ENGLISH TRANSLATION

TELEMETER, TELECONTROL AND DATA TRANSMISSION RADIO EQUIPMENT FOR SPECIFIED LOW-POWER RADIO STATION

ARIB STANDARD

VERSION 1.1

ARIB STD-T67

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Association of Radio Industries and Businesses (ARIB)

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[1] There are a lot of difference between version 1.0 and the latest version of English translation of ARIB STD-T67. English expression had been just changed for the matter of English expression except for the changes which appear on the table of Standard revisions.

Introduction

The Association of Radio Industries and Businesses (ARIB) establishes basic requirements such as standard specifications for radio equipment relating to each system that uses radio waves and makes them 'standard' with the participation of radio equipment manufacturers, operators, broadcasters and users.

This standard is a private one that is based on two standards: a national technical standard for the purpose of effective use of radio frequencies and avoidance of interference among users, and a private optional standard for the purpose of convenience of radio equipment manufacturers and users.

This standard is established principally for “Telemeter, Telecontrol and Data Transmission Radio Equipment for Specified Low-Power Radio Station” through the integration of the following standards: “Data Transmission Radio Equipment (RCR STD-2),” “Telemeter/Telecontrol Radio Equipment (RCR STD-4),” “Telemeter/Telecontrol Radio Equipment for Specified Low-Power Radio Station (RCR STD-16),” “400 MHz Band Data Transmission Radio Equipment for Specified Low-Power Radio Station (RCR STD-17),” and “1,200 MHz Band Data Transmission Radio Equipment for Specified Low-Power Radio Station (RCR STD-18).” In order to ensure fairness, impartiality, and openness among all parties involved, during the drafting stages, we invited radio equipment manufacturers, telecommunications operators, broadcasting companies, test organizations, and users, both domestic and foreign, to participate openly in the activities of the Standard Assembly so as to develop standards with the total agreement of all parties involved.

We hope that this standard will aid all parties involved, including radio equipment manufacturers, test organizations, users, and other interested parties.

Contents

Chapter 1. General

1.1 Overview

Among the specified low-power radio stations defined in Article 6 of the Regulations for Enforcement of the Radio Law, this standard provides for telemetry radio equipment designed to automatically indicate and/or record the results obtained by measuring instruments located remotely by means of radio waves; telecontrol radio equipment for the transmission of signals to activate, change, or deactivate the functions of devices located remotely by means of radio waves; and data transmission radio equipment intended for the transmission of information to be processed primarily by machines, or of previously processed information.

1.2 Scope of application

Telemetry, telecontrol and data transmission radio stations are composed of radio equipment and associated equipment (including that connected to telecommunications circuit facilities), as illustrated in Figure 1.1. This standard provides for that radio equipment.

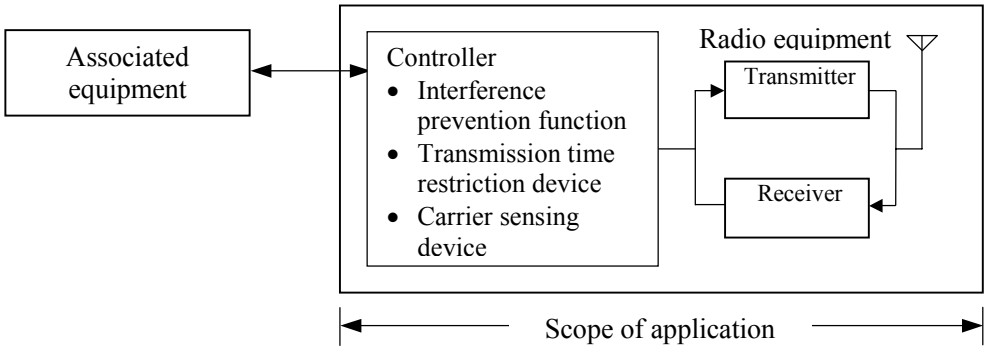

Figure 1.1 Configuration of Telemetry, Telecontrol and Data Transmission Radio Equipment

1.3 Conforming documents

In this standard, “Enforcement” refers to Regulations for Enforcement of the Radio Law, “Equipment” refers to Ordinance Regulating Radio Equipment, “Technical Conformity” refers to Ordinance Concerning Technical Regulations Conformity Certification etc. of Specified Radio Equipment, “Terminal” refers to Ordinance Concerning Terminal Facilities etc., “Terminal Technical Approval” refers to Rules Concerning the Technical Conditions Compliance Approval etc. for Terminal Equipment, and “Notification” refers to a Notification of the Ministry of Posts and Telecommunications if issued in 2000 or earlier, and a Notification of the Ministry of Internal Affairs and Communications if issued in 2001 or later.

