FURUNO

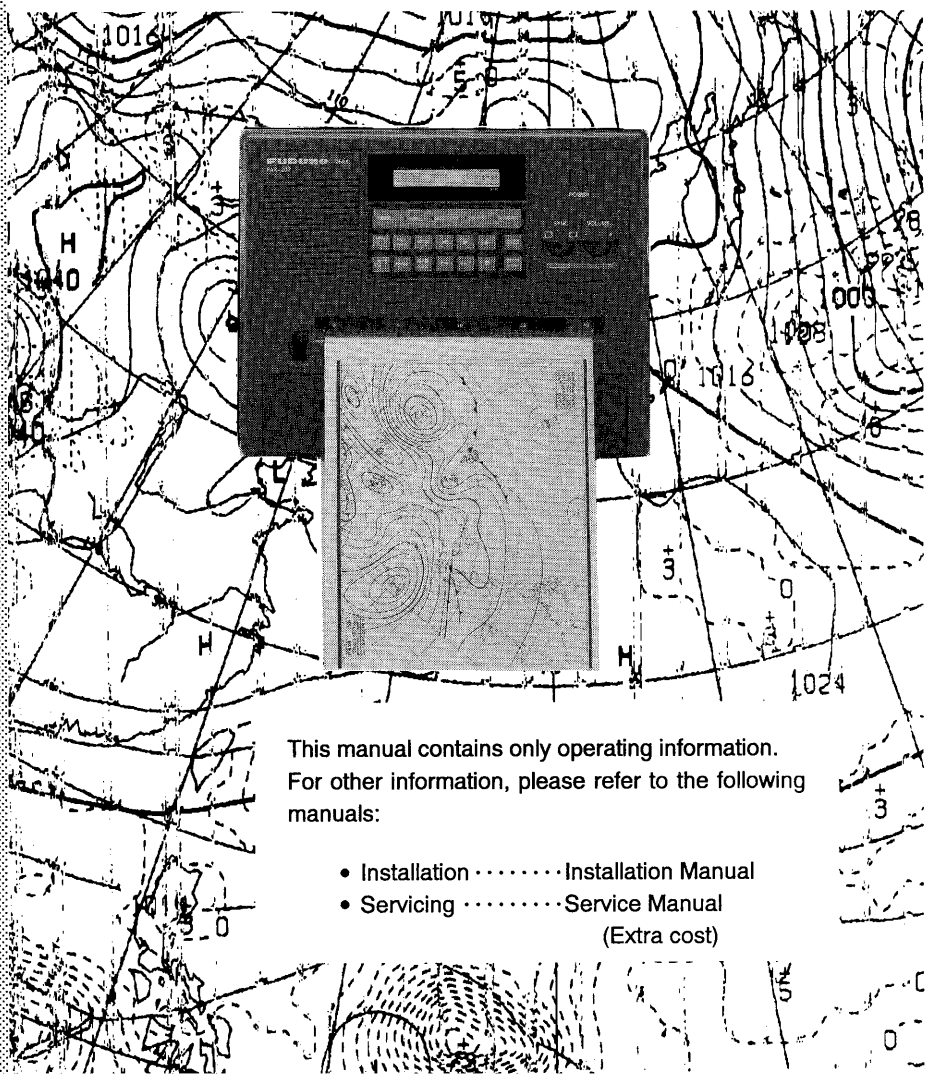
Back

OPERATOR'S MANUAL

DFAX

DUAL FUNCTION FACSIMILE RECEIVER

Model: **FAX-207**



This manual contains only operating information.
For other information, please refer to the following manuals:

- Installation ····· Installation Manual
- Servicing ····· Service Manual (Extra cost)

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Initial : MAR 1994
D : JUN. 12, 1996

9606100TA
(TAYA)

PUB. No. OME-62580
FAX-207

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⚠ SAFETY INSTRUCTIONS

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

⚠ **DANGER**	This notice indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury.
⚠ **WARNING**	This notice indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ **CAUTION**	This notice indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury or property damage.

⚠ WARNING

Avoid opening cover of equipment except to replace paper, fuse or printing head.

This equipment uses high voltage electricity which can shock.

Do not disassemble or modify the equipment.

Fire, electrical shock or serious injury can result.

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

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

⚠ CAUTION

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

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

Do not place heater the equipment.

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

Do not operate the unit with wet hands.

Electrical shock can result.

Use the correct fuse.

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

Do not touch Printing head just after printing.

Burn can result.

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FOREWORD

A Word to FAX-207 Owners

FURUNO Electric Company thanks you for considering and purchasing the FURUNO FAX-207 Facsimile Receiver. We are confident you will discover why FURUNO has become synonymous with quality and reliability.
For over 40 years FURUNO has enjoyed an enviable reputation for superior marine electronics equipment. This dedication to excellence is furthered by our extensive global network of agents and dealers.
FURUNO designs and manufactures its products to meet the exacting demands of the marine environment. However, no machine can perform to the utmost of its ability unless properly installed and maintained. Please carefully read and follow the recommended operating procedures in this manual and the installation instructions in the installation manual.

Thank you for considering and purchasing FURUNO.

Features

The FAX-207 Dual Function Facsimile (DFAX) Receiver provides high resolution charts and satellite images transmitted from facsimile stations throughout the world. It can be programmed to receive facsimile broadcasts automatically, providing hands-off operation.
The FAX-207 has a wide variety of functions, all contained in a rugged plastic case which is small enough to fit on almost any class of vessel. All keys respond immediately to the operator's command. Each time a keying sequence is correctly executed the unit emits a "beep" to confirm that it has received the operator's command.

A few of the FAX-207's features are

- Noise-free, carbon dust-free thermal printing head.
- High resolution thermal paper provides crisp and clean pictures in four tones. Cloud analysis picture (FM band) presented clearly.
- Programmed with all existing facsimile stations and frequencies. Free memory provides for storage of up to 230 user channels.
- Fully automatic operation by built-in schedule timer. Storage for up to 30 programs provided.
- Fully automatic selection of speed, IOC, phase alignment, and frequency.
- Easy-to-understand menu-driven operation.
- Optional NAV RCV Board provides for reception of NAVTEX messages.
- AM mode available (AM broadcast can be heard.)
- Connectable to personal computer to use FAX-207 as a PC printer. (Optional I/F board required.)

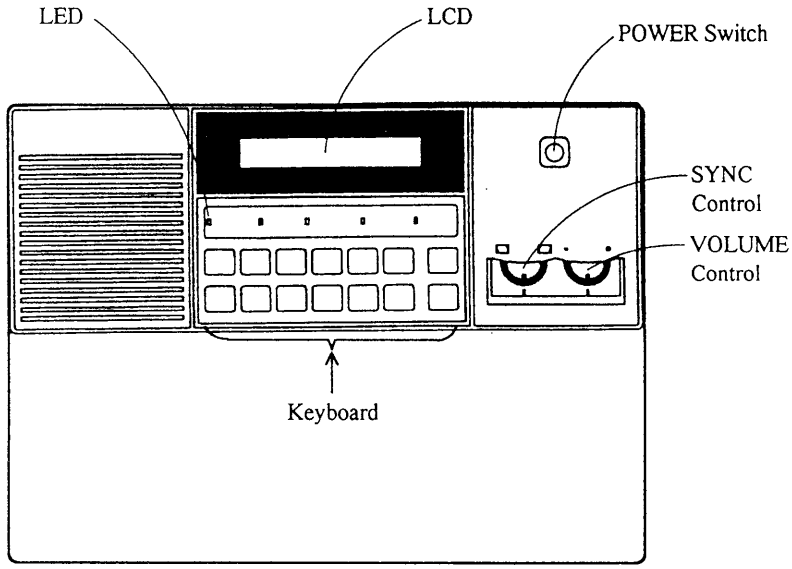
1. CONTROLS

1.1 General

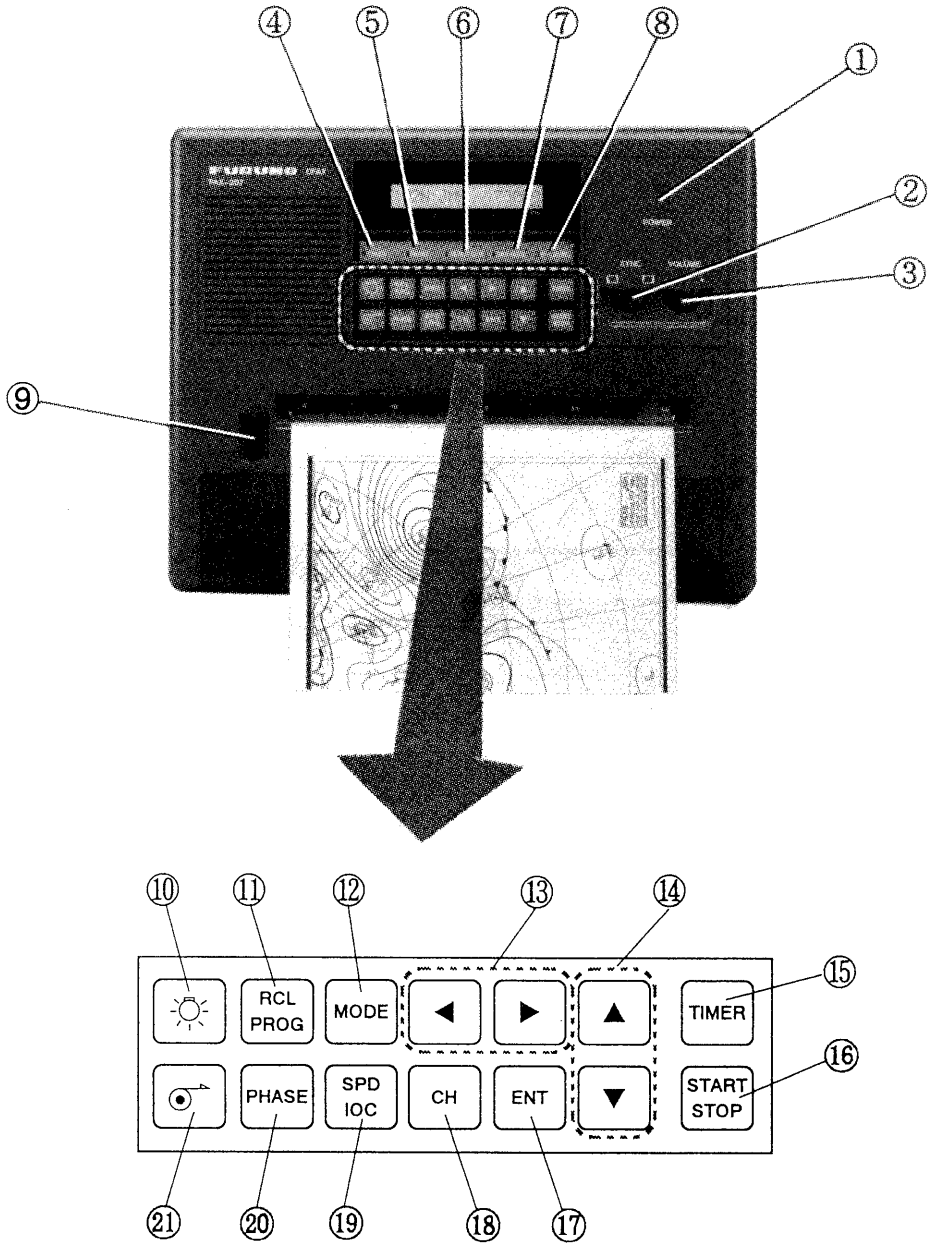
Front panel

The front panel contains all the controls necessary for the operation of the FAX-207.

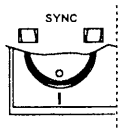
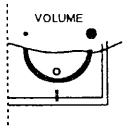
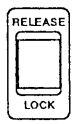
Take a look at the front panel. At the top right-hand side there is a POWER switch. Below it are the SYNC and VOLUME controls. They fine tune picture synchronization and adjust the volume of the speaker. The LCD in the center of the unit displays operating information such as receiving frequency and settings. Below the LCD are the LEDs. They light to show equipment state. And below the LEDs is the keyboard consisting of 14 keys.



1.2 Control Description



Controls, Keys and LEDs

No.	Controls, Keys and LEDs		No.	Controls, Keys and LEDs	
①		Turns on/off the unit.	⑩		Turns on/off illumination.
②		Fine tunes picture synchronization.	⑪	RCL PRG	Displays data; programs the unit.
③		Adjusts audio level of the monitor speaker.	⑫	MODE	Adjusts contrast of LCD and intensity of recording.
④	☐ TIMER	Lights when timer recording is on.	⑬	◄ ►	Shift the cursor leftward and rightward.
⑤	☐ PRINT	Lights when printing.	⑭	▲ ▼	Change menu and setting data.
⑥	☐ PAPER OUT	Lights when there is no recording paper.	⑮	TIMER	Turns timer recording on/off.
⑦	☐ SAR MSG	Lights when SAR message is received. (Alarm sounds. To silence it, press [ENT] key.)	⑯	START STOP	Resumes/stops printing manually.
⑧	☐ S-LEVEL	Lights when signal level is low.	⑰	ENT	Registers data.
⑨		Releases/locks recording paper.	⑱	CH	Selects receiving channel.
			⑲	SPD IOC	Adjusts scanning speed and IOC to match those of transmitter.
			⑳	PHASE	Adjusts picture phase.
			㉑		Feeds paper 43 mm/pressing.

1.3 [MODE] and [RCL/PRG] Keys

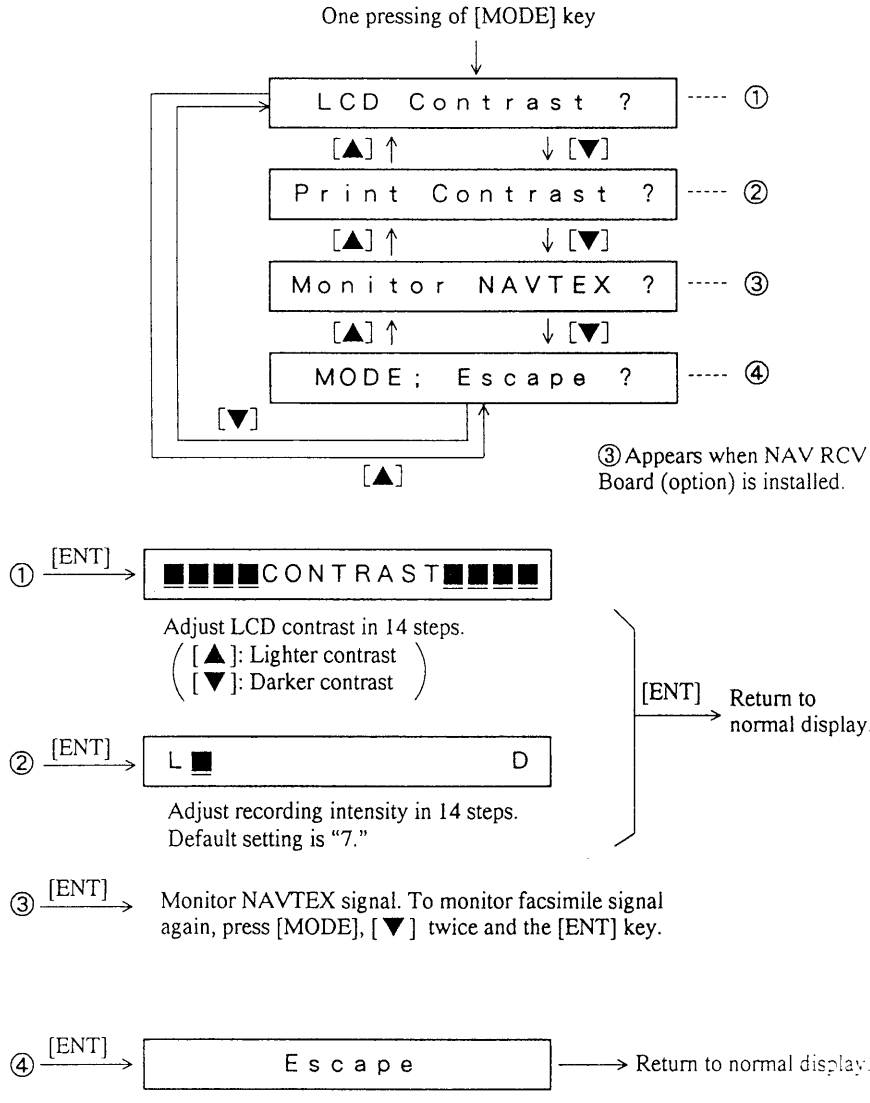
Function

The [MODE] key functions to adjust the contrast of the LCD and intensity of recording. And the [RCL/PRG] key displays or changes time and various data.

