KH2AR

Amateur Radio Lighthouse Society
ARLHS.COM
ARLHS #1665

Jim Pogue
1905 Linden Ave.
Memphis, TN 38104

USA
Grid EM55ad • Shelby County
CQ 04 • ITU 08
KH2AR@comcast.net

U.S. Department of Transportation
United States Coast Guard

Commanding Officer
USCG LORAN Station
Marcus Island

FPO Seattle,WA
98782-0006

2000
21 March 1988

James T. Pogue
P.O. Box 3058
Memphis, TN 38173

Dear Mr. Pogue:

I am happy to confirm your reception of our radio transmission on 10 March 1988. Enclosed is your QSL card with all the pertinent information filled in. Along with the transmission you heard on 10523.6 KHZ we also use 3786.1, 5063.6, 7836.6, 11028.0, 11606.0, 13608.6, 15922.0, and 17488.6 KHZ as necessary to keep in contact with Yokota monitor, located near Tokyo, Japan, and the Coast Guard Communication station located on the island of Guam. I've included a pamphlet with gives you some information about our island, our station and our mission. I hope that you find it enjoyable.

In addition to the radio equipment listed in the pamphlet we have added a Sunair Scancall-10. This radio is similar to the 100 watt Sunair GSB-900 DXs (I have included its specifications sheet) but with the added feature that it can scan 10 preset frequencies either in the transmit or receive mode. This gives us the ability to monitor 13 frequencies, receive on three and transmit on two. After a link is established on the Scancall-10 it can be used like a GSB-900 DX which gives us a third transmit frequency.

Our antennas consist of two 35 foot whips with Sunair DCU-100 couplers (I have included its specification sheet also), one 10 to 30 MHZ LPA on a 80 foot tower with a 360 degree rotor, one 2 to 30 MHZ mini loop fixed directional antenna and two fixed frequency sloper antennas. All radios and antennas pass thru a comms panel which allows us to cross-connect any radio to any antenna and to troubleshoot the systems.

All the above equipment is used solely to support our primary mission of transmitting a LORAN signal. We also have a MARS system which consists of a ICOM IC720A Transceiver with a IC2K1 500 watt linear amplifier. This is used with a 10 to 30 MHZ LPA mounted on a 80 foot tower with a 360 degree rotor.

A tour of duty at Marcus is one year, during which you may leave once for a maximum of three weeks. Although we manage to keep very busy, we are very isolated out here in the middle of the Pacific. As such, it is always a pleasure to receive correspondence such as yours to let us know we are being heard. I wish you lots of luck and enjoyment in your amateur radio pursuits.

Sincerely,

BRIAN G. BENSON
LTJG, U. S. Coast Guard
Commanding Officer

Encl: Marcus Island Information Book
GSB-900 DX specification sheet
DCU-100 Coupler Specification sheet

1.3 TECHNICAL SPECIFICATIONS

Electrical and physical specifications of the Sunair GSB-900DX Transceiver are listed below.

1.3.1 GENERAL

FREQUENCY RANGE: 1.6 to 30 MHz (100 Hz increments, plus VFO).

NUMBER of CHANNELS: 284,000, Synthesized.

RESOLUTION: Digital, direct readout (100 Hz steps, plus VFO).

FREQUENCY STABILITY: $\pm 1 \times 10^{-6}$ TCXO, over rated temperature range.

OPERATING MODES: USB, LSB, AME, CW, (FSK and FAX with external optional modems).

RF INPUT/OUTPUT IMPEDANCE: 50 ohms nominal, unbalanced.

DUTY CYCLE: Continuous.

ENVIRONMENTAL TEMPERATURE: -30°C to $+65^{\circ}$C, for 100 watts PEP output. -30° to $+50^{\circ}$C, for 100 watts Average (Continuous FSK). External blower kit required for continuous FSK service.

HUMIDITY: 100% at 50°C.

SHOCK: Per MIL-STD-810B, Method 516.1, Procedure I, Fig. 516.1.2, Amplitude a Duration c.