Chapter 2. Standard Systems

2.1 Configurations of Standard System

Figure 2.1 represents the configurations of standard system, which are divided into the basic type and the extended-area type.

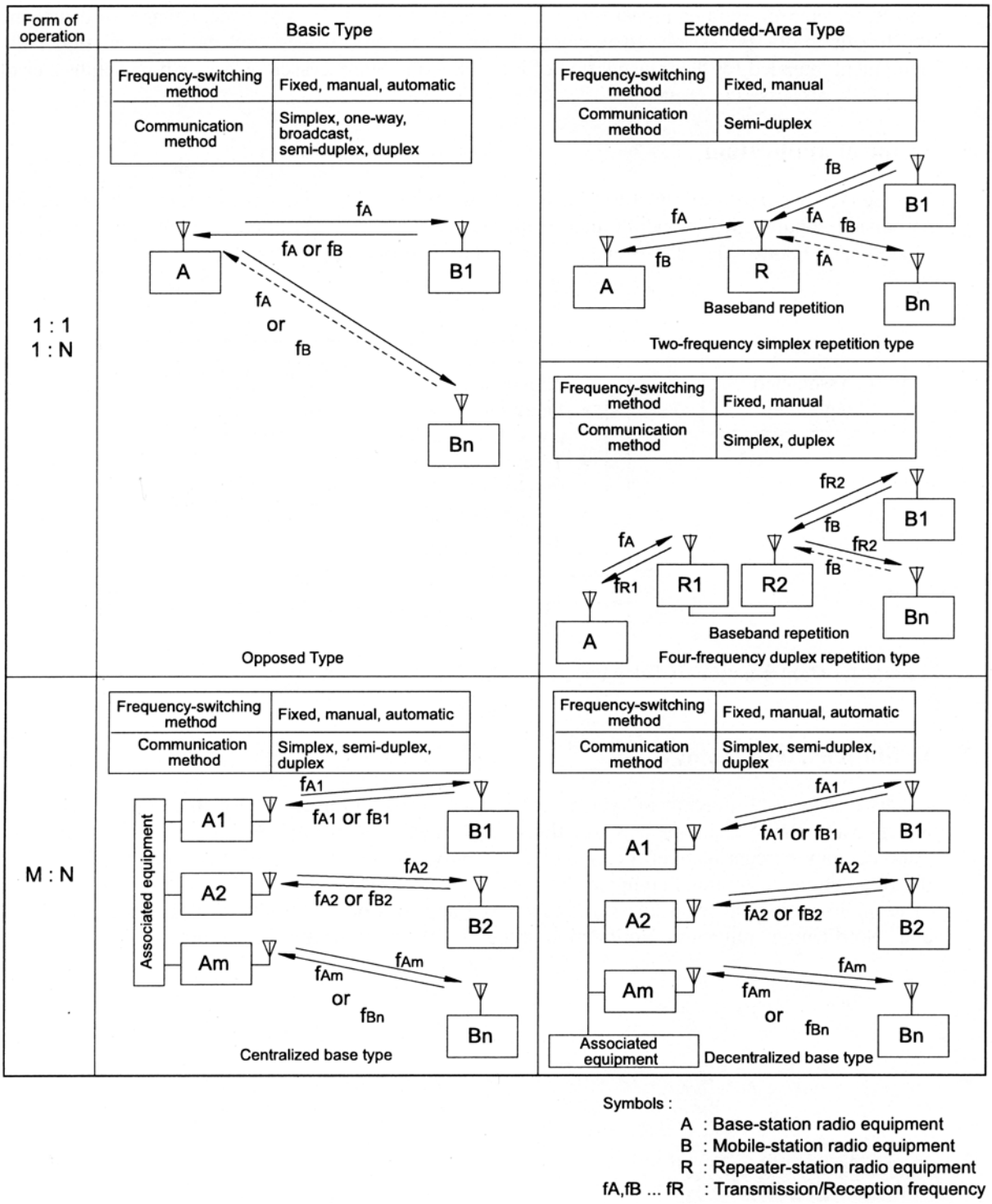

Figure 2.1 Configurations of Standard System

2.2 Operation forms of standard system

The standard system of the telemetry, telecontrol and data transmission radio equipment is operated as described below.

