

NHK's Low Power Shortwave Outlets

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1. Background

Nippon Hoso Kyokai (NHK), the public broadcaster in Japan, operated low power shortwave outlets from several locations. WIRTH mentioned the shortwave outlets from 1983, with a full schedule from 1986. The service had an official name in English: Program Transmission Administration of Order (PAO), according to NHK Handbook (1966). Maybe the English name does not make sense. On the other hand, it was called "shortwave for communication and relay" in Japanese, which is much easier to understand.

The main purpose of the shortwave outlet was to serve as a backup for supply of programs in case of unavailability of the land line relay, as well as to maintain contact for administrative, or "intramural," purposes, such as scheduling transmissions, i.e. inter-station communication among the shortwave outlets. Thus they were licensed in Japan as a fixed station (utility station), rather than a broadcasting station, conducting point to point transmissions. Channels within the 49 and 31 meter shortwave broadcast bands, however, were registered at the International Frequency Registration Board (IFRB) as a domestic service of NHK. This was one of the strategies used by Japan after World War in order to secure the use of shortwave frequencies at a time when her voice was weak. It was feared that few frequencies would be available for the resumption of an overseas service on shortwave in the future unless the channels were kept in use. A change in the frequency registration system at the Geneva Convention of 1959 made such tactics unnecessary.

2. Brief History

Since establishment of the Broadcasting Corporation of Japan (NHK¹) in 1926, stations were linked together mainly by land lines. In December 1941 Japan entered war with the United States. In spite of initial victories, the war situation gradually became unfavorable to Japan. This led to increased U.S. bombing over Japan, which began to endanger the NHK communication network. In 1943, in order to be prepared for the failure of land lines with which the national and regional networks had been connected, introduction of a shortwave link was planned.

Shortwave transmitters were installed at the transmitter sites of the central broadcasting stations, which served as key stations in the regional network. These were in Tokyo, Osaka, Nagoya, Hiroshima, Kumamoto, Sendai, and Sapporo. In addition, the stations in Niigata, Matsuyama and Fukuoka were also equipped with shortwave. Niigata and Matsuyama became central broadcasting stations in January 1945 (the former lasted only for four months). Fukuoka, one of the two major cities on Kyushu island, had a special position in the regional network of that island.

It was in October 1944 that the shortwave outlets of NHK were inaugurated, except for Matsuyama, which started in November.

¹ The acronym of NHK was not officially used until 1946, but it is used here for convenience.

In October 1948, PAO was mainly used by NHK-Tokyo for relaying programs as well as for inter-station communication. Daily operation of inter-station communication was also scheduled at Hiroshima, Kumamoto, Sapporo, Matsuyama and Fukuoka, but the total time for each station was less than 90 minutes a day. Other outlets, namely Osaka, Nagoya, Sendai and Niigata, operated irregularly.

In the mid-1960's, PAO was actually utilized for inter-station communication. The operation schedule for October 1965 indicates that most of the time was used for relaying programs, but there were regular daytime time slots allocated for inter-station communication in the daytime in the 49 and 31 meter bands.

NHK maintains two networks: the 1st network for general programs (news, music, information), and the 2nd network for educational programs. Shortwave outlets carried either network, depending on the station. As of October 1965, the relays were as follows:

- 1st Network: Tokyo, Nagoya, Matsuyama, Sendai, and Sapporo.
- 2nd Network: Tokyo, Osaka, Hiroshima, and Kumamoto
- No program relay (inter-station communication only): Fukuoka

By 1983, the Osaka station became the only outlet to relay the 2nd network.

Over time, the shortwave outlets were reduced. At first, in October 1986, Hiroshima and Matsuyama were closed; in November 1987, Kumamoto and Sendai. In February 2005, NHK made the decision to close all shortwave outlets, due mainly to the following reasons:

a) No use of PAO,

In spite of regular operation, PAO had not been used as backup for more than ten years. This is because multiple, reliable backup systems had been formulated:

For an interruption of radio and/or landline relay network

- Backup with an alternative program transmission system.
- Backup with transmission via broadcast/communication satellite in case of emergency/disaster.

For a communication failure of NHK-IDX (internal line) between stations:

- Alternative use of landline (telephone subscriber line provided by telephone companies).
- Alternative use of a sky phone (telephone via communication satellite) in case of failure of NHK-IDX and landline at emergency/disaster

b) Expensive cost for replacement and maintenance of a transmitter.

Replacement of a shortwave transmitter was estimated to cost about US\$240,000 per station. It was no longer affordable for NHK to bear such an expenditure for unused services.

In line with the decision, the shortwave outlets were abolished, one after another, by July 2005. Operation periods (years of service), operating schedules, and technical details, as well as major changes in frequency and callsign for PAO, are shown in Tables 1 to 4.

