancel the menu selection, returning the equipment to the normal receiving operation.

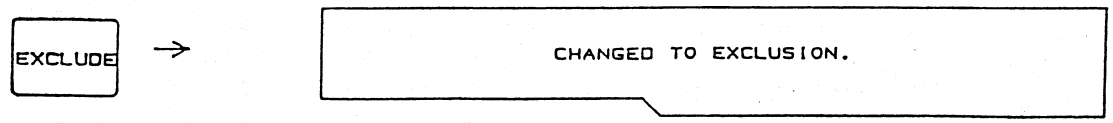
4.5.5. Controlling Audible Alarm

When an SAR (search-and-rescue) message is received, the audible alarm is activated together with the **ALARM** indicator. The alarm will stop automatically after approx. 10 seconds. This control menu function allows selection of the audible alarm.

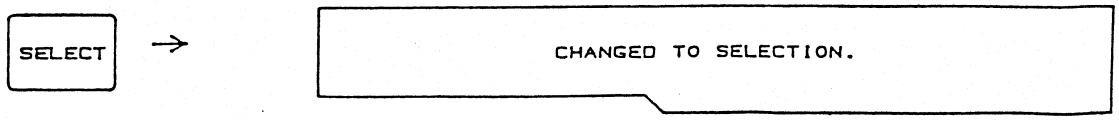
Enter this control menu function by repeatedly pressing the [**MENU**] key:



The above printout example shows that the audible alarm is available. If you want to exclude it:



If you want to reactivate it:



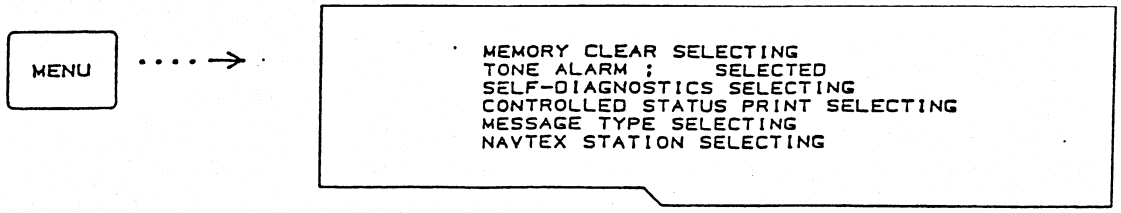
By pressing the [**LINE FEED**] key after setting the audible alarm, the equipment will return to normal receiving operation.

4.5.6. Clearing Memory (Resetting the System)

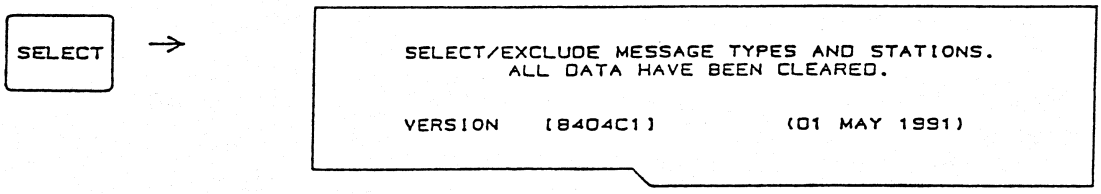
< CAUTION >

Execution of this control menu function will reset all user-selected settings, and will also erase all station and message IDs stored. The only occasions when memory clearing would be desirable or required are as follows:

(1) If you experience a system malfunction.
(2) If the microprocessor fails to operate as programmed.
(3) If you wish to reset all previous control status settings to the factory's defaults or if you wish to erase all stored IDs.



Press the **[SELECT]** key. The function clears the memory and the prints the software version number and its release date, as in the example below.



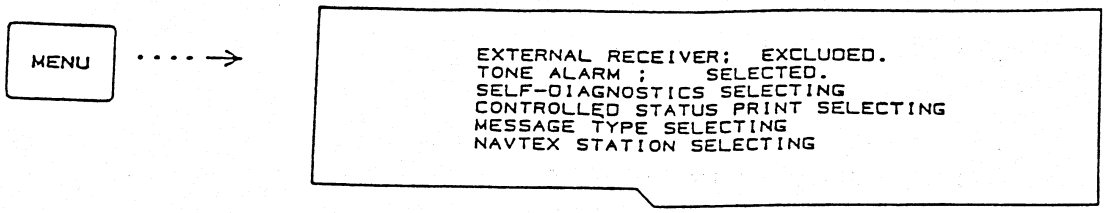
If you want to cancel this function, press the **[EXCLUDE]** key.

4.5.7. Using External (AF) Receiver

NOTE

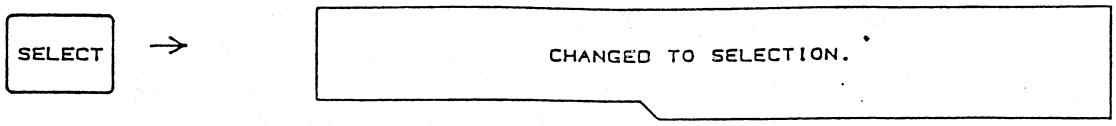
This operation is available only when the optional AF receiver board (9345-9-2A) is installed inside the equipment. If the jumper plug is not connected to "**JP2**" on the microprocessor unit board, the "external receiver" status will not be printed on the list of control menu functions.

If you wish to receive NAVTEX signal using the AF receiver board:

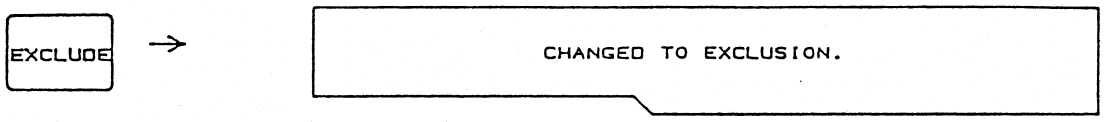


(continued on next page)

followed by:



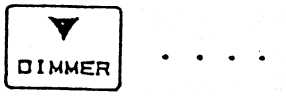
The LED indicator "**EXT RX**" will light up and the microprocessor will begin to process signal from the AF receiver unit. While the "**EXT RX**" indicator is illuminated, the equipment will not receive signal from the internal receiver unit. To change the signal source from the external receiver back to the internal receiver unit:



Then the "**EXT RX**" lamp will go off and the microprocessor will resume receiving signal from the internal receiver.

4.6. Dimming LED Indicator Lamps

At power-up, all LED indicator lamps are at the highest brightness level. The brightness can be gradually reduced by pressing the [**▼/DIMMER**] key twice:



Pressing the [**▼/DIMMER**] key a third time extinguishes all lamps except the "**ALARM**" indicator. Pressing the key a fourth time brings the brightness of all lamps to the highest level.

4.7. Signal Monitor

The signal monitoring function allows you to audibly check the condition of the receiver; it provides a signal check from the antenna to the signal processor. Signal quality, however, cannot be checked with this function. Demodulated NAVTEX signal or noise is monitored by a single tone piezo-electric buzzer in the following manner. When receiving a signal of a frequency higher than 518 kHz, the buzzer emits a tone; whereas, when receiving a signal lower than 518 kHz, the buzzer remains silent.

The monitoring function is available only during the time the [**▲/MONITOR**] key is pressed. If an SAR message is received while the key is pressed, the alarm tone will automatically sound. To continue monitoring, first reset the alarm with the [**ALARM STOP**] key, then press the [**▲/MONITOR**] key again.

4.8. Manual Paper Advance

Each time the [**LINE FEED**] key is depressed, the print head moves over the paper without printing and the paper advances one line. After installing a new roll of paper, or whenever a paper feed problem is experienced, press this key to check if the paper advances correctly, and correct any problem.

4.9. Loading Thermo-Sensitive Paper

An illuminated "**PAPER**" indicator signifies that an end-of-paper or an accidental stoppage of the print head is detected. While the "**PAPER**" indicator is lit, the equipment will not print messages. If the paper supply is low, replace the paper as shown below.

< WARNINGS >

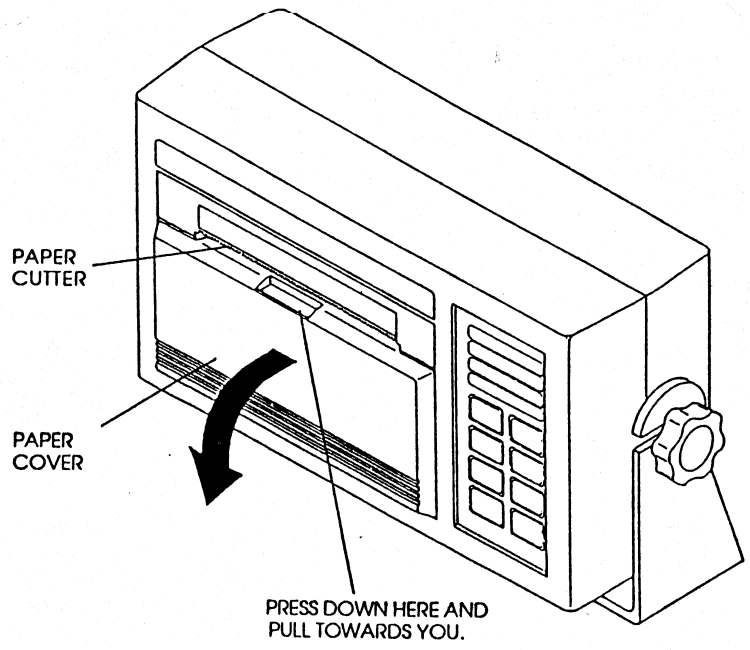
1. BE VERY CAREFUL WHEN LOADING PAPER INTO THE UNIT. THE PAPER CUTTER IS SHARP AND COULD CAUSE INJURY IF YOU ARE CARELESS.
2. THE PAPER INDICATOR WILL NOT GLOW IF PAPER GETS JAMMED OR IS FORCED TO STOP FOR ANY REASON. THE MESSAGE ID WILL BE STORED, HOWEVER, IN THIS CASE. RESET THE SYSTEM TO RECEIVE THE SAME MESSAGE OVER NEXT TRANSMISSION.

The procedure for loading the paper is as follows:

(1) Pull out the remaining printing paper by hand.

(2) To open the paper compartment cover on the front panel, press down at the location shown in the figure below, and pull the cover towards you.

Figure 4-4 Open the Paper Compartment Cover



(3) Remove the paper bobbin remaining in the case, and extract the paper roll mandrel from the bobbin.

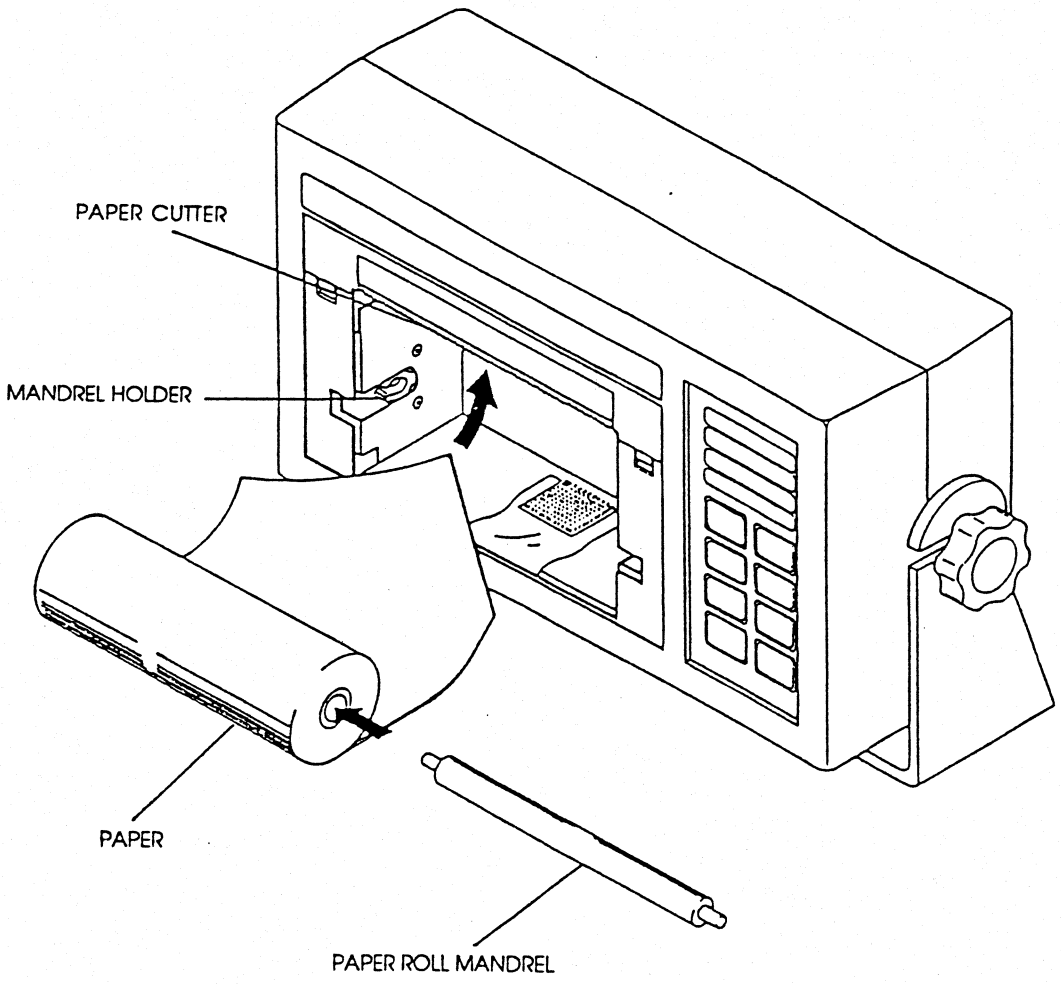
(4) Cut a point at the end of the new roll of paper with scissors to ease loading it into the printer, as in the figure below.

(5) Slip the pointed end of the paper into the slot at the bottom of the printer until the paper comes out in front of the printer. Make sure that the coated surface is facing down.

(6) Insert the paper roll mandrel into the center of the paper roll.

(7) Load the roll into the paper holder, placing the ends of the mandrel into the mandrel holders.

Figure 4-5 Loading a New Roll of Paper



(8) Feed out the paper by pressing the [**LINE FEED**] key.

(9) Check to be sure that the center of paper lines up with the center of the printer. If not, pull out with both hands until the paper center is shifted to the printer center.

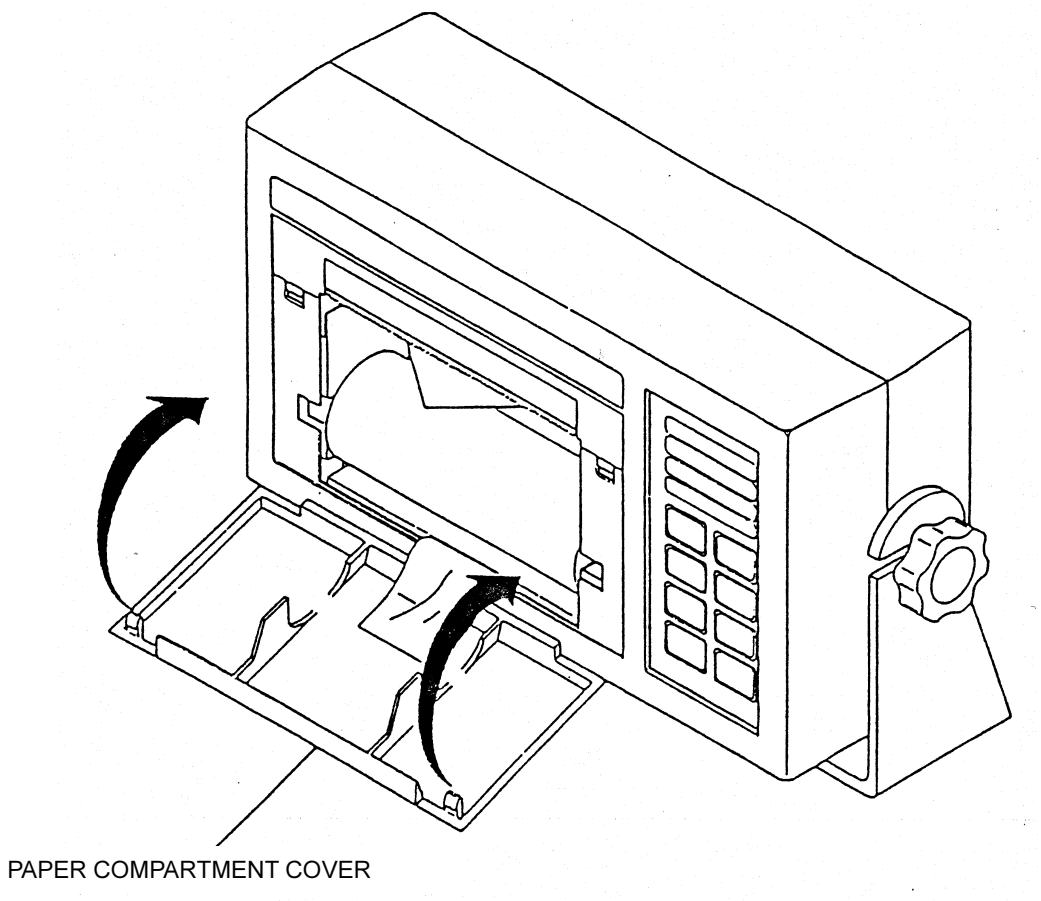
(10) Feed the paper with the [**LINE FEED**] key until the "**PAPER**" indicator goes off.

NOTE

The "**PAPER**" alarm caused by a low paper supply can only be reset by advancing the paper using the [**LINE FEED**] key.

(11) Reinstall the paper compartment cover to the front panel.