(1) Basic 1:1 type
The basic 1:1 type enables one-on-one basis in the point to point communication.
a. For one-way communication and simplex operation, the frequencies defined for such communication methods shall be used.
b. For duplex operation, the paired frequencies defined for such methods or semi-duplex operation shall be used.

(2) Basic 1:N type
The basic 1:N type allows multiple mobile stations to communicate with one unit of base-station radio equipment in the point to multi-point communication. In either communication method, the downlink lines to multiple mobile stations use the same frequency, while the following frequencies are available for the uplink lines from the mobile stations:
a. For simplex operation and broadcast communication, the frequencies defined for one-way communication or simplex operation shall be used (if a simplex operation employs a different transmission frequency from that of the base station, the mobile stations shall be equipped with a receiver capable of receiving that transmission frequency to perform carrier sensing).
b. For duplex operation, frequencies paired to the base station shall be used.

(3) Basic M: N type
The basic M: N type is a centralized base type composed of multiple units of radio equipment that are installed at the same location and are controlled by one unit of associated equipment. It allows simultaneous communication with multiple mobile stations, and also enables the mobile stations to communication among themselves through the repetition by the centralized-base-type radio equipment.

(4) Extended-area 1:1 and 1:N types
In the extended-area type, a repeater station is provided for the purpose of extending the service area. This type is subdivided into the "Two-frequency simplex repetition type," which consists of one unit of duplex operation radio equipment, and the "Four-frequency duplex repetition type," which is composed of two units of duplex operation radio equipment.

The two-frequency simplex repetition type is a two-frequency simplex operation that uses the two frequencies of a duplex operation and enables semi-duplex operation between the base station and a mobile station, and also between mobile stations.

The four-frequency duplex repetition type uses the four frequencies of two different duplex operation in communications between the base station and the repeater station and between the repeater station and the mobile stations, thereby enabling simplex or duplex operation. However, if automatic control is adopted with loopback from R2, communication can also be held between the mobile stations by the simplex operation.

It is necessary that the repetition is carried out on the baseband level, and the repeater station performs carrier sensing prior to the repetition.

(5) Extended-area M: N type
Unlike the system described in Item (3) above, which is of the centralized base type that places multiple units of radio equipment in a single centralized location, the extended-area M: N type is a decentralized base type in which multiple units of radio equipment are installed in a scattered fashion. Other than the layout of the base stations, the rest of operation is exactly the same as in Item (3).

Chapter 3. Technical Conditions of Radio Equipment

3.1 General conditions

(1) Communication method (Notification: No. 42 in 1989)
The communication method shall be that defined in Table 3.1.

(2) Communication contents (Notification: No. 42 in 1989)
The Communication contents shall be suitable for the transfer of telemetry, telecontrol, and data-transmission signals.

(3) Emission classes (Notification: No. 42 in 1989)
The emission classes shall be F1D, F1F, F2D, F2F, F7D, F7F, G1D, G1F, G2D, G2F, G7D, G7F, D1D, D1F, D2D, D2F, D7D or D7F.

(4) Operating frequencies
The operating frequencies shall be those defined in Tables 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, and 3.7.

(5) Frequency-switching method
The frequency-switching method shall be of the fixed, manual, or automatic type.

(6) Ambient conditions
This standard does not provide for the ambient conditions.

Table 3.1 Emission Classes, Communication Method, Operating Frequencies and Antenna Powers