3. Transmitters

Ten sets of transmitters with a power of 300 watts each were manufactured at the NHK Shingo works in 1944. The model number was 300SC.

By 1951, after five years of operation, the transmitters were modified or replaced with 1 kW. transmitters. Irrespective of the maximum output, the transmitters were operated at 300, 600, or 900 watts, in accordance with the power authorized. There is no information as to the transmitter of Niigata during this period. In 1951, Osaka became the last station to replace its transmitter with one manufactured by Kokusai Electric Company (KEC). It seems that the performance of this KEC transmitter was so good that it remained in service longer, and thus the timing of further replacements at Osaka became different from the other stations.

In 1966, most of the stations introduced the 60PH-41² 1 kW. transmitter manufactured by KEC, while Osaka purchased one of the same type (60PH-41) from Toshiba in 1969.

In 1979, with the inauguration of a new transmitter site at Ebetsu for NHK-Sapporo, the first fully solid state, AM-DSB transmitter (58SH-71) in Japan, with a power of 600 watts, manufactured by KEC, was installed.

In 1982-1983, SSB transmitters were introduced in Tokyo, Nagoya and Fukuoka. All were manufactured by Japan Radio Company (JRC). Osaka was the last to adopt SSB, in 1993.

4. Test transmissions

According to an October 1965 operation schedule of PAO, a monthly test transmission was conducted from some stations, as follows:

- Fukuoka: 0800-0810 UTC on the third Monday on 3259 kHz.
- Kumamoto: 0810-0820 UTC on the third Monday on 3259 kHz.
- Nagoya: 0745-0755 UTC on the third Wednesday on 9535 kHz.
- Osaka: 0800-0810 UTC on the third Wednesday on 9535 kHz.
- Sendai: 0800-0810 UTC on the third Monday on 9535 kHz.

By 1968, they began to conduct a seasonal test to know the most appropriate frequency for the time of day and season. On such occasions, they interrupted relay of programs, and instead played repeated identification of a fixed station (named after the transmitter site location) and representative music of the region where the station was located. No information is available as to how long these test transmissions were conducted. At least NHK-Tokyo was reported testing in March 1988. Table 5 shows the station identification and the title of the music played during test transmissions in 1978. They conducted tests for one hour from 2300, 0200, 0500, 0800 and 1100 UTC for three consecutive days. Mostly one station tested for one hour, but sometimes two or three stations were heard testing, one by one, for 20 or 30 minutes each, on 9535 kHz.

² The model name indicated here is a specification number given by NHK, not by the manufacturer.

5. Additional notes

1) Korean War / VUNC

With the outbreak of the Korean War, NHK began to relay Korean programs at the request of General Headquarters (GHQ) starting on June 29, 1950. Programs produced by VOA and the Voice of the United Nations Command (VUNC) were broadcast from medium wave outlets of Tokyo (JOAK), Fukuoka (JOLK) and Matsue (JOTK). Shortwave facilities, including NHK-Tokyo, were added starting on July 19, 1950.

At first, NHK-Tokyo (JKI21 on 6175 kHz) relayed a VUNC program at 1330-1345 UTC, but as of September 10, 1950, the time was changed to 1215-1300 UTC. Regular relays by JKI21 ended at the end of September, and it was replaced by Nazaki (JKI3) on the same channel with a power of 50 kW as of October 1, 1950.

On October 1, 1950, a special VUNC program was broadcast at 0245-0315 UTC: General MacArthur's message to the Commander of the North Korean forces to call upon the North Koreans to lay down their arms and cease hostilities. This program was aired from various shortwave sites in Japan, namely Yamata, Nazaki, Kawachi, and NHK-Tokyo (JKI22 on 9550 kHz).

On October 9, 1950, the second MacArthur Ultimatum broadcast to the commander of the North Korean forces demanding immediate surrender was made at 0200-0215 UTC, and repeated at 0800-0815 UTC, from the same shortwave sites mentioned above, as well as from medium wave outlets of Fukuoka and Matsue. The 9550 kHz channel (JKI22) was used again for transmission from NHK-Tokyo.

2) Call signs for SSB

For SSB transmission, no call signs in the form of letters and numbers were assigned. Instead, they identified as "NHK + transmitter site name," with no distinction as to frequency, e.g. "NHK Shobu" for Tokyo, "NHK Kasuga" for Fukuoka, etc. Only NHK-Sapporo (Ebetsu) maintained the traditional call sign until the end of the service.

3) Original program of Tokyo (NHK Shobu)

Each station principally relayed the program of either the 1st or 2nd network. Local programs, such as notices, weather, traffic, and, naturally, local ID with a call sign, were also aired on shortwave. But NHK-Tokyo (NHK Shobu) did not follow such a practice. I noticed this fact during my intensive monitoring of PAO in September 1988.