Figure 4-6 Roll of Paper Shown Installed

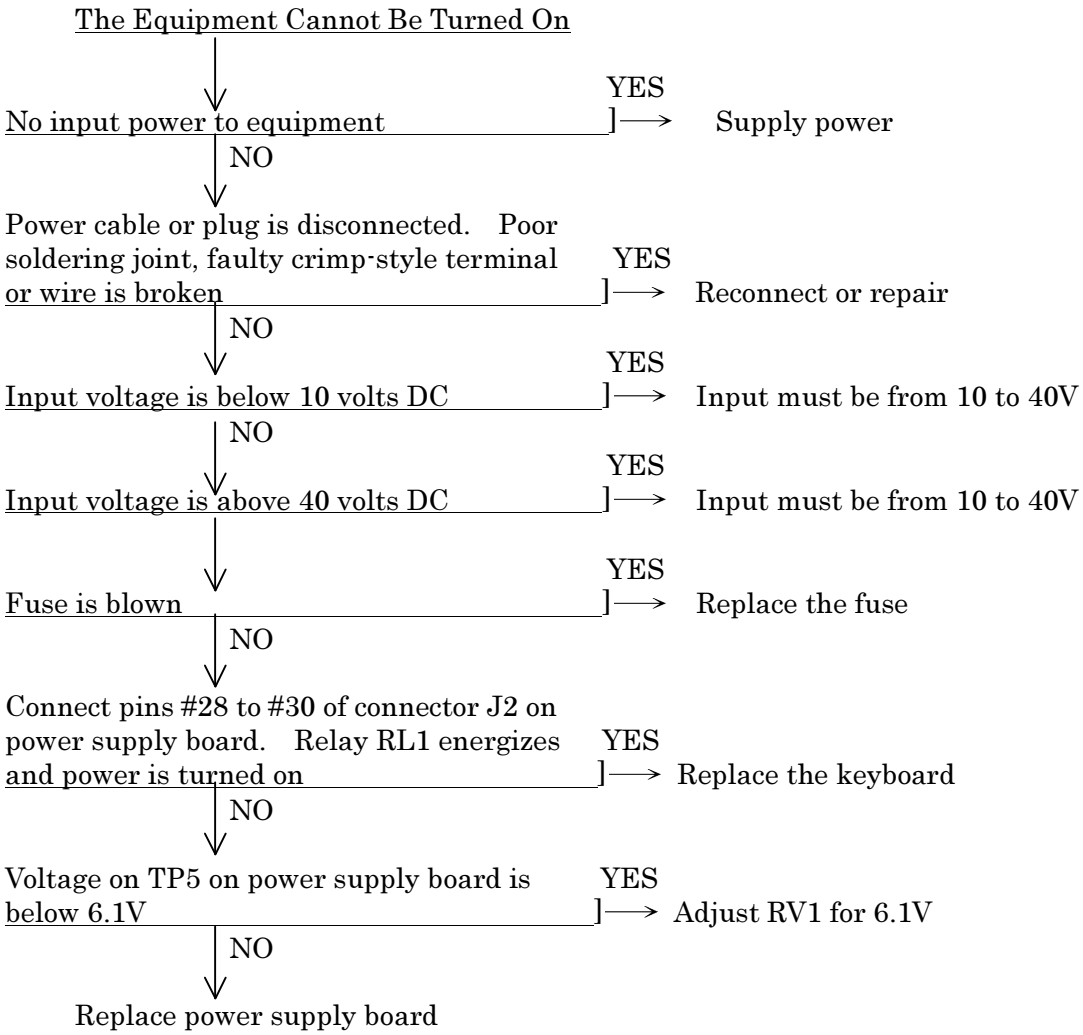


5. TROUBLESHOOTING

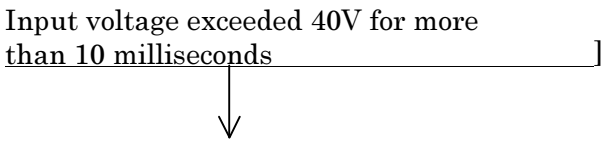
IMPORTANT NOTICE

The adjustments and replacements specified in this section must be carried out only by an authorized dealer or a technically qualified person.

5.1. Power Supply



The Equipment Is Switched Off Without Touching The [**POWER**] Key.



5.2. Printer

One of 7 Dots Does Not Print.

One of thermal elements has high resistance.
Check resistance from pins #1 through #7 of J3 to ground. Is resistance more than 5Ω?] YES ⟶ Replace entire printer assembly*
NO ↓
Power (pulse) is not fed to faulty element] YES ⟶ Replace power supply board.
NO ↓
Replace microprocessor board

* CAUTION: Check the part number on the printer assembly before replacing it. If the number of the replacement printer unit is EPT2025SL4, the software must be changed to version 8404F1 or greater. Otherwise, erratic printing will result. If the replacement carries the number EPT1025LW4, the existing software applies.

Light Printing Density
↓
Paper coating has degenerated] YES ⟶ Change paper
NO ↓
Print head requires cleaning] YES ⟶ Clean using alcohol
↓
Print head has worn out. Replace printer assembly.

Print Head Moves But Does Not Print.
↓
When power is supplied to print head, does output from U4 (print head driver) go low?] YES ⟶ Replace printer assembly
NO ↓
Replace power supply board.

Line Feed Does Not Occur.

↓

Long length of paper hanging from printer] YES ⟶ Remove printed portion

↓ NO

When loading paper, [**LINE FEED**] does not feed properly] YES ⟶ Correctly position paper by hand

↓ NO

Paper roll mandrel is not properly seated in mandrel holder] YES ⟶ Place mandrel properly

↓ NO

If line feed does not occur by pressing [**LINE FEED**] key, replace printer assembly.

Paper Alarm Does Not Reset Properly

↓

(1) After installing new paper and feeding paper by pressing [**LINE FEED**] key, paper alarm does not reset; or ...

(2) Paper alarm sounds even if adequate amount of paper remains

↓ NO

Paper is loose in front of paper sensor] YES ⟶ Pull out some paper by hand

↓ NO

Paper sensor is dirty] YES ⟶ Clean paper sensor

↓ NO

Paper sensor output has dropped below 3.5V] YES ⟶ Replace sensor. Check voltages.

↓ NO

Try replacing microprocessor board] YES ⟶ Replace microprocessor board

↓ NO

Replace Key and Display Board.

Paper Alarm Will Not Reset After Print Head Stoppage Caused By Paper Jam.

↓

(1) Wet or crumpled portion of paper obstructs print head movement.

(2) Paper alarm illuminates when sufficient paper remains on roll. Turn power off and remove any paper jam that blocks print head.

At power-up, print head does not return to left edge, and paper alarm is on again.

↓ YES

When power is off, print head can be easily moved with pencil] NO ⟶ Replace printer assembly*

↓ YES

Motor drive voltage pulses of approx. 5V are fed to 4 terminals of printer motor] NO ⟶ Replace power supply unit

↓ YES

Try replacing microprocessor board] OK ⟶ Replace microprocessor board

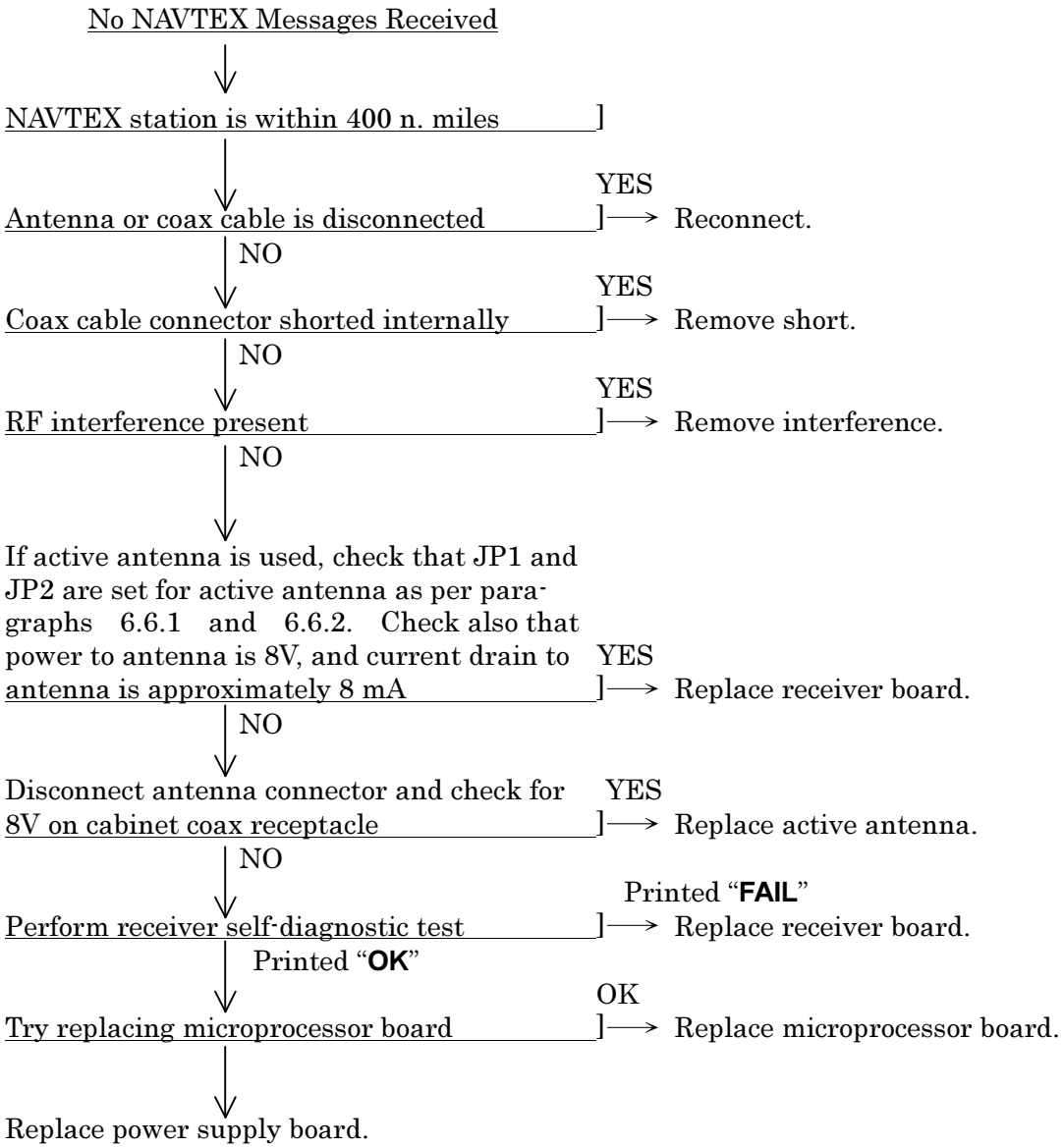
↓

Replace power supply board.

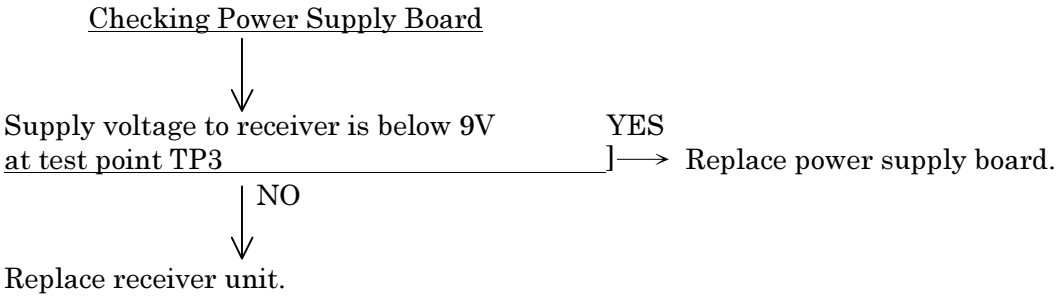
* CAUTION: Check the part number on the printer assembly before replacing it. If the number of the replacement printer unit is EPT2025SL4, the software must be changed to version 8404F1 or greater. Otherwise, erratic printing will result.

If the replacement carries the number EPT1025LW4, the existing software applies.

5.3. Receiving Signal



5.4. Power Supply Board



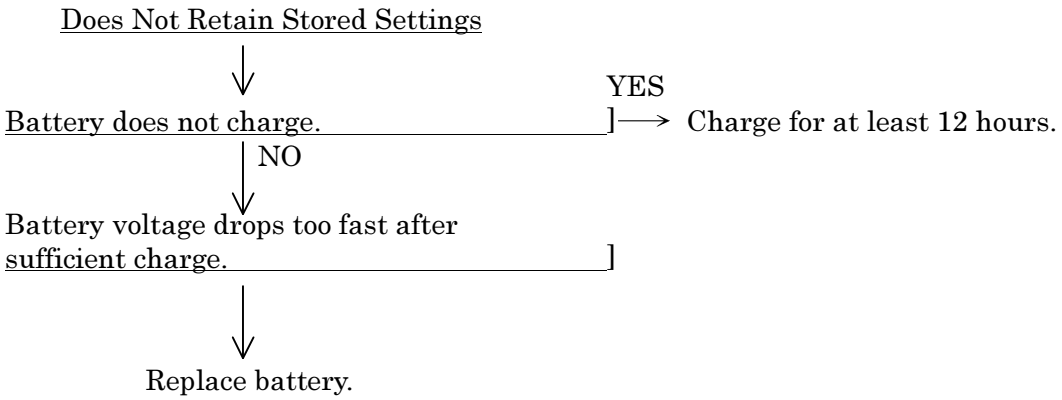
Additional Information on Trouble-Shooting Power Supply Board

Applicable serial numbers: 223386 through 223835

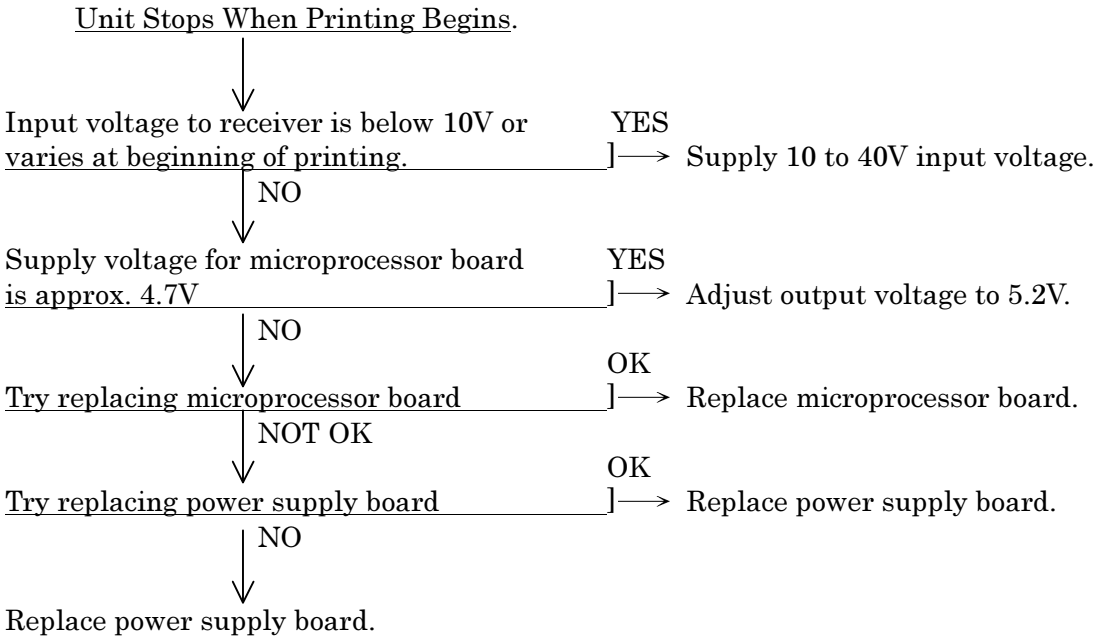
Replace the entire power supply board (Y-9017) if one of the following troubles is encountered.

1. The fuse (2A) blows repetitively or the equipment cannot be turned on.
2. Choke coil L2 on power supply board shows a sign of burning or overheating.
3. Capacitor C17 (1000 μF) on power supply board is physically damaged (shows a sign of explosion).
4. Resistor R27 ($3 \times 1 k\Omega$) on receiver board (Y-9013) shows a sign of burning or overheating. *Replace three resistors first before replacing the power supply PCB.*
5. Capacitor C30 (2200 μF) on receiver board (Y-9013) is physically damaged (shows a sign of explosion). *Replace that capacitor first before replacing the power supply PCB.*

5.5. Microprocessor Board (CPU Board)



5.6. Overall Unit Operation



6. INSTALLATION

6.1. Antenna Requirements

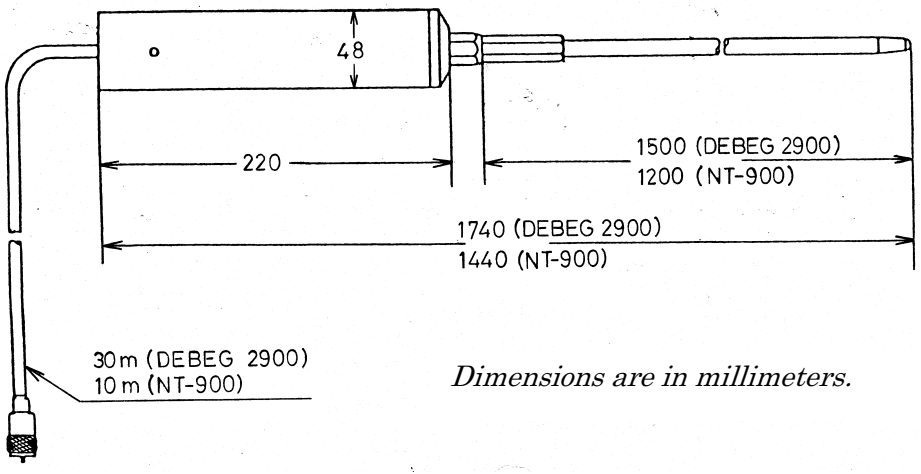
6.1.1. Active Antenna

Best reception of the 518 kHz NAVTEX signal is usually obtained using the pre-amplified whip antenna unit (referred to as the active antenna in this manual) supplied as standard. Select a location for the antenna that is not near a transmitting antenna while keeping in mind the following standard cable lengths:

30 meters for Model DEBEG 2900
10 meters for Model NT-900 (30 meters option)

If a longer cable is required, use the RG-58/U coax cable and BNC type connectors to extend the existing cable. The cable junction must be made waterproof if it is located outside the cabin. *Water intrusion into the cable will short-circuit the power line to the antenna's preamplifier unit. The cable carries dc power (+8V on center conductor) during the time the equipment is turned on.*

Figure 6-1 Active Antenna Dimensions



6.1.2. Long-Wire Antenna (Passive Antenna)

< CAUTION >

As initially delivered from the factory, the equipment is usually set for the active antenna unit, unless specified otherwise. If a long-wire antenna is to be used, internal wiring must be changed as per the instructions in paragraph "6.5 Changing Jumpers on Receiver Board" to cut off the +8V power supply to the antenna and impedance-match the wire antenna.