<table>
<tr><th>Emission Class</th><th>Communication Method</th><th>Operating Frequency Band (MHz)</th><th>Antenna Power (W)</th><th>Channel No., Operating Frequency and Transmission Time restriction</th></tr>
<tr><td rowspan="14">F1D,F1F,
F2D,F2F,
F7D,F7F,
G1D,G1F,
G2D,G2F,
G7D,G7F,
D1D,D1F,
D2D,D2F,
D7D or
D7F</td><td rowspan="4">One-way communication , Simplex operation , or Broadcast communication</td><td>426.0250～426.1375
(12.5-kHz interval)</td><td rowspan="2">0.001 W
or less</td><td>Table 3.2</td></tr>
<tr><td>426.0375～426.1125
(25-kHz interval)</td><td>Table 3.3</td></tr>
<tr><td>429.1750～429.2375
(12.5-kHz interval)</td><td rowspan="10">0.01 W
or less</td><td rowspan="2">Table 3.4</td></tr>
<tr><td>429.2500～429.7375
(12.5-kHz interval)</td></tr>
<tr><td rowspan="10">One-way communication, Simplex operation , Broadcast communication, Semi-duplex operation or Duplex operation</td><td>429.8125～429.9250
(12.5-kHz interval)</td><td rowspan="4">Table 3.5</td></tr>
<tr><td>449.7125～449.8250
(12.5-kHz interval)</td></tr>
<tr><td>449.8375～449.8875
(12.5-kHz interval)</td></tr>
<tr><td>469.4375～469.4875
(12.5-kHz interval)</td></tr>
<tr><td>1216.000～1217.000
(50-kHz interval)</td><td rowspan="2">Table 3.6</td></tr>
<tr><td>1252.000～1253.000
(50-kHz interval)</td></tr>
<tr><td>1216.0125～1216.9875
(25-kHz interval)</td><td rowspan="2">Table 3.7</td></tr>
<tr><td>1252.0125～1252.9875
(25-kHz interval)</td></tr>
</table>

Table 3.2 Channel No., Operating Frequency and Transmission Time restriction
(Radio Equipment with Occupied Bandwidth of 8.5 kHz or less)

Channel No.	Operating Frequency (MHz)	Transmission Time restriction (Transmission Continuous Time, Transmission Quiescence Time)
1	426.0250	Transmission Continuous Time : 40 seconds, Transmission Quiescence Time : 2 seconds (Telemetry, data transmission) Transmission Continuous Time : 5 seconds, Transmission Quiescence Time : 2 seconds (Telecontrol, data transmission)
2	426.0375	
3	426.0500	
4	426.0625	
5	426.0750	
6	426.0875	
7	426.1000	
8	426.1125	
9	426.1250	
10	426.1375	

Table 3.3 Channel No., Operating Frequency and Transmission Time restriction
(Radio Equipment with Occupied Bandwidth Over 8.5 kHz and up to 16 kHz)

Channel No.	Operating Frequency (MHz)	Transmission Time restriction (Transmission Continuous Time, Transmission Quiescence Time)
1	426.0375	Transmission Continuous Time : 40 seconds, Transmission Quiescence Time : 2 seconds (Telemetry, data transmission) Transmission Continuous Time : 5 seconds, Transmission Quiescence Time : 2 seconds (Telecontrol, data transmission)
2	426.0625	
3	426.0875	
4	426.1125	

Table 3.4 Channel No., Operating Frequency and Transmission Time restriction
(Radio Equipment with Occupied Bandwidth of 8.5 kHz or less)

Channel No.	Operating Frequency (MHz)	Transmission Time restriction (Transmission Continuous Time, Transmission Quiescence Time)
1	429.1750	Transmission Continuous Time : 40 seconds, Transmission Quiescence Time : 2 seconds
2	429.1875	
3	429.2000	
4	429.2125	
5	429.2250	
6	429.2375	
7	429.2500	Continuous transmission (Intermittent communication possible)
8	429.2625	
9	429.2750	
10	429.2875	
11	429.3000	
12	429.3125	
13	429.3250	
14	429.3375	
15	429.3500	
16	429.3625	
17	429.3750	
18	429.3875	
19	429.4000	
20	429.4125	
21	429.4250	
22	429.4375	
23	429.4500	
24	429.4625	
25	429.4750	
26	429.4875	
27	429.5000	
28	429.5125	
29	429.5250	
30	429.5375	
31	429.5500	
32	429.5625	
33	429.5750	
34	429.5875	
35	429.6000	
36	429.6125	
37	429.6250	
38	429.6375	
39	429.6500	
40	429.6625	
41	429.6750	
42	429.6875	
43	429.7000	
44	429.7125	
45	429.7250	
46	429.7375	

Table 3.5 Channel No., Operating Frequency and Transmission Time restriction
(Radio Equipment with Occupied Bandwidth of 8.5 kHz or less)