VIBRATION: Per MIL-STD-810B, Method 514.1, Procedure VIII, Curve V.

ENCLOSURE: Per MIL-STD-108, table II. (Splash-proof).

METER MONITORS: Relative power output, received signal strength.

FRONT PANEL CONTROLS: Digital Frequency Select, Simplex/Half duplex operation, VFO, Volume, Mode/on-off, RF Gain, Transmitter Gain, Speaker on/off, Light Dimmer, and optional plug-in antenna coupler control panel.

POWER INPUT: AC: 115/230 volts ±15%, 50-60 Hz; at 400 watts max.
DC: (optional) 13/26 volts, ±10%; at 480 watts max.

DIMENSIONS: (CM) 15.2H x 46.6W x 45.7D
(INCHES) 6H x 18.25W x 18D

WEIGHT: 22.7 kgs. (55 pounds)

1.3.2 RECEIVER

SENSITIVITY: (2-30 MHz)
- SSB: 0.5 uv into 50 ohms for 10 db S+N/N.
- AM: Not more than 3.0 uv into 50 ohms for 10 db S+N/N.

(1.6 to 2.0 MHz) 6db degradation.

AUDIO OUTPUT: 5 watts into 8 ohms (speaker) @ less than 10% distortion; 10 dbm nominal into 600 ohms (internally adjustable).

SELECTIVITY: 300 to 3000 Hz nominal (6db points), standard.

IF REJECTION: Not less than 70 db.

IMAGE REJECTION: Not less than 80 db.

AGC: Fast attack, slow release. Threshold 5 uv nominal, 15 db max audio change for 100 db R.F. input change.

INTERNAL SPURIOUS RESPONSE: 99.5% below equivalent 0.2 uv noise input at antenna terminals.

EXTERNAL SPURIOUS RESPONSE: -65 db, non-harmonically related.

1.3.3 TRANSMITTER

POWER OUTPUT:
- SSB: 100 watts PEP and average nom.
- CW: 100 watts Avg. nom.
- AME: 30-40 watt carrier.

HARMONIC SUPPRESSION:
-40 db, second harmonic.
-50 db, all other harmonics.
-60 db, all harmonics, (with antenna coupler)

INTERMODULATION DISTORTION: At least 33 db below PEP., typical.

CARRIER SUPPRESSION: 50 db.

UNDESIRED SIDEBAND SUPPRESSION: 50 db at 1.5 kHz.

HUM AND NOISE LEVEL: -50 db.

1.4 EQUIPMENT SUPPLIED

The following table is a list of equipment, with appropriate Sunair part numbers, supplied with the GSB-900DX Transceiver.

		Sunair Part No.	
1.4.1	Transceiver, GSB-900DX with 115/230 volt power supply.	5024601050 5024601092	Gray Green
1.4.2	Hand Held Microphone Assembly	5024000609	
1.4.3	Operation and Maintenance Manual	5024600509	
1.4.4	Power Cord Assembly, 115 V A.C. OR Power Cord Assembly, 230V A.C.	5024002091 5024002156	
1.4.5	Ancillary Kit	5024000455 5024000498	115V 230V
1.4.6	Temperature Compensated Crystal Oscillator (TCXO) Frequency Standard-mounts inside GSB-900DX.	5024012704	

1.5 OPTIONAL EQUIPMENT-NOT SUPPLIED

The following table of accessories and spares are NOT supplied but are made available by Sunair Electronics, Inc. as compatable equipment for the GSB-900DX. Part numbers and descriptions are given to facilitate ordering.

1.5.1	Antenna Coupler, Remote Controlled, GCU-910A	5024300050 5024300092	Gray Green
1.5.2	Automatic Antenna Coupler, GCU-935	6035003095 6035003052	Green Gray
1.5.3	Kilowatt Linear Power Amplifier GSL-1900A.	6032001059 6032001091	Gray Green

1.3 SPECIFICATIONS

1.3.1 General

Frequency Range: 1.6000 to 29.9999 MHz

Tuning Capabilities:
9 ft. whips
16 ft. whips
23 ft. whips
35 ft. whips
50 ft. to 150 ft. longwires
Suitable as a line flattener

RF Input Power: 100 Watts PEP and AVERAGE

Input Impedance: 50 ohms, non-reactive

Duty Cycle: Continuous for antennas 23 feet and longer. Fifty percent (maximum 5 minutes continuous key down time) for 9 and 16 ft. antennas.