The antenna should be of inverted "L" type, and for best results, should be 20 meters long which the receiver input is designed to match. If installation requires a shorter length, it should be at least 10 meters for practical operation. Since any open wire is vulnerable to extraneous noise, avoid routing the wire element close to a radar scanner, GPS antenna, echo sounder, track plotter, etc. that could become a source of heavy interference, and use an appropriate length of 50-ohm coaxial cable to place the feedpoint away from such onboard electronics, as shown in 6-4.

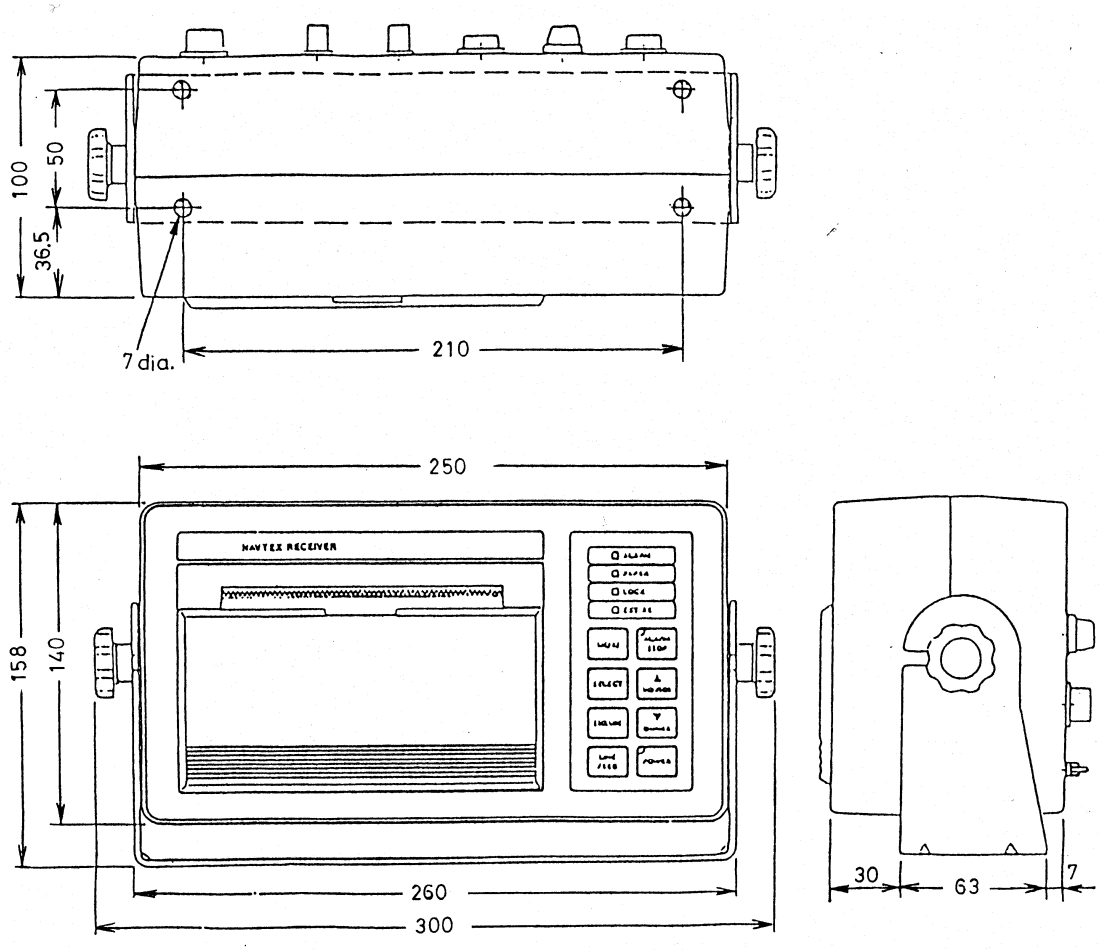
6.2. Receiver Cabinet

The receiver cabinet can be mounted on a table-top, bulkhead or under a shelf using the bracket supplied. The cabinet is not waterproof. Avoid sites where it is likely to be exposed to water splash. Areas where the paper will be exposed to direct sunlight should also be avoided.

To facilitate connecting/disconnecting the cables to/from the cabinet, allow at least 12 centimeters of clearance behind the rear panel before deciding on the installation site.

Figure 6-2 Receiver Cabinet Dimensions

Dimensions are in millimeters.



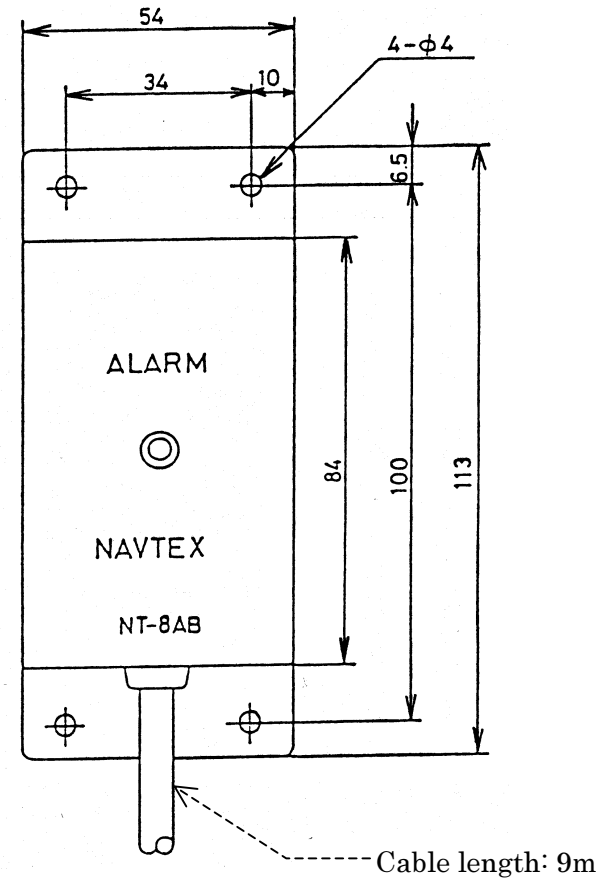
Weight: approx. 4 kg with a standard roll of paper installed.

6.3. External Alarm Box (Option)

The optional NT-8AB external alarm box consists of a remote visual indicator that is illuminated upon receiving an SAR (search-and-rescue) message (message type "D"). The alarm box (with 9 meter cable attached) should be located where it can be readily seen by crew members. Avoid areas where the box will be exposed to water splash.

Figure 6-3 External Alarm Box Dimensions

Dimensions are in millimeters.



6.4. Connections

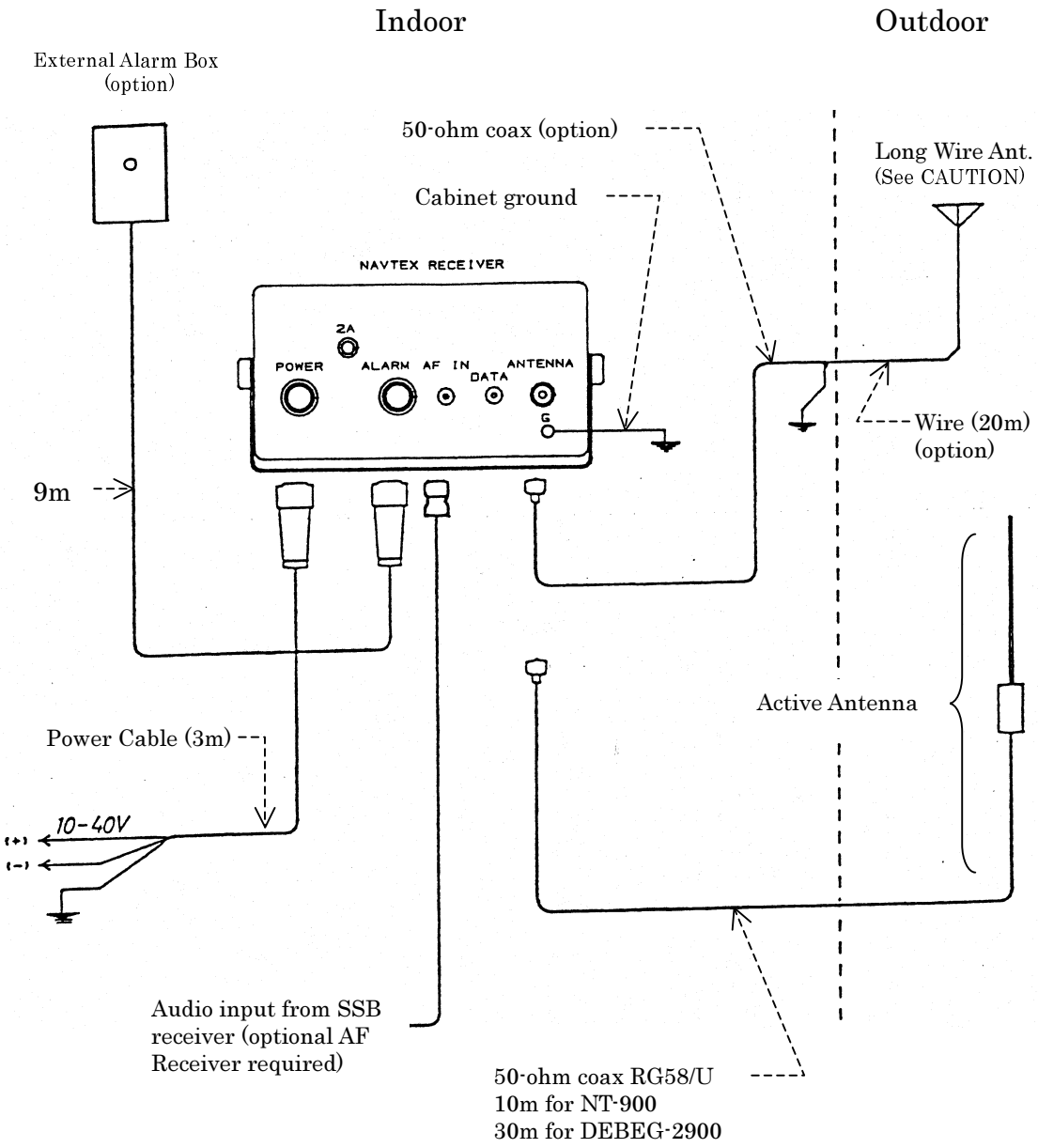
Refer to "Figure 6-4 External Connections" on the next page for wiring information.

6.4.1. Connecting Antenna Cable

The antenna cable supplied with the active antenna unit is the RG-58/U type coaxial cable and usually terminated in a PL-259 type coaxial cable plug when it is initially delivered from the factory.

Be sure to turn the equipment off or disconnect the power supply cable before plugging the antenna, always keeping in mind that the center conductor of the plug is at 8V d-c whenever the equipment is turned on. Refer to paragraph 6.5 for related information.

Figure 6-4 External Connections



< CAUTION >

If you wish to use a long-wire antenna, change the wiring on the receiver board as instructed in paragraph 6.5 and cut off 8V supply to the coax center conductor.

6.4.2. Connecting Power Supply

The equipment is designed to operate on a d-c input voltage between 10 and 40 volts. Connections to the ship's power supply are to be made using the 3-meter 2-wire shielded cable supplied. The cable is terminated in a 3-prong plug at one end, which mates with the "**POWER**" receptacle on the rear panel. To minimize the chance of picking up inter-ference, the cable's shield must be connected to the ship's ground. The plug's pin assignments and conductor color code are listed below.

Plug Pin #	Conductor Color	Connection
1	white	power ＋ (10 to 40 VDC)
2	black	power －
3	shield (braid)	ground

The receiver cabinet should always be grounded for safety and EMC compliance. Connect the rear panel "**GND**" terminal to the ship's ground, using as thick and short a wire as possible.

6.4.3. Connecting External Alarm Box

Simply plug the cable into the receptacle "**ALARM**" on the rear panel. If cable extension is required, use 2-wire shielded cable. The plug pin assignments and conductor color code are given below.

Plug Pin #	Conductor Color	Connection
1	white	LED anode
2	black	LED cathode

6.5. Changing Jumpers on Receiver Board (for Use with Long-Wire Antenna)

The following instructions should be carried out by a qualified service engineer.

The equipment is normally configured to operate with the active antenna unit supplied as standard. If a long wire antenna is to be used instead, follow the procedure given in this paragraph. After making the change, be sure to re-label the rear panel coax connector.

Before these settings can be made, the cabinet must be opened and the cover shielding the receiver board must be removed in the following manner:

(1) Switch off the equipment.
(2) Remove the cabinet from the mounting bracket.
(3) Open the cabinet by removing the four screws from each corner of the rear panel.
(4) Remove the receiver shielding cover, which is attached to the rear side of the inner board.

6.5.1. Input Impedance Selection

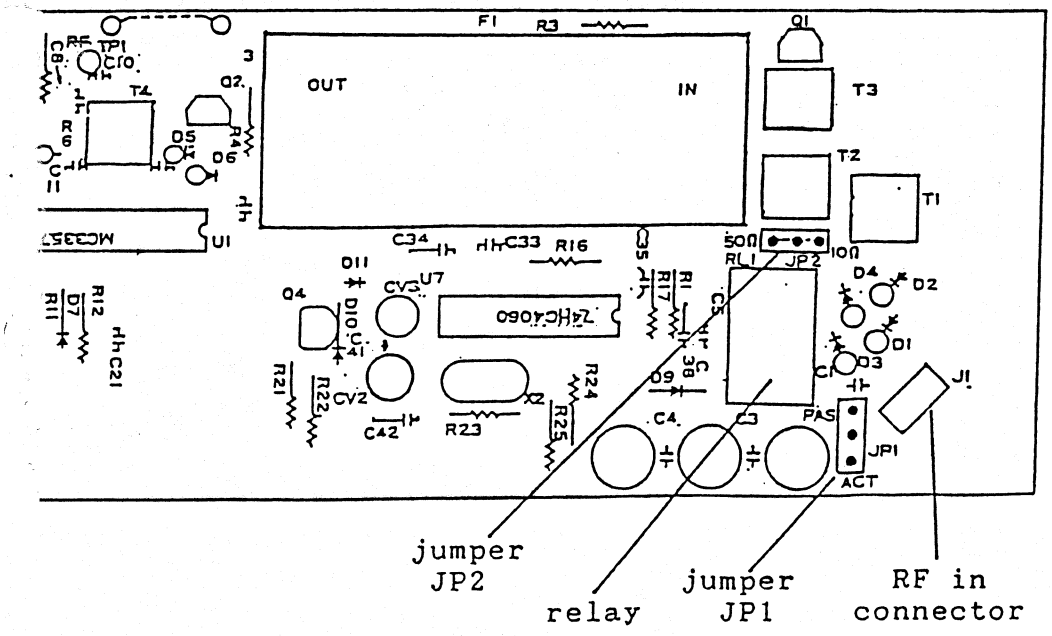
The RF input of the equipment is designed to match either a 50Ω impedance or a 10Ω impedance in series with 150 pF capacitance. The 50Ω impedance, which is normally selected at the initial delivery time, is used when using the active antenna unit.

The 10Ω impedance is provided when a long wire antenna or other shipboard whip that has no preamplifier inside is to be connected in place of the active unit.

The impedance selection is determined by the position of jumper JP2 on the receiver board (shown in Figure 6-5). The jumper is normally placed on the 50Ω side (i.e. between center pin and "50Ω" pin) for use with the active antenna, as shown in the figure. To select the 10Ω value, place it between the center pin and the "10Ω" pin, using a pair of long-nose pliers.

After changing the jumper position, be sure to attach the appropriate ID label above the rear panel coax connector.

Figure 6-5 Jumper Location on Receiver Board



6.5.2. Cutting off Power Supply to Long Wire Antenna

The center conductor of the rear panel "**ANTENNA**" coaxial connector is at +8V d-c whenever the equipment is switched on. This voltage is used to feed power to the pre-amplifier of the active antenna unit.

Before a long wire antenna can be connected, the 8V power supply must be cut off to prevent a possible short to ground, and for this purpose jumper "**JP1**" is provided on the receiver board as shown in Figure 6-5. When the equipment is initially delivered, **JP1** is normally placed between the center pin and the "**ACT**" pin; this jumper setting is for the active antenna unit. **ACT**=active

To cut off the 8V line to the antenna connector, remove **JP1** and place it between the center pin and the "**PAS**" pin. PAS=passive

6.6. Connecting External Receiver

The equipment with an optional AF receiver board installed accepts audio frequency NAVTEX signal from the audio output of an external SSB receiver. The SSB receiver must comply with the following requirements before it can be used for NAVTEX reception.

- Audio output frequencies must be 1785 Hz±10 Hz for high frequency shift, and 1615±10Hz for low frequency shift. NAVTEX signal must be received in the USB mode on the SSB receiver.

- Output level must be between 0 dBm (approx. 0.7V) and –10 dBm (approx. 0.07V) across 600Ω and unbalanced

The AF receiver board is installed inside the NAVTEX receiver cabinet. Connection from the board to the rear panel "**AF IN**" connector is required, and a jumper plug must be placed on the "**JP2**" position on the microprocessor board (See Figure 6-9).

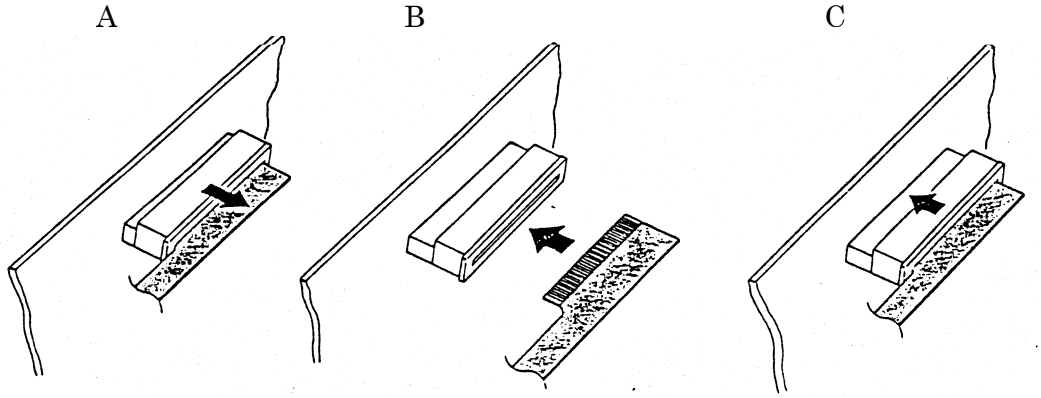
Refer to paragraph "4.5.7 Using External AF Receiver" for related software setting.