NOTE: *If you accidentally press the [MODE] key or the [RCL/PRG] key, you can return to the normal display by pressing [▲] and [▼] keys to display "Escape?" and then press the [ENT] key.*

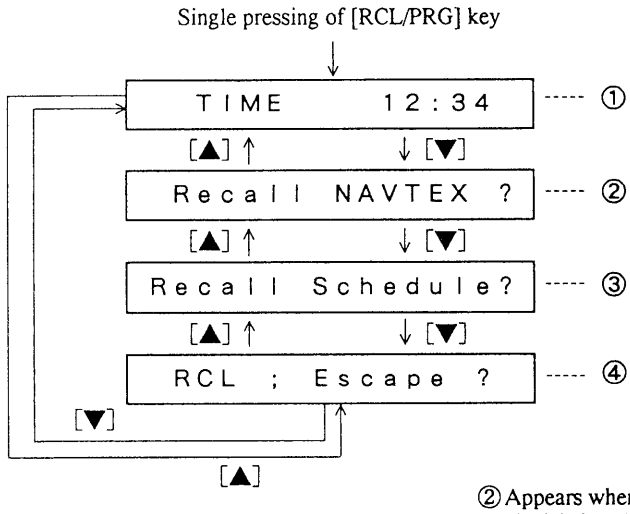
The [MODE] key

The [MODE] key and the [▲] and [▼] keys perform the functions shown in the figure which follows.



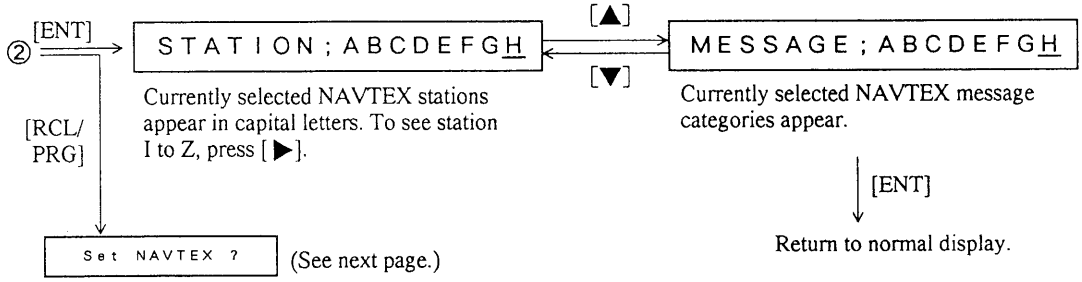
Single pressing of the [RCL/PRG] key

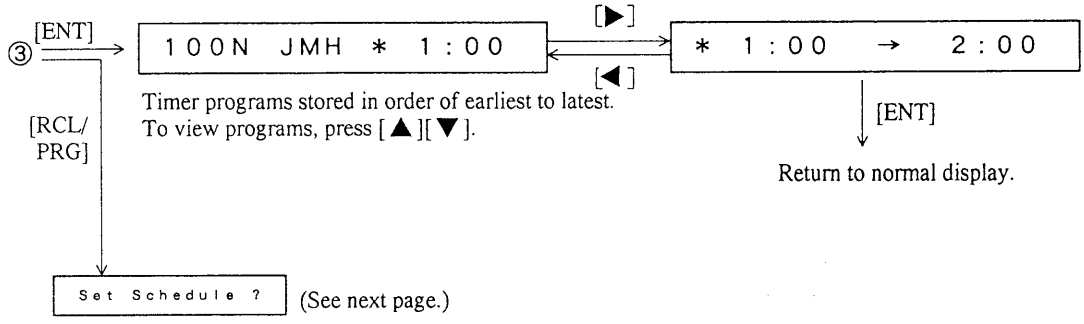
A single pressing of the [RCL/PRG] key enables confirmation of time, NAVTEX settings and timer programs. You may select the item to confirm by operating the [▲] and [▼] keys.

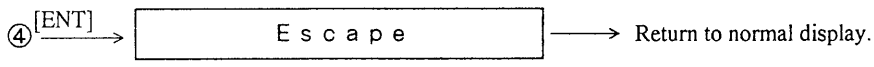


② Appears when NAV RCV Board (option) is installed.

① ⟶ Time Display

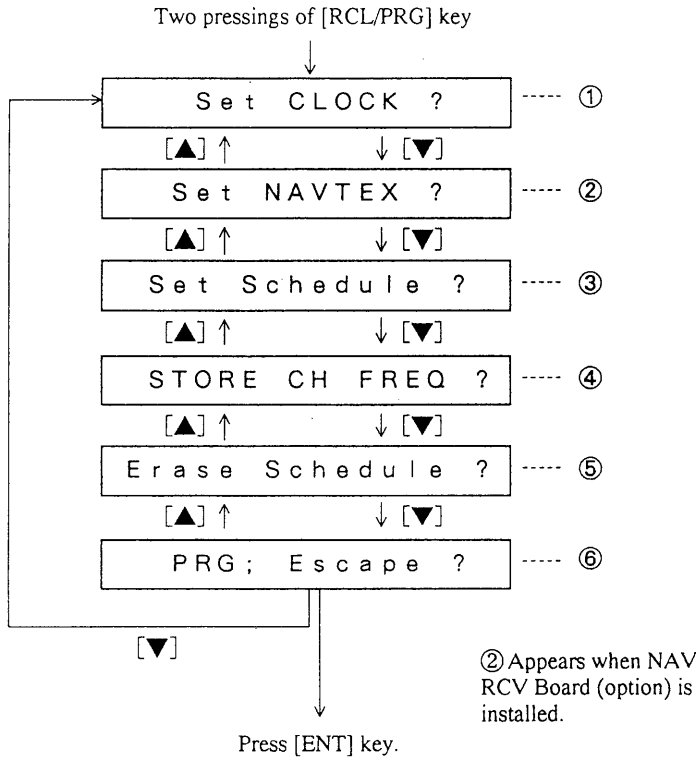






Two pressings of the [RCL/PRG] key

Two pressings of the [RCL/PRG] key enable change of time, NAVTEX settings and timer programs. You can select what to change by operating the [▲] and [▼] keys.



	Function	Page
①	Enters time.	5-1
②	Selects NAVTEX station/message.	6-2
③	Sets timer programs. Up to 30 programs may be entered.	2-3
④	Enter new channels (frequencies).	5-2
⑤	Cancels timer programs.	2-6
⑥	Returns to normal display.	

[MODE] key + POWER switch

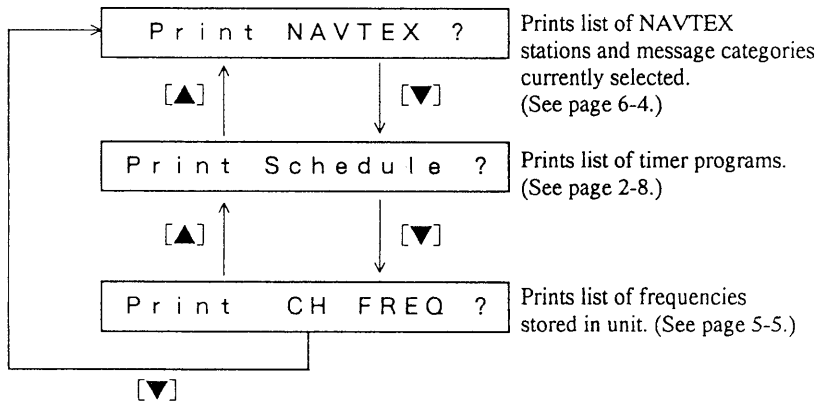
Turning on the power while pressing and holding down the [MODE] key starts the self-test program, which tests the unit for proper operation. For further details, see page 8-1.

[CH] key + POWER switch

This combination of keys clears the memory of all data. For further details, see page 8-5.

[RCL/PRG] key + POWER switch

These keys print the lists shown in the following figure. To print a list, select it by the [▲] and [▼] keys and then press the [ENT] key.



2. AUTOMATIC RECORDING

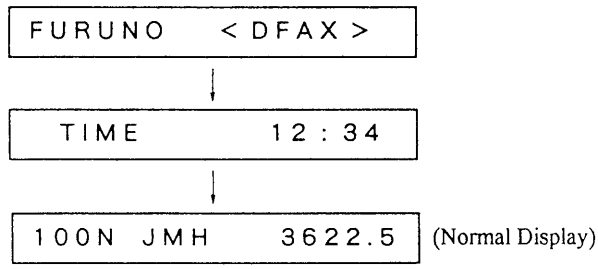
2.1 Automatic Recording

General

Once you set the facsimile station from which to receive, the unit goes into stand-by, ready to receive facsimile broadcast automatically upon reception of remote signal from the facsimile station. The procedure which follows shows how to ready the unit for automatic reception. You may also receive facsimile broadcasts automatically by the timer program feature. The instructions for how to do this are in "2.2 Timer Recording."

Getting into stand-by

1. Press the POWER switch to turn on the power. The display changes in the sequence shown below (your display make look a little different), taking about five seconds to complete the sequence. The last-used station and frequency appear on the display.

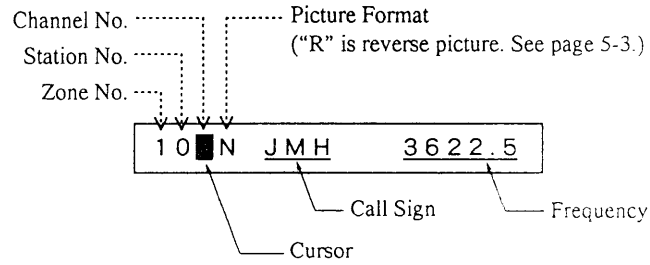


2. Press the [MODE] key followed by the [ENT] key to enable adjustment of the contrast of the LCD. Operate the [▲] and [▼] to adjust contrast.

Selecting station

3. Referring to the facsimile station list at the end of this manual, select zone number and station no., and set them as follows. In the example shown below, station JMJ (Tokyo, Japan) zone 1, station 1 and channel no. 2 are temporarily set.

   1) Press the [CH] key. The (blinking) cursor should be under channel number.



2) Press the [◀] key to set the cursor under zone number. Set zone by operating the [▲] and [▼] keys.

3) Press the [▶] key once to place the cursor under station number. Set station number by operating the [▲] and [▼] keys.

4) Press the [▶] key once to place the cursor under channel number. Set channel number by operating the [▲] and [▼] keys.

```
112N JMJ    9438.0
```

5) Press the [ENT] key. Station call sign, channel frequency and other information set in steps 2, 3 and 4 appear on the display.

```
112N JMJ    9438.0
```

Receiving and printing

The unit is now ready to receive. When it receives the start signal from the facsimile station, it automatically adjusts itself to match speed, IOC and phase of the transmitter and then saves picture information to the memory. ("PRINT" LED lights.) When a certain amount of picture information is accumulated, printing starts. Upon completion of the broadcast, the facsimile station sends the stop signal.

Stopping printing manually

You can stop printing anytime by pressing the [START/STOP] key. **DO NOT STOP PRINTING BY TURNING OFF THE POWER, TO PREVENT DAMAGE TO THE PRINTING HEAD.**

2.2 Timer Recording

General

Most LF/HF facsimile stations transmit facsimiles in accordance with a schedule issued by relative meteorological observatory. (You can find facsimile schedules in the publication "Meteorological Facsimile Broadcasts," available through meteorological observatory bodies.) If you wish to receive a certain facsimile broadcast on a daily basis, therefore, the timer recording mode will virtually allow you "hands-off" automatic operation. You may preset 30 timer programs.

Preparation

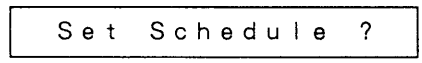
Before you start entering program times into the unit, you should prepare a list of stations and start/stop times. (A log for such is provided at the end of this manual.)

Adjusting recording, stopping printing

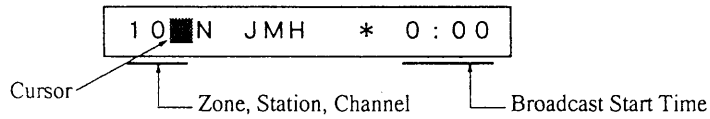
If the picture looks strange, you can adjust (while printing) the frequency, speed, IOC and phase to correct it. You can stop printing anytime by pressing the [START/STOP] key.

Procedure

1. Press the [RCL/PRG] key twice. Operate the [▲] and [▼] keys to display the following message.



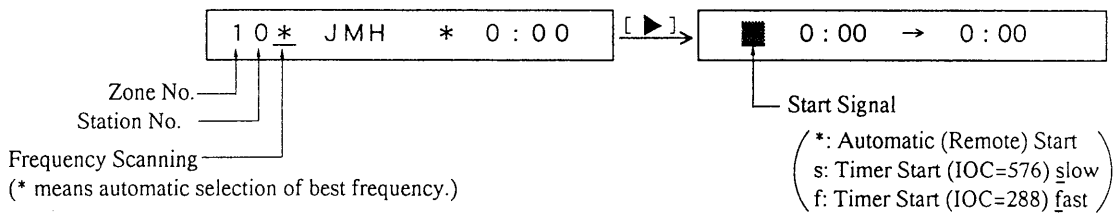
2. Press the [ENT] key. The following display appears.



In the procedure which follows you are shown how to set Tokyo, Japan station JMH, zone number 1, station number 0, and broadcast start and stop times of 15:29 and 15:47.

Set station

3. Set "1", "0" and "*" as zone number, station number and channel by operating the [◀] and [▶] keys to shift cursor and the [▲] and [▼] keys to set data.



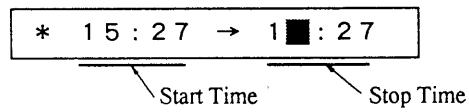
Select start signal to use

4. Press the [▶] key to display the "start signal" display. Operate the [▲] and [▼] keys to display "*" (automatic start).