Surprisingly enough, NHK-Tokyo (NHK-Shobu) had an original program as of January 2000. During a time slot for a local program at 0250-0300 UTC daily and 0950-1000 UTC on Saturday and Sunday, NHK-Shobu had an independent program from NHK-Tokyo (JOAK on 594 kHz). For the first five minutes they played mini-programs which could be relayed by other local stations. At 0255 and 0955 UTC, to fill the time, they began to play a harpsichord melody for five minutes. This music was never heard on NHK-Tokyo (JOAK) on medium wave.

Table 1
Operation Period

| Station | Location | Power (W) | 1940 | | | | | 1950 | | | | | 1960 | | | | | 1970 | | | | | 1980 | | | | | 1990 | | | | | 2000 | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|-------------------------|-----------|------------------------|---|---|---|---|---------------------------------|---|---|---|---|-------------------|---|---|---|---|------|---|---|---|---|------|---|---|---|---|--------------------------|---|---|---|---|------------------------------|---|---|---|---|--------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|------------------------------|---|--|--|--|
| | | | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | | | |
| Tokyo | Kawaguchi Shobu-Kuki | 300 / 900 | Kawaguchi (1944/10-) | | | | | | | | | | | | | | | | | | | | | | | | | Shobu-Kuki (1982/03/31-) | | | | | (up to 2005/07/05 or 09) | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 900 | * | | | | | | | | | | * | | | | | | | | | | * | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Nagoya | Okehazama Nabeta | 300 | Okehazama (1944/10-) | | | | | | | | | | | | | | | | | | | | | | | | | Nabeta (1983/12/22-) | | | | | Date of licence cancellation | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 300 | | | | | | (*) | | | | | (*) | | | | | | | | | | * | | | | | (up to 2005/06/24) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Osaka | Senri | 300 | Senri (1944/10-) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | * | | | | | | | | | | | | | | |
| | Sakai | 300 | | | | | | Sakai (1951/11/03-) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Mihara | 300 | * | | | | | | | | | | Mihara (1969/02-) | | | | | | | | | | | | | | | * | | | | | (1993/04/04 or 04/21-) | | | | | | | | | | | | | | | | | | | | | | | | |
| Hiroshima | Hara / Gion | 300 / 600 | Hara / Gion (1944/10-) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | * | | | | | (up to 2005/06/02) | | | | |
| | | 300 / 600 | | | | | | (*) | | | | | * | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Matsuyama | Oguri Harita | 300 / 600 | Oguri (1944/11/30-) | | | | | | | | | | | | | | | | | | | | | | | | | Harita (1964/02/05-) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 600 | * | | | | | | | | | | * | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fukuoka | Fukuoka Kasuga | 300 | Fukuoka (1944/10-) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Date of licence cancellation | | | | |
| | | 600 | | | | | | Kasuga (1952/01 or 1952/02/11-) | | | | | | | | | | | | | | | | | | | | * | | | | | (1983/08/08-) | | | | | (up to 2005/07/20) | | | | | | | | | | | | | | | | | | | |
| Kumamoto | Shimizu | 300 / 600 | Shimizu (1944/10-) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 300 / 600 | | | | | | (*) | | | | | (*) | | | | | | | | | | | | | | | * | | | | | (up to 1987/11/30) | | | | | | | | | | | | | | | | | | | | | | | | |
| Sendai | Haranomachi | 300 / 600 | Haranomachi (1944/10-) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 300 / 600 | * | | | | | | | | | | * | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sapporo | Tsukisamu | 300 / 600 | Tsukisamu (1944/10-) | | | | | | | | | | | | | | | | | | | | | | | | | Nopporo (1957/12/22-) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nopporo | 600 | * | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ebetsu | 600 | | | | | | | | | | | * | | | | | | | | | | | | | | | * | | | | | Ebetsu (1979/09/15-) | | | | | (up to 2005/06/03) | | | | | | | | | | | | | | | | | | | |
| Niigata | Niigata | 300 | Niigata(1944/10-) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 300 | | | | | | (upt to 1961/08/19) | | | | | | | | | | | | | | | | | | | | | | | | | * | | | | | | | | | | | | | | | | | | | | | | | | |



Legend:  AM transmission  SSB transmission * Replacement of transmitter (those not confirmed by documents are shown in parenthesis.)