6.7. Disconnecting and Re-Connecting Internal Cables

6.7.1. Flat Cable for Printer Assembly

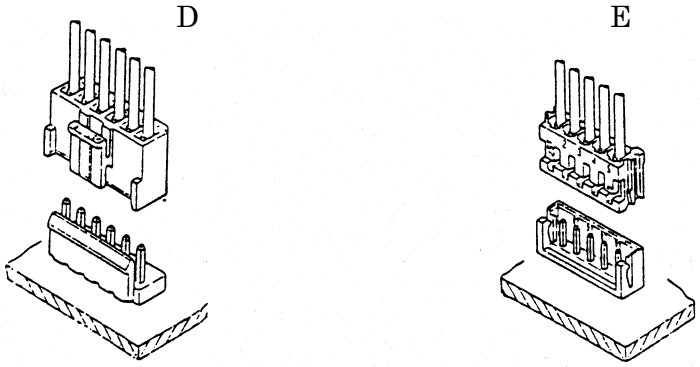
To disconnect the flat cable from the printer assembly, use a small screw driver to push out the connector's outer housing (illustration A). The flat plug can now be pulled out by hand.

To reconnect the plug, first be sure that the outer housing is pulled out, then with the plug contact surface facing up, insert the plug into the connector (illustration B). Finally push in the outer housing with a screw driver (illustration C).



6.7.2. Small Plastic Connectors

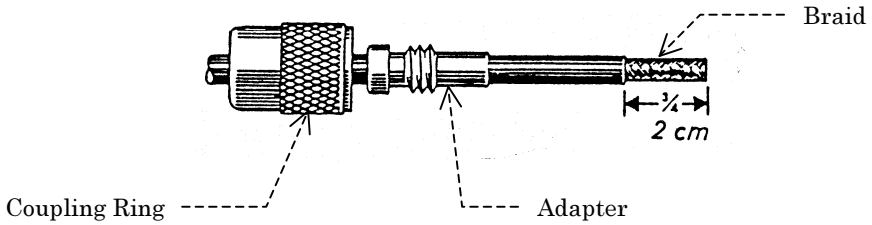
DO NOT pull the wires/cable when removing the small plastic plug from the connector housing. For the locking clamp version (illustration D), simply squeeze the clamp and pull out the plug. For the smaller version with no clamp (illustration E), use a small screw driver to separate the two parts of the connector. When reconnecting either version, be sure that the two parts of each connector are keyed (oriented) properly before attempt-ing to make the connection. DO NOT force it; take time to insert the plug correctly.



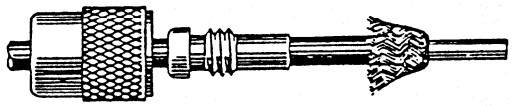
6.8. Installing Coaxial Plug to Antenna Cable

Use the following instructions to install a PL-259 type coaxial plug to the existing antenna cable.

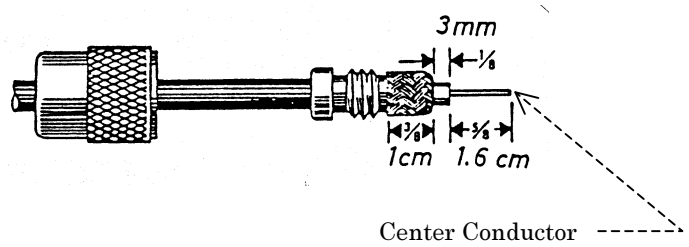
(1) Cut the cable end even. Remove vinyl jacket by approx. 2 cm (3”/4). Slide the coupling ring and adapter over the cable.



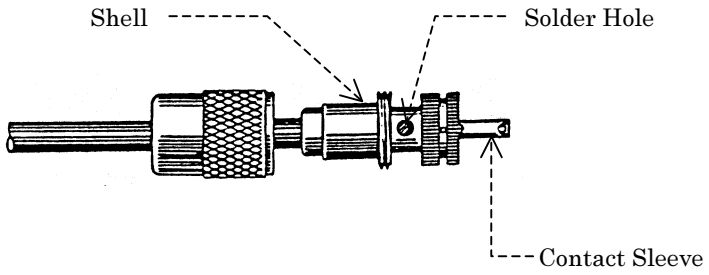
(2) Fan the braid (shield) slightly and fold it back as shown below.



(3) Position the adapter to the dimensions shown. Press the braid down over the body of the adapter, and trim to approx. 1 cm (3”/8). Bare approx. 1.6 cm (5”/8) of the center conductor, and tin the exposed portion.



(4) Screw the plug subassembly onto the adapter. Solder the braid to the shell through the solder holes, and then the center conductor to the contact sleeve.



(5) For final assembly, screw the coupling ring onto the plug subassembly.

(6) Check to be sure that there is no short circuit between the contact sleeve and the coupling ring.

7. MAINTENANCE & SERVICING INSTRUCTIONS

7.1. Summary Description of Functional Blocks

The circuitry of the DEBEG 2900/NT-900 consists of the following functional blocks (printed circuit boards):

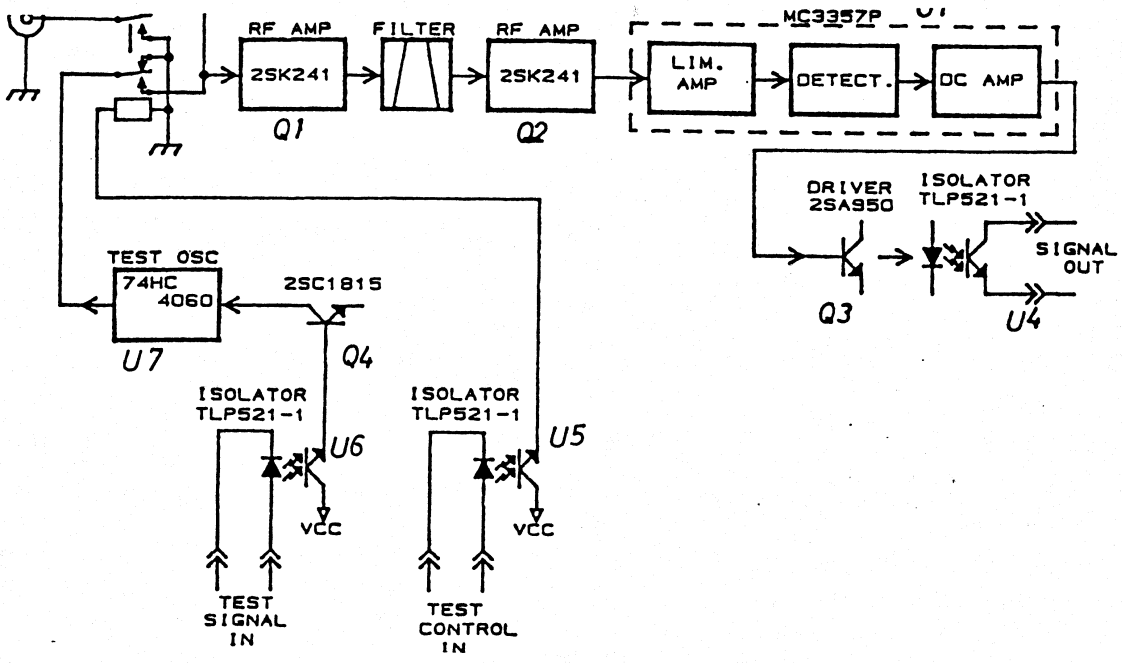
- Receiver Board (RXU)
- Microprocessor Board (MPU)
- Key & Display Board
- Power Supply Board (PSU)

The following paragraphs summarize the functions of these boards.

7.1.1. Receiver Board (RXU)

Figure 7-1 below shows the functional blocks of the Receiver Board. The receiver circuitry is basically a straight amplifier tuned to 518 kHz. NAVTEX signal picked up by the antenna is fed to the tuned amplifier consisting of FETs Q1 (2SK241), Q2 (2SK241) and crystal filter F1, and then passed to the FM detection circuit consisting of FM limiting amplifier/demodulator IC chip U1 (MC3357), quartz crystal X1 and their associated parts. The detected signal (pulse signal at DC level) is sent to the Microprocessor Board via driver Q3 (2SA950) and opto-isolator U4 (TLP521-1) which optically couples the two boards.

Figure 7-1 Receiver Block Diagram

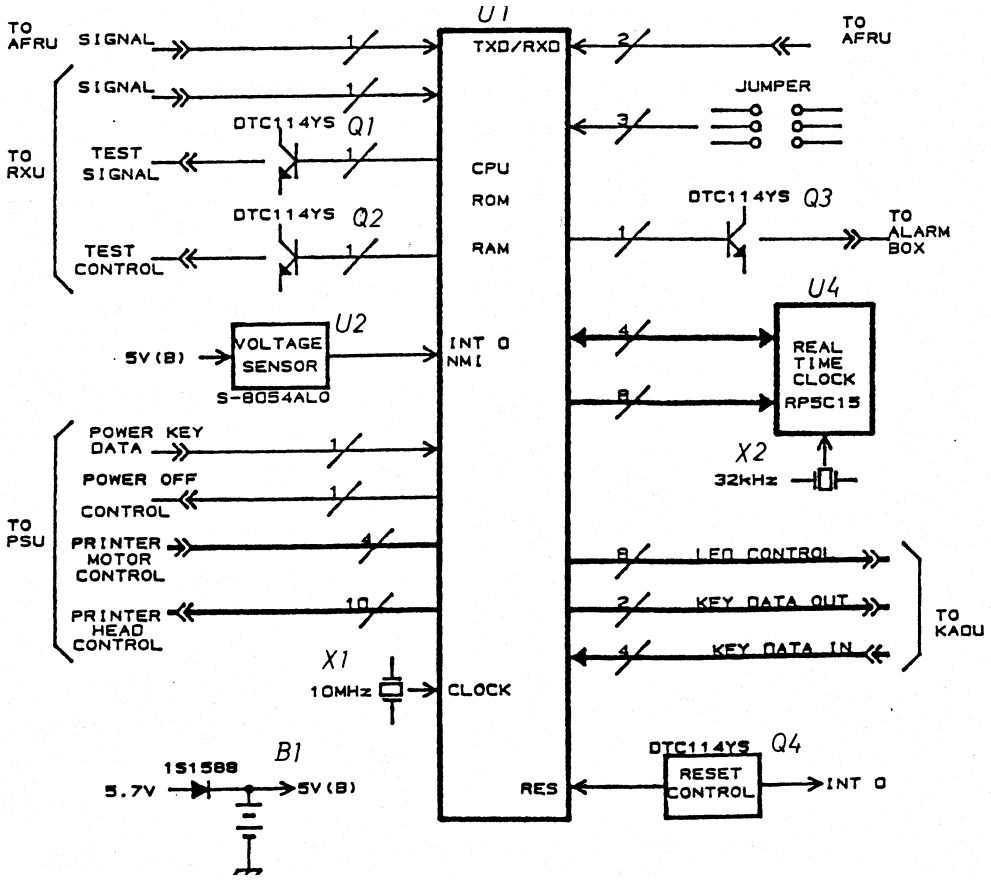


To check the receiver performance as a part of the self-diagnostic functions, a 518 kHz FSK (frequency shift keying) test signal generator is provided, which consists of oscillator/frequency divider U7 (74HC4060), quartz crystal X2 (8.288 MHz), transistor switch Q4 (2SC1815) and their associated parts. U7 performs divide-by-16 frequency division, generating 518 kHz signal from the crystal oscillating frequency. A test message signal generated in the Microprocessor Board, supplied via opto-isolator U6 (TLP521-1) is used to frequency-shift the oscillating frequency by turning Q4 on/off. The oscillator circuit is turned on/off using relay RL1 energized by a control signal supplied by the Microprocessor Board via another opto-isolator U5 (TLP521-1). RL1 also switches the receiver input between the antenna and the test signal generator.

7.1.2. Microprocessor Board (MPU)

Figure 7-2 shows the functional block diagram of the Microprocessor Board. U1 (HD64F3048F16) is a single-chip microcomputer unit containing a HITACHI H8 series CPU, ROM, RAM, I/O interface and other peripheral devices in its package. The CPU operates at a clock rate of approx. 16 MHz supplied by quartz crystal X1, and executes the signal processing and receiver control software stored in its ROM section. User-initiated settings and message IDs are stored in the RAM section which is backed by 5V Super Capacitor B1.

Figure 7-2 Microprocessor Board Block Diagram



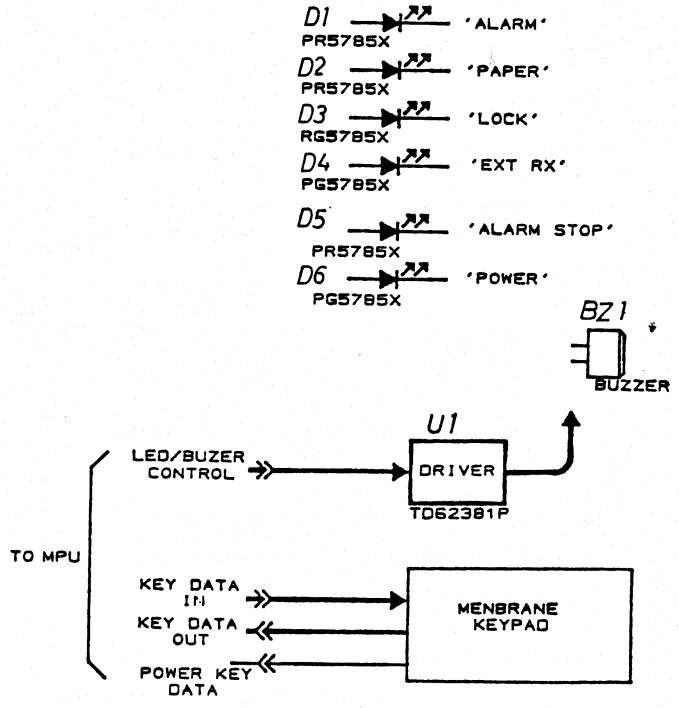
At power-up, voltage sensor U2, (M51953AL) sends a reset signal to the CPU and Real Time Clock, starting up the CPU. U1 also checks the power supply voltage, and interrupts the CPU in the event of a power failure. Real-time clock (RTC) IC U4 (RTC-62423), which is backed up by B1, checks the elapsed time to allow the CPU to control the storage and erasure of message IDs. The major functions of the Microprocessor Board are as follows:

- Converts demodulated NAVTEX signal it into an alphanumeric data character stream, and feeds the data stream to the printer via the Power Supply Board.
- Generates printer control signals (printer motor control, printer head control).
- Generates a test message and test control signal for the self-diagnostic functions.
- Senses alarm conditions (SAR message reception, end-of-paper condition, printing head stoppage, etc.), and turns on/off the appropriate front panel alarm LED lamps and audible alarm.
- Senses the keys pressed, and executes the corresponding commands.

7.1.3. Key & Display Board

Figure 7-3 shows the block diagram of the Key & Display Board. The board connects the front panel keypad and the CPU on the Microprocessor Board. The keypad LED lamps (D1 – D6) are mounted on this board, and turned on/off by transistor array U1 (TD62381P) using control signal from the Microprocessor Board. U1 also controls piezo-electric buzzer BZ1, turning on/off audible alarm using control signal from the CPU.

Figure 7-3 Key & Display Board Block Diagram

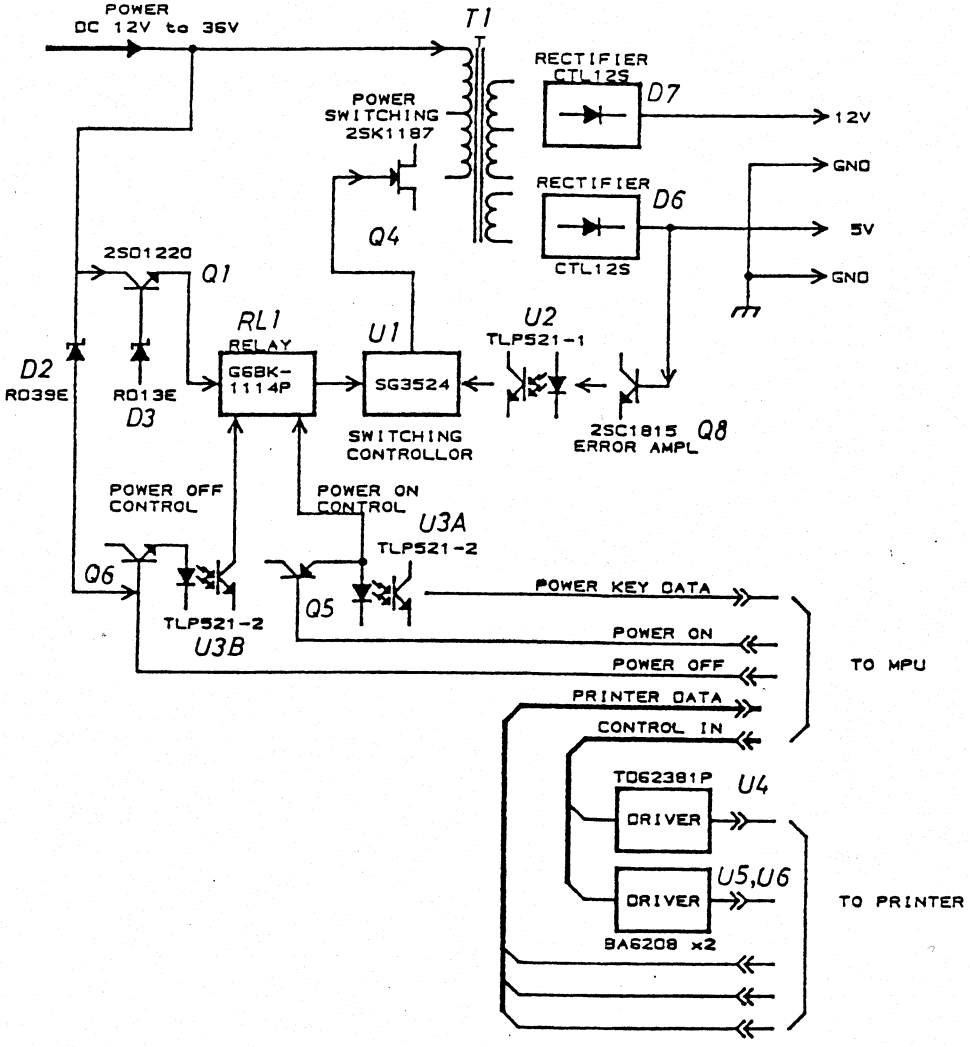


7.1.4. Power Supply Board (PSU)

The Power Supply Board consists of the following main functional blocks: switch-mode voltage regulator, power-on/off control, and printer interface. Figure 7-4 shows its functional block diagram.