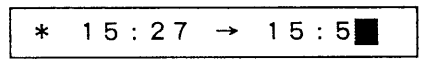
Set recording start and stop times

5. Press the [▶] key to set the cursor on the hour in the starting time column. Press the [▲] and [▼] keys to set starting time, using 24-hour notation. (In the example the starting time hour is 15.) You may press and hold down on those keys to speed up the rate of change. Similarly set the starting minute. Enter a time at least two minutes earlier than actual start time to allow for detection of the start signal.

6. Press the [▶] key to set the cursor on the stop recording time column.



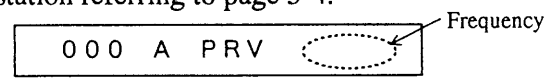
7. Set recording stop time by operating the arrow keys. Enter a time at least two minutes later than actual stop time to allow for detection of stop signal.



8. Press the [ENT] key. This concludes the procedure for entering timer program.

Timer program for AM broadcast is possible. First, register AM station referring to page 5-4.

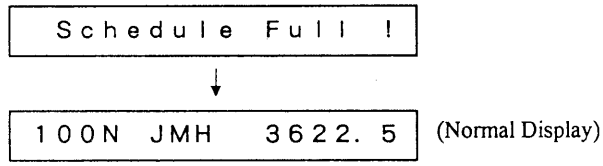
(ex.)



Then, recall "000" in step 3 on the previous page, and the private channel for AM broadcast is automatically selected. Follow steps 5 to 7 shown above to enter start and stop times.

To enter another timer program, repeat the procedure.

NOTE: *If, when you open the timer program menu, 30 timer programs already exist, the message "Schedule full" momentarily appears and then control is returned to the normal display. You cannot write over existing programs, however you can erase them individually or collectively. More on this later.*



You can confirm timer programs by printing the timer program list. For further details, see page 2-8.

Enabling timer operation

Press the [TIMER] key. The timer program closest to current time appears and then the power goes off automatically. (The "TIMER" LED lights.)

Stopping timer operation

Before start of printing
Press the [TIMER] key. The "TIMER" LED goes off and the power comes on.

While printing
Press the [START/STOP] key.

Remarks on timer recording

- If you set two programs which overlap each other in time, the program having the later starting time is not recorded. For example, program A's start and stop times are 2:00 and 2:30 and program B's, 2:15 and 2:40. In this instance program B will not be recorded.
- When the start signal detection method is "automatic start," the receiver scans a facsimile station's transmit frequencies to find the most suitable one. If there is no signal or a suitable frequency cannot be found, the picture is not printed.
- You may change receive frequency during printing, when picture quality is not satisfactory.
- Use of the scanning function is not recommended when phasing or other factor varies greatly by signal strength. Instead, set the channel (frequency) you feel is most suitable.
- For the automatic start mode, the start and stop times should be set at least one minute earlier and later than scheduled times to allow for complete acquisition of the start and stop signals.

Two methods of timer recording

There are two methods by which timer recording can be started: automatic start and timer start.
In automatic start, the unit is in stand-by at the program start time, and records the picture when it receives the "start signal" from a facsimile station. The IOC number is automatically chosen by the unit.
In the timer start mode, the unit operates by programmed timer schedule regardless of the presence or absence of a facsimile signal. However, the proper IOC (576 or 288) must be chosen by the operator.
Because of the inconvenience of having to choose IOC, it is recommended to select automatic start rather timer start to ensure reception of the entire picture.

Changing timer programs

Follow the procedure below to change timer programs.

1. Press the [RCL/PRG] key once. Press the [▲] and [▼] keys to display the following.

Recall Schedule?

2. Press the [ENT] key. The start time nearest to 00:00 appears. Press the [▲] and [▼] keys to display the program you want to change; [▲] for earlier program, [▼] for later one.

52* WLO * 17:26	(Timer Program)

3. Press the [RCL/PRG] key again to get into the timer program mode. Change program times as necessary.

■ 17:26 ↔ 18:00

4. Press the [ENT] key. The normal display appears.

SET
↓
100N JMH 3622.5 (Normal Display)

Cancelling timer programs

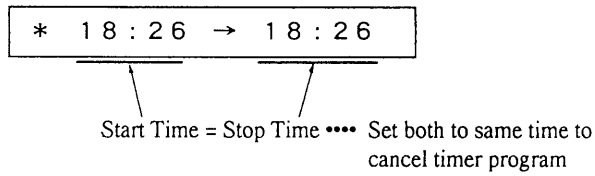
You may cancel all or specific timer programs as follows.

<u>Specific programs</u>

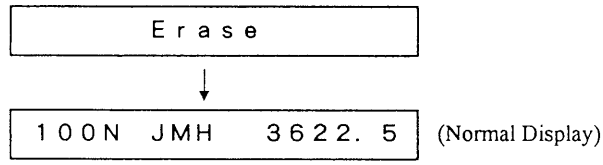
1. Follow steps 1 through 3 in "Changing timer programs" to display the timer program you want to cancel.

■ 17:26 ↔ 18:00

2. Press the [▶] key to set the cursor on the starting time column. Press the [▲] key once. This sets stop time to same time as start time, cancelling that timer program.

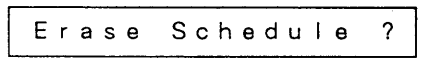


3. Press the [ENT] key. The display changes in the following sequence.

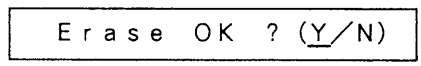


All programs

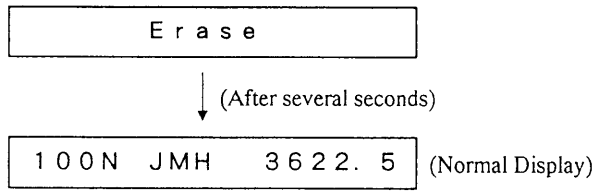
1. Press the [RCL/PRG] key twice. Press the [▲] and [▼] keys to show the following display.



2. Press the [ENT] key. The following display appears.



3. Press the [ENT] key to cancel all programs, or escape by selecting "N" (NO) followed by the [ENT] key.



Printing timer program list

The timer program list contains all timer programs, arranged in chronological order. You can print a hard copy of it for reference.

1. Turn off the power. While pressing and holding down the [RCL/PRG] key, turn on the power. Release the [RCL/PRG] key when a display appears.

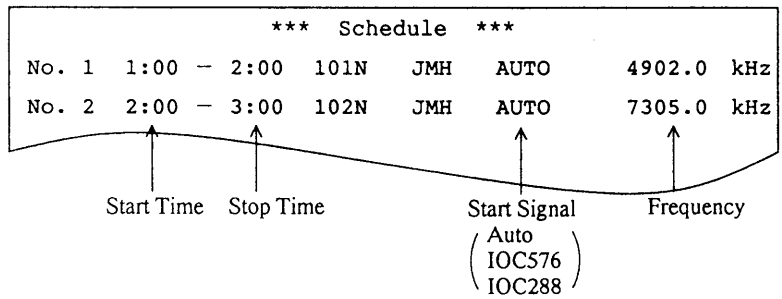
2. Press the [▼] key to show the following display.

```
Print Schedule ?
```

3. Press the [ENT] key to print the timer program list.

```
Print Schedule
```

The figure below shows a sample timer program list. Check your list for correctness.



4. After the list is completely printed, printing stops and the normal display appears.

```
TIME 12:34
```

↓

Return to normal display

3. MANUAL RECORDING

3.1 How to Record Manually

Preparation

To receive a facsimile signal manually, you will first need to set zone number, station number and channel number. These are listed in the facsimile station list in Appendix 1. The list does not show frequencies (since they are usually not necessary for operation). You may, however, print a hard copy of all frequencies (including ones you entered) stored in this unit. For further details, see page 5-5.

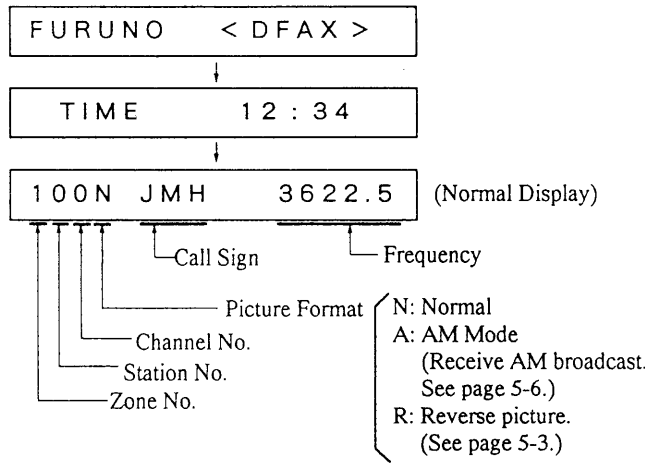
NOTE: *Do not turn off the power while printing, to prevent damage to the printing head.*

The procedure which follows includes how to manually receive automatic recording broadcast which has already started and how to receive from a facsimile station which does not use start and stop signals.

Procedure

Turning on the power

1. Press the POWER switch. The display changes in the sequence shown below, the entire sequence taking about five seconds. The last-used station and frequency appear.



Turning illumination on and off

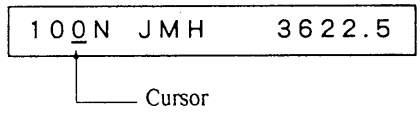
2. Press the [☼] key to turn LCD and LED illumination on or off.

3. Press the [MODE] key followed by the [ENT] key to enable adjustment of LCD contrast by the [▲] and [▼] keys.

Selecting station

4. Select facsimile station (zone and station) as follows.

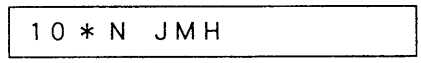
1) Press the [CH] key. The cursor should be under channel number.



2) Press the [◀] key to place the cursor on zone number (far left side digit). Operate the [▲] and [▼] keys to set zone number.

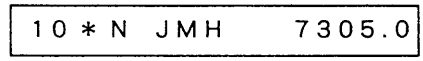
3) Press the [▶] key once to place the cursor under station number. Operate the [▲] and [▼] keys to set station number.

4) Press the [▶] key to place the cursor under channel number. Press the [▲] key to display the asterisk (*), to get automatic frequency scanning. This is the preferred (and easiest) method of frequency selection, however you may wish to designate specific channel number.



5) Press the [ENT] key. The unit scans the frequencies of the facsimile station selected.

6) The frequency found through scanning appears on the display.



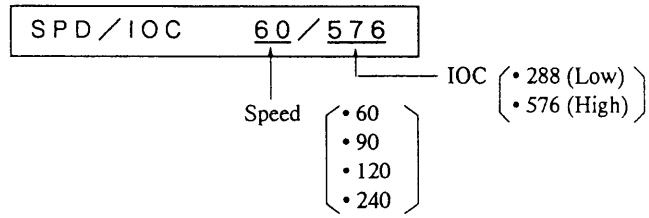
"S-LEVEL" LED lights when signal level is low.
If you cannnot receive by scanning, select a suitable frequency.

5. You can monitor the facsimile signal through the speaker. Adjust the volume of the speaker by the VOLUME control, if necessary.

Changing SPD/IOC

6. You may have to change the SPD (speed) and IOC (Index of Cooperation) depending on the facsimile station. SPD and IOC of the receiver must match those of the transmitting station to reproduce an exact copy of the picture. You can find SPD and IOC of all facsimile stations in the publication "Meteorological Facsimile Broadcasts."

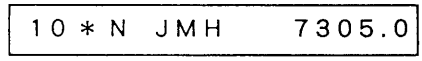
1) Press the [START/STOP] key.



2) Press the [▲] and [▼] keys to set speed.

3) Press the [▶] key to place the cursor in the far right-hand column. Operate the [▲] and [▼] keys to set IOC.

4) Press the [ENT] key.



(Normal Display)

Adjusting intensity of recording

Press the [MODE] key and the [▼] key followed by the [ENT] key to enable adjustment of recording intensity. Operate the [◀] and [▶] keys to set intensity desired.

Stopping the printer

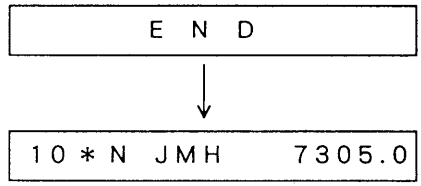
By stop signal (automatic)

7. Most facsimile stations transmit the stop signal at the end of a broadcast to stop printing automatically.

Manually

If the facsimile station does not transmit the stop signal, or you want to stop printing yourself, do the following.

1) Press the [START/STOP] key.



8. Press the [⊙] key to feed the recording paper. Tear off the recording.

3.2 When the Recording is Abnormal...

This section provides the information necessary for adjustment of the recording.

Wrong SPD/IOC setting

Wrong SPD causes overlapped picture or multiple pictures. Incorrect IOC expands (or shrinks) the picture vertically. Find the correct SPD and IOC numbers, and set them as shown in the following procedure.

1) Press the [SPD/IOC] key.

```
SPD/IOC   120/576
```

2) Operate the arrow keys to set both SPD and IOC.

3) Press the [ENT] key to register settings and return to the normal display.

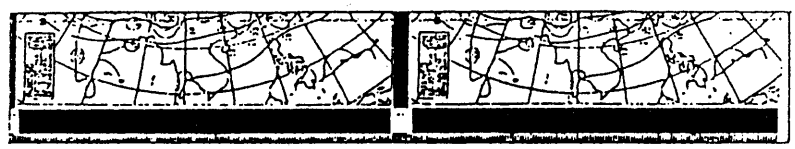
```
10 * N  JMH      7305.0
```

NOTE: *The [SPD/IOC] key is operative only while printing.*

Examples of recordings with wrong settings of SPD and IOC

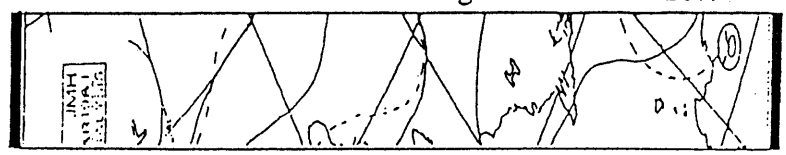
What happens to picture when SPD or IOC is wrong

* Multiple pictures...Speed lower than correct speed.



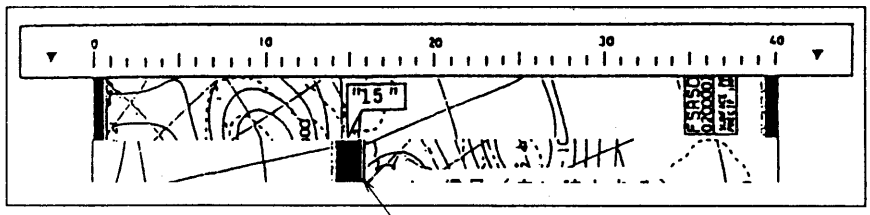
* Overlapped picture...Speed higher than correct speed.

*Enlarged picture...IOC 576 signal but IOC 288 set on FAX-207.
Shrunk picture: IOC 288 signal but IOC 576 signal set on FAX-207.



Phase mismatch

When the FAX-207 starts receiving a broadcast already in progress, or noise prevents detection of the phasing signal, the recording may be divided into two parts by a thick black (or white) stripe called a dead sector. This phenomenon is due to phase mismatching. When this occurs, use the [PHASE] key to shift the dead sector to the left edge of the recording paper.



1) Press the [PHASE] key. The following display appears.

```
Set PHASE;00
```

2. Read the scale to find the center of the dead sector. Enter it by operating the [▲] and [▼] keys. For example, in the figure shown above the dead sector is centered at "15" on the scale. The setting range is 00 and 40.