<table>
<tr><th rowspan="2">Channel No.</th><th colspan="3" rowspan="2">Operating Frequency
(MHz)</th><th rowspan="2">Transmission Time restriction
(Transmission Continuous Time,
Transmission Quiescence Time)</th></tr>
<tr></tr>
<tr><td>1</td><td>429.8125</td><td>449.7125</td><td rowspan="10"></td><td rowspan="9">Transmission Continuous Time : 40 seconds,
Transmission Quiescence Time : 2 seconds</td></tr>
<tr><td>2</td><td>429.8250</td><td>449.7250</td></tr>
<tr><td>3</td><td>429.8375</td><td>449.7375</td></tr>
<tr><td>4</td><td>429.8500</td><td>449.7500</td></tr>
<tr><td>5</td><td>429.8625</td><td>449.7625</td></tr>
<tr><td>6</td><td>429.8750</td><td>449.7750</td></tr>
<tr><td>7</td><td>429.8875</td><td>449.7875</td></tr>
<tr><td>8</td><td>429.9000</td><td>449.8000</td></tr>
<tr><td>9</td><td>429.9125</td><td>449.8125</td></tr>
<tr><td>10</td><td>429.9250</td><td>449.8250</td><td>Transmission Continuous Time : 0.2 seconds,
Transmission Quiescence Time : 2 seconds</td></tr>
<tr><td>11</td><td rowspan="5"></td><td>449.8375</td><td>469.4375</td><td rowspan="4">Transmission Continuous Time : 40 seconds,
Transmission Quiescence Time : 2 seconds</td></tr>
<tr><td>12</td><td>449.8500</td><td>469.4500</td></tr>
<tr><td>13</td><td>449.8625</td><td>469.4625</td></tr>
<tr><td>14</td><td>449.8750</td><td>469.4750</td></tr>
<tr><td>15</td><td>449.8875</td><td>469.4875</td><td>Transmission Continuous Time : 0.2 seconds,
Transmission Quiescence Time : 2 seconds</td></tr>
</table>

Note 1: The four frequencies of Channel No. 10 and 15 shall be used for the frequency control channels.

Note 2: For the data channels of the duplex or semi-duplex operation, the paired frequencies of the same channel No. shall be used, excluding the four frequencies of Channel No. 10 and 15.

Table 3.6 Channel No., Operating Frequency and Transmission Time restriction
(Radio Equipment with Occupied Bandwidth of 32 kHz or less)

Channel No.	Operating Frequency (MHz)		Transmission Time restriction (Transmission Continuous Time, Transmission Quiescence Time)
1	1216.0000	1252.0000	Transmission Continuous Time : 0.2 seconds, Transmission Quiescence Time : 2 seconds
2	1216.0500	1252.0500	Continuous transmission (Intermittent communication possible)
3	1216.1000	1252.1000	
4	1216.1500	1252.1500	
5	1216.2000	1252.2000	
6	1216.2500	1252.2500	
7	1216.3000	1252.3000	
8	1216.3500	1252.3500	
9	1216.4000	1252.4000	
10	1216.4500	1252.4500	
11	1216.5000	1252.5000	
12	1216.5500	1252.5500	Transmission Continuous Time : 40 seconds, Transmission Quiescence Time : 2 seconds
13	1216.6000	1252.6000	
14	1216.6500	1252.6500	
15	1216.7000	1252.7000	
16	1216.7500	1252.7500	
17	1216.8000	1252.8000	
18	1216.8500	1252.8500	
19	1216.9000	1252.9000	
20	1216.9500	1252.9500	
21	1217.0000	1253.0000	

Note 1: The two frequencies of Channel No. 1 shall be used for the frequency control channels.
Note 2: As far as possible, the transmission frequencies of base stations shall range from 1216.0000 MHz to 1217.0000 MHz.
Note 3: For the data channels of the duplex or semi-duplex operation, the paired frequencies of the same channel No. shall be used, excluding the two frequencies of Channel No. 1.

Table 3.7 Channel No., Operating Frequency and Transmission Time restriction
(Radio Equipment with Occupied Bandwidth of 16 kHz or less)