U1 (SG3524) acts as the switching controller, oscillating at approx. 70 kHz. It drives switching transistor Q4 (power FET 2SK1187), causing the input current (power line) to be chopped at the same rate, producing pulsed voltage across the primary winding of transformer T1. Preset potentiometer R9 adjusts the switching frequency. T1 has two secondary windings, and the resultant two a-c voltages, which develop across these windings, are rectified by diodes D6 and D7 to produce two d-c output voltages, 6V and 12V, respectively. To regulate the output voltages, U1 also controls the on/off duty ratio of Q1 using a voltage fed back from the 6V output voltage via transistor Q8 (error voltage amplifier 2SC1815) and opto-isolator U2 (TLP521-1). Preset potentiometer RV1 adjusts the output voltage.

Figure 7-4 Power Supply Board Block Diagram



Relay RL1 (self-latching type) turns the equipment on in response to the power-on signal from the front panel [POWER] key via opto-isolator U3A (TLP521-1) and transistor Q5 (DTA114YS or RN2207), and turns the equipment off using the power-off signal also from the same key via U3B and Q6. Once energized, RL1 holds either the make or break state even after power is removed. This prevents the equipment from being kept in the power-off condition if the ship's power source is accidentally turned off and turned on again with the equipment switched on.

Zener diode D2 (RD39E) conducts when the input voltage exceeds 40 volts, allowing Q6 to conduct to switch off the equipment, thereby protecting the circuit against high input voltage.

Transistor array U4 (TD62381P) drives the thermal print head with demodulated NAVTEX data characters. A pair of another transistor arrays U5 and U6 (BA6208) controls the movement of the print head using motor control signals from the Microprocessor Board.

7.2. Checking and Alignment

7.2.1. Test Instruments Required

The test instruments required for performance checks and alignment are listed below.

• standard signal generator:	518± 1 kHz, 50Ω output
• RF voltmeter (VTVM or similar):	1 MHz, 0.1V to 1V, high input impedance
• d-c voltmeter:	0.1V to 20V, accuracy± 1 %
• frequency counter:	15 MHz, accuracy 1 ppm or better
• oscilloscope:	50 MHz or greater

7.2.2. Receiver Board Checks and Alignment

7.2.2.1. Tuned Amplifier

① Place jumper plugs JP1 on the "**PAS**" side, and JP2 on the "50Ω" side.

Set the standard signal generator frequency to within 518.0 kHz±10 Hz, and output level to 50 dBμ (136μV). Use the frequency counter to calibrate the frequency.

② Connect the signal generator to the "**ANTENNA**" coax receptacle, and connect the RF voltmeter between test point TP1 (marked "RF") and ground.

③ Using a non-metallic tuning tool, adjust the slugs in transformers T4, T3, and T2 (in this order) for a maximum voltmeter reading.

④ Check to be sure that the voltmeter reading is within 0.18V±0.07V.

7.2.2.2. Demodulator

The following procedure should be carried out after completing the alignment of the Tuned Amplifier (paragraph 7.2.2.1).

① Adjust the signal generator output level to 40 dBμ (50 μV) while maintaining the frequency within 518 kHz ± 10 Hz.

② Connect the d-c voltmeter between test point **TP2** (marked "**DO**") and the negative lead of a nearby component (ground).

③ Using a non-metallic tuning tool, adjust trimmer capacitor CV1 so that the volt-meter reads 3V.

④ Adjust the generator frequency to exactly 517.915 kHz (to simulate low frequency shift keying), and check to be sure that the voltmeter reading drops to 2.86V.

Then, adjust the frequency to exactly 518.085 kHz (to simulate high frequency shift keying), and check to be sure that the reading rises to 3.14V.

⑤ Connect the oscilloscope to test point **TP2** (**DO**). The d-c voltmeter may be removed. Turn the equipment off using the [**POWER**] key, and then turn it on again while hold ing down the [**ALARM STOP**] key. This keypress sequence will turn on the built-in test signal generator, generating a test signal. A pulse signal should then be ob-served on the oscilloscope.

⑥ Select the menu option "**50Hz, 50% DUTY SIGNAL**" using the [**▲/MONITOR**] key, and check to be sure that the duty ratio of the pulse is approx. 50%.

⑦ Proceed to paragraph 7.2.2.3 (Built-in Test Signal Generator).

NOTE: To exit the test mode, turn the equipment off, and turn it on again.

7.2.2.3. Built-in Test Signal Generator

It is assumed that the Receiver Board is still in the test mode as in paragraph 7.2.2.2.

① Select the menu option "**518.085kHz TEST SIGNAL**" using the [**▲/MONITOR**] key. This will turn on the built-in test signal generator.

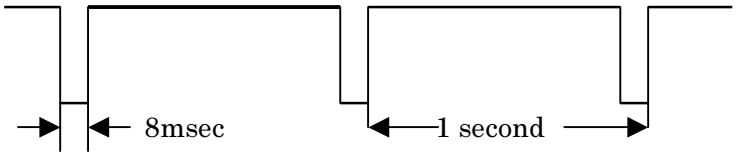
② Connect the frequency counter to test point **TP1** (marked "**RF**"), adjust trimmer capacitor **CV2** so that the counter reads exactly 518.085 kHz.

③ Likewise, select the menu option "**517.915KHZ TEST SIGNAL**," and adjust trimmer capacitor **CV3** so that the counter reads exactly 517.915 kHz.

④ Turn the equipment off, and turn it on again to exit the test mode.

7.2.3. Microprocessor Board Checks

① Connect the oscilloscope or counter to test point **TP1** (marked "**TP1**"), and confirm that the counter reads exactly 1.000Hz. Typical waveform is as follows;



② Remove the counter from **TP1**, and connect it to test point **TP2** (marked "**TP2**"). Confirm that counter reads 16.000MHz generated by crystal X1.

7.2.4. Power Supply Board Checks and Alignment

7.2.4.1. Regulated Outputs

① Connect the d-c voltmeter between the cathode lead of diode **D10** (AMD1Z) (+) and test point **TP6** (−), and adjust trimmer potentiometer **RV1** so that the voltmeter reads approx. 5.5V.

< **WARNING** >

RV1 MUST BE ADJUSTED VERY CAREFULLY; IT MUST NOT BE TURNED FULLY CLOCKWISE OR RESULTANT OVERVOLTAGE CAN DAMAGE THE MICROPROCESSOR BOARD.

② After this adjustment, activate the self-diagnostic test functions (paragraph 4.5.4), and allow the equipment to print test messages. With printing in progress, check to be sure that the voltmeter reading stays within 5V±5% (4.75V to 5.25V).

③ Remove the voltmeter and connect it between **TP3** (+) and **TP4** (−). Check to be sure that the voltmeter reading is approx. 12V.

7.2.4.2. Switching Frequency

① Connect the frequency counter to test point **TP1**.

② Adjust trimmer potentiometer **R9** so that the counter reads exactly *71.448 kHz.

**This frequency is chosen to avoid its harmonics (especially 7th harmonic) do not enter into the receiver passband*

③ Remove the counter, completing the alignment.

7.3. Parts List

The values, ratings and tolerances of the components listed in this section are typical; some of them are determined during production, and may not match the corresponding parts used in your equipment. Some of the semiconductors used may be direct replace-ments or equivalents of those listed.

7.3.1. Parts Mounted on Receiver Board

Board Part #: Y-9013

Circuit Ref.	Name	Specifications	
C1	Capacitor, ceramic	0.47 μF	50V
C2	Capacitor, ceramic	4 pF	50V
C3	Capacitor, ceramic	0.47 μF	50V
C4	Capacitor, ceramic	0.47 μF	50V
C5	Capacitor, ceramic	1 pF	50V
C6	Capacitor, ceramic	0.1 μF	50V
C7	Capacitor, electrolytic	1000 μF	10V
C8	Capacitor, ceramic	0.1 μF	50V
C9	Capacitor, ceramic	0.1 μF	50V
C10	Capacitor, ceramic	0.01 μF	50V
C11	Capacitor, ceramic	0.1 μF	50V
C12	Capacitor, ceramic	0.1 μF	50V
C13	Capacitor, ceramic	0.47 μF	50V
C14	Capacitor, ceramic	10 pF	50V
C15	Capacitor, ceramic	10 pF	50V
C16	Capacitor, ceramic	0.1 μF	50V
C17	Not in use		
C18	Capacitor, ceramic	0.1 μF	50V
C19	Capacitor, ceramic	0.1 μF	50V
C20	Not in use		
C21	Capacitor, ceramic	1000 pF	50V
C22	Capacitor, ceramic	0.1 μF	50V
C23	Capacitor, ceramic	0.1 μF	50V
C24	Capacitor, electrolytic	470 μF	10V
C25	Capacitor, ceramic	0.47 μF	50V
C26	Capacitor, ceramic	0.47 μF	50V
C27	Capacitor, electrolytic	470 μF	10V
C28	Capacitor, ceramic	0.1 μF	50V
C29	Capacitor, electrolytic	2200 μF	16V
C30	Capacitor, electrolytic	2200 μF	16V

7.3.1 Parts Mounted on Receiver Board (continued)

Circuit Ref.	Name	Specifications	
C31	Capacitor, ceramic	0.47 μF	50V
C32	Capacitor, ceramic	0.47 μF	50V
C33	Capacitor, ceramic	1000 pF	50V
C34	Capacitor, ceramic	5600 pF	50V
C35	Capacitor, ceramic	5600 pF	50V
C36	Capacitor, ceramic	5600 pF	50V
C37	Capacitor, ceramic	0.1 μF	50V
C38	Capacitor, ceramic	0.01 μF	50V
C39	Capacitor, ceramic	0.1 μF	50V
C40	Capacitor, ceramic	0.01 μF	50V
C41	Capacitor, ceramic	33 pF	50V
C42	Capacitor, ceramic	47 pF	50V
C43	Capacitor, ceramic	0.1 μF	50V
CV1	Trimmer capacitor, ceramic	4 pF	50V
CV2	Trimmer capacitor, ceramic	6 pF	50V
CV3	Trimmer capacitor, ceramic	40 pF	50V
R1	Resistor, carbon film	51 Ω	1/4 W
R2	Resistor, carbon film	1 kΩ	1/4 W
R3	Resistor, carbon film	220 Ω	1/4 W
R4	Resistor, carbon film	3.9 kΩ	1/4 W
R5	Resistor, carbon film	220 Ω	1/4 W
R6	Resistor, carbon film	3.3 kΩ	1/4 W
R7	Resistor, carbon film	47 kΩ	1/4 W
R8	Resistor, carbon film	220 kΩ	1/4 W
R9	Resistor, carbon film	8.2 kΩ	1/4 W
R10	Resistor, carbon film	100 kΩ	1/4 W
R11	Resistor, carbon film	220 kΩ	1/4 W
R12	Resistor, carbon film	47 kΩ	1/4 W
R13	Resistor, carbon film	470 Ω	1/4 W
R14	Resistor, carbon film	120 Ω	1/4 W
R15	Resistor, carbon film	51 Ω	1/4 W
R16	Resistor, carbon film	10 kΩ	1/4 W
R17	Resistor, carbon film	10 kΩ	1/4 W
R18	Not in use		
R19	Not in use		
R20	Resistor, carbon film	680 Ω	1/4 W

7.3.1 Parts Mounted on Receiver Board (continued)

Circuit Ref.	Name	Specifications	
R21	Resistor, carbon film	220Ω	1/4 W
R22	Resistor, carbon film	470Ω	1/4 W
R23	Resistor, carbon film	100 kΩ	1/4 W
R24	Resistor, carbon film	10 kΩ	1/4 W
R25	Resistor, carbon film	15 kΩ	1/4 W
R26	Resistor, carbon film	560Ω	1/4 W
R27	Resistor, carbon film	1 kΩ	1/4 W
L1	Inductor, magnetic shield type	1 mH	145 mA (max)
L2	Inductor, magnetic shield type	1 mH	145 mA (max)
L3	Inductor, magnetic shield type	1 mH	145 mA (max)
L4	Inductor, magnetic shield type	1 mH	145 mA (max)
L5	Inductor, magnetic shield type	3.3 mH	145 mA (max)
L6	Inductor, magnetic shield type	1 mH	145 mA (max)
L7	Inductor, magnetic shield type	1 mH	145 mA (max)
T1	RF tuned transformer	350117-T1	
T2	RF tuned transformer	350117-T2	
T3	RF tuned transformer	350117-T3	
T4	RF tuned transformer	350117-T4	
Q1	Field-Effect Transistor	2SK241-GR	
Q2	Field-Effect Transistor	2SK241-GR	
Q3	Transistor, PNP	2SA950-O	
Q4	Transistor, NPN	2SC1815-Y	
D1	Diode, rectifier	F114B or H114B	
D2	Diode, rectifier	F114B or H114B	
D3	Diode, rectifier	F114B or H114B	
D4	Diode, rectifier	F114B or H114B	
D5	Diode, small signal	1S953	
D6	Diode small signal	1S953	
D7	Diode small signal	1S953	
D8	Diode small signal	1S953	
D9	Diode small signal	1S953	
D10	Diode small signal	1S953	
D11	Diode small signal	1SS279	
D12	Diode, zener	RD4.7EN, 4.7V 250mW	

7.3.1 Parts Mounted on Receiver Board (continued)

Circuit Ref.	Name	Specifications
U1	Limiting amp./demodulator	MC3357P
U2	Voltage regulator, 8V	MC78L08ACP
U3	Voltage regulator, 6V	TA78L006AP
U4	Opto-isolator	TLP521-1
U5	Opto-isolator	TLP521-1
U6	Opto-isolator	TLP521-1
U7	14-stage binary counter/osc.	SN74HC4060
X1	Quartz crystal	518 kHz 450118-HC49U
X2	Quartz crystal	8288 kHz 450122-HC49U
F1	RF filter	518 kHz SFOL03
RL1	Relay	9V, G5A-234P
JP1	Jumper header, 3-pin	RE-H032TD-1110
	Jumper socket, 2-pin	JM2BL-63
JP2	Jumper header, 3-pin	RE-H032TD-1110
	Jumper socket, 2-pin	JM2BL-63, 2
J1	Mini jack, 1-pin	TMP-J02X-A1
J2	Not in use	
J3	Connector, 16-pin	HIF3FC-16PA-2.54DSA

7.3.2. Parts Mounted on Microprocessor Board

Board Part #: Y-9016C

Circuit Ref.	Name	Specifications	
C1	Capacitor, multi-layer ceramic	0.1 μF	50V
C2	Capacitor, ceramic	15 pF	50V
C3	Capacitor, ceramic	15 pF	50V
C4	Capacitor, electrolytic	100 μF	10V
C5	Capacitor, electrolytic	100 μF	10V
C6	Capacitor, electrolytic	4.7 μF	50V
Z1~Z4	Capacitor, multi-layer ceramic	0.1 μF	50V
Z6~Z10	Capacitor, multi-layer ceramic	0.1 μF	50V
R1	Resistor, carbon film	10k Ω	1/4 W
R2	Resistor, carbon film	68k Ω	1/4 W

7.3.2 Parts Mounted on Microprocessor Board (continued)

Circuit Ref.	Name	Specifications
R3	Resistor, carbon film	10kΩ 1/4W
R4	Resistor, carbon film	10kΩ 1/4W
R5	Resistor, carbon film	100kΩ 1/4W
R6	Resistor, carbon film	75Ω 1/4 W
R7	Resistor, carbon film	10kΩ 1/4 W
R8	Resistor, carbon film	100kΩ 1/4 W
R9	Resistor, carbon film	100 kΩ 1/4 W
R10	Resistor, carbon film	22 kΩ 1/4 W
R11	Resistor, carbon film	10 kΩ 1/4 W
R12	Resistor, carbon film	10kΩ 1/4 W
R13	Resistor, carbon film	10 kΩ 1/4 W
R14	Resistor, carbon film	10 kΩ 1/4 W
R15	Resistor, carbon film	220Ω 1/4 W
R16	Resistor, carbon film	150Ω 1/4 W
R17	Resistor, carbon film	150Ω 1/4 W
R18	Resistor, carbon film	100kΩ 1/4 W
R19	Resistor, carbon film	100kΩ 1/4 W
R20	Resistor, carbon film	100kΩ 1/4 W
R21	Resistor, carbon film	680Ω 1/4 W
RM1	Resistor, array	8x100kΩ RKC1/8B8 100KΩ
TH1	Thermistor	212ET
D1	Diode, small signal	1S1588
D2	Diode, small signal	1S1588
D3	Diode, small signal	1S1588
ZD1	Diode, zener	RD4.3E
Q1	Hybrid transistor, NPN	DTC114ESA
Q2	Hybrid transistor, NPN	DTC114ESA
Q3	Hybrid transistor, NPN	DTC114ESA
U1	Single chip microprocessor	HD64F3048F16
U2	Real-time clock (RTC)	RTC-62423
U3	Voltage sensor	M51953AL
U4	Voltage sensor	M51951AL
U5	Voltage sensor	M51955BL
U6	RS232C converter	MAX202ECPE
J1	Connector, 10-pin receptacle	B10-10B-EH
J2	Connector, 8-pin receptacle	B10-08B-EH
J3	Connector, 16-pin female	HIF3FB-16DA-2.54DSA
J4	Connector, 30-pin female	HIF3FB-30DA-2.54DSA
J5	Connector, 10-pin receptacle	FFC-10BMEP1
X1	Quartz crystal	HC-49/U-S 16.000MHz