Tuning Time:
Memory Tuning - 50 to 100 milliseconds.
Non-Memory Tuning - Typical: 1 second.
Maximum: 10 seconds.

Tune Power Required: 25 Watts RF delivered

Tune Accuracy: 1.5:1 VSWR maximum

Remote Capability: Up to 250 ft. from transmitter

Power Input: 28 VDC from transmitter, 1 amp maximum

Weight: 23.75 lbs (10.77 kgs)

Size: (Inches) 9.1H X 9.6W X 11.4D
(CM) 23.1H X 24.4W X 28.96D

1.3.2 Environmental

Temperature: Operating: −30°C to +65°C
Storage: −55°C to +85°C

Humidity: MIL-STD-810C, Method 507.1, Proc II

Shock: MIL-STD-810C, Method 516.2, Proc I, Figure 516.2-2, Ampl. b (20 g.), Dur. d.

Vibration: MIL-STD-810C, Method 514.2 equipment category f, Table 514.2-VI for wheeled vehicles, Figure 514.2-6, curve V.

Dust: MIL-STD-810C, Method 510.1, Proc I

Rain: MIL-STD-810C, Method 506.1, Proc I

Packaging: Rain tight, for exposed installations.

1.4 EQUIPMENT SUPPLIED

	SUNAIR PART NUMBER
Automatic Digital Antenna Coupler, DCU-100	8080000255 Grey 8080000298 Olive Drab
Coupler Control Panel	8080150052 Grey 8080150095 Olive Drab
Connector Kit	6035002099
Operation and Maintenance Manual	8080000701

CHAPTER I
GENERAL INFORMATION

A. DISCOVERY AND HISTORY OF THE ISLAND:

In 1864, CAPTAIN GELETT, commanding the Hawaiian mission vessel, MORNING STAR, announced the discovery of an island located at 24-18N latitude and 153-58E longitude and claimed it for the United States. However, in 1879, the Japanese government, despite protest from the United States, declared ownership and colonized the island. This and several subsequent attempts (1884 - 1909), proved fruitless as the scarcity of fresh water prevented the early settlers from establishing a farming type community, and thereby from becoming self-supporting. A cemetery, which entombs the remains of some of the early pioneers still exists on the island and bespeaks, in part, of the hardships these early settlers endured.

During the 1930's as Japan expanded its empire, Marcus Island again became important, this time as part of a far flung defensive outpost structure. Sailors from the Japanese Imperial Navy with a labor force of 300 Japanese criminals constructed an elaborate system of underground bunkers, tunnels a torpedo factory, and an airstrip. Portions of these still exist throughout the island.

Marcus Island was, for the most part, by-passed by American Forces during World War II. In March of 1942, one of many surprise air raids was made on Marcus by U. S. Navy carrier based aircraft, and diversionary sea bombardment was also carried out by the U. S Navy. Additionally, Marcus Island was bombed on 9 October 1944 in a maneuver which Admiral Halsey "had conceived to bewilder the Japanese high command." Marcus, in the eastern part of the Nampo Shoto, was 825 miles from Saipan and with its well developed air base was an important staging point along the outer route from Japan to Saipan and the Marshall and Gilbert Islands. However, during the later portion of the war, forces labored to keep the airstrip in repair for planes which seldom appeared. This was because Marcus was kept under constant surveillance by armed reconnaissance missions of two or three B-24's. Between September 1944 and July 1945, a total of 565 such missions were performed. The XXI Bomber Command dispatched a total of eighty-five B-29's during the last shakedown missions, something the 313th Bombardment Wing routinely did. The minute damage incurred speaks highly for the defensive preparations made the Japanese. Over 4500 Japanese Imperial Army and Navy troops were removed from Marcus when hostilities ended.