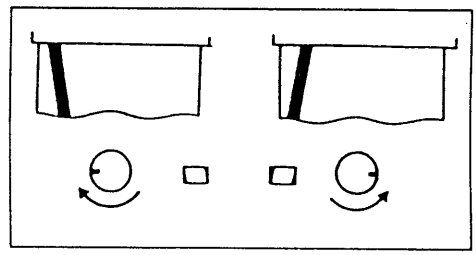
```
Set PHASE;15
```

3) Press the [ENT] key. The dead sector shifts to the left edge of the recording paper.

Note that the [PHASE] key also is operative only while printing.

Phasing signal out of synchronization

The SYNC control functions to fine tune of the phasing signal. If the dead sector is plotted at an angle even when the PHASE is properly selected, turn the SYNC control in an appropriate direction to print the dead sector straightly.



3.3 Selection of Receive Frequency

General

A facsimile station will usually transmit a facsimile picture over several different frequencies (on the HF band). This allows the receiving station to select the most suitable frequency channel, to obtain a quality recording.
The general rule for selection of frequency is to select the highest useable frequency band first, and then switch to the next lower useable frequency band if the picture is not reproduced satisfactorily.
Further, other factors such as the distance to the transmitting station, receiving time, season, and year should be taken into consideration when selecting a frequency.

Scanning

The FAX-207 eliminates the inconvenience of manual frequency selection by using a scanning receiver to do the job automatically. The receiver scans the frequencies of a facsimile station and locks onto the frequency of which the signal strength is the highest. It scans by the following rules:

- If the signal level of two or more channels is the same, the highest frequency is selected.
- It always picks up an LF channel (80 kHz to 160 kHz) above a certain level, regardless of whether signal is stronger on other channel(s).
- It recommences scanning if the signal level stays below a certain level.

NOTE: *Another method for selection of frequency is to monitor signal strength through the built-in speaker. The clearer the signal, the higher the strength.*

When automatic scanning does not work...

The automatic scanning function may not work when, for example, the signal is too weak. In this case designate a channel instead of using automatic scanning.

4. REPLACEMENT OF RECORDING PAPER

4.1 General

When to replace the recording paper

When about one meter of recording paper remains a red stripe starts appearing at the right edge of the recording paper. If this occurs during printing you can continue printing, however you should load a new roll as soon as printing is completed. When the paper runs out completely, a buzzer sounds, the "PAPER OUT" LED lights and the message "PAPER ours appears on the display.

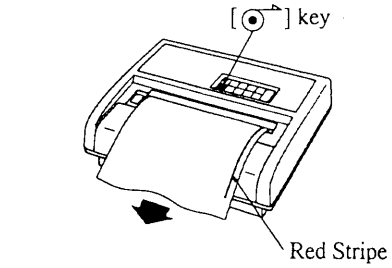
Leave the power on and change paper as shown in the procedure on the next page.

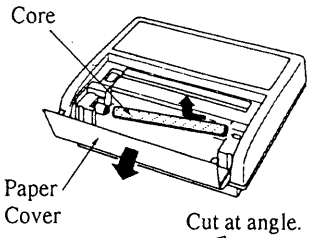
⚠ CAUTION

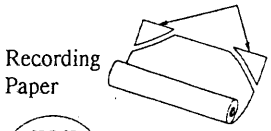
Do not touch Printing head just after printing.

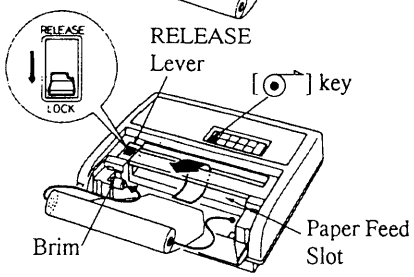
Burn can result.

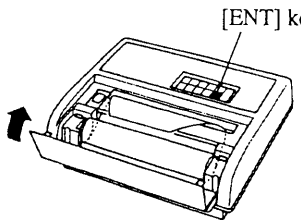
4.2 Replacement of Recording Paper











Name	Thermal Paper
Type	TP-0820B (216mm × 20m)
Code No.	005-946-000

1. Press the [ ] key to feed out remaining paper.
2. Pull the paper cover forward. Take out the paper spool by pushing the spool catch leftward.
3. Set new paper roll to paper container. Cut both corners of the paper end to ensure smooth feeding. Set the RELEASE lever in the "RELEASE" position and insert paper through paper feed slot.
4. After the message "PUSH [ENT]" appears on the display, set the RELEASE lever in the "LOCK" position and press the [ ] key to feed the paper. ("PAPER OUT" LED goes off.)
5. If there is slack in the paper or it is uneven, release paper by the RELEASE lever and adjust it.
6. Confirm that the RELEASE lever is set in the "LOCK" position. Close the paper cover.
7. Press the [ENT] key to return to the normal display.

5. CHANGING FREQUENCIES AND SETTINGS

5.1 Setting the Built-in Clock

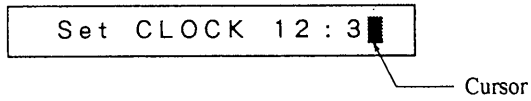
When to set the clock

The time of the built-in clock must be accurate for effective timer recording. You will need to set the time when the unit is first installed, when the time is wrong, or when the memory is cleared. The clock continues working by a battery when the unit is off.

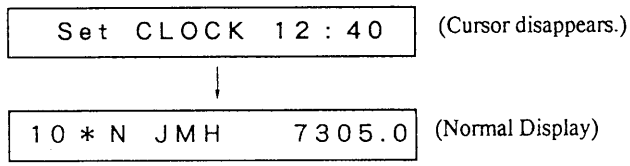
Procedure

1. Press the [RCL/PRG] key twice.

2. Press the [ENT] key. The following display appears.



3. Using the arrow keys, set UTC time in 24-hour notation. Press the [ENT] key at the exact moment the time signal sounds for the start of a new minute or hour.



5.2 Changing Frequencies

General

The FAX-207's memory contains all frequencies for existing facsimile stations. However, if the transmit frequency of a station changes, change frequency data as shown in the procedure below.

Procedure

For example, the Tokyo, Japan station JMH (zone no. 1, station no. 0) will change the frequency of channel number 4 from 13597.0 kHz to 13582.0 kHz.

1. Press the [RCL/PRG] key twice. Press the [▲] and [▼] keys to show the following display.

   ```
   STORE CH FREQ ?
   ```

2. Press the [ENT] key. The following display appears.

   ```
   ■00N PRV 799
   ```

3. Using the arrow keys, set zone number as "1," station no. as "0," and channel no. as "4." If the station transmits the facsimile picture in white characters on black background, change "N" to "R." (See next page.)

   ```
   104N JMH 13597.■
   ```

   You may enter call sign if you wish, using up to four characters.

4. Place the cursor in the frequency column. Press the [▲] and [▼] keys to change the frequency from 13597.0 to 13582.0.

   ```
   104N JMH 13582.■
   ```

5. Confirm the data and then press the [ENT] key to register it and return to the normal display.

   ```
   S E T
     ↓
   100N JMH 13582. 0
   ```
   (Normal Display)

Remarks

Another method is available for changing frequencies.

1. Press the [CH] key and the [RCL/PRG] key.

```
104■ JMH 13597. 0
```

2. Press the [▶] key to place the cursor in the frequency column. Change the frequency by operating the [▲] and [▼] keys.

3. Press the [ENT] key.

Reverse picture

The usual facsimile picture format has black text on white background. Some stations, however, print white characters on black background. This information is programmed into the memory, thus you need not designate picture format when receiving a facsimile. However, if you are entering frequency data of a newly established station whose picture format is reverse, designate "R" (instead of "N") to print the picture in the usual format.

5.3 Entering New Frequencies

General

The FAX-207 provides a free memory for storage of new channels (private channels). You can store up to 230 channels, in the zone numbers 0 to 9.

Zone No.	Station No.	Call Sign	Channel No. (Qty)
0	0	PRV	0 ~ 9 (10)
	1	PRV	0 ~ 9 (10)
	2	PRV	0 ~ 9 (10)
	3	PRV	0 ~ 9 (10)
	4	PRV	0 ~ 9 (10)
	5	PRV	0 ~ 9 (10)
	6	PRV	0 ~ 9 (10)
	7	PRV	0 ~ 9 (10)
	8	PRV	0 ~ 9 (10)
	9	PRV	0 ~ 9 (10)
2	9	PRV	0 ~ 9 (10)
6	9	PRV	0 ~ 9 (10)
8	9	PRV	0 ~ 9 (10)
9	0	PRV	0 ~ 9 (10)
	⋮	⋮	⋮
	9	PRV	0 ~ 9 (10)

You may enter facsimile station data in any zone. However, it is probably less confusing if you use zone "0" for new frequencies and enter other frequencies in corresponding zones. (Sorting by zone is especially important for efficient scanning.) The procedure for entering frequencies is the same as in "5.2 Changing Frequencies."

Printing channel frequency list

You may wish to print a hard copy of all frequencies (both user entered and preprogrammed) stored in the unit.

1. Turn off the power. While pressing and holding down the [RCL/PRG] key, turn on the power. Release the [RCL/PRG] key when a display appears.

2. Press the [▲] and [▼] keys to display the following message.

```
Print CH FREQ ?
```

3. Press the [ENT] key to print.

```
Print CH FREQ
```

After the list is printed the normal display appears.

```
Group - 03    PRV
Group - 04    PRV
Group - 05    PRV
Group - 06    PRV
Group - 07    PRV
Group - 08    PRV
Group - 09    PRV
Group - 10    JMH
 36225  49020  73050  99700 135970 182200 235229
Group - 11    JMJ
 33650  54050  94380 146925 184412
```

```
TIME    12:40
```

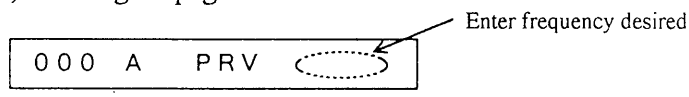
↓

Normal Display

5.4 Receiving AM Broadcasts

Procedure

First register AM station to receive as shown in the figure below, referring to page 5-4.



After registration, press the [CH] key, operate arrow keys to select AM station, and then press the [ENT] key.

NOTE: *Facsimile broadcasts cannot be received when receiving AM station broadcast.*

6. NAVTEX OPERATION

6.1 About NAVTEX Messages

This chapter describes operation of the NAVTEX receiver (option).

Message categories

NAVTEX stations throughout the world provide mariners with weather and navigational NAVTEX messages. These messages carry a four character header code which identifies transmitting station, category of message, and message number, numbered from 00 to 99. Message number "00" is reserved for important emergency messages. The categories of messages available in the NAVTEX system are shown in the table which follows.

Message Categories	
A : Coastal navigational warning	H : Loran-C message
B : Meteorological warning	I : Omega message
C : Ice report	J : Differential Omega message
D : Search and Rescue Alert (SAR)	K : Other electronic navigator system message
E : Meteorological forecast	L : Navarea warnings
F : Pilot message	M to Y : No category allocated
G : Decca message	Z : QRU (no message on hand)

The user may select which message categories to receive and the stations from which to receive them. Categories A, B and D must be received; international regulations require all NAVTEX receivers to print these messages because of their importance.

Receiving navtex messages

When the unit receives a routine NAVTEX message while receiving a facsimile broadcast, the NAVTEX message is stored in the memory and printed upon completion of the facsimile broadcast. For an SAR message (category D), the "SAR" LED lights, alarm sounds and the message is printed immediately.

NOTE: *This unit can function as a stand alone NAVTEX receiver, receiving only NAVTEX messages. For further details, see page 6-5.*

6.2 Selection of NAVTEX Stations/Messages

As noted in the previous section you may freely select NAVTEX stations and messages.

Selecting stations

1. Press the [RCL/PRG] key twice. Operate the [▲] and [▼] keys to display the following message.

   ```
   Set NAVTEX ?
   ```

2. Press the [ENT] key. NAVTEX stations A through H appear. You can display stations I through Z by pressing the [▶] key several times.

   ```
   Station;■BCDEFGH
   ```

3. Operate the [▲] or [▼] key to select or deselect stations as shown in the figure below.

   ```
   Station;ABCDEFGH   (Display in upper case to select.)
            [▲] ↕ [▼]
   Station;ABCDeFGH   (Display in lower case to deselect.)
   ```

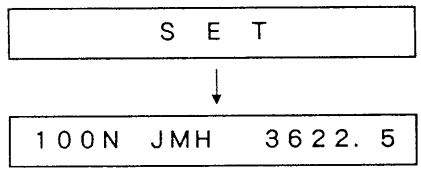
Selecting message categories

4. Press the [ENT] key to register stations and show the "MESSAGE" display.

   ```
   Message;ABCDEFGH
   ```

5. Similar to how you selected (or deselected) NAVTEX stations, select or deselect NAVTEX messages. You cannot deselect message categories A, B and D.

6. Press the [ENT] key to register message categories and return to the normal display.



(Normal Display)

To silence the alarm of a D message, press the [ENT] key.

Sample NAVTEX message

The figure which follows shows an actual NAVTEX message. All NAVTEX messages begin with "ZCZC" and end with "NNNN." On the top line notice the characters "JA77." J is the transmitting station, A is the message category (coastal navigation warning), and 77 is the message number.

```
ZCZC JA77
010930 UTC FEB 94
JAPAN NAVTEX N.W.  NR 0173/1994
HONSYU, NW COAST.
E OF AWA SIMA.
LOG ADRIFT FOLLOWING EACH POSITIONS
AT 010153Z FEB.
(1) 38-26.6N 139-17.6E.
(2) 38-28.7N 139-24.3E.

NNNN
```

Remarks on NAVTEX messages

- An asterisk (*) is printed in place of actual character when it could not be read.
- When more than 33 percent of the main text of a message is in error printing is stopped.

Sample message showing asterisks

```
ZCZC QB79
240740 UTC ǂEPT ǂQOOW
TǂXW NR31 XSG
ǂSHAI OBSY ǂROPǂCAL STǂRM 9219 (9219)ǂTED
WǂIOING 24080ǂZǂ NǂI6
ǂ54ǂǂǂ:-) `5ǂǂǂ 92ǂǂ (ǂǂIǂMGǂWǂǂǂLǂǂVǂǂJǂFPǂǂPYǂOǂǂǂǂǂ
```

- Message number "00" contains important emergency messages. It is printed every time it is received.

Confirming NAVTEX settings

You may display and print NAVTEX settings.

Displaying

1. Press the [RCL/PRG] key. Press the [▲] and [▼] keys to display the following message.

```
Recall NAVTEX ?
```

2. Press the [ENT] key. The "STATION" display appears. Use the [◀] and [▶] keys to scroll the display leftward and rightward. Press the [▲] and [▼] keys to display station and message alternately.

```
Station;abcDefgh
[▲]↕[▼]
Message;ABcDefgh
```

Printing

1. Turn off the unit. While pressing and holding down the [RCL/PRG] key, turn on the power. Release the [RCL/PRG] key when the following message appears.

```
Print NAVTEX ?
```

2. Press the [ENT] key to print.

6.3 Monitoring the NAVTEX Signal

You may monitor the NAVTEX signal (instead of the facsimile signal) through the speaker .