7.3.3. Parts Mounted on Key and Display Board

Board Part #: Y-9015

Circuit Ref.	Name	Specifications	
C1	Capacitor, ceramic	100 pF	50V
C2	Capacitor, ceramic	100 pF	50V
C3	Capacitor, ceramic	100 pF	50V
C4	Capacitor, ceramic	100 pF	50V
C5	Capacitor, ceramic	100 pF	50V
C6	Capacitor, ceramic	100 pF	50V
C7	Capacitor, ceramic	100 pF	50V
C8	Capacitor, ceramic	100 pF	50V
C9	Capacitor, polyester film	0.1 μF	50V
C10	Capacitor, electrolytic	100 μF	10V
R1	Resistor, carbon film	150 Ω	1/4 W
R2	Resistor, carbon film	150 Ω	1/4 W
R3	Resistor, carbon film	150 Ω	1/4 W
R4	Resistor, carbon film	150 Ω	1/4 W
R5	Resistor, carbon film	150 Ω	1/4 W
R6	Resistor, carbon film	150 Ω	1/4 W
R7	Resistor, carbon film	68 Ω	1/4 W
RA1	Resistor array	6 × 22k Ω	IHR6-223JA
D1	Light emitting diode (LED)	PR5785X	
D2	Light emitting diode (LED)	PR5785X	
D3	Light emitting diode (LED)	PR5785X	
D4	Light emitting diode (LED)	PR5785X	
D5	Light emitting diode (LED)	PR5785X	
D6	Light emitting diode (LED)	PR5785X	
U1	Transistor array	TD62381P	
J1	Connector, 10-pin receptacle	B10B-EH	
J2	Connector, 8-pin receptacle	B8B-EH	
J3	Connector, 8-pin female	FH1-8S-2.54DSA	
BZ1	Piezo-electric buzzer	PB2130UP002C	

7.3.4. Parts Mounted on Power Supply Board

Board Part #: Y-9017

Circuit Ref.	Name	Specifications	
C1	Capacitor, ceramic	220 pF	50V
C2	Capacitor, ceramic	220 pF	50V
C3	Capacitor, polyester film	0.47 μF	63V
C4	Capacitor, polyester film	0.47 μF	63V
C5	Capacitor, polyester film	0.001 μF	50V
C6	Capacitor, electrolytic	1000 μF	63V
C7	Capacitor, polyester film	0.47 μF	63V
C8	Capacitor, ceramic	470 pF	50V
C9	Capacitor, ceramic	0.1 μF	50V
C10	Capacitor, ceramic	220 pF	50V
C11	Capacitor, electrolytic	220 μF	25V
C12	Capacitor, multi-layer ceramic	1500 pF	50V
C13	Capacitor, polyester film	0.001 μF	50V
C14	Capacitor, polyester film	0.01 μF	63V
C15	Capacitor, ceramic	470 pF	50V
C16	Capacitor, polyester film	0.47 μF	63V
C17	Capacitor, electrolytic	1000 μF	25V
C18	Not in use		
C19	Not in use		
C20	Capacitor, ceramic	470 pF	50V
C21	Capacitor, polyester film	0.47 μF	63V
C22	Capacitor, electrolytic	2200 μF	10V
C23	Capacitor, electrolytic	3300 μF	10V
C24	Capacitor, ceramic	0.1 μF	50V
C25	Capacitor, electrolytic	3300 μF	10V
C26	Capacitor, electrolytic	3300 μF	10V
C27	Capacitor, ceramic	220 pF	50V
C28	Capacitor, ceramic	0.1 μF	50V
C29	Capacitor, polyester film	1500 pF	50V
C30	Not in use		
C31	Capacitor, multi-layer ceramic	1.0 μF	50V
C32	Capacitor, multi-layer ceramic	1.0 μF	50V
R1	Resistor, metal film	2.2 kΩ	1W
R2	Resistor, metal film	10 kΩ	1W
R3	Resistor, metal film	10 kΩ	1W
R4	Not in use		
R5	Resistor, carbon film	150Ω	1/4 W

7.3.4 Parts Mounted on Power Supply Board (continued)

Circuit Ref.	Name	Specifications	
R6	Resistor, carbon film	2.2 kΩ	1/4 W
R7	Resistor, carbon film	51Ω	1/4 W
R8	Resistor, wire-wound	0.05Ω	1W
R9	Trimmer pot., carbon film	5 kΩ	1/4 W
R10	Resistor, carbon film	68 kΩ	1/4 W
R11	Resistor, carbon film	22 kΩ	1/4 W
R12	Resistor, carbon film	4.7 kΩ	1/4 W
R13	Resistor, carbon film	4.7 kΩ	1/4 W
R14	Resistor, carbon film	1.5 kΩ	1/4 W
R15	Resistor, carbon film	4.7 kΩ	1/4 W
R16	Resistor, carbon film	470Ω	1/4 W
R17	Resistor, carbon film	22Ω	1/4 W
R18	Resistor, carbon film	22Ω	1/4 W
R19	Resistor, carbon film	220Ω	1/4 W
R20	Resistor, carbon film	2.7 kΩ	1/4 W
R21	Resistor, carbon film	1 kΩ	1/4 W
R22	Resistor, carbon film	220Ω	1/4 W
R23	Resistor, carbon film	1.8 kΩ	1/4 W
R24	Not in use		
R25	Resistor, carbon film	4.7 kΩ	1/4 W
R26	Resistor, carbon film	4.7 kΩ	1/4 W
R27	Resistor, carbon film	68 kΩ	1/4 W
R28	Resistor, carbon film	68 kΩ	1/4 W
R29	Resistor, carbon film	68 kΩ	1/4 W
R30	Resistor, carbon film	180Ω	1/4 W
R31	Not in use		
R32	Not in use		
R33	Not in use		
R34	Not in use		
R35	Not in use		
R36	Resistor, carbon film	330Ω	1/4 W
R37	Resistor, carbon film	3.3kΩ	1/4 W
RV1	Trimmer pot., carbon film	1 kΩ	1/4 W
L1	Common mode choke coil	SC-02-20G, 1mH 2A	
L2	Choke coil	FL9H, 2.2 mH 200mA	
L3	Choke coil	SBC-01, 300 μH 0.5A	
L4	Choke coil	ELF0708SKI-102K, 1mH	

7.3.4 Parts Mounted on Power Supply Board (continued)

Circuit Ref.	Name	Specifications
D1	Diode, power	AM01Z
D2	Diode, zener	RD39E, 39V 250mW
D3	Diode, zener	RD13E, 13V 250mW
D4	Diode, small signal	1S1588
D5	Diode, power	AM01Z
D6	Diode, high speed switching	EU-2
D7	Diode, paired, rectifier	CTL-12S
D8	Diode, paired, rectifier	CTL-12S
D9	Diode, power	AM01Z
D10	Diode, power	AM01Z
Q1	Transistor, NPN power	2SD1220
Q2	Not in use	
Q3	Not in use	
Q4	FET, power	2SK1187
Q5	Hybrid transistor, PNP	RN2207
Q6	Hybrid transistor, NPN	RN1207
Q7	Hybrid transistor, PNP	RN2207
Q8	Transistor, NPN small signal	2SC1815
U1	IC, switching controller	SG3524
U2	IC, opto-isolator	TLP521-1
U3	IC, opto-isolator	TLP521-1
U4	IC, transistor array	TD62381P
U5	IC, transistor array	BA6208
U6	IC, transistor array	BA6208
T1	Transformer, switching	350143-T1
J1	Connector, 3-pin receptacle	B3P-VH
J2	Connector, 30-pin receptacle	HIF3FB-30DA-2.54DSA
J3	Connector, 20-pin female	5597-20CPB
J5	Connector, 10-pin receptacle	HIF3FB-10DA-2.54DSA
J6	Connector, 3-pin receptacle	B-03B-EH

7.3.5. Parts Mounted on Receiver Cabinet

Circuit Ref.	Name	Specifications
C1	Capacitor, ceramic	0.22 μF 50V
C2	Capacitor, ceramic	0.22 μF 50V
C3	Capacitor, ceramic	0.22 μF 50V
C4	Capacitor, electrolytic	220 μF 63V
C5	Capacitor, electrolytic	220 μF 63V
C6	Capacitor, electrolytic	220 μF 63V
L1	Common mode choke coil	SC-02-20G, 1mH 2A
L2	Choke coil	SBC-34
U1	IC, photo-interrupter	GP2A12F or GP2A10F
CN1	Connector, coax receptacle	Y-R
CN2	Connector, 3-pin receptacle	RB-14R3M
CN3 (option)	Connector, 2-pin receptacle	RB-14R2M
CN4 (option)	Connector, coax receptacle	BNC-R
CN5	Not in use	
F1	Fuse holder	FH-003
	Fuse	Mini type, 2A
UT4	Printer assembly	EPT-2025SL4 (See *NOTE 1*)

* *NOTES:*
When ordering a replacement printer unit, check the software version marked on the microprocessor U1(HD64F3048F16N).

(1) This printer assembly must be used with version 2002G1 series software embedded in microprocessor U1.

(2) Old type printer assembly EPT1025LW4 can not used with system software version 2002G1 or greater. Otherwise, erratic printing will result.

7.3.6. Parts Mounted on Active Antenna Preamplifier Board

Board Part # : Y-8335B (See CAUTION below)

Circuit Ref.	Name	Specifications	
C1	Capacitor, ceramic	820 pF	50V
C2	Capacitor, ceramic	0.1 μF	50V
C3	Capacitor, ceramic	820 pF	50V
C4	Capacitor, ceramic	15 pF	50V
C5	Capacitor, ceramic	0.1 μF	50V
CV1 (VC1)	Trimmer capacitor, ceramic	40 pF	50V
R1	Resistor, carbon film	100 kΩ	1/4 W
R2	Resistor, carbon film	100 kΩ	1/4 W
L1	Inductor	2.7 mH	
L2	Inductor	2.7 mH	
L3	Inductor	0.33 mH	
D1	Diode, rectifier	F114B or H114B	
D2	Diode, rectifier	F114B or H114B	
D3	Diode, rectifier	F114B or H114B	
D4	Diode, rectifier	F114B or H114B	
Q1	Transistor, FET	2SK241	
T1	RF-tuned transformer	45013-5	
T2	RF-tuned transformer	45013-6	
	Coaxial plug	MP5	
	Coaxial cable,	RG-58/U or 5D2V, 50Ω	
		10m for Model NT-900 30m for Model DEBEG 2900	

< CAUTION >

The preamplifier board for the NT-900 is not compatible with that for the DEBEG-2900. When ordering a replacement board, be sure to specify the model number of your equipment.

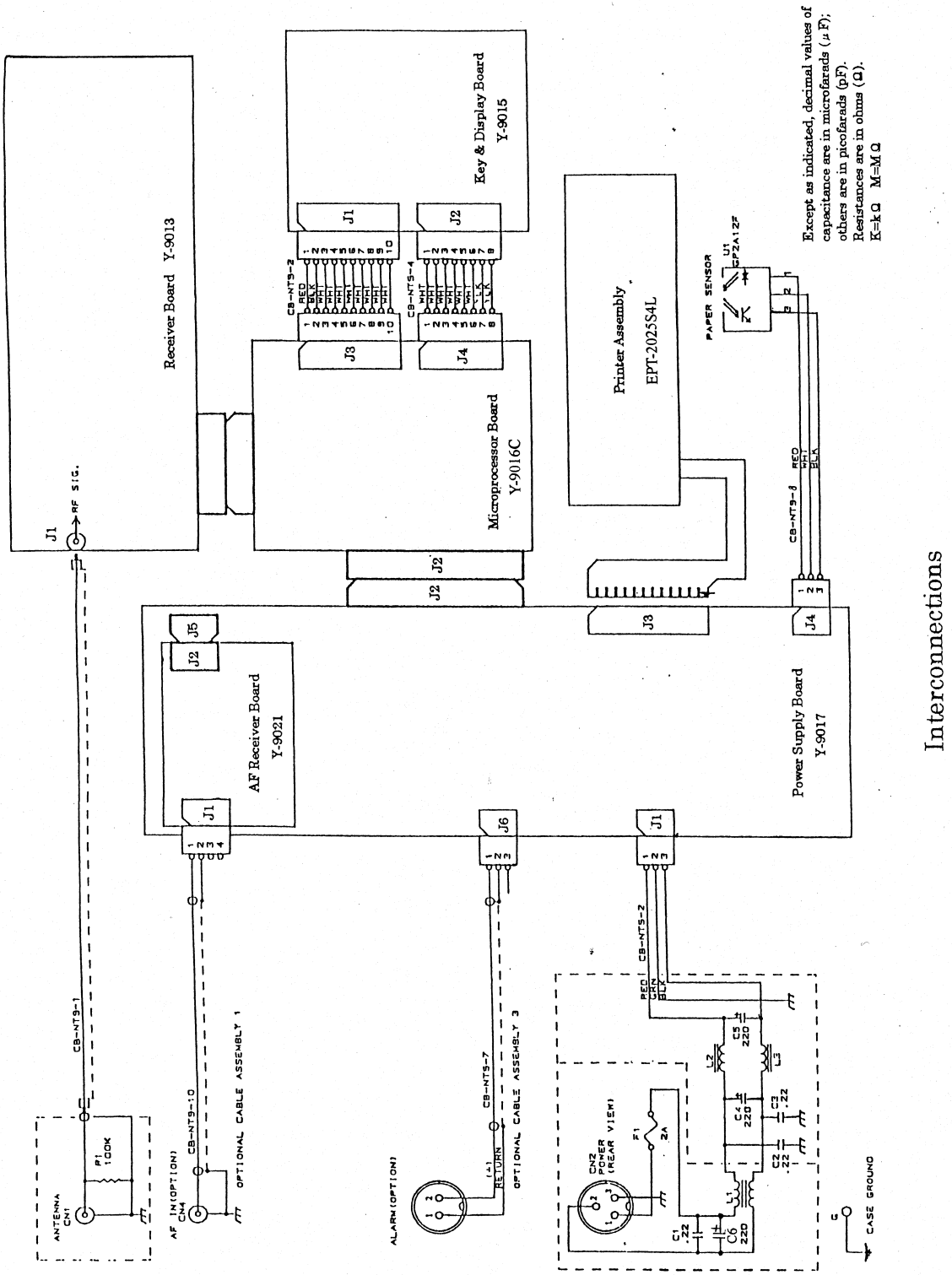
7.3.7. Parts Mounted on AF Receiver Board (option)

Board Part #: Y-9021

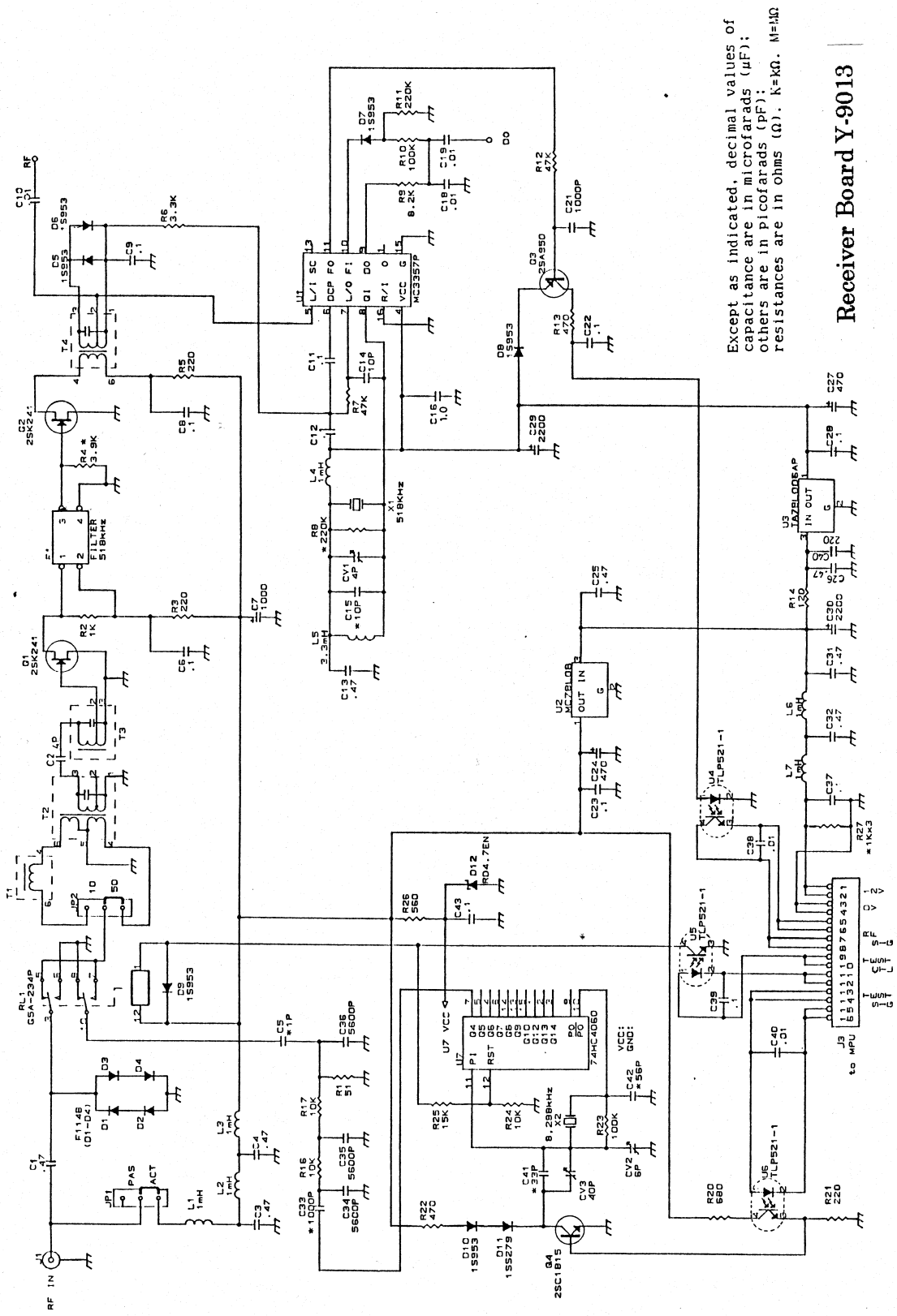
Circuit Ref.	Name	Specifications	
C1	Capacitor, ceramic	470 pF	50V
C2	Capacitor, ceramic	0.1 μF	50V
C3	Capacitor, polyester film	0.033 μF	63V
C4	Capacitor, polyester film	0.01 μF	63V
C5	Capacitor, polyester film	0.033 μF	63V
C6	Capacitor, ceramic	0.1 μF	50V
C7	Capacitor, polyester film	0.033 μF	63V
C8	Capacitor, electrolytic	100 μF	25V
R1	Resistor, carbon film	620 Ω	1/4 W
R2	Resistor, carbon film	1 kΩ	1/4 W
R3	Resistor, carbon film	470 kΩ	1/4 W
R4	Resistor, carbon film	15 kΩ	1/4 W
R6	Resistor, carbon film	100 kΩ	1/4 W
R7	Resistor, carbon film	510 kΩ	1/4 W
R8	Resistor, carbon film	51 kΩ	1/4 W
R9	Resistor, carbon film	4.7 kΩ	1/4 W
R10	Resistor, carbon film	330 Ω	1/4 W
R11	Resistor, carbon film	33 Ω	1/4 W
R12	Resistor, carbon film	2.2 kΩ	1/4 W
R13	Resistor, carbon film	220 Ω	1/4 W
R14	Resistor, carbon film	10k Ω	1/4 W
RV1	Trimmer pot., metal film	5 kΩ	1/8W
D1	Diode, small signal	1S1588	
D2	Diode, small signal	1S1588	
D3	Diode, small signal	1S1588	
D4	Diode, small signal	1S1588	
Q1	Hybrid transistor, NPN	DTC114YS	
Q2	Hybrid transistor, PNP	DTA114YS	
U1	IC, FSK receiver	XR2211CP	
U2	Dual opto-isolator	TLP521-2	
J1	Connector, 6-pin receptacle	B6P-VH	
J2	Connector, 10-pin receptacle	HIF3FB-10DA-2.54DSA	