After World War II, the Japanese were permitted to continue operation of a Weather and Radiobeacon Station on Marcus. It was in the 1950's that the United States defensive requirements called for establishment of a more accurate navigation system in the Western Pacific area. Marcus Island was selected to be used as a site for construction of a station in the new LORAN-C star chain complex. Work began during the spring of 1963, and concluded with commissioning ceremonies held 1 October 1963.

From November 1963 through August 1968 the Weather Station was operated by the U. S. Department of Commerce, and the Radiobeacon by the U. S. Coast Guard in conjunction with the LORAN-C Transmitting Station. On 26 June 1968 the Island was returned to the administration of the Government of Japan, and since 17 January 1969 the Japanese Maritime Self Defense Force and Japanese Meteorological Agency now maintain the Weather Station and Radiobeacan as joint tenants with the U. S. Coast Guard LORAN Station.

B. Geography and Topography:

Located in the Central Pacific, Marcus Island is a triangular shaped island with a sub-tropical climate, 840 miles northeast of Guam, 810 miles west of Wake, and 1020 miles southeast of Tokyo. The island measures approximately 3/4 of a square mile in land area (740 acres). A reef 100 yards wide, borders the entire island area and serves as an adquate protection against stormy seas. Marcus Island is one of the more isolated inhabited islands in the world. The island is essentially flat, rising no more that 26 feet above mean low water.

C. WEATHER:

The weather is excellent throughout the year with little seasonal variation. The average monthly temperature ranges between 69 and 85 degrees Fahrenheit, with an average yearly temperature of 78 degrees. Compiled U. S. Weather Bureau and Japanese Meteorological Agency records dating back to 1963 indicate that the highest temperature, 96 degrees, was recorded on 8 February 1964. Prevailing east southeasterly winds at 10 to 15 knots temper both the heat and the average yearly humidity of 76 percent. Rainfall throughout the year is mainly in the form of showers and averages approximately 40 inches. Depending upon the frequency and/or duration of typhoons affecting Marcus, The yearly average rainfall has differed by as much as 20 inches. On the average, there are three typhoons yearly, mostly during the months of June through December.

D. POPULATION

The population of Marcus Island is composed entirely of professional personnel of the Governments of Japan and the United States. There are no native inhabitants. Twenty-four U. S. Coast Guard personnel are stationed on the island, whose purpose is the operation and maintenance of the LORAN Station. The Japanese personnel administer the island and operate and maintain the WX station, the runway, and radiobeacon. Thirty Japanese personnel are stationed on Marcus.

E. NATIONAL AGREEMENTS:

Upon reversion of Marcus Island to the Japanese Government on 26 June 1968, agreements were drawn up specifying property rights. Essentially the U. S. Coast Guard has sole right to the use of the land area necessary to the operation and maintenance of the station buildings and equipment including the LORAN tower and associated ground system. Certain easements have been granted to the Coast Guard for access to the sewage disposal system which runs under the runway and across Japanese property and for access to and use of the small craft landing facilities. The Japanese have the responsibility of maintaining the radiobeacon, runway and associated facilities and portions of the seawall in at least the same condition as that which existed at the time of reversion.

All U. S. Armed Forces are in Japan under the "Status of Forces Agreement" (SOFA). This agreement is the basis for determining control of the actions of individuals. With respect to personnel on U. S. installations, it gives the Japanese Government first right of refusal in the prosecution of felony crimes. Most significant is that the Japanese Government is extremely rigid in the punishment of drug related crimes. The Tokyo Prefectual Police have jurisdiction over Marcus Island.