1. Press the [MODE] key.

2. Press the [▲] and [▼] keys to display the following message.

3. Press the [ENT] key to return to the normal display.

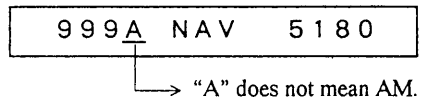
   To again monitor the facsimile signal, display "Monitor FAX?" in step 2 of the above procedure and press the [ENT] key.

6.4 Receiving Only NAVTEX Messages

As noted earlier this unit can function as a standalone NAVTEX receiver.

1. Press the [CH] key.

2. Using the arrow keys, set up the display as shown in the following figure.



3. Press the [ENT] key.

The unit now receives only NAVTEX messages. To restore facsimile function, enter facsimile station at step 2 in the above procedure and press the [ENT] key.

7. MAINTENANCE

7.1 Visual Checks and Cleaning

Visual checks

This unit is designed and manufactured to provide many years of trouble free performance. However, no machine can perform its intended function unless properly maintained.

The unit should be visually checked on a regular basis, following the check points shown in the table below.

Check Point	Action/Remedy
Whip antenna	Check for damage. Replace if necessary.
Antenna wire	Check sheath for cracks. Tape minor cracks. Replace the antenna if there are signs of water leakage.
Junction between whip antenna and preamp (option)	Check for corrosion and tight connection. Clean and waterproof with sealing compound, if necessary.
Coaxial cable	Check for damage and tight connection. Replace if damaged.
Power cable	Check for tight connection at battery and unit.
Ground terminal	Check for tight connection and corrosion. Remove rust.

Cleaning

Keep the unit clean and dry at all times. Dust can be removed with a soft cloth. If necessary, the unit can be cleaned with a mild detergent diluted with fresh water. Chemical solvents should never be used to clean the unit. They can remove paint and markings.

7.2 Cleaning of the Printing Head

When to clean the printing head

The printing head is capable of printing more than 50 rolls of paper. However, if dust is allowed to accumulate on the surface of the head, print quality will drop considerably. A cleaning pen comes with the printing head. Clean the head with the pen every three to five rolls of paper as follows.

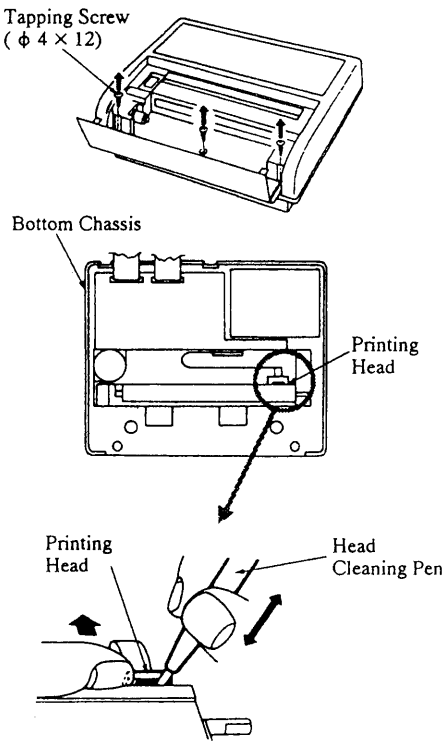
Procedure

1. Detach the paper cover and remove the three tapping screws shown in the figure at right.

2. Lift up the top chassis, being careful not to damage the flat cable connected between the top and bottom chassis.

3. Clean the head with the cleaning pen.

4. Refasten the top chassis and close the paper cover.

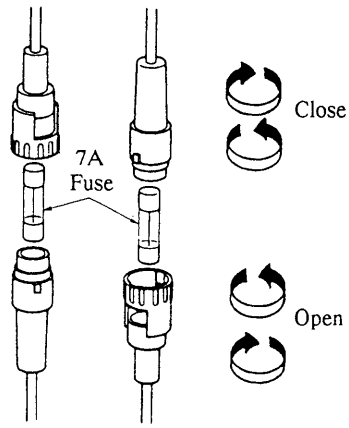


Name	Thermal Head Cleaner
Type	OWP-FD-6A1-01
Code No.	000-115-199

7.3 Replacement of Fuses

Two 7A fuses in the power cable protect the unit from reverse polarity of the power source and equipment fault. If a fuse blows, find out the cause before replacing the fuse.

Use only a 7A fuse. Use of the wrong fuse will damage the equipment and void the warranty.



Type	FGVO 7A 125V
Code No.	000-549-013

8. TROUBLESHOOTING

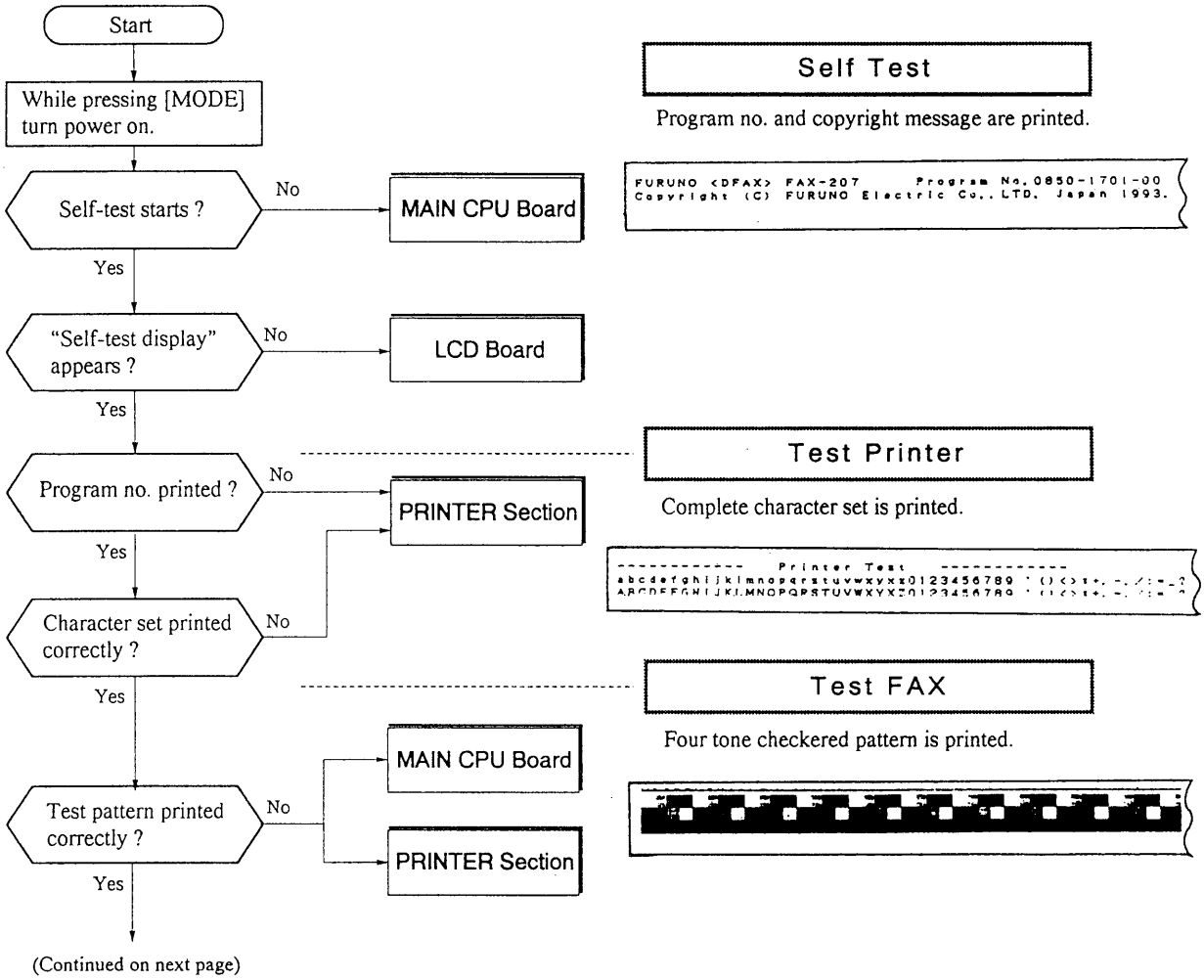
8.1 Self-test

General

The self-test conducts a general check of the electrical circuits and mechanisms. Before starting the self-test, confirm that the ship's mains voltage is within the rated range and no fuses are blown. Check also that the recording paper is properly loaded.

Procedure

To start the test, press the POWER switch while holding down the [MODE] key.



(From previous page)

RAM, ROM are OK ? — No → MAIN CPU Board

Yes

Signal strength 3 to 9 ? — No → FAX RCV Board / PREAMP / TB Board

Yes

RAM, ROM are OK ? — No → NAV RCV Board

Yes

NAVTEX message printed correctly ? — No → NAV RCV Board

Yes

TX and RX messages are same ? — No → NAV RCV Board

Yes

All keys (except. ☼) operate correctly ? — No → PANEL Board

Yes

End of test.

Turn off power.

End test

Test Master

Checks RAM, ROM of master CPU and prints results.

All LEDs light.

```
------------    ROM, RAM Test    ------------
ROM TEST - OK
RAM TEST - OK

-----------  FAX Receiver Test  ------------
 5000.0 KHz    Sense-Level = 5
10000.0 KHz    Sense-Level = 7
15000.0 KHz    Sense-Level = 6
```

Receives standard time signal (WWX, JJY, MSF, ZUO, etc.) at 5, 10 and 15 MHz and prints out signal level, from 0 to 9. If abnormal, signal level will be less than 2.

Test NAVTEX

When NAV RCV Board is installed.

- Checks ROM, RAM on NAV RCV Board and prints results.
- Conducts local loopback test and prints results.

```
------------  NAVTEX Self Test  ------------
ROM Test OK
RAM Test OK
ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789
NAVTEX Signal Send and Receive (Local Loop Test)
ZCZC TE01
ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456890
NNNN
------------  End NAVTEX Test  ------------
```

Internally generated TX message

Check results (RX message)

Press key directed by prompt.

If key is normal, beep sounds and display directs next key to press.

PUSH [RCL/PRG]

PUSH [PH]

PUSH [DOWN]

All Key OK

End of Test

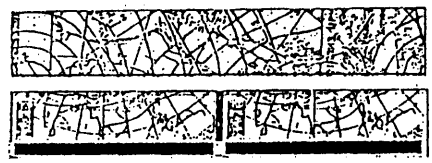
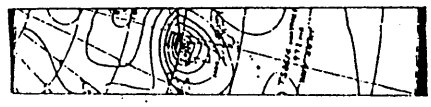
8.2 Troubleshooting List

General

Problems with the equipment may stem from circuit trouble, signal condition, inadequate installation, or even operator error. The troubleshooting list which follows provides typical troubles and the means with which to restore normal operation. If you cannot restore normal operation do not attempt to check inside the unit. Any repair work is best left to a qualified technician.

IF ...	THEN ...	Remedy
you cannot turn on the power	• check if main switchboard is off. • check for loosened or disconnected power connector. • check for blown fuse. • battery may be dead.	• Turn on the mains switch. • Plug in power connector. • Check mains voltage (polarity) and then replace fuse. If it blows again, request service. • Charge battery.
LEDs light but no or faint LED display	• check LCD contrast setting.	• Adjust LCD contrast (page 1-4).
garbled characters appear	• the memory may be corrupted. • the back-up battery for preserving memory contents is dead.	• Clear the memory (page 8-5). • Ask your dealer to replace the battery.
no sound from speaker	• VOLUME control is set too low.	• Adjust the VOLUME control.
noise is present but signal is weak	• for loosened antenna connector. • coaxial cable in antenna cable is shorted or damaged.	• Plug in antenna connector. • Repair or replace antenna cable.
there is no key response	• unit is set for timer recording. ("TIMER" LED is lit.) • connections inside the unit may have loosened.	• Press [TIMER] to cancel timer recording and return to normal operation. • Check for loosened connectors inside the unit.
printing does not start	• there is no paper. ("PAPER OUT" LED is lit.)	• Load new roll of paper (Chapter 4).
paper does not advance	• paper has slipped from supporting catches. RELEASE lever is in "RELEASE" position.	• Reload paper. • Set RELEASE lever in "LOCK" position.

(Continued on next page)

IF ...	THEN ...	Remedy
paper feeds but nothing is printed	• paper is loaded with front-side-back. • incorrect paper is used.	• Load paper correctly. • Use specified thermal paper.
recording intensity is improper	• misadjustment of recording intensity.	• Adjust it referring to page 1-4.
multiple or overlapped picture is printed	• speed is wrong. 	• Select correct speed (page 3-5).
picture is split (dead sector in middle)	• picture is out of phase. 	• Set phase manually (page 3-6).
the picture is shrunk (or enlarged) vertically	• IOC is wrong. 	• Change IOC (page 3-5).
picture is printed at an angle	• change synchronization. 	• Adjust the SYNC control (page 3-6).
picture is faint or filled with noise	• signal is weak. • frequency is detuned.	• Select another frequency. • Fine tune frequency.
timer recording does not start as shceduled	• remote start mode is selected but start signal is not transmitted. • improper setting of schedule (for example, two programs overlap each other in time).	• Use timer start mode if dead sector is black. • Review schedule.
timer schedule is erased	• the battery which preserves memory contents may be dead.	• Ask your dealer to replace the battery.
paper in storage is black	• paper storage area is too hot or contains active gases.	• Store paper in dry, cool place.

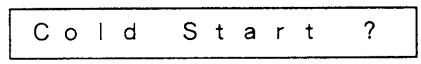
8.3 Clearing the Memory (Cold Start)

When to clear the memory

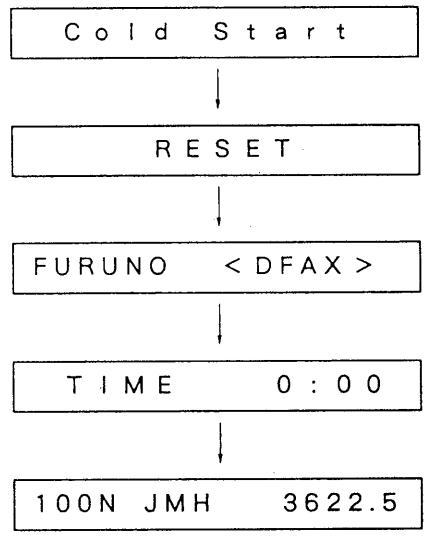
The FAX-207 retains all user-entered information, such as time, timer programs and frequencies, in a memory. A "back-up" battery, of which the estimated life is two years, preserves the contents of the memory when the power is off. However, the contents of the memory may become jumbled because of a dead battery. When this occurs, clear the memory to remove any stray data that may still remain there after replacement of the battery. All data are cleared and the unit starts operation with default settings. If the information you have entered is important to you, jot it down in a log before clearing the memory.

Procedure

1. Turn off the power. While pressing and holding down the [CH] key, turn on the power. Release the [CH] key when the following message appears.



2. Press the [ENT] key. The display changes in the following sequence.



9. Connection of Personal Computer (option)

General

A PC can be connected to the FAX-207 (optional I/F Board required). This enables use of the FAX-207 as a PC printer. Further, frequencies can be registered into the FAX-207 through the computer keyboard. The procedure for registering frequencies by PC is shown on the next page.

9.1 Using FAX-207 as a PC Printer

Before printing

To enable use of the FAX-207 as a PC printer do the following. The FAX-207 cannot receive facsimile broadcasts while functioning a PC printer.