8. Schematics

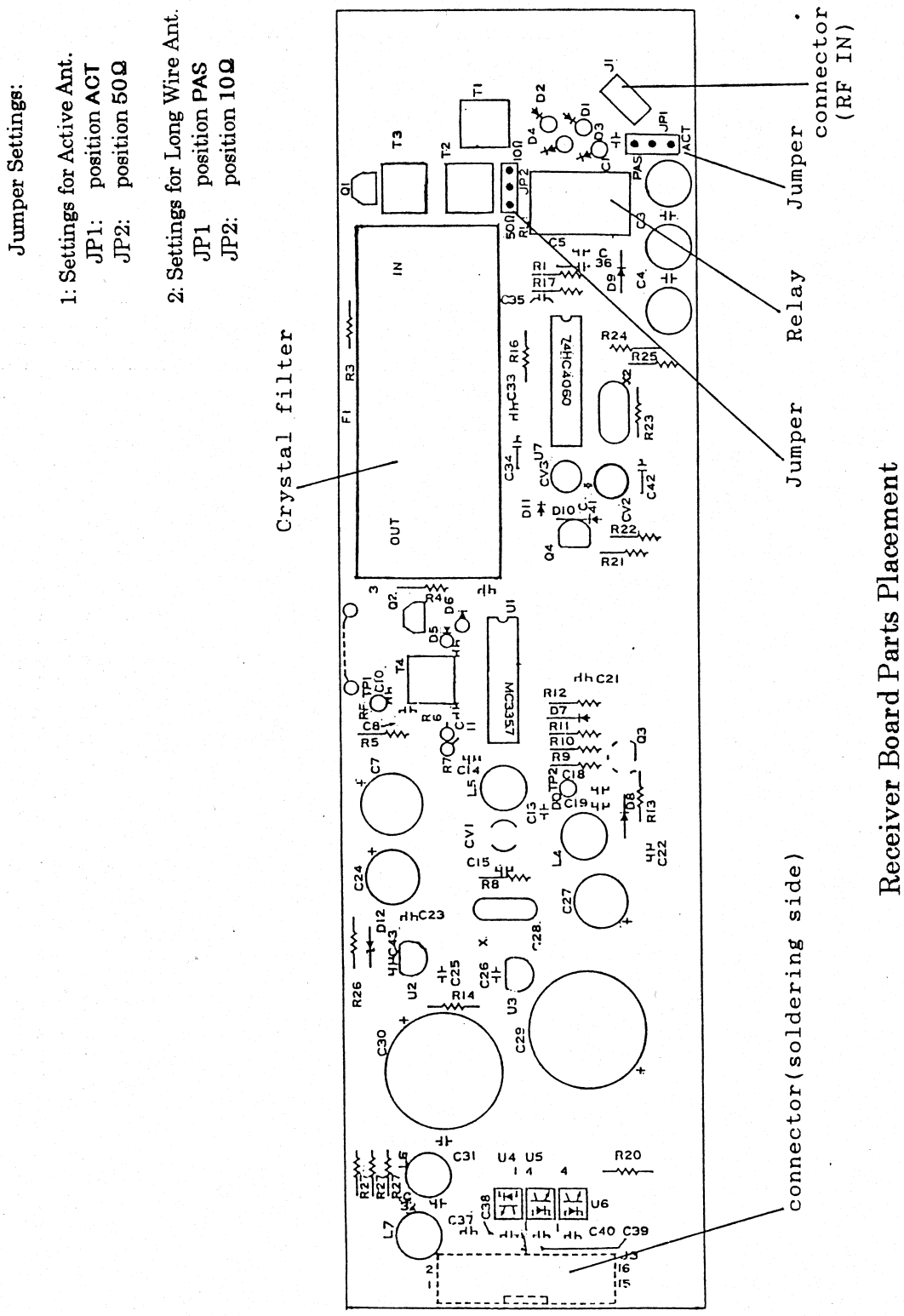
8.1. Interconnections



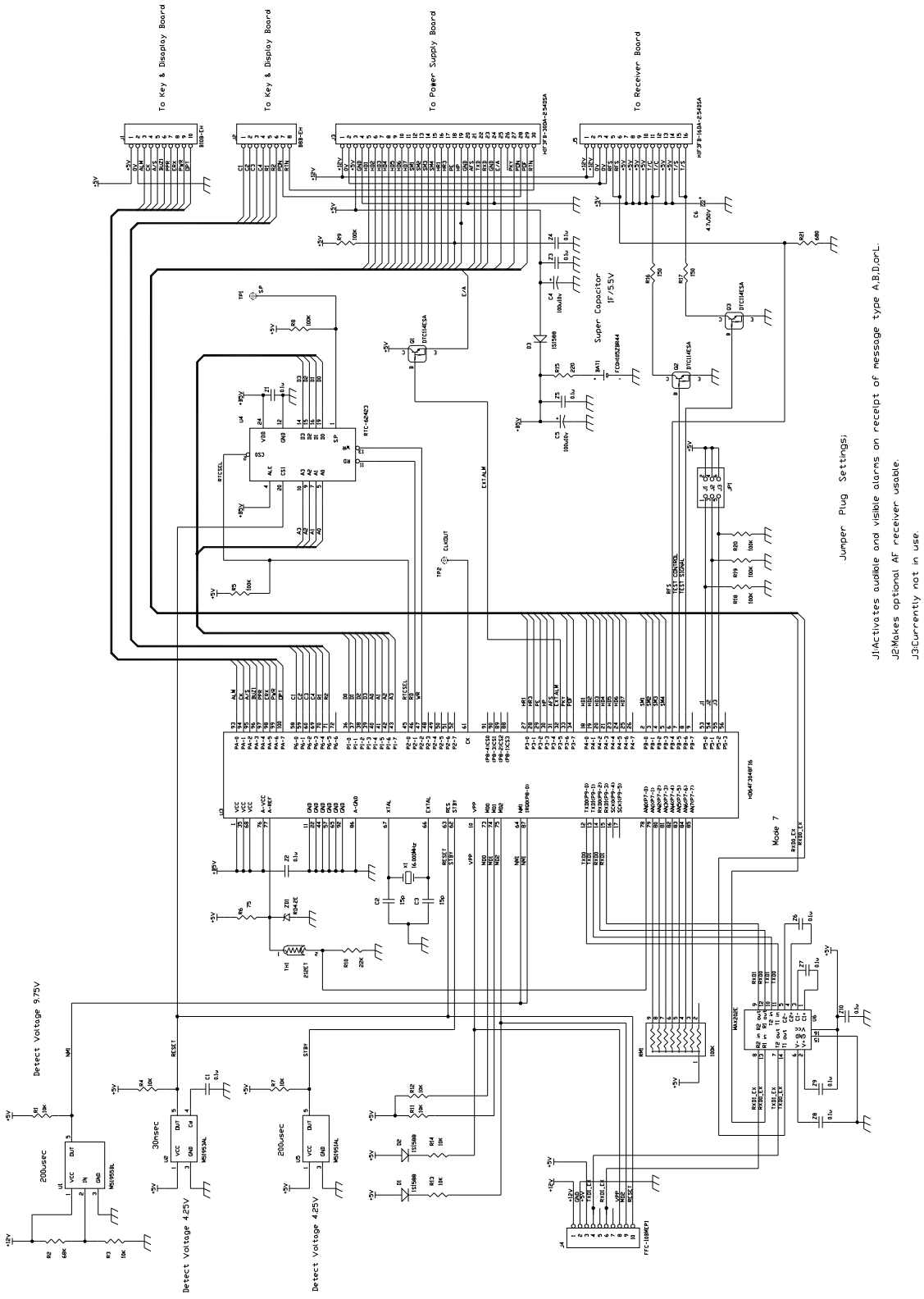
8.2. Receiver Board

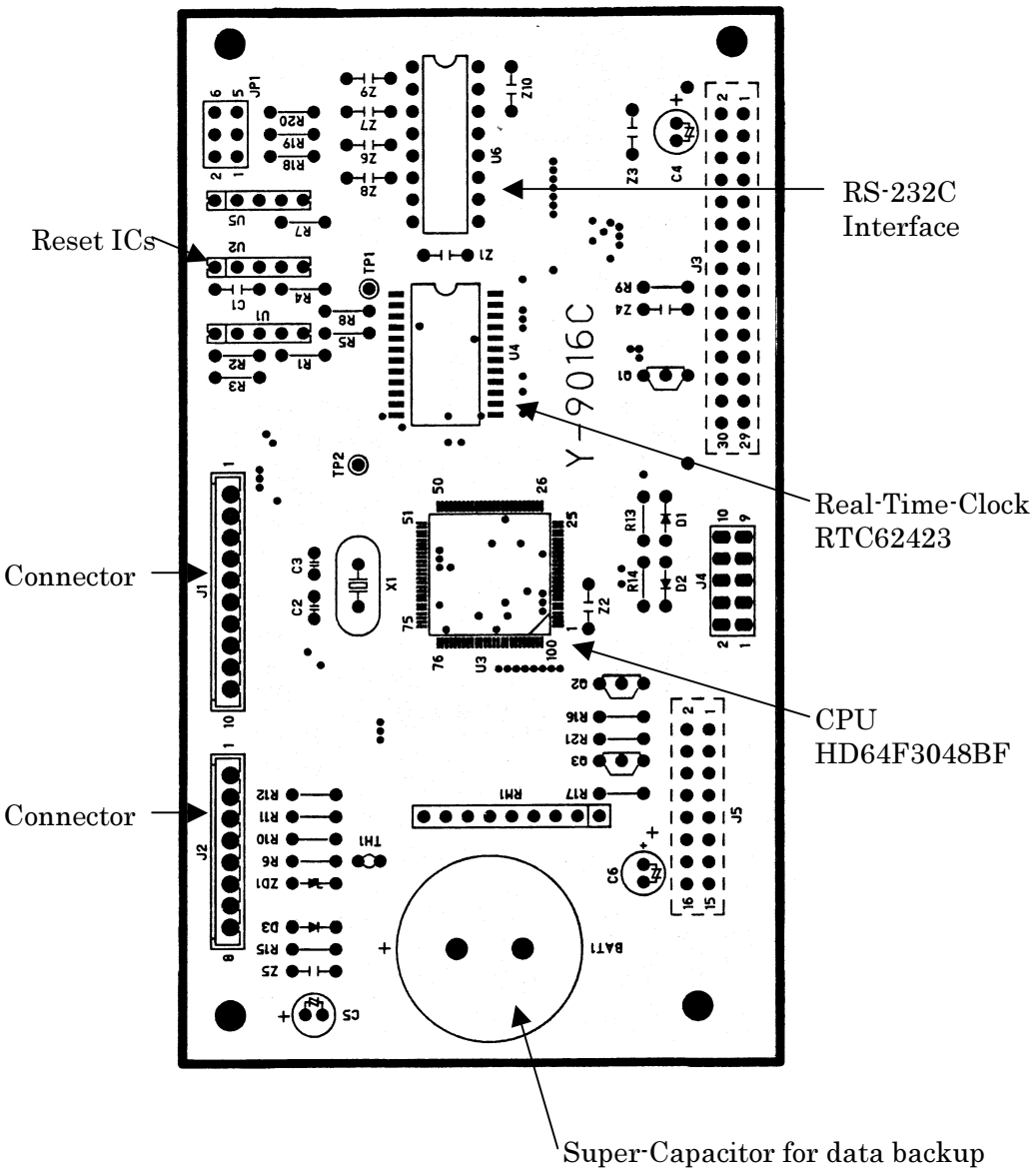


Receiver Board Parts Placement



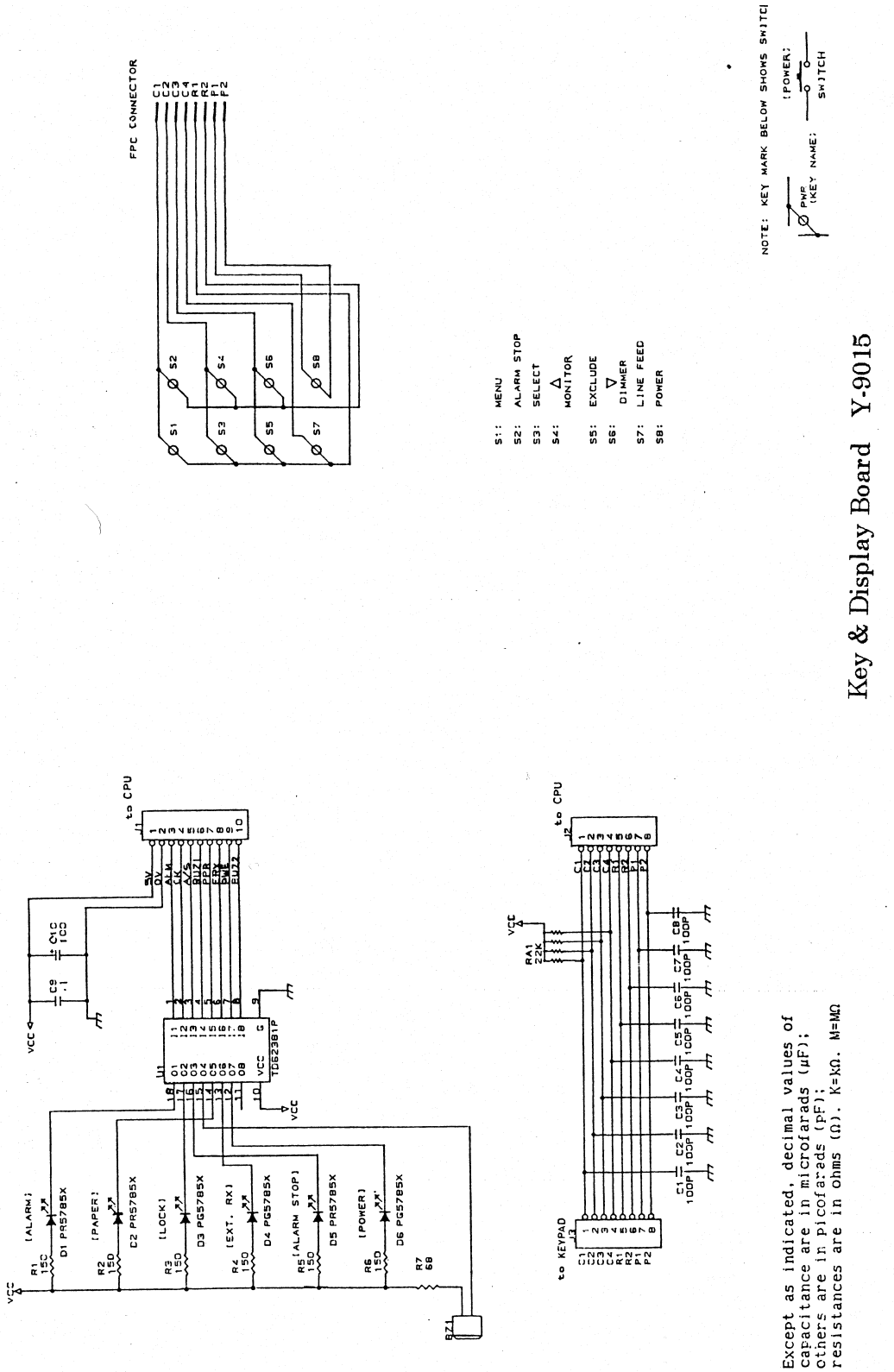
8.3. Microprocessor Board



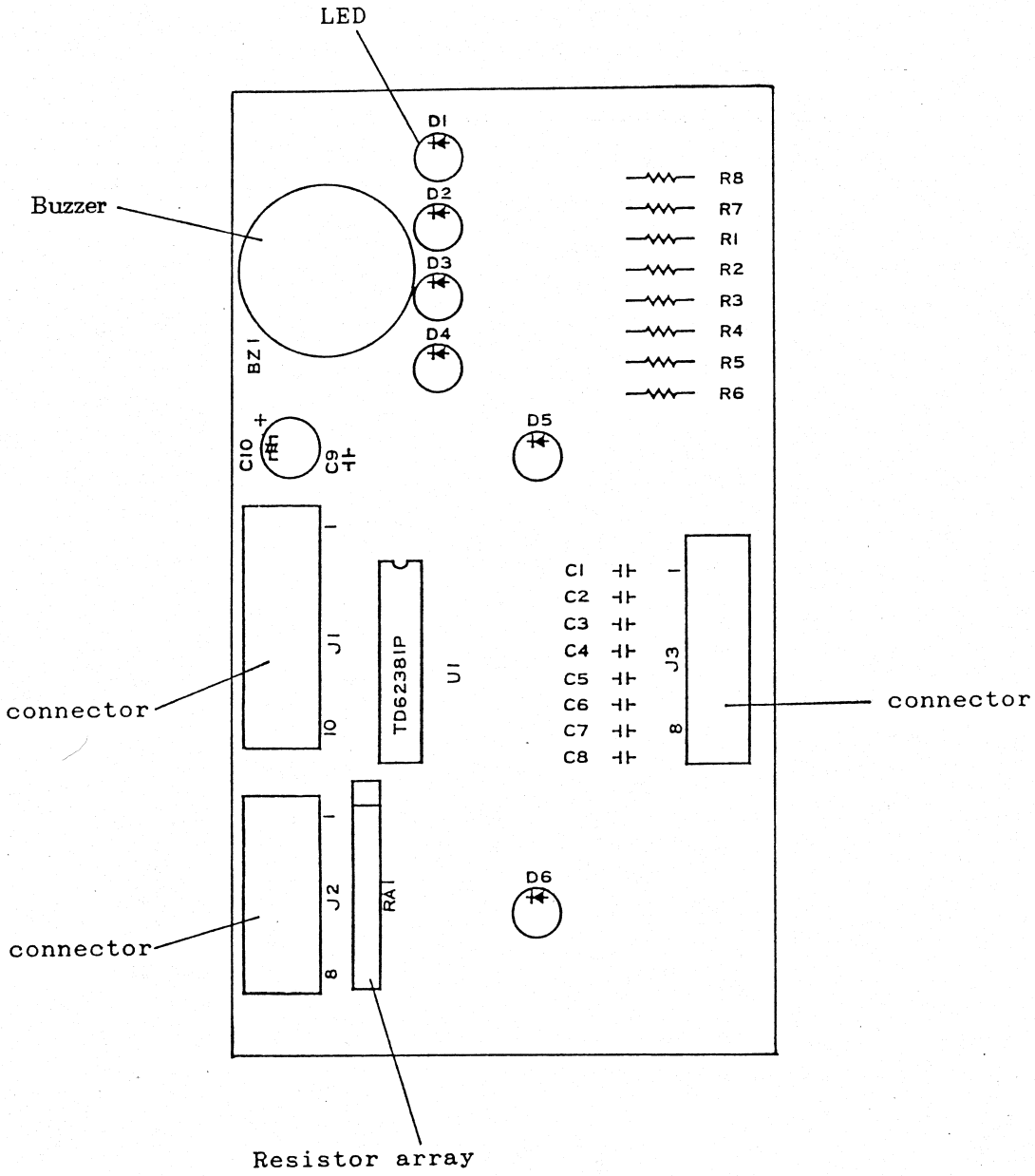


Microprocessor Board Parts Placement

8.4. Key & Display Board

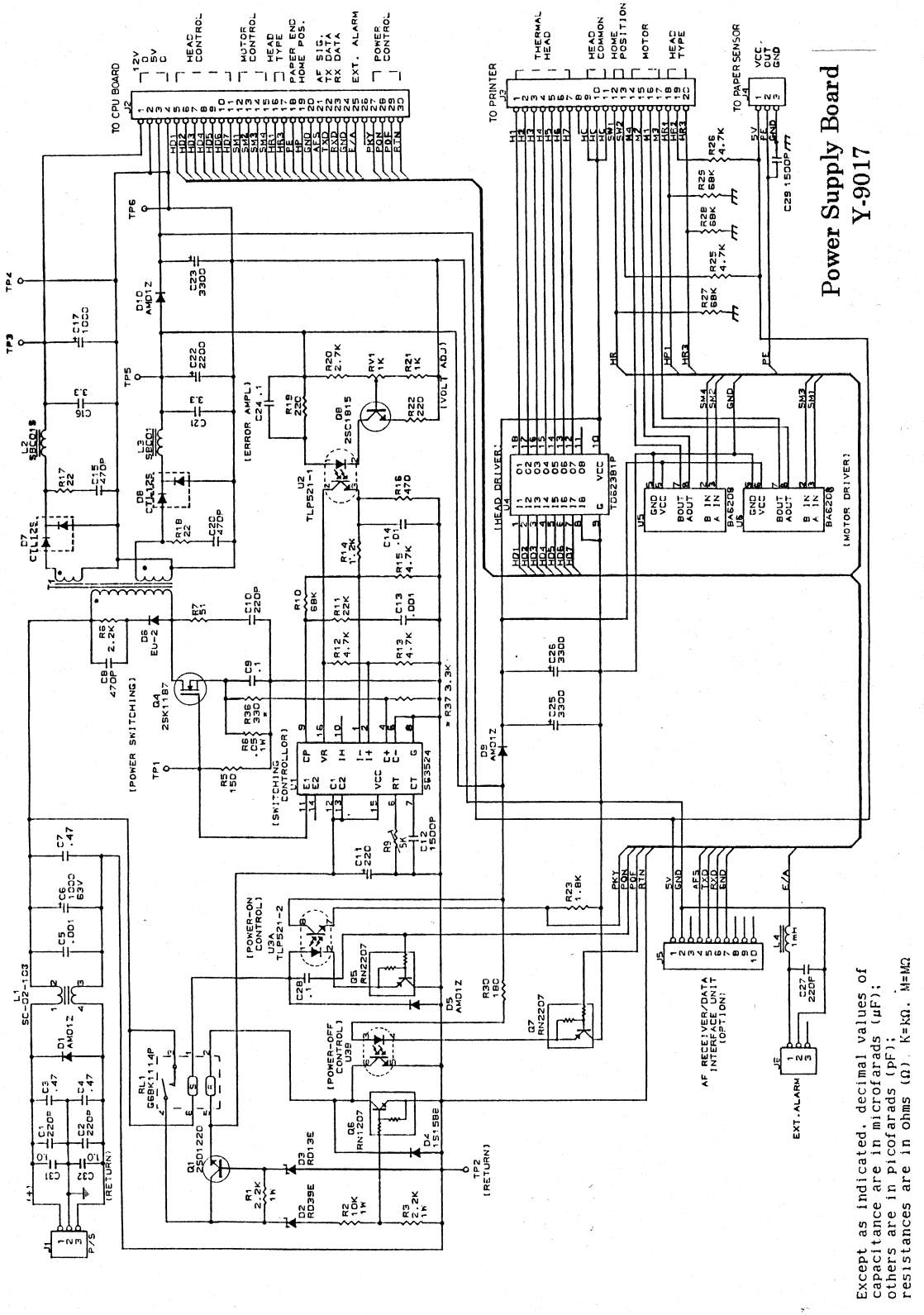


Key & Display Board Parts Placement

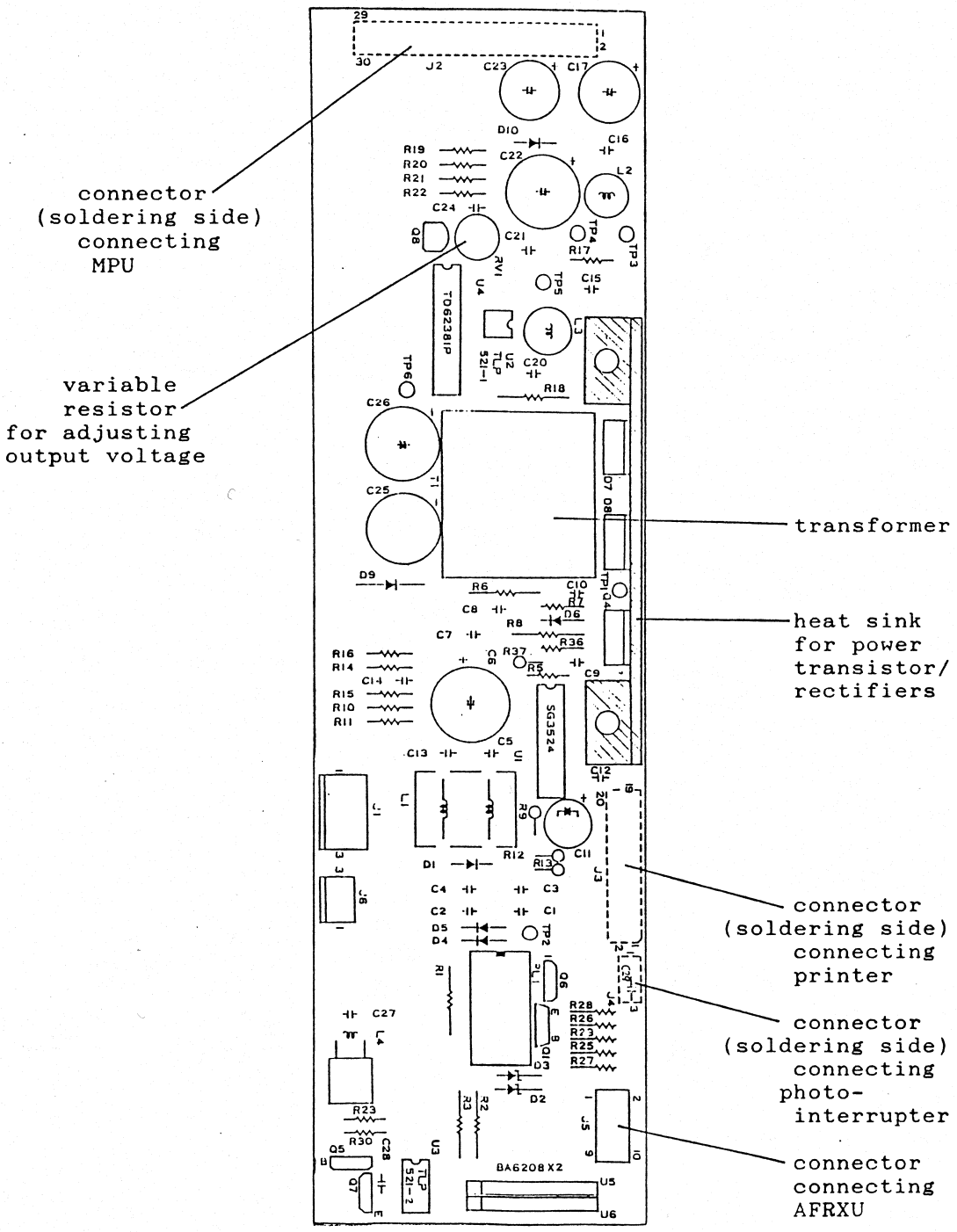


Key & Display Board Parts Placement