Channel No.	Operating Frequency (MHz)		Transmission Time restriction (Transmission Continuous Time, Transmission Quiescence Time)
1	1216.0125	1252.0125	Transmission Continuous Time : 0.2 seconds, Transmission Quiescence Time : 2 seconds
2	1216.0375	1252.0375	Continuous transmission (Intermittent communication possible)
3	1216.0625	1252.0625	
4	1216.0875	1252.0875	
5	1216.1125	1252.1125	
6	1216.1375	1252.1375	
7	1216.1625	1252.1625	
8	1216.1875	1252.1875	
9	1216.2125	1252.2125	
10	1216.2375	1252.2375	
11	1216.2625	1252.2625	
12	1216.2875	1252.2875	
13	1216.3125	1252.3125	
14	1216.3375	1252.3375	
15	1216.3625	1252.3625	
16	1216.3875	1252.3875	
17	1216.4125	1252.4125	
18	1216.4375	1252.4375	
19	1216.4625	1252.4625	
20	1216.4875	1252.4875	
21	1216.5125	1252.5125	Transmission Continuous Time : 0.2 seconds, Transmission Quiescence Time : 2 seconds
22	1216.5375	1252.5375	Transmission Continuous Time : 40 seconds, Transmission Quiescence Time : 2 seconds
23	1216.5625	1252.5625	
24	1216.5875	1252.5875	
25	1216.6125	1252.6125	
26	1216.6375	1252.6375	
27	1216.6625	1252.6625	
28	1216.6875	1252.6875	
29	1216.7125	1252.7125	
30	1216.7375	1252.7375	
31	1216.7625	1252.7625	
32	1216.7875	1252.7875	
33	1216.8125	1252.8125	
34	1216.8375	1252.8375	
35	1216.8625	1252.8625	
36	1216.8875	1252.8875	
37	1216.9125	1252.9125	
38	1216.9375	1252.9375	
39	1216.9625	1252.9625	
40	1216.9875	1252.9875	

Note 1: The four frequencies of Channel No.1 and 21 shall be used for the frequency control channels.

Note 2: As far as possible, the transmission frequencies of base stations shall range from 1216.0125 MHz to 1216.9875 MHz.

Note 3: For the data channels of the duplex or semi-duplex operation, the paired frequencies of the same channel No. shall be used, excluding the four frequencies of Channel No. 1 and 21.

3.2 Transmitter

(1) Antenna power (Notification: No. 42 in 1989)
The antenna power (the specified or rated power that is supplied from the transmitter to the feeder of an antenna system in normal operation and is averaged over a sufficiently long period of time compared to the cycle of the lowest frequency) shall be 0.01 W or less. However, for transmission units using a frequency between 426.025 MHz and 426.1375 MHz, the antenna power shall be 0.001 W or less.

(2) Tolerances for antenna power (Equipment: Article 14)
The tolerances for antenna power (the maximum allowable deviation from the specified or rated antenna power) shall be +20% to -50%.

(3) Oscillation method (Equipment: Article 49.14)
The oscillation method shall be the crystal oscillation method or the synthesizer method which uses crystal oscillation to control the oscillation frequency.

(4) Frequency tolerance (Equipment: Article 5)
(Notification: No. 50 in 1989)
The frequency tolerance (the maximum allowable deviation of the center frequency of the band occupied by emission from the allocated frequency) shall be $\pm 4 \times 10^{-6}$, measured as an average value, with respect to the standard coded test signal (a signal of repetitive binary pseudo-noise with a code length of 511 bits) taken as the modulating input signal. However, for transmitters operating in the 1,200-MHz band with channel interval of 25 kHz, the frequency tolerance shall be $\pm 3 \times 10^{-6}$.

For transmitters having a function for sending non-modulated carriers, the frequency tolerance may be measured on those carriers.

(5) Modulation method
The modulation method shall be one that conforms to the emission classes specified in 3.1 (3).

(6) Frequency deviation
This standard does not provide frequency deviation.

(7) Modulation rate
This standard does not provide modulation rates.

(8) Coding type
This standard does not provide coding type.

(9) Adjacent-channel leakage power (Equipment: Article 49.14)
(Notification: No. 49 in 1989)

a. As for the adjacent-channel leakage power in the 400MHz band (the power radiated in a certain band of the adjacent channel separated from the carrier frequency at the specified frequency interval), the power radiated into the ±4.25 kHz band of the frequency 12.5 kHz distant from the carrier frequency shall be lower than the carrier power by 40 dB or more, when modulation is performed using the standard coded test signal at the same transmission speed as that of the modulation signal. However, for transmitters that emit radio waves in an occupied bandwidth over 8.5 kHz and up to 16 kHz, the power radiated into the ±8 kHz band of the frequency 25 kHz distant from the carrier frequency shall be lower than the carrier power by 40 dB or more.

b. As for the adjacent-channel leakage power in the 1,200MHz band, the power radiated into the ±16 kHz band of the frequency 50 kHz distant from the carrier frequency shall be lower than the carrier power by 40 dB or more for transmitters with channel interval of 50 kHz, and the power radiated into the ±8 kHz band of the frequency 25 kHz distant from the carrier frequency shall be lower than the carrier power by 40 dB or more for transmitters with channel interval of 25 kHz when, in both cases, the modulation is performed using the standard coded test signal at the same

transmission speed as that of the modulation signal.