Procedure

1. Turn on the FAX-207.
2. Press the [MODE] key and operate the [▲]/[▼] keys to display the following.

Input EXT.Data ?

3. Press the [ENT] key.

Printer Interface

The FAX-207 is now ready to function as a PC printer.

Printing copy of computer screen

PC Maker	Key to Press
IBM	[Print Screen]
NEC	[Copy]

Note that the PC prints only the following characters.

abcdefghijklmnopqrstuvwxyz0123456789 '()<>*+,-./:=_?
ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789 '()<>*+,-./:=_?
(Same characters which appear on the FAX-207's self-test.)

Printing frequency list

Type the characters shown below on the computer and press the [ENT] key.

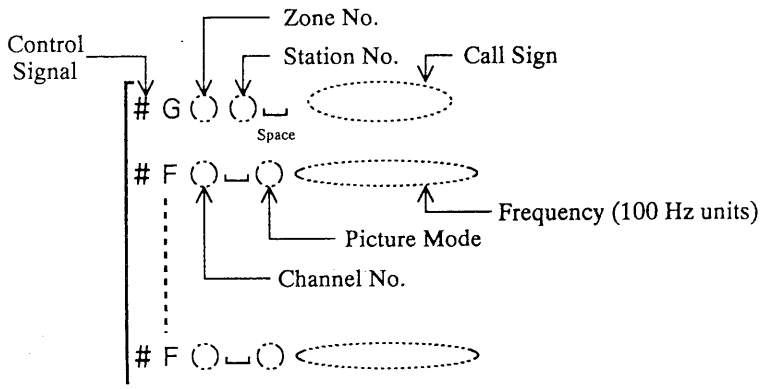
```
C:\>COPY␣B:\FREQ.USR␣PRN
```

Space

9.2 Registering Frequencies Through PC Keyboard

How to enter frequencies

Enter frequencies as shown below.



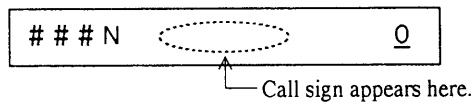
(Example) Below are two examples and their appearance on computer screen.

Zone No.: 0	Zone No.: 0
Station No.: 4	Station No.: 4
Call Sign: PRV	Call Sign: PRV
Channel No.: 2	Channel No.: 3
Frequency: 7401.5 kHz	Frequency: 5014.0 kHz

```
# G04␣PRV
# F2␣N74015
# F3␣N50140
```

Setting at FAX-207

After entering frequency, do the following to receive PC command.
Press and hold down [▼] while turning on the power. The following display appears (Facsimile broadcast cannot be received in this state.)



Registering frequencies in the FAX

Type characters as shown in 9.1 on the previous page and then press the [ENT] key.

10. SPECIFICATIONS

RECORDER SECTION

1. Recording System	Parallel thermal head recording system (24 dot)
2. Recording Paper	Thermal recording paper TP-0820B, 216 mm(W) × 20 m(L) Effective recording width 200.2 mm (1420 dot)
3. Scanning Speed	60, 90, 120 and 240 rpm
4. Index of Cooperation (IOC)	576 (high density) and 288 (low density)
5. Recording Resolution	Horizontal and vertical 0.14 mm (about 7 lines/mm)
6. Gradation	Four tones
7. Recording Controls	a. Start/stop.....automatic (by internal timer or WMO remote start and stop signals) or manual b. Scanning speed.....automatic (by line synchronization signal) or manual c. Phase matching.....automatic (by line synchronization signal) or manual d. IOC.... automatic (by WMO start signal) or manual
8. Alarm	Paper outage (lighting LED plus buzzer)
9. External Input Signal	1500 Hz, black; 2300 Hz, white -- FM or FSK signal, 0 dBm (600 ohms)

FAX RECEIVER SECTION

1. Receiving Frequency	80 kHz to 25 MHz (100 Hz steps)
2. Number of Channels	606 channels (376 preset, 230 empty), user programmable
3. Frequency Selection	Automatic channel search/track for highest signal strength within a selected zone/station Manual selection of zone, station and channel number Manual tuning in 100 Hz steps by front panel controls
4. Receiver	Double superheterodyne
5. Class of Emission	F3C, J3C (USB/LSB programmable), A3E, H3E
6. Receiving Sensitivity	LF: less than 25 dB μ V MF/HF: less than 10 dB μ V (at 20 dB SINAD)
7. Selectivity	6 kHz (-6 dB), 10 kHz (-60 dB)
8. Alarm	Low level signal (lighting LED)

GENERAL SPECIFICATIONS

1. Power Supply	12 V/24VDC (+30%, -10%, floating)
2. Power Consumption	Stand-by: less than 15 W (for 12V set) or 25W (for 24V set) Timer: less than 2 W Recording: less than 30 W (for 12V set) or 50W (for 24V set)
3. Environmental Conditions	0 ℃ to + 50 ℃ , relative humidity 95% (40 ℃)
4. Compass Safe Distance	Standard compass: 1.2 m Steering compass: 0.8 m
5. Color	Chassis: N-3

NAVTEX RECEIVER SECTION (option)

1. Receiving Frequency	518 kHz
2. Station, Message Selection	By front panel controls
3. Message Storage Capacity	7000 characters (30 ID codes)
4. Message Retaining Time	66 hours after reception
5. Alarm	Lighting LED and buzzer for SAR message reception
6. Receiving Sensitivity	Less than 2 μ V (50 ohm antenna) Less than 5 μ V (10 ohm + 150 pF antenna) (error rate less than 4% with desired signal)
7. Interference Rejection	Error rate less than 4% (objective signal 20 dBμ, interfering signal 14 dB μ)
8. Intermodulation	Less than 70 dB (objective signal 20 dBμ, less than 4% error rate)
9. Spurious Emission	Less than 1 nW
10. Printing	Alphabet, figures, symbols, 16 × 16 dot matrix, 69 characters/line
11. Printing Speed	50 characters/second
12. Complying Regulations	CCIR rec. 476-3/540-1, CEPT, MTP 1240B

LF/HF PREAMP UNIT FAX-5 (option)

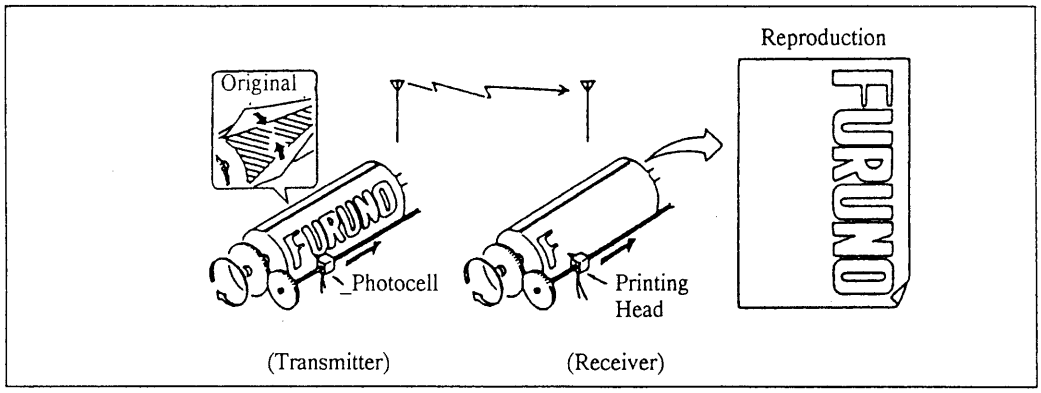
1. Frequency Range	80 kHz to 30 MHz
2. Suitable Antenna	Wire antenna or 2.6 meter whip antenna
3. Input Protection	Protected against 30 Vrms input for more than 15 minutes
4. Output Impedance	50 ohms
5. Power	9 VDC (supplied by main unit through coaxial cable)

11. PRINCIPLE OF FACSIMILE AND NAVTEX SYSTEMS

11.1 Facsimile System

The picture on a TV screen and a facsimile recording are produced similarly. The picture on a TV screen is composed of many fine horizontal lines. This is because of its transmission system that a frame of picture is sliced into narrow strips and sent piece by piece serially to a receiving station, where the strips are reassembled to reconstruct the original picture. As the frequency band assigned for TV broadcasting is comparatively wide, 25 or 30 frames of pictures can be sent in a second. The radio facsimile uses much the same principle as the TV broadcasting system, but in a lower frequency and in a narrower bandwidth. Due to this limitation, it takes several minutes for the facsimile transmitter to send a frame of a picture. Although the transmission speed is slower than that of the TV, the facsimile signals in LF or HF bands travel at much greater distances than the normal TV signal.

Radio facsimile system



At the facsimile transmitter, the original picture is fitted on a drum rotating at 60, 90, 120 or 240 rpm, and a photocell mounted on the threaded shaft moves slowly along the drum. The photocell, focused on a point on the drum, converts black and white information into an electrical signal. As the drum rotates and the photocell moves, the picture information is sliced into narrow pieces and a series of black and white signals are obtained. In the transmitter, the black and white signals are converted into 1500 Hz (black) and 2300 Hz (white) frequency shifts and modulates the radio frequency assigned for the station. (The black and white frequencies will be reversed in the LSB transmission.) At the receiver, the frequency shift (FS) signals are converted into a black and white recording signal and the marks are printed on the recording paper.

To obtain an exact copy of the original picture at the receiver, the rotating speed and

phasing of the transmitter and receiver must agree with each other, that is, synchronization in rotation and synchronization in position.

To achieve automatic synchronization, most transmitters transmit a phasing signal before sending pictures. The phasing signal is a continuous black signal with narrow white gaps at the seam of the original picture. In the automatic facsimile receiver, the repetition rate and position of the white gaps are detected to determine rotating speed and phase.

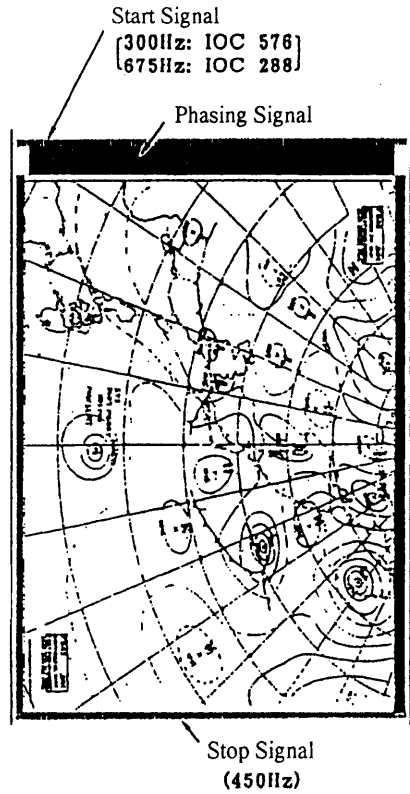
In addition to the speed and phase synchronization, the line density with respect to the picture width for the transmitter and receiver must agree with each other to obtain an exact copy of the original picture. Otherwise the reproduced picture may be enlarged or shrunk vertically. To maintain international compatibility, two line density standards are assigned by the WMO: high density, IOC 576; low density, IOC 288. IOC stands for Index Of Cooperation, and indicates the horizontal/vertical ratio of a picture. In practice, it is the product of line density and drum diameter.

$$\text{IOC} = (\text{line density}) \times (\text{drum diameter})$$

or

$$\text{IOC} = \frac{(\text{line density}) \times (\text{picture width})}{\text{pi}}$$

To enable fully automatic start and stop of picture recording, most facsimile transmitters send remote start and remote stop signals before and after transmission of pictures, respectively. The remote signals appear as black/white stripes as shown right. For identification of start, stop and line density of picture transmission, three frequencies are used as remote signals. The start signal is either 300 Hz or 675 Hz to indicate the line density of the forthcoming picture. The remote stop signal is always 450 Hz.



Recording system of the FAX-207

The recording system used in the FAX-207 is somewhat different from conventional facsimile recorders. The received signal is first stored and assembled in the memory according to the given speed, phase and IOC. It is then printed by the parallel printer head when a certain amount of picture information is accumulated in the memory.

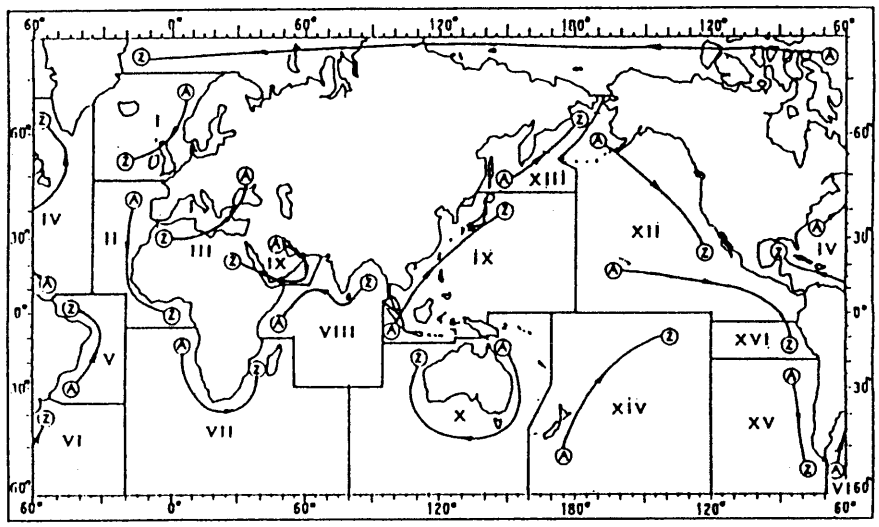
For IOC 576, one piece of the picture, corresponding to approximately 30 scan lines of incoming signal, is printed at a time. Picture recording is performed by controlling the temperature of each thermal element rapidly while moving the parallel head on the recording paper. Depending on the temperature, chemical material on the paper changes the color of the paper and reproduces picture.

11.2 NAVTEX System

There are many types of navigational and meteorological information available on radio such as NAVAREA, HYDROPAC, etc. However, these systems rely heavily upon the operator's experience and skill in tuning the radio and interpreting messages. In addition, constant monitoring to pick up wanted information among a vast volume of messages is not practical with a limited radio staff. To provide all mariners with up-to-the-minute information automatically, the NAVTEX system was developed. NAVTEX is an acronym meanings Navigational Telex. As its name implies, it is a kind of narrow band radio teletype system for sending (by frequency shift keying) text messages expressed in a 7-unit code. The difference between the conventional narrow band teletype system and the NAVTEX is that a NAVTEX transmitter transmits nine control characters (header code) ahead of the main message, so that the receiver can identify the station, message type and serial number automatically.

NAVTEX areas

For navigation purposes, the world is divided into 16 areas as shown in the figure below. Each NAVTEX station in each area has an identification code, from "A" to "Z."



The frequency assigned to NAVTEX is only one (518 kHz), and many stations exist in the same service coverage. If the stations were to transmit without any rule, the system would collapse due to mutual interference. To avoid this problem, the following rules apply.