CHAPTER II

OPERATIONS

A. AIDS TO NAVIGATION:

1. LORAN: LORAN Station Marcus Island is the Whiskey Secondary for the Northwest Pacific LORAN-C Chain, with the Master located on Iwo Jima. The other secondaries are LORAN Station Yap (Zulu), LORAN Station Gesashi (Yankee), and LORAN Station Hokkaido (Xray). The monitor for the Master-Whiskey baseline is located at Yokota AB, which also monitors the Master-Zulu signals. LORAN Station Marcus has a 700 foot antenna for radiation of the synchronized LORAN pulses that have a peak power of 3 million watts. All ships and planes equipped with LORAN-C receivers can use these signals for precise navigation when two or more pairs of signals are present.

2. ADDITIONAL ATON FACILITIES: Marcus Island is also equipped with radiobeacon transmitter and antenna which were formerly maintained by the U. S. Coast Guard, but have been taken over by the Japanese. The radiobecon equipment and antenna are at the Japanese station at the other end of the runway from the LORAN Station. Additionally, the Japanese Maritime Self Defense Force (JMSDF) also maintains TACAN for aircraft navigation during approach and departure from Marcus Island.

B. COMMUNICATIONS:

Communications with the NWPAC LORAN and Monitor Stations, CG Communications Station Guam and Commander, Far East Section via LORMONSTA Yokota, are handled by the Radio Room (next to the Timer Room in the Signal Power Building) on a twenty-four hour watch schedule.

The Radio Room is equipped with one COL-6515 receiver and two CDIE-GSB-900DX, one hundred watt HF transceivers. The transceivers are operated with the help of associated tone keyers, two CGO-732ASR teletypewriters, one CC2C-RF-3500B ARQ unit, plus additional equipment for calibration and testing.

The Radio Room is fully air-conditioned as a precaution against rust and corrosion of the electronics equipment, due to the high humidity condition that exists throughout most of the year. Intra-station communications are handled by sound powered phone system between the Signal/Power, Transmitter, and Barracks Buildings. There is also a phone system to communicate with the JMSDF and JMA.

CHAPTER IV

ENGINEERING

A. GENERAL ENGINEERING:

1. POWER PLANT: The station is powered by four D-398B, 636 HP Caterpillar diesel engines in combination with four 55 K. W. A. C. generators. These are connected to the master electrical switchboard which is capable of starting and securing the generators, regulating voltage and cycles, and distribution of power throughout the station. The power required may be handled by one generator.

   The engines are cooled by a closed water system which runs to four horizontally mounted radiators external to the building. These are arranged so that any combination of engines may be used with any combination of radiators

2. DAMAGE CONTROL: Damage control functions are normally carried out by a Damage Controlman First Class who works from a large shop and has a supply of general building and maintenance materials on hand, including a band saw, radial arm saw, joiner, lathe, burning outfit, welder and an assortment of common power tools.

3. ELECTRICAL SYSTEM: Aside from the generators already discribed, four 32 volt starting batteries are used with each engine.

4. HEATING SYSTEM: Due to climate conditions, no heating system is necessry.

5. VENTILATION SYSTEM: Engine room ventilation is accomplished by two large exhaust fans mounted on top of the generator room which draws fresh air through 3 large banks of wall mounted foam filters into the engine and force hot air out the top of the building.

   Each room in the barracks is equipped with a small air conditioning unit which has a vent from which to draw outside air if so desired. Due to high outside humidity these vents are normally kept closed.

6. FUEL OIL SYSTEM: Fuel oil, which is received twice a year by tanker, is stored in eleven 30,000 gallon tanks. From these tanks it is pumped, by the transfer pumps, to a 1000 gallon day tank outside the engine room and thence, through the fuel oil filter, to the engines. Approximately 260,000 gallons of fuel are used annually.

7. REFRIGERATION SYSTEM: Four walk-in Vollrath refrigeration compartments, two at freezing temperatures and two chill temperatures, hold all the food requiring refrigeration. These units are cooled by four compressor/condenser reefer units outside the galley, using Freon-12.

The barracks air conditioner is a chilled water system. The heat is transferred by an exchanger, from this system, to a three compressor, 65-Ton, unit using Freon-22. This is in turn cooled by a large condenser located outside the building. Each room has a small unit connected to the chilled water system controllable in both temperature and in fan speed.

Other room and buildings on the station are cooled by individual self contained wall units.