Table 2
Operating Schedule

(as of 1999)

| Frequency | UTC | 20 | 21 | 22 | 23 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | |
|--|-------|----|----|----|----|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|
| Station name (call sign) | | | | | | | | | | | | | | | | | | | | | |
| 3259 kHz Fukuoka (NHK Kasuga) | | | | | | | | | | | | | | | | | | | | | |
| 3377.5 kHz Osaka (NHK Mihara) | | | | | | | | | | | | | | | | | | | | | |
| 3607.5 kHz Tokyo (NHK Shobu) | | | | | | | | | | | | | | | | | | | | | |
| 3970 kHz Nagoya (NHK Nabeta), Sapporo (JKU20) | | | | | | | | | | | | | | | | | | | | | |
| 5428 kHz Osaka (NHK Mihara) | | | | | | | | | | | | | | | | | | | | | |
| 6005 kHz Nagoya (NHK Nabeta), Sapporo (JKU21) | | | | | | | | | | | | | | | | | | | | | |
| 6130 kHz Fukuoka (NHK Kasuga) | | | | | | | | | | | | | | | | | | | | | |
| 6175 kHz Tokyo (NHK Shobu) | | | | | | | | | | | | | | | | | | | | | |
| 9181 kHz Osaka (NHK Mihara) | | | | | | | | | | | | | | | | | | | | | |
| 9535 kHz Fukuoka (NHK Kasuga), Sapporo (JKU22) Nagoya (NHK Nabeta) * | | | | | | | | | | | | | | | | | | | | | |
| 9550 kHz Tokyo (NHK Shobu) | | | | | | | | | | | | | | | | | | | | | |
| | J S T | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | |

*) Nagoya is assigned on 9535 kHz, but not used for regular operation.

Table 3

Technical Details of Shortwave Stations in Japan (1949)

| STATION | | LOCATION | | OUT PUT (POWER) | CALL SIGN | KC/S FREQUENCY | USE | BROADCAST TRA | | |
|--------------|-----------------|------------|-----------|-----------------|----------------------------|----------------------|----------------------------|-------------------|-----------------|-----------------|
| NAME | TYPE OF STATION | LATITUDE | LONGITUDE | | | | | MODULATION SYSTEM | AMPLIFIER TUBES | MODULATOR TUBES |
| TOKYO | CENTRAL | 139°43'25" | 35°49'35" | 300W | JKI-20 JKI-21 JKI-22 | 3475 6175 9550 | RELAY & COMMUNICATION | HG | SN205Cx2 | UY807 |
| OSAKA | CENTRAL | 135°31'35" | 34°48'28" | 300W | JKM-20 JKM-21 JKM-22 | 3345 6190 9535 | RELAY & COMMUNICATION | HG | SN205Cx2 | UY807 |
| NAGOYA | CENTRAL | 136°58'2" | 35°3'4" | 300W | JKD-20 JKD-21 JKD-22 | 3970 6005 9535 | RELAY & COMMUNICATION | HG | SN205Cx2 | UY807 |
| HIROSHIMA | CENTRAL | 132°28'10" | 34°25'59" | 300W | JKG-20 JKG-21 JKG-22 | 3475 6175 9535 | RELAY & COMMUNICATION | HG | SN205Cx2 | UY807 |
| KUMAMOTO | CENTRAL | 130°43'34" | 32°51'53" | 300W | JKQ-20 JKQ-21 JKQ-22 | 3970 6130 9535 | RELAY & COMMUNICATION | HG | SN205Cx2 | UY807 |
| SENDAI | CENTRAL | 140°54'30" | 38°16'13" | 300W | JKS-20 JKS-21 JKS-22 | 3345 6190 9535 | RELAY & COMMUNICATION | HG | SN205Cx2 | UY807 |
| SAPPORO | CENTRAL | 141°23'11" | 43°1'20" | 300W | JKU-20 JKU-21 JKU-22 | 3250 6005 9535 | RELAY & COMMUNICATION | HG | SN205Cx2 | UY807 |
| MATSUYAMA | CENTRAL | 132°45'28" | 33°50'35" | 300W | JKD-20 JKD-21 JKD-22 | 3250 6005 9535 | RELAY & COMMUNICATION | HG | UV849x2 | UY807 |
| NIIGATA | LOCAL | 139°2'12" | 37°55'3" | 300W | JKA-20 JKA-21 | 3250 6005 | RELAY & COMMUNICATION | HG | SN205Cx2 | UY807 |
| FUKUOKA | LOCAL | 130°24'0" | 33°35'10" | 300W | JKP-20 JKP-21 | 3250 6005 | RELAY & COMMUNICATION | HG | SN205Cx2 | UY807 |
| NAZAKI T.S. | | 139°51'0" | 36°10'44" | 5KW | JKI-2 | 4910 9655 | 1ST. TR. RELAY | LPP(T) | TB509Bx4 | TW5040x4 |
| | | | | 5KW | JKJ | 7285 | 2ND. TR. RELAY | LPP(C) | UN167Bx2 | UN205Ax4 |
| | | | | 5KW | JKK | 6015 | A.F.R.S. | LPP(C) | UN167Bx4 | UN205Ax4 |
| YAMATA T.S. | | 139°49'34" | 36°10'15" | 5KW | JKL JKL-2 | 4860 9605 | 1ST. TR. RELAY A.F.R.S. | LPP(T) | WT370x2 | UN205Ax2 |
| | | | | 5KW | JKM JKM-2 | 4930 9695 | 2ND. TR. RELAY | LPP(C) | TW504Ax2 | P560 |
| KAWACHI T.S. | | 135°33'20" | 34°31'26" | 5KW | JBD JBD-3 | 9505 15225 | OVER SEA TRANSMISSION | HPP(T) | WT365x4 | UN1671x6 |
| | | | | 5KW | JBD-2 JBD-4 | 9560 15235 | OVER SEA TRANSMISSION | LPP(C) | TW504Ax2 | P560 |