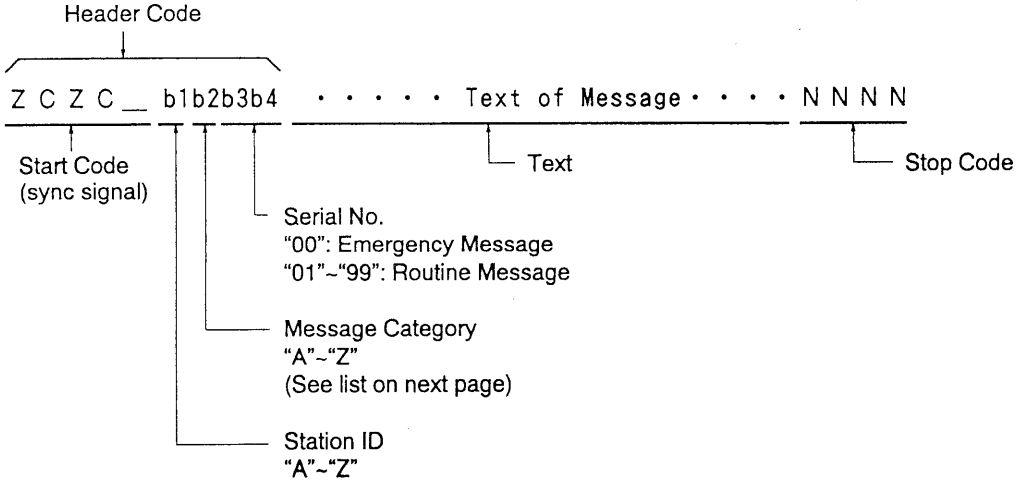
- The transmission schedule is determined so that two or more stations having common a service area may not overlap in time.
- Each station transmits with minimum required power to cover its service area (200 nautical miles nominal).

The table below shows the transmission time schedule in Navarea I.

Reykjavik (R)	0318	0718	1118	1518	1918	2318
Scheveningen (P)	0348	0748	1148	1548	1948	2348
Stockholm (J)	0330	0730	1130	1530	1930	2330
Oostend (T)	0248	0648	1248	1848	2248	
Rogaland (L)	0148	0548	0948	1348	1748	2148
Brest le C. (F)	0118	0518	0918	1318	1718	2118
Cullercoast (G)	0048	0448	0848	1648	2048	
Tallin (U)	0030	0430	0830	1230	1630	2030
Haernoesand (H)	0000	0400	0800	1200	1600	2000
Bodo (B)	0018	0418	0818	1218	1618	2018

Message format

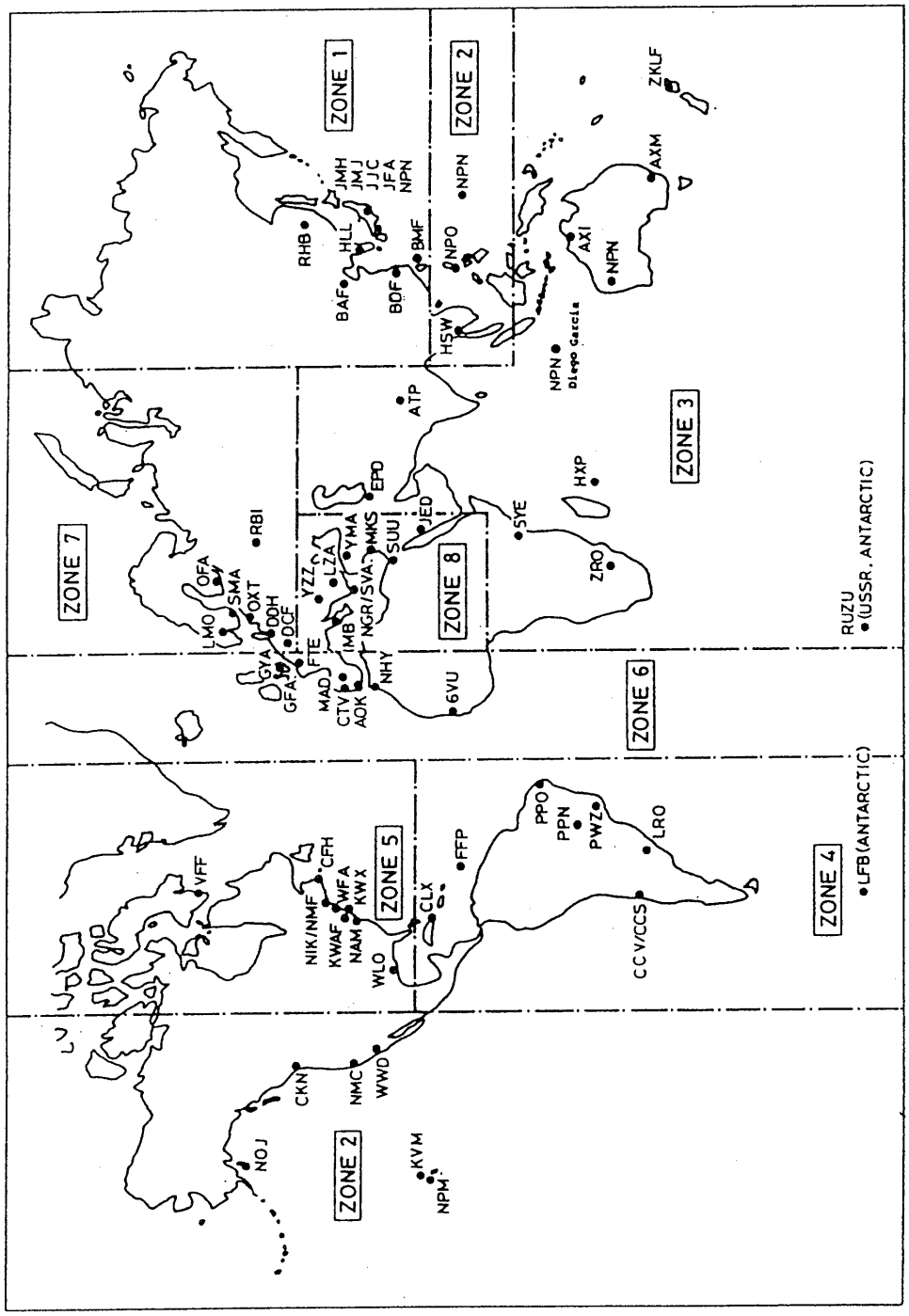
For automatic identification of messages, each message starts with nine control characters called "header codes." The first five characters are always "ZCZC" and common to all messages. This part is used for message synchronization. The latter four characters are designated as b1, b2, b3 and b4, and indicate origin, category and serial number of the message. Character b1 is the identification letter of the NAVTEX station, "A" to "Z." Character b2 indicates the type of message, "A" thru "Z", as listed in the following page. Characters b3 and b4 indicate the serial number of the message. The serial numbers are counted up from "01" to "99." Number "00" is reserved for important emergency messages, such as a search and rescue (SAR) message. The end of each message is indicated by "NNNN."



Message Categories	
A : Coastal navigational warning	H : Loran-C message
B : Meteorological warning	I : Omega message
C : Ice report	J : Differential Omega message
D : Search and Rescue Alert (SAR)	K : Other electronic navigator system messages
E : Meteorological forecast	L : Navarea warnings
F : Pilot message	M to Y : No category allocated
G : Decca message	Z : QRU (no message on hand)

APPENDIX 1 FACSIMILE STATION MAP/STATION LIST

Facsimile Station Map



ZONE 1 NORTH PACIFIC OCEAN WESTERN PART

STATION	CALL SIGN	TRANSMITTED FROM	
0	JMH	Tokyo	JAPAN
1	JMJ	Tokyo	JAPAN
2	JJC	Tokyo	JAPAN
	9VF *	Tokyo	Via SINGAPORE
3	JFA	Tokyo	JAPAN
4	3SD	Beijing	CHINA
5	BAF	Beijing	CHINA
6	BDF	Shanghai	CHINA
7	BMF	Taipei	TAIWAN
8	RHB	Khabarovsk	RUSSIA
9	HLL	Seoul	KOREA

ZONE 2 NORTH PACIFIC OCEAN EASTERN PART

STATION	CALL SIGN	TRANSMITTED FROM	
0	NPN	Guam	MARIANA IS.
1	NPO	Sanglay Point	PHILIPINES
2	HSW	Bangkok	THAILAND
3	NPM	Pearl Harbour	USA
4	KVM	Honolulu	USA
5	NOJ	Kodiak Alaska	USA
6	CKN	Esquimalt	CANADA
7	NMC	San Francisco	USA
8	WWD	La Jolla	USA
9	AUX		

ZONE 3 SOUTH PACIFIC OCEAN, INDIAN OCEAN, PERSIAN GULF

STATION	CALL SIGN	TRANSMITTED FROM	
0	AXI	Darwin	AUSTRALIA
1	AXM	Camberra	AUSTRALIA
2	ZKLF	Auckland	NWE ZEALAND
3	NPN	Guam	Via AUSTRALIA
		Guam	Via JAPAN
4	ATP	New Delhi	INDIA
5	EPD	Teheran	IRAN
	NPN *	Guam	Via Diego Garcia
6	5YE	Nairobi	KENYA
7	ZRO	Pretoria	SOUTH AFRICA
8	HXP	Saint Denis	MAURITIUS
9	RUZU	Molodezhnaya	RUSSIA

ZONE 4 SOUTH ATLANTIC OCEAN

STATION	CALL SIGN	TRANSMITTED FROM	
0	CLX	Casablanca	CUBA
1	FFP	Fort de France	MARTINIQUE
2	GYA		
3	PPN	Brasilia	BRASIL
4	PWZ	Rio de Janeiro	BRASIL
	PRO *	Orinda	BRASIL
5	LRO	Buenos Aires	ALGENTINE
6	CCS	Santiago	CHILE
7	CCV	Belloto	CHILE
8	LFB	Centro Meteorologeco	ANTARCTIC
9	CBV	Valparaiso Armada de	CHILE

ZONE 5 NORTH ATLANTIC OCEAN WESTERN PART

STATION	CALL SIGN	TRANSMITTED FROM	
0	WLO	Mobile	USA
1	NAM	Norfoik	USA
2	KWAF	Washington DC	USA
3	KW	Lewes	USA
		Dalaware	USA
4	WFH	Brentwood	USA
5	NIK	Boston	USA
6	NMF	Boston	USA
7	CFH	Halifax	CANADA
8	VFF	Frobisher	CANADA
9	OXT	Skamlebaek	GREENLAND
	XPM		

ZONE 6 NORTH ATLANTIC OCEAN EASTERN PART

STATION	CALL SIGN	TRANSMITTED FROM	
0	GFA	Bracknell	UK
1		Bracknell	UK
2	GYA		
	GZZ *	Northwood	UK
	GYJ *		
3	FTE	Paris	FRANCE
4	CTV	Monsanto	PORTUGAL
5	AOK	Rota	SPAIN
6	MAD	Madrid	SPAIN
	NPN *		
7	NHY	Kenitora	MOROCCO
8	6VU	Dakar	SENEGAL
9	AUX		

ZONE 7 NORTH ATLANTIC OCEAN NORTHERN PART

STATION	CALL SIGN	TRANSMITTED FROM	
0	DCF	Offenbach	GERMANY
1	DDK	Hamburg	GERMANY
	DDH *		
2	OXT	Copenhagen	DENMARK
3	OLT	Praha-Modrany	CZECHOSLOVAKIA
4	SMA	Norrkoping	SWEDEN
5	LMO	Oslo	NORWAY
6	OFA	Helsinki	FINLAND
	OFH *		
	OHG *		
7	OFW	Vaasa	FINLAND
	TFA *	Reykjavic	ICELAND
8	RBI	Moscow	RUSSIA
9	AUX		

ZONE 8 MEDITERRANEAN SEA

STATION	CALL SIGN	TRANSMITTED FROM	
0	IMB	Rome	ITALY
1	NPN	Ahtens	GREECE
	SVG4 *		
2	YZZ	Beograde	YUGOSLAVIA
3	NGR	Athens	GREECE
4	LZJ2	Sofia	BULGALIA
5	YMA	Ankara	TURKEY
6	MKS	Episkopi	CYPRUS
7	SUU	Cairo	EGYPT
8	JED	Jeddah	SAUDI ARABIA
	HZN *		
9	AUX		

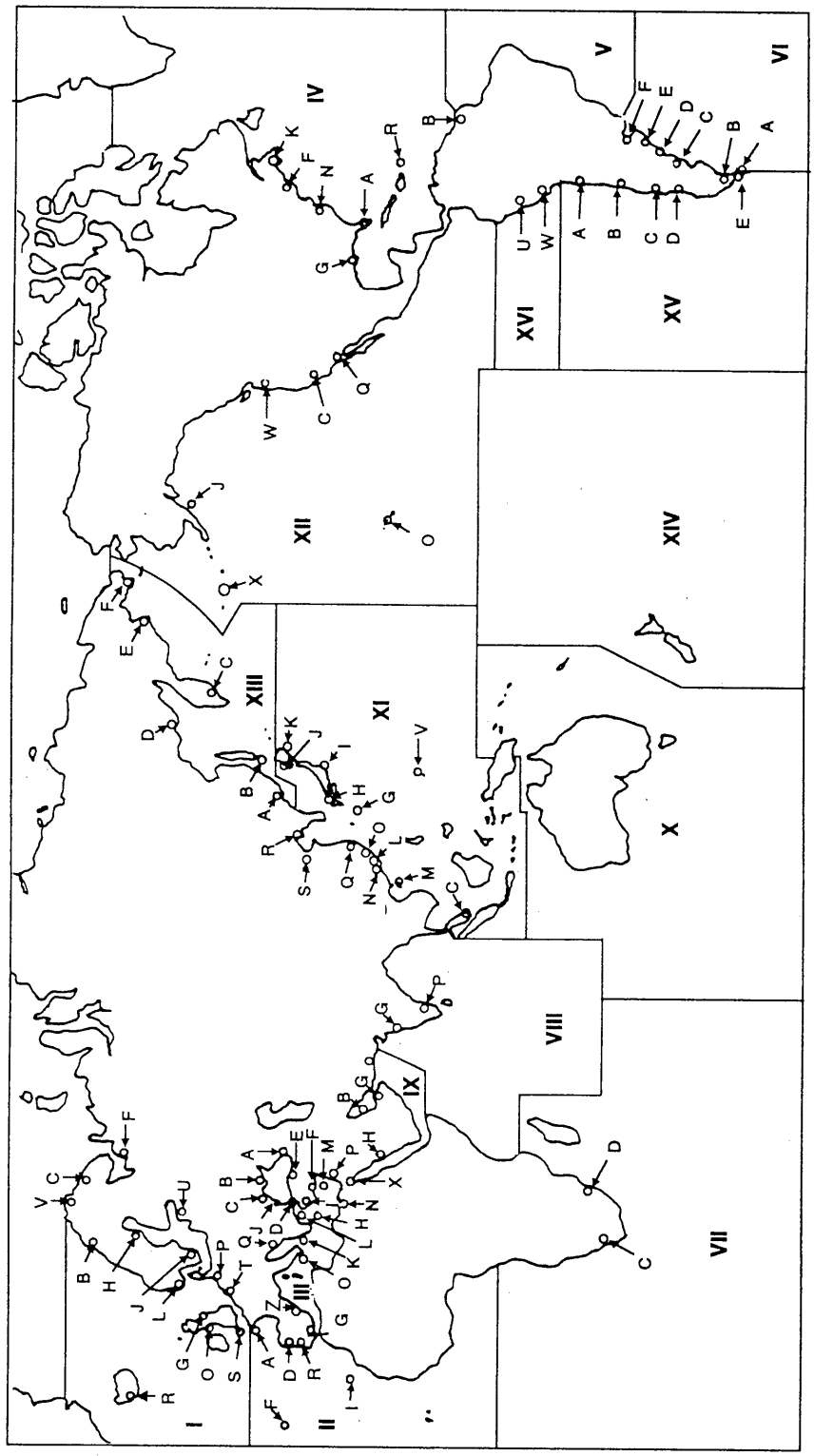
FACSIMILE STATION LIST

ZONE[0] is allocated for private channels.
(10 channels each for 12 stations)
*: Callsign not displayed.