8. FRESH WATER: A 32,000 square foot catchment system composed of the tennis court and the roofs of the station buildings comprises the main source of fresh water. The water from these catchment areas drain into two 60,000 gallon raw water tanks from which it is pumped through a filter into two 30,000 gallon treated water tanks for storage. Additionally, nine 30,000 gallon fuel tanks have been converted for raw water storage. They are filled by pumping from the 60,000 gallon raw water tanks.

9. SANITARY WATER SYSTEM: Salt water for the swimming pool and sanitary system is pumped directly from the sea.

10. BUILDINGS: The station buildings are constructed of cinder block with concrete floors and linoleum tile decks. All buildings are one story high with the exception of the living quarters of the barracks building. Due to the normally warm weather, there is a large use of external walkways vs inside corridors. This can be seen on the attached floor plans in the back of this booklet.

a. BARRACKS - SUBISTENCE BUILDING: In this building are living quarters, recreational rooms, and messing areas for the crew. In addition, storerooms, machinery rooms and gear lockers are located throughout the building. Rooms in this building include: 24 rooms available for individual occupancy, post office, weight room, bos'n locker, exchange, laundry room (3 washers and 3 dryers), head on each deck, station office, rec deck, galley and storerooms, mess deck and movie projection booth, ham shack, photo lab, air conditioning machinery room, sick bay, First Class Petty Officer's quarters (4 rooms with living room), and BOQ (3 rooms with living room).

b. SIGNAL POWER BUILDING: This building houses all equipment, machinery, and supplies for generating power for the station and electronic signal for LORAN-C transmissions. Floor plan and space designations are shown in Appendix I.

c. CPO QUARTERS: This building is separate from, but in the same area as the barracks building and consists of five bedrooms, laundry room, one head, storage room, and living room.

d. TRANSMITTER BUILDING: Located at the base of the tower, it has a storage room, transformer room, work area, coupler room and the transmitter room.

e. PUMP HOUSE: The #1 pump house for fresh water is situated directly over the four freshwater water tanks and contains four transfer pumps, and equipment for filtration and chlorination. The #2 pump house is located beside the pool and contains the sanitary water pump.