1. MODULATION SYSTEM

HG - FINAL STAGE GRID MODULATION
 LPP(T)-LOW LEVEL PLATE MODULATION WITH A TRANSFORMER
 LPP(C)-LOW LEVEL PLATE MODULATION WITH A CHOKE
 HPP(T)-HIGH LEVEL PLATE MODULATION WITH A TRANSFORMER

2. MANUFACTURER

BCJ - BROADCASTING CORPORATION
 NEC - JAPAN ELECTRIC CO. LTD.
 TEC - TOKYO ELECTRIC CO. LTD.
 ITG - INTERNATIONAL TELECOM

| RECTIFIER TUBES | MANUFACTURER | POLE | | | | ANTENNA WIRE | | | | | FEEDER | REMARKS | |
|-----------------|--------------|--------------|----------------------------------|--------------|-----------------------|-----------------|---|-----------------------------------|-----|-------|---------------------|---|----------------------------|
| | | CONSTRUCTION | HEIGHT | NO. OF POLES | SPAN | TYPE | SIZE OF WIRE | ARRANGEMENT | BAY | TIERS | | | ANGLE OF DIRECTIVITY |
| HV972x6 | B.C.J. | WOOD | 33M | 4 | 38.6M | TELEFUNKEN | 29MMφ 8MM ² 8MM ² | HORIZONTAL | 4 | 1 | NO DIR-SECTION | 29MMφ 8MM ² 8MM ² | 294.2M 275.2M 275.2M |
| HV972x6 | B.C.J. | IRON WOOD | 60M 22M | 1 | 38M | DIPOLE | 6MMφ | HORIZONTAL | 2 | 1 | 100° | 2.5MMφ | 31M |
| HV972x6 | B.C.J. | IRON | 28M | 2 | 68M | DIPOLE | 3.5MM ² | HORIZONTAL | 2 | 1 | 108° 108° 24° | 3.5MM ² | 7.3M 6.4M 5.5M |
| HV972x6 | B.C.J. | WOOD | 20M | 2 | 43M 25M 17M | DIPOLE | 165MMφ | HORIZONTAL | 2 | 1 | 130° 25° 130° | 165MMφ | 3.0M 3.0M 1.5M |
| HV972x6 | B.C.J. | WOOD | 3MG: 30M 6MG: 20M 9MG: 20M | 2 | 76M 61.5M 61.5M | DIPOLE | 4MMφ | HORIZONTAL | 2 | 1 | 45° 65° 65° | 2MMφ | 65M 25.325M 25.325M |
| HV972x6 | B.C.J. | IRON | 60M | 1 | 56M | INCLINED | 2.2MM ² | INCLINED HORIZONTAL HORIZONTAL | 2 | 1 | 18° | 2.2MM ² | 99M |
| HV972x6 | B.C.J. | IRON | 27.5M | 2 | 37M 35M 20M | INCLINED DIPOLE | 5.5MM ² | INCLINED HORIZONTAL HORIZONTAL | 2 | 1 | 139° 8° 8° | 5.5MM ² | 40.2M 34.2M 18M |
| HV972x6 | B.C.J. | WOOD | 10M | 2 | 70M 70M 42M | DIPOLE | 3MMφ | HORIZONTAL | 2 | 1 | 90° | 3MMφ | 8M 8M 33M |
| HV972x6 | B.C.J. | IRON WOOD | 27M 14M | 1 | 52M | DIPOLE | 5MMφ | HORIZONTAL | 2 | 1 | 100° | 5MMφ | 35M |
| HV972x6 | B.C.J. | IRON WOOD | 16M 16M | 2 | 52.2M 31.6M | ZEPPELIN DIPOLE | 5MM ² | HORIZONTAL | 1 | 1 | 2° 55° | 1.6MMφ | 41M 38.25M |
| HV951Bx6 | N.E.C. | IRON | 30M | 1 | 100M | BEAM | 29MMφ | HORIZONTAL | 2 | 2 | 15° | 29MMφ | 407M |
| HV951Bx6 | T.E.C. | WOOD | 23M | 1 | 100M | BEAM | 29MMφ | HORIZONTAL | 2 | 2 | 75° | 29MMφ | 60M |
| HV951Bx6 | T.E.C. | WOOD | 60M | 2 | 100M | BEAM | 29MMφ | HORIZONTAL | 2 | 2 | 30° | 29MMφ | 43M |
| HV951Bx6 | I.T.C. | WOOD | 60M | 2 | 100M | BEAM | 29MMφ | VERTICAL | 2 | 2 | 77° | 29MMφ | 700M |
| HV951Bx6 | I.T.C. | WOOD | 60M | 2 | 100M | BEAM | 29MMφ | HORIZONTAL | 2 | 1 | 15° 20° | 29MMφ | 100M 350M |
| HV969x2 | N.E.C. | WOOD | 30M | 2 | 100M | BEAM | 29MMφ | HORIZONTAL | 2 | 4 | 60° | 29MMφ | 300M |
| HV951Bx6 | I.T.C. | WOOD | 60M 6 | 4 | 100M | BEAM | 29MMφ | HORIZONTAL | 4 | 8 | 259° 242° | 29MMφ | 600M 450M 450M |
| HV969x2 | N.E.C. | WOOD | 30M | 2 | 100M | BEAM | 29MMφ | HORIZONTAL | 2 | 4 | 120° | 29MMφ | 155M |