Facsimile Station List (alphabetical order)

	Nation	City	Zone No.	Station No.	Call sign	Remarks
A	ANTARCTIC	Meteorologic.	4	8	LFB	
	ARGENTINE	Buenos Aires	4	5	LRO	
	AUSTRALIA	Canberra	3	1	AXM	
		Darwin	3	0	AXI	
		H.E.Holt	3	3	NPN	US Navy
B	BRAZIL	Brasilia	4	3	PPN	
		Orinda	4	4	PPO	
		Rio de Janeiro	4	4	PWZ	
	BULGARIA	Sofia	8	4	LZJ2	
C	CANADA	Esquimalt	2	6	CKN	
		Frobishier	5	8	VFF	
		Halifax	5	7	CFH	
	CHILE	Belloto	4	7	CCV	
		Santiago	4	6	CCS	
		Valparaiso	4	9	CBV	
	CHINA	Beijing	1	4	3SD	
		Beijing	1	5	BAF	
		Shanghai	1	6	BDF	
	CUBA	Casablanca	4	0	CLX	
	CYPRUS	Episkopi	8	6	MKS	
	CZECHOSLOVAKIA	Praha-Modrany	7	3	OLT	
D	DENMARK	Copenhagen	7	2	OXT	
E	EGYPT	Cairo	8	7	SUU	
F	FINLAND	Helsinki	7	6	OFA	
					OFH	
					OHG	
		Vaasa	7	7	OFW	
	FRANCE	Paris	6	3	FTE	
G	GREECE	Athens	8	1	NPN	
					SVG4	
		Athens	8	3	NGR	US Navy
	GREENLAND	Skamlebaek	5	9	OXT	
					XPM	
I	ICELAND	Reykjavik	7	7	TFA	
	INDIA	New Delhi	3	4	ATP	
	IRAN	Teheran	3	5	EPD	
	ITALY	Rome	8	0	IMB	
J	JAPAN	Tokyo	1	0	JMH	No.1
		Tokyo	1	1	JMJ	No.2
		Tokyo	1	2	JJC	JMSA & Kyodo
					9VF	
		Tokyo	1	3	JFA	Chuo Gyogyo
K	KENYA	Nairobi	3	6	5YE	
	KOREA	Seoul	1	9	HLL	
M	MARIANA IS.	Guam	2	0	NPN	US Navy
	MARTINIQUE	Fort de France	4	1	FFP	
	MAURITIUS	Sain Denis	3	8	HXP	
	MOROCCO	Kenitora	6	7	NHY	
N	NEW ZEALAND	Auckland	3	2	ZKLF	
	NORWAY	Oslo	7	5	LMO	
P	PHILIPPINES	Sanglay Point	2	1	NPO	US Navy
	PORTUGAL	Monsanto	6	4	CTV	
S	SENEGAL	Dakar	6	8	6VU	
	SAUDI ARABIA	Jeddah	8	8	JED	
					HZN	
	SOUTH AFRICA	Pretoria	3	7	ZRO	
	SPAIN	Rota	6	5	AOK	US Navy
		Madrid	6	6	MAD	
					NPN	
	SWEDEN	Norrkoping	7	4	SMA	
T	TAIWAN	Taipei	1	7	BMF	
	THAILAND	Bangkok	2	2	HSW	
	TURKEY	Ankara	8	5	YMA	
U	UK	Bracknell	6	0	GFA	
		Bracknell	6	1	GFA	
		Northwood	4	2	GYA	For S.A.
		Northwood	6	2	GYA	
					GZZ	
	USA	Boston	5	5	GYJ	
		Boston	5	6	NIK	
		Brentwood	5	4	NMF	
		Diego Garcia	3	5	WFH	
		Honolulu	2	4	NPN	
		Kodiak Alaska	2	5	KVM	
		La Jolla	2	8	NOJ	
		Lewes	5	3	WWD	
		Delaware	5	3	KWX	
		Mobile	5	0	KWX	
		Norfolk	5	1	WLO	
		Pearl Harbour	2	3	NAM	US Navy
		San Francisco	2	7	NPM	
		Washington DC	5	2	NMC	AIR Force
	RUSSIA	Khabarovsk	1	8	KWAF	
		Molodezhnaya	3	9	RHB	
		Moscow	7	8	RUZU	
					RBI	
W	GERMANY	Hamburg	7	1	DDK	
					DDH	
		Offenbach	7	0	DCF	
Y	YUGOSLAVIA	Belgrade	8	2	YZZ	

NAVTEX Station List



NAVTEX Station List (1/3)

Nav-area	Stn ID	Country	City	Time Schedule (UTC)	Remarks
	B	NORWAY	Bodo	0018, 0418, 0900, 1218, 1618, 2100	
	C	RUSSIA	Murmansk	0120, 0520, 0920, 1320, 1720, 2120	
	F	RUSSIA	Arkhangelsk	0200, 0600, 1000, 1400, 1800, 2200	
	G	U.K.	Cullercoats	0048, 0448, 0848, 1248, 1648, 2048	
I	H	SWEDEN	Haernoesand	0000, 0400, 0800, 1200, 1600, 2000	
	J	SWEDEN	Stockholm	0300, 0730, 1130, 1530, 1930, 2330	
	L	NORWAY	Rogaland	0148, 0548, 0948, 1348, 1748, 2148	
	O	U.K.	Portpatrick	0130, 0530, 0930, 1330, 1730, 2130	Pre-operational
	P	NETH. L	Scheveningen	0348, 0748, 1148, 1548, 1948, 2348	
	R	ICELAND	Reykjavik	0318, 0718, 1118, 1518, 1918, 2318	
	S	U.K.	Niton	0018, 0418, 0900, 1218, 1618, 2100	
	T	BELGIUM	Oostende	0248, 0648, 1048, 1448, 1848, 2248	
	U	RUSSIA	Tallin	0030, 0430, 0830, 1230, 1630, 2030	
	V	NORWAY	Vardoe	0300, 0700, 1100, 1500, 1900, 2300	
	A	FRANCE	Brest-Le conq		Planned
	D	SPAIN	Finisterre	0030, 0430, 0830, 1230, 1630, 2030	
II	F	PORTUGAL	Azores	0050, 0450, 0850, 1250, 1650, 2050	
	I	SPAIN	Canary Islands	0100, 0500, 0900, 1300, 1700, 2100	
	R	PORTUGAL	Lisbon	0250, 0650, 1050, 1450, 1850, 2250	
		CAMEROON	Douala		Planned
	A	RUSSIA	Novorossiysk	0300, 0700, 1100, 1500, 1900, 2300	
	B	RUSSIA	Mariupol	0100, 0500, 0900, 1300, 1700, 2100	
	C	RUSSIA	Odessa	0230, 0630, 1030, 1430, 1830, 2230	
	D	TURKEY	Istanbul	0030, 0430, 0830, 1230, 1630, 2030	Planned
	E	TURKEY	Samsun	0040, 0440, 0840, 1240, 1640, 2040	
III	F	TURKEY	Antalya	0050, 0450, 0850, 1250, 1650, 2050	
	G	SPAIN	Tarifa	0100, 0500, 0900, 1300, 1700, 2100	
	H	GREECE	Iraklion	0110, 0510, 0910, 1310, 1710, 2110	
	I	TURKEY	Izmir	0120, 0520, 0920, 1320, 1720, 2120	
	J	BULGARIA	Varna	0130, 0530, 0930, 1330, 1730, 2130	
	K	GREECE	Kerkyra	0140, 0540, 0940, 1340, 1740, 2140	Planned
	L	GREECE	Limnos	0150, 0550, 0950, 1350, 1750, 2150	
	M	CYPRUS	Troodos	0200, 0600, 1000, 1400, 1800, 2200	
	N	EGYPT	Alexandria	0210, 0610, 1010, 1410, 1810, 2210	
	O	MALTA	Malta	0220, 0620, 1020, 1420, 1820, 2220	Planned
	P	ISRAEL	Haifa	0020, 0420, 0820, 1220, 1620, 2020	Planned
	Q	YUGO.	Split	0250, 0650, 1050, 1450, 1850, 2250	
	Z	SPAIN	Cabo La Nao		
		FRANCE	La Garde		
	A	USA	Miami	0000, 0600, 1200,1800	Pre-operational
	B	BERMUDA	St. Georges	0100, 0700, 1300, 1900	
	F	USA	Boston	0445, 1045, 1645, 2245	
IV	G	USA	New Orlearns	0300, 0900, 1500, 2100	
	K	CANADA	Sydney	0040, 0540, 0940, 1340, 1740, 2140	Under trials
	N	USA	Portsmouth	0130, 0730, 1330, 1930	Pre-operational
	R	USA	San Juan	0415, 1015, 1615, 2215	Pre-operational

NAVTEX Station List (2/3)

Nav-area	Stn ID	Country	City	Time Schedule (UTC)	Remarks
V		URUGUAY	Colonia		Planned
		URUGUAY	Laguna D Sauce		Planned
		URUGUAY	La Paloma		Planned
		URUGUAY	Montevideo		Planned
		URUGUAY	Punta de Este		Planned
		URUGUAY	Salto		Planned
VI	A	ARGENTINA	Ushuaia	0240, 0840, 1440, 2040	
	B	ARGENTINA	Rio Gallegos	0140, 0740, 1340, 1940	
	C	ARGENTINA	Rivadavia	0040, 0640, 1240, 1840	
	D	ARGENTINA	Bahia Blanca	0210, 0810, 1410, 2010	planned
	E	ARGENTINA	Mar Del Plata	0110, 0710, 1310, 1910	
	F	ARGENTINA	Buenos Aires	0510, 1110, 1710, 2310	
	G	ARGENTINA	Rosario	0110, 0610, 1210, 1810	
VII	C	S. AFRICA	CAPETOWN	0020, 0420, 0820, 1220, 1620, 2020	
	D	S. AFRICA	DURBAN	0120, 0520, 0920, 1320, 1720, 2120	
VIII	G	INDIA	Bombay	0100, 0500, 0900, 1300, 1700, 2100	
	P	INDIA	Madras	0230, 0630, 1030, 1430, 1830, 2230	
IX	H	S. ARABIA	Jeddah		Planned
	G	S. ARABIA	Dammam		Planned
	X	EGYPT	Ismailia		Planned
	B	BAHRAIN	Hamala	0010, 0410, 0810, 1210, 1610, 2010	Planned
XI	V	USA	Guam	0100, 0700, 1300, 1900	
	C	SINGAPORE	Jurong	0020, 0420, 0820, 1220, 1620, 2020	
	G	JAPAN	Naha	0100, 0500, 0900, 1300, 1700, 2100	
	H	JAPAN	Moji	0110, 0510, 0910, 1310, 1710, 2110	
	I	JAPAN	Yokohama	0120, 0520, 0920, 1320, 1720, 2120	
	J	JAPAN	Otaru	0130, 0530, 0930, 1330, 1730, 2130	
	K	JAPAN	Kushiro	0140, 0540, 0940, 1340, 1740, 2140	
	L	HONG KONG	Hong Kong	0200, 0600, 1000, 1400, 1800, 2200	
	M	CHINA	Zhanjiang		
	N	CHINA	Guangzhou	0210,0610,1010,1410,2210	
	O	CHINA	Fuzhou		
	R	CHINA	Dalian	0250,0650,1050,1450,2250	
	Q	CHINA	Shanghai	0240,0640,1040,1440,2240	
	S	CHINA	Tianjin		
		CHINA	Hainan		
XII	C	USA	San Francisco	0400, 1000, 1600, 2200	Pre-operational
	W	USA	Astoria	0130, 0730, 1330, 1930	Pre-operational
	Q	USA	Cambria	0445, 1045, 1645, 2245	Pre-operational
	J	USA	Kodiak	0300, 0900, 1500, 2100	Pre-operational
	O	USA	Honolulu	0040, 0640, 1240, 1840	
	X	USA	Adak	0000, 0600, 1200, 1745	Planned
XIII	A	RUSSIA	Vladivostok	0000, 0400, 0800, 1200, 1600, 2000	
	B	RUSSIA	Kholmsk	0010, 0410, 0810, 1210, 1610, 2010	
	C	RUSSIA	Petropavlovsk	0050, 0450, 0850	
	D	RUSSIA	Magadan	0030, 0430, 0830, 1230, 1630, 2030	
	E	RUSSIA	Beringovskiy	0040, 0440, 0840, 1240, 1640, 2040	
	F	RUSSIA	Providenya	0050, 0450, 0850, 1250, 1650, 2050	

NAVTEX Station List (3/3)

Nav-area	Stn ID	Country	City	Time Schedule (UTC)	Remarks
XV	A	CHILE	Antofagasta	0010, 0410, 0810, 1210, 1610, 2010	
	B	CHILE	Valparaiso		
	C	CHILE	Talcahuano		
	D	CHILE	Puerto Montt		
	E	CHILE	Magallanes		
XVI	S	PERU	Paita	0300, 0700, 1100, 1500, 1900, 2300	Planned
	U	PERU	Callao	0320, 0720, 1120, 1520, 1920, 2320	Planned
	W	PERU	Mollendo	0340, 0740, 1140, 1540, 1940, 2340	Planned

This list shows the stations register with the International. Frequency Board (FRB) for transmission over 518 kHz as of January 1994. Not all stations listed are operational.

APPENDIX 2
USER FREQUENCY LISTS

Private Channel List

Zone	Station	Channel	Call sign on LCD	Actual call sign	Freq.	Remarks
0		0	PRV			
		1	PRV			
		2	PRV			
		3	PRV			
		4	PRV			
		5	PRV			
		6	PRV			
		7	PRV			
		8	PRV			
		9	PRV			

Zone	Station	Channel	Call sign on LCD	Actual call sign	Freq.	Remarks
0		0	PRV			
		1	PRV			
		2	PRV			
		3	PRV			
		4	PRV			
		5	PRV			
		6	PRV			
		7	PRV			
		8	PRV			
		9	PRV			

Zone	Station	Channel	Call sign on LCD	Actual call sign	Freq.	Remarks
0		0	PRV			
		1	PRV			
		2	PRV			
		3	PRV			
		4	PRV			
		5	PRV			
		6	PRV			
		7	PRV			
		8	PRV			
		9	PRV			

Timer Program List

No.	Zone	Station	CH	Speed	Start signal	Time		Off/On	Remarks
						Start	Stop		
1				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
2				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
3				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
4				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
5				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
6				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
7				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
8				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
9				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
10				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
11				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
12				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
13				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
14				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
15				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
16				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	

No.	Zone	Station	CH	Speed	Start signal	Time		Off/On	Remarks
						Start	Stop		
1				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
2				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
3				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
4				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
5				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
6				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
7				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
8				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
9				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
10				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
11				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
12				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
13				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
14				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
15				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	
16				* (Auto) a (60rpm) b (90rpm) c (120rpm) d (240rpm)	* (Auto) s (Time: High) f (Time: Low)	:	:	Y (Off) N (On)	