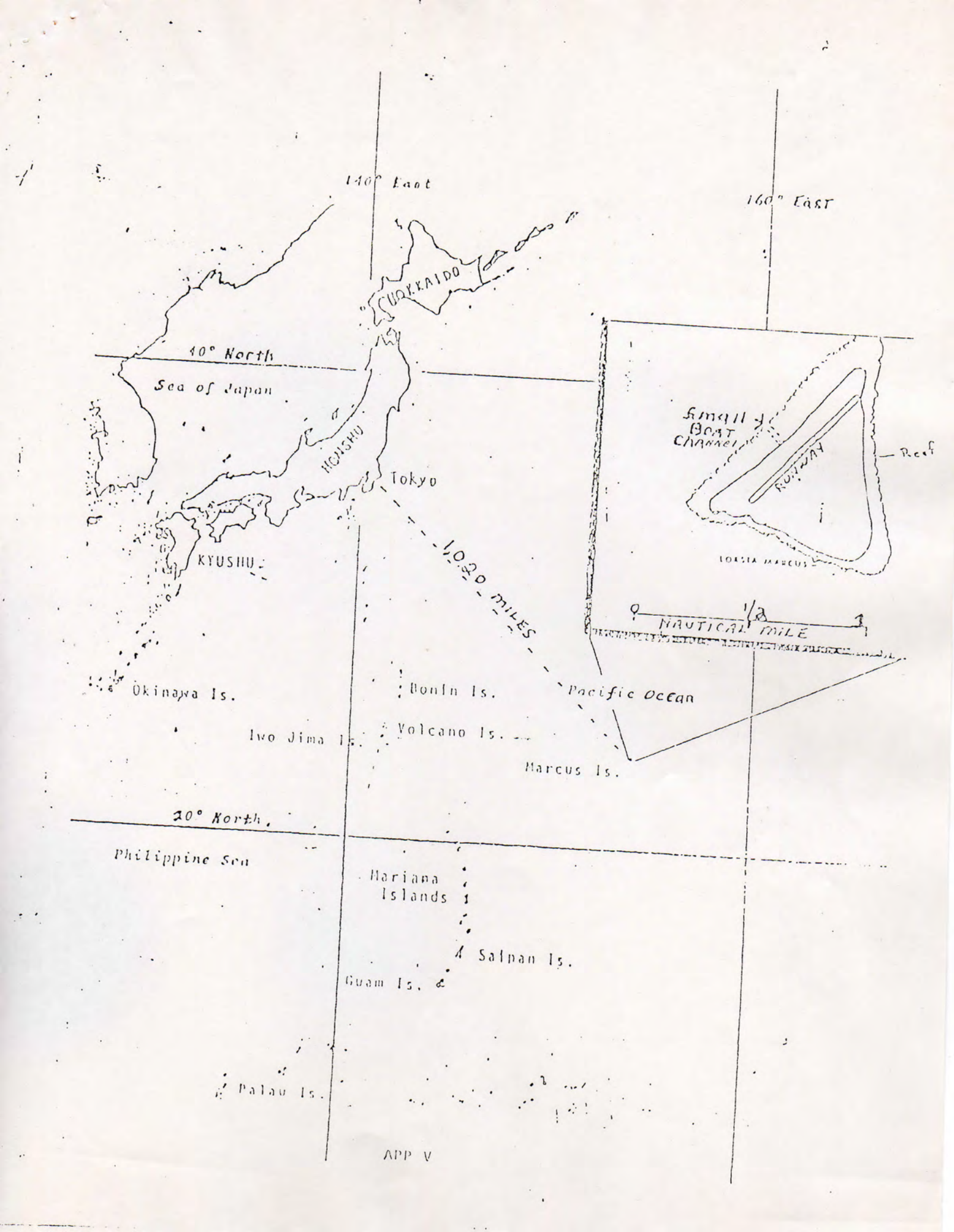
f. BUNKER: A large triple bunker, approximately a third of a mile fron the signal power building, provides a large storage space for Engineering, Deck, and Electronics.

B. ELECTRONICS ENGINEERING:

The Electronics personnel on board have a full time job maintaining the numerous items of equipment used to carry out the communications and LORAN functions. Communications gear has been described in Chapter II, so only the LORAN miscellaneous equipment will be covered here.

LORAN operations are divided between the timer room and transmitter building. The timer room is an air conditioned, shielded room containing an AN/FPN-54A LORAN Timming Set. Cesium beam oscillators are currently in use. The timer is the heart of the LORAN system. Using inputs from the frequency standards, the timer creates the format waveforms needed to generate the LORAN pulses and provide the timing synchronization for the various monitoring facilities. One watchstander is on duty here at all times; checking the many functions of the timers for proper operation, keeping the six recording charts properly marked, and maintaining a LORAN log and a graphical chart of the station's LORAN operations.

The transmitter building adjacent to the LORAN tower contains two high power AN/FPN-45 LORAN transmitters, associated power input transformers, an antenna coupler/dummy load, a small parts room and an area for electronic repair work. One transmitter is always on-air while the other is in either a maintenance or standby condition. Should one transmitter fail, the timer room watchstander can remotely switch transmitters with less than a minute of interruption of LORAN service. A duty ET is available at a moments notice, 24 hours a day, for operational failures, or when a LORAN watchstander requires assistance. All ET's, E-6 and below stand duty ET


140° East
160° East
HOKKAIDO
40° North
Sea of Japan
HONSHU
Tokyo
KYUSHU
1020 MILES
Pacific Ocean
Okinawa Is.
Bonin Is.
Iwo Jima Is.
Volcano Is.
Marcus Is.
20° North
Philippine Sea
Mariana Islands
Saipan Is.
Guam Is.
Palau Is.
Small Boat Channel
Runway
Reef
TORISHIMA MARCUS
0
1/2
1
NAUTICAL MILE