3. SIZE OF WIRE

MMφ - DIAMETER IN MILLIMETERS
 MM² - CROSS SECTIONAL AREA IN SQUARE MILLIMETERS

4. ANGLE OF DIRECTIVITY

MEASURED IN DEGREES CLOCKWISE FROM NORTH

* THESE ANTENNA SYSTEMS ARE EQUIPPED WITH REFLECTORS

Source: Documents prepared by GHQ/SCAP (Archive in National Diet Library of Japan)

Note: No date is indicated in the original document. It is presumed to be prepared between January to August 1949.

Table 4
Major Change in Frequency and Call-sign

| Station | 1944 | Aug. 1946 | Jan. 1949 | As of Aug.1983 | As of 1999 |
|-----------|--------|-------------|--------------|----------------|----------------------|
| Tokyo | 3790 | 3475 (JO9H) | 3475 (JKI20) | 3607.5 (JKI20) | 3607.5 (NHK Shobu)** |
| | 6080 | 6175 (JO9J) | 6175 (JKI21) | 6175 (JKI21) | 6175 (NHK Shobu)** |
| | 7470 | 9550 (JO9K) | 9530 (JKI22) | 9550 (JKI22) | 9550 (NHK Shobu)** |
| Osaka | 3590 | 3345 (JO3E) | 3345 (JKM20) | 3377.5 (JKM20) | 3377.5 (NHK Mihara) |
| | 6100 | 6190 (JO3F) | 6190 (JKM21) | 6190 (JKM21) | 5248 (NHK Mihara) |
| | | 9535 (JO3G) | 9535 (JKM22) | 9535 * (JKM22) | 9181 (NHK Mihara) |
| Nagoya | 3790 | 3965 (JO2J) | 3970 (JKD20) | 3970 (JKD20) | 3970 (NHK Nabeta) |
| | 7345 | 6005 (JO2K) | 6005 (JKD21) | 6005 (JKD21) | 6005 (NHK Nabeta) |
| | | 9535 (JO2L) | 9535 (JKD22) | 9535 (JKD22) | 9535 * (NHK Nabeta) |
| Hiroshima | 3965 | 3475 (JO4D) | 3475 (JKG20) | 3607.5 (JKG20) | — |
| | (7345) | 6175 (JO4E) | 6175 (JKG21) | 6175 (JKG21) | — |
| | | 9535 (JO4F) | 9535 (JKG22) | 9535 (JKG22) | — |
| Matsuyama | 4385 | 3220 (JO5A) | 3250 (JKO20) | 3970 (JKO20) | — |
| | 6080 | 6005 (JO5B) | 6005 (JKO21) | 6005 (JKO21) | — |
| | | 9535 (JO5C) | 9535 (JKO22) | 9535 (JKO22) | — |
| Fukuoka | 3925 | 3220 (JO6D) | 3250 (JKP20) | 3259 * (JKP20) | 3259 (NHK Kasuga) |
| | (7345) | 6005 (JO6F) | 6005 (JKP21) | 6005 (JKP21) | 6130 (NHK Kasuga) |
| | | — | — | 9535 (JKP22) | 9535 (NHK Kasuga) |
| Kumamoto | 3220 | 3965 (JO6E) | 3970 (JKQ20) | 3259 * (JKQ20) | — |
| | 6100 | 6130 (JO6G) | 6130 (JKQ21) | 6005 (JKQ21) | — |
| | | 9535 (JO6H) | 9535 (JKQ22) | 9535 * (JKQ22) | — |
| Sendai | 3475 | 3345 (JO7E) | 3345 (JKS20) | 3259 (JKS20) | — |
| | (7345) | 6190 (JO7F) | 6190 (JKS21) | 6190 (JKS21) | — |
| | | 9535 (JO7G) | 9535 (JKS22) | 9535 (JKS22) | — |
| Sapporo | 3230 | 3220 (JO8F) | 3250 (JKU20) | 3970 (JKU20) | 3970 (JKU20) |
| | (7470) | 6005 (JO8G) | 6005 (JKU21) | 6005 (JKU21) | 6005 (JKU21) |
| | | 9535 (JO8H) | 9535 (JKU22) | 9535 (JKU22) | 9535 (JKU22) |
| Niigata | 3990 | 3220 (JO9G) | 3250 (JKA20) | — | — |
| | (6100) | 6005 (JO9I) | 6005 (JKA21) | — | — |