8.5. Power Supply Board

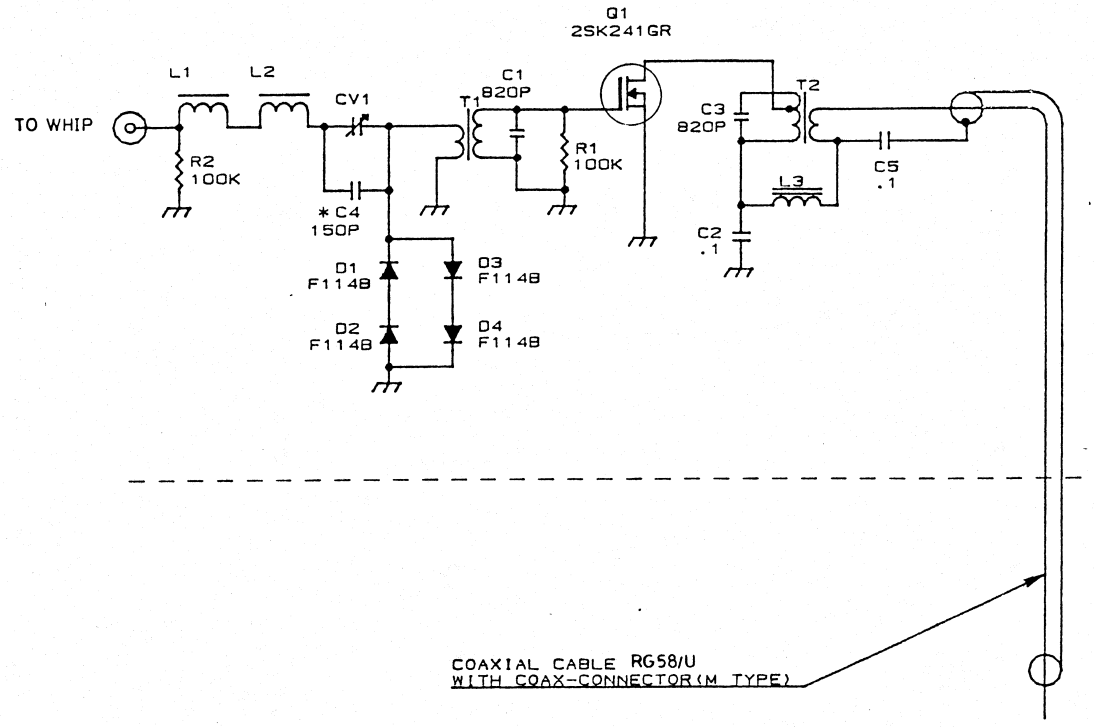


Power Supply Board Parts Placement



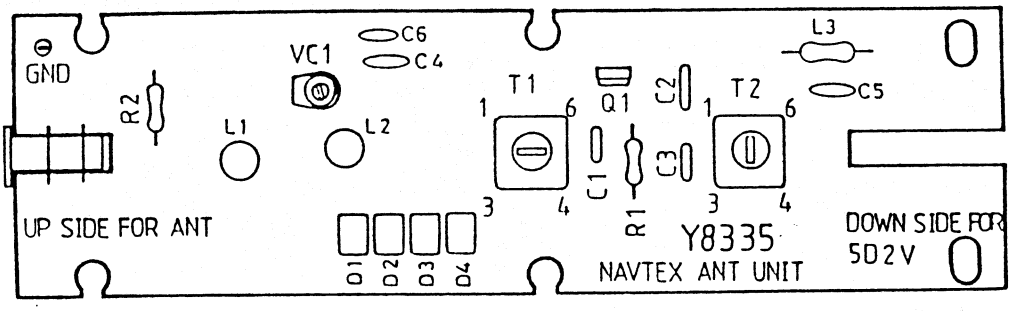
Power Supply Board Parts Placement

8.6. Active Antenna Preamplifier Board

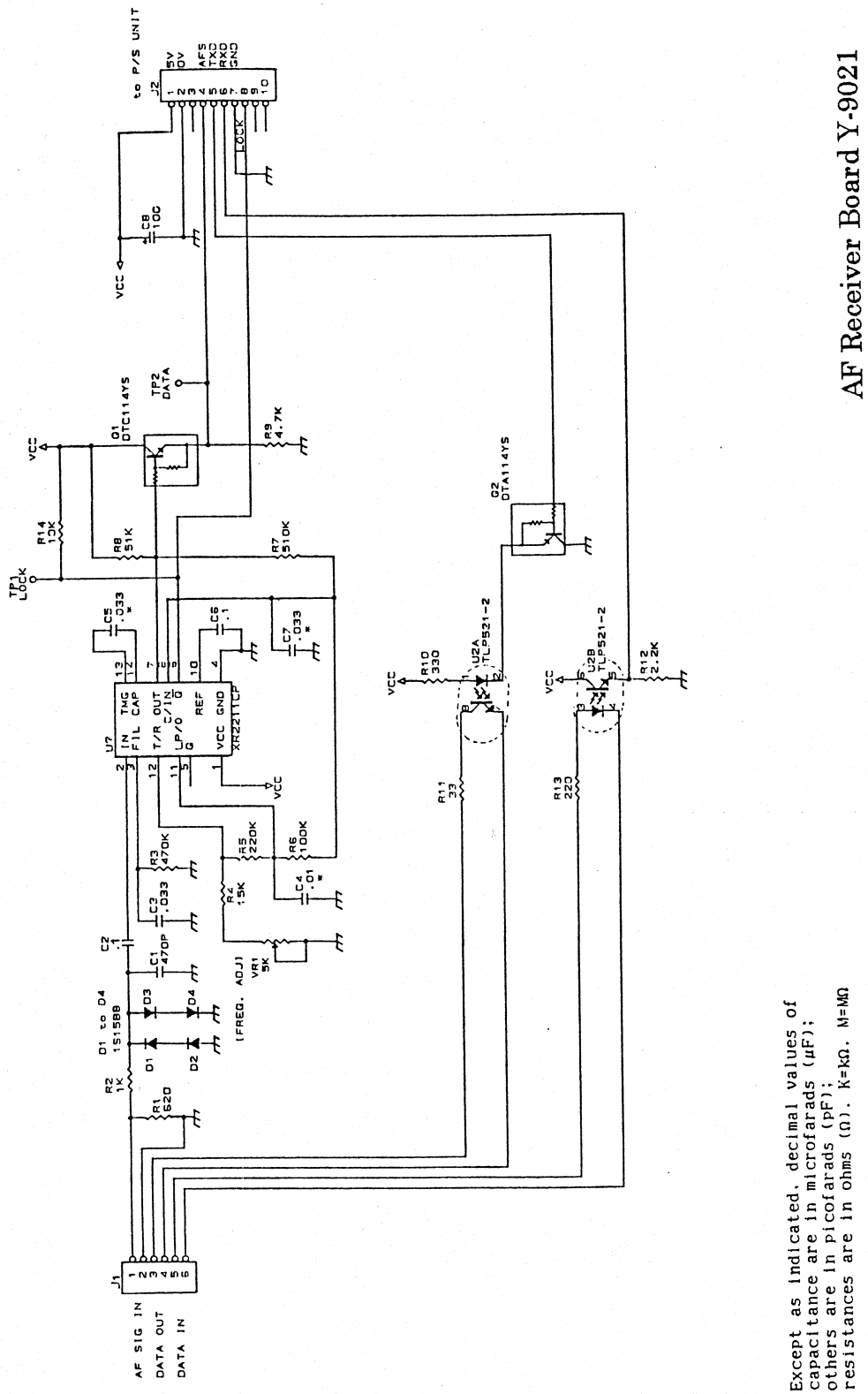


Except as indicated, decimal values of capacitance are in microfarads (μF); others are in picofarads (pF); resistances are in ohms (Ω). K=kΩ. M=MΩ

Active Antenna Preamplifier Board Parts Placement



8.7. AF Receiver Board



AF Receiver Board Parts Placement