(10) Permissible value for occupied bandwidth (Equipment: Article 6)
(Notification: No. 51 in 1989)

a. The permissible value for a occupied bandwidth (the bandwidth such that the mean powers radiated below its lower-frequency limit and above its upper-frequency limit are each equal to 0.5% of the total mean power radiated by a given emission) in the 400MHz band shall be 8.5 kHz when the modulation is performed using the standard coded test signal at the same transmission speed as that of the modulation signal. However, for transmitters emitting radio waves in an occupied bandwidth over 8.5 kHz and up to 16 kHz, the value shall be 16 kHz.
b. The permissible value for a occupied bandwidth in the 1,200MHz band shall be 32 kHz for transmitters with channel interval of 50 kHz, and 16 kHz for those with channel interval of 25 kHz when, in both cases, the modulation is performed using the standard coded test signal at the same transmission speed as that of the modulation signal.

(11) Permissible value of intensity of spurious emission or unwanted emission

a. Definitions (Enforcement: Article 2.1)
(Equipment: Table 3)

"Spurious emission" refers to the emission on a frequency or frequencies which are outside the permitted bandwidth and the level of which may be reduced without affecting the corresponding transmission of information, including a high-harmonic emission, a low-harmonic emission, a parasitic emission and an intermodulation product but excluding an out-of-band emission. (Enforcement: Article 2.1.63)

"Out-of-band emission" refers to the emission which results from the modulation process on a frequency or frequencies outside the permitted bandwidth. (Enforcement: Article 2.1.63-2)

"Unwanted emission" refers to the emission consisting of the spurious emission and the out-band emission. (Enforcement: Article 2.1.63-3)

"Spurious domain" refers to the frequency range immediately outside the out-of-band domain in which spurious emissions generally predominate. (Enforcement: Article 2.1.63-4)

"Out-of-band domain" refers to the frequency range immediately outside the necessary bandwidth in which out-of-band emissions generally predominate.
(Enforcement: Article 2.1.63-5)

"Permissible value of spurious emission intensity" refers to the permissible value defined according to the mean power of the spurious emissions of each non-modulated frequency supplied to the feeder. (Equipment: Table 3 Item 1 (1))

"Permissible value of the unwanted emission intensity" refers to the permissible value defined according to the mean power of unwanted emissions of each modulated frequency supplied to the feeder. (Equipment: Table 3 Item 1 (2))

b. Permissible values applied after December 1, 2005

The permissible value of the intensity of spurious emissions in the out-of-band domain and the permissible value of the intensity of unwanted emissions in the spurious domain shall be 2.5 μW or lower, as measured in the average power.

Transitional measures are able to be applied.

(Equipment: Supplementary Provisions (MPT Ordinance No. 119 issued on August 9, 2005))

c. Permissible values based on the Ordinance Regulating Radio Equipment before November 30, 2005

(11) Permissible value for spurious emission intensity (Equipment: Article 7)

The permissible value for the intensity of spurious emissions (the emission of radio waves at one or more frequencies outside the necessary frequency band, the level of which can be reduced without affecting information transmission, including harmonic emissions, subharmonic emissions, parasitic emissions, and intermodulation products, but not including the emission of radio waves at frequencies in the proximity of the necessary frequency band that results from the modulation process for information transmission) shall be 2.5 μW or less, as measured in the average power, when the modulation is performed using the standard coded test signal at the same transmission speed as that of the modulation signal.

For transmission units having a function for sending non-modulated carriers, the value

may be measured on those carriers. (ARIB STD-T67 Version 1.0)

(12) Transmission rise time and fall time
This standard does not provide transmission rise time and fall time.

3.3 Receiver

(1) Encoding reference sensitivity
The encoding reference sensitivity (the necessary receiver input voltage such that the output bit error rate of the device will be 1 x 10^{-2} when the desired wave modulated by the standard coded test signal at the same transmission speed as that of the transmitter is applied) shall be 2 μV or less for receivers with channel intervals of 12.5 kHz and 25 kHz, and 2.8 μV or less for receivers with channel interval of 50 kHz.

(2) Spurious response at effective selectivity
The spurious response at effective selectivity (the ratio of the jamming wave input voltage to the encoding reference sensitivity as the output bit error rate of the device becomes 1 x 10^{-2} when a non-modulated jamming wave is applied in a state in which a desired wave input voltage 3 dB higher than the encoding reference sensitivity is applied) shall be 40 dB or more.