Note: No call sign was assigned in 1944.

*) No regular program relay is scheduled on these frequencies.

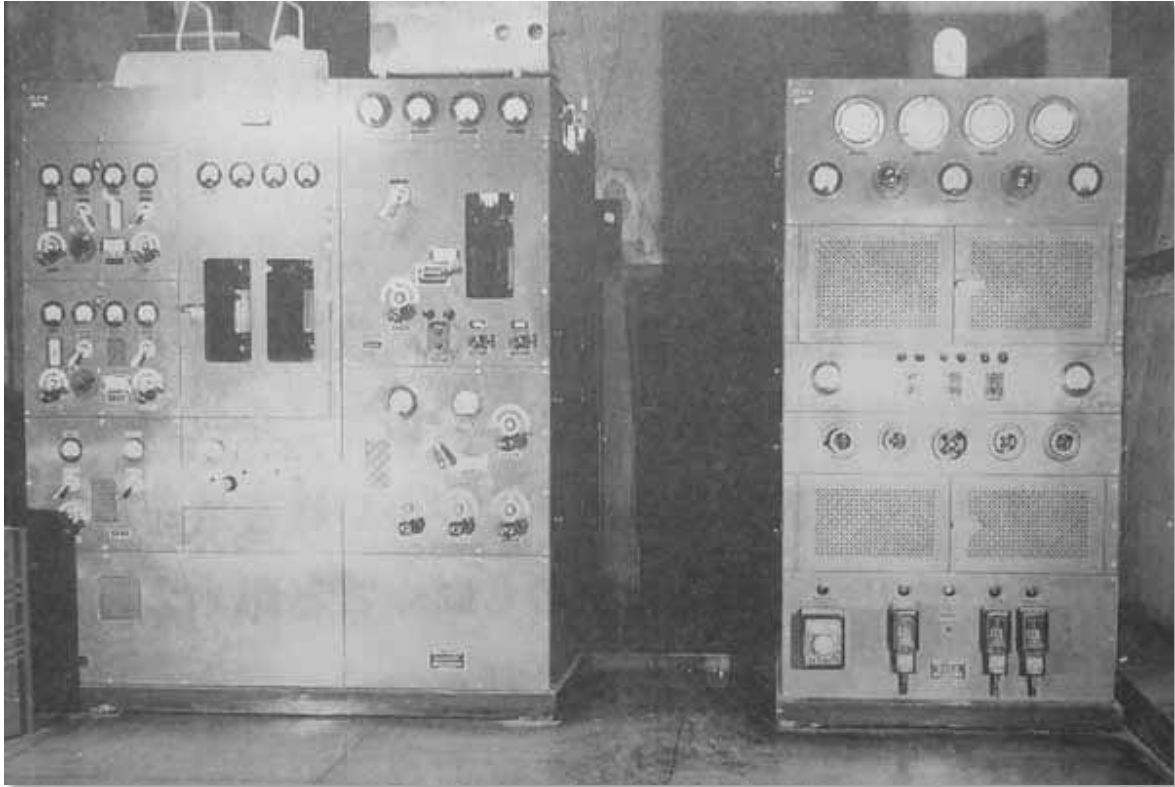
***) NHK-Tokyo broadcasts from “Shobu-Kuki Radio Transmitting Station” since 1982. But the shortwave outlet is called “NHK Shobu” for short.

Table 5
Contents of Test Transmission (Recorded in September 1978)

| Station (Location) | Contents |
|--------------------------------------|--|
| <p><u>Tokyo</u> (Kawaguchi)</p> | <p>Music title: Tokyo Ondo (folk dance song)</p> <hr/> <p>ID: Kochirawa JKI21, NHK Kawaguchi renraku chūkeiyō tampa desu. Tadaima shūhasū 6175 [rokusen hyaku nanajū go] kHz, shutsuryoku 900 [kyūhyaku] watto de ookurishite imasu.</p> <p><i>(Translation: This is JKI21, NHK Kawaguchi shortwave for communication and relay. We are now transmitting on a frequency of 6175 kHz with a power of 900 W.)</i></p> <p><i>Note: “kHz” is announced as “kīroherutsu”.</i></p> |
| <p><u>Osaka</u> (Mihara)</p> | <p>Music title: unknown (folk song)</p> <hr/> <p>ID: JKM21, JKM21, Kochirawa Mihara Koteikyoku desu. Tadaima shūhasū 6190 [rokusen hyaku kyūju] kHz, shutsuryoku 300 [sanbyaku] watto de shikendempa o hasshashite orimasu.</p> <p><i>(Translation: JKM21, JKM21, This is Mihara Fixed Station. We are now conducting a test transmission on a frequency of 6190 kHz with a power of 300 W.)</i></p> |
| <p><u>Nagoya</u> (Okehazama)</p> | <p>Music title: Kiso Bushi (folk song)</p> <hr/> <p>ID: JKD20, JKD20, JKD20, Kochirawa Okehazama Koteikyoku desu. Shūhasū 3970 [sanzen kyūhyaku nanaju] kHz, shutsuryoku 300 [sanbyaku] watto de shikendempa o hassha shiteorimasu.</p> <p><i>(Translation: JKD20, JKD20, JKD20, This is Okehazama Fixed Station. We are conducting a test transmission on a frequency of 3970 kHz with a power of 300 W.)</i></p> |
| <p><u>Hiroshima</u> (Gion)</p> | <p>Music title: unknown (folk song)</p> <hr/> <p>ID: JKG22, Kochirawa Gion Koteikyoku, shūhasū 9535 [kyūsen gohyaku sanjū go] kHz, shutsuryoku 600 [roppyaku] watto de tadaima shiken dempa hasshachū desu.</p> <p><i>(Translation: JKG22, This is Gion Fixed Station. We are now conducting a test transmission on a frequency of 9535 kHz with a power of 600 W.)</i></p> |

| | |
|------------------|--|
| <u>Matsuyama</u> | Music title: Nangoku Tosa o Atonishite (popular song) |
| (Harita) | ID: JKO21, JKO21, Kochirawa Harita Koteikyoku desu. Shūhasū 6005 [rokusen go] kc, shutsuryoku 600 [roppyaku] watto de dempa o hashashite orimasu. <i>(Translation: JKO21, JKO21, This is Harita Fixed Station. We are transmitting on a frequency of 6005 kc with a power of 600 W.)</i> |
| <u>Fukuoka</u> | Music title: Kuroda Bushi (folk song) |
| (Kasuga) | ID: JKP20, JKP20, Kochirawa Kasuga Koteikyoku desu. Shūhasū 3259 [sanzen nihyaku gojū kyū] kHz, shutsuryoku 600 [roppyaku] watto de tadaima shiken dempa o hasshachū desu. <i>(Translation: JKP20, JKP20, This is Kasuga Fixed Station. We are now conducting a test transmission on a frequency of 3259 kHz with a power of 600 W.)</i> |
| <u>Kumamoto</u> | Music title: Itsukino Komoriuta (folk song) |
| (Shimizu) | ID: JKQ21, Kochirawa Shimizu Koteikyoku, shūhasū wa 6130 [rokusen hyaku sanju] kHz, shutsuryoku 600 [roppyaku] watto desu. (repetition) <i>(Translation: JKQ21, This is Shimizu Fixed Station, on a frequency of 6130 kHz, with a power of 600 W.)</i> |
| <u>Sendai</u> | Music title: Tairyo Utaikomi (folk song) |
| (Haranomachi) | ID: JKS21, Haranomachi Koteikyoku. Shūhasū 6190 [rokusen hyaku kyūju] kHz. Tadaima shiken dempa o hashashite orimasu. <i>(Translation: JKS21, Haranomachi Fixed Station, we are now conducting a test transmission on a frequency of 6190 kHz.)</i> |
| <u>Sapporo</u> | Music title: Soran Bushi (folk song) |
| (Nopporo) | ID: JKU21, Kochirawa Nopporo Tampa Koteikyoku desu. Tadaima shūhasū 6005 [rokusen go] kHz, shutsuryoku 600 [roppyaku] watto de shiken dempa no hasshachū desu. (repetition) <i>(Translation: JKU21, This is Nopporo Shortwave Fixed Station. We are now conducting a test transmission on a frequency of 6005 kHz with a power of 600 W.)</i> |

Photo 1



900 W Transmitter of NHK-Tokyo at Kawaguchi Radio Transmitting Station (Date unknown)

Source: History of Kawaguchi and Hatogaya Radio Transmitting Stations
(NHK Transmission Engineering Center, 1996)

Photo 2



Shortwave antenna of NHK-Tokyo (Shobu-Kuki Radio Transmitting Station) in 1999