(3) Adjacent-channel selectivity at effective selectivity
a. The adjacent-channel selectivity at effective selectivity in the 400MHz band (the ratio of the jamming wave input voltage to the encoding reference sensitivity as the output bit error rate of the device becomes 1 x 10^{-2} when a jamming wave that is modulated by a signal of repetitive binary pseudo-noise with a code length of 32767 bits and is 12.5 kHz or 25 kHz distant from the desired wave is applied to a device with channel interval of 12.5 kHz or 25 kHz, respectively, in a state in which the desired wave input voltage 3 dB higher than the encoding reference sensitivity is applied) shall be 30 dB or more.

b. The adjacent-channel selectivity at effective selectivity in the 1,200MHz band (the ratio of the jamming wave input voltage to the encoding reference sensitivity as the output bit error rate of the device becomes 1 x 10^{-2} when a jamming wave that is modulated by a signal of repetitive binary pseudo-noise with a code length of 32767 bits and is 50 kHz or 25 kHz distant from the desired wave is applied to a device with channel interval of 50 kHz or 25 kHz, respectively, in a state in which the desired wave input voltage 3 dB higher than the encoding reference sensitivity is applied) shall be 40 dB or more.

(4) Frequency drift of the local oscillator
The frequency drift (the maximum width of drift at the oscillation frequency of a local oscillator) of the local oscillator shall be within ±4 x 10^{-6} for a receiver operating in the 400MHz or 1,200MHz band with channel interval of 50 kHz. However, for receivers operating in the 1,200MHz band with channel interval of 25 kHz, the frequency drift shall be within ±3 x 10^{-6}.

(5) Limit on Secondary Radiated Emissions (Equipment: Article 24)
That limit on secondary emissions radiated from the receiving equipment shall be, in terms of the power of a dummy antenna circuit that has the same electrical constant as the receiving antenna, 4 nW or lower as measured using the circuit.

3.4 Controller

The controller shall be equipped with the following units and functions, and shall conform to the respective conditions:

(1) Interference prevention function (Enforcement: Article 6.2)
(Equipment: Article 9.4)

a. When connected to a telecommunications circuit
   Function for automatically transmitting or receiving an identification sign (sign designed to identify the remote party of communication but which is not an identification signal as prescribed in Article 8.1.3 of the Radio Law; hereinafter) in the radio equipment of a radio station used primarily on the same premises

b. When not connected to a telecommunications circuit
   Function of 1) or 2) below:
   1) Function for automatically transmitting or receiving an identification sign in the radio equipment of a radio station used primarily on the same premises
   2) Function for enabling the user to switch frequencies or easily deactivate radio-frequency transmission

(2) Identification of the opposite party of communication
The controller connected to telecommunications circuit facilities shall detect the identification sign for the radio station of the opposite party of communication from the received radio waves.

(3) Transmission time restricting device (Notification: No. 49 in 1989)
The transmission time restricting device (device having a function for stopping emission radiation within a transmission time indicated below after the emissions are radiated and for transmitting the subsequent emissions only after the transmission quiescence time has passed, or a function for automatically limiting the communication time to within the time indicated below and for resuming the subsequent communication only after a certain transmission quiescence time has elapsed following the end of the communication) shall restrict the transmission time and transmission quiescence time as specified below. However, a controller operating at a frequency between 429.25 MHz and 429.7375 MHz, between 1216.0375 MHz and 1216.5 MHz, or between 1252.0375 MHz and 1252.5 MHz shall not be required a transmission time restricting device.

a. The transmission time of the telemetry, telecontrol, and data transmission equipment shall be within 40 seconds. However, the transmission time of the telecontrol (including the data transmission annexed thereto) which uses emissions of a frequency in a range of higher than 426.025 MHz to 426.1375 MHz shall be 5 seconds, and the transmission time restricting device shall be capable of re-transmitting the emissions without having any transmission quiescence time only within 5 continuous seconds of the emission radiation after stopping the emission radiation. Figure 3.1 graphically represents the transmission times of telecontrol equipment (including the data transmission annexed thereto) using radio waves at a frequency between 426.025 MHz and 426.1375 MHz.
b. When a frequency control channel is used, the transmission time shall be within 0.2 second.
c. The transmission quiescence time shall be 2 seconds or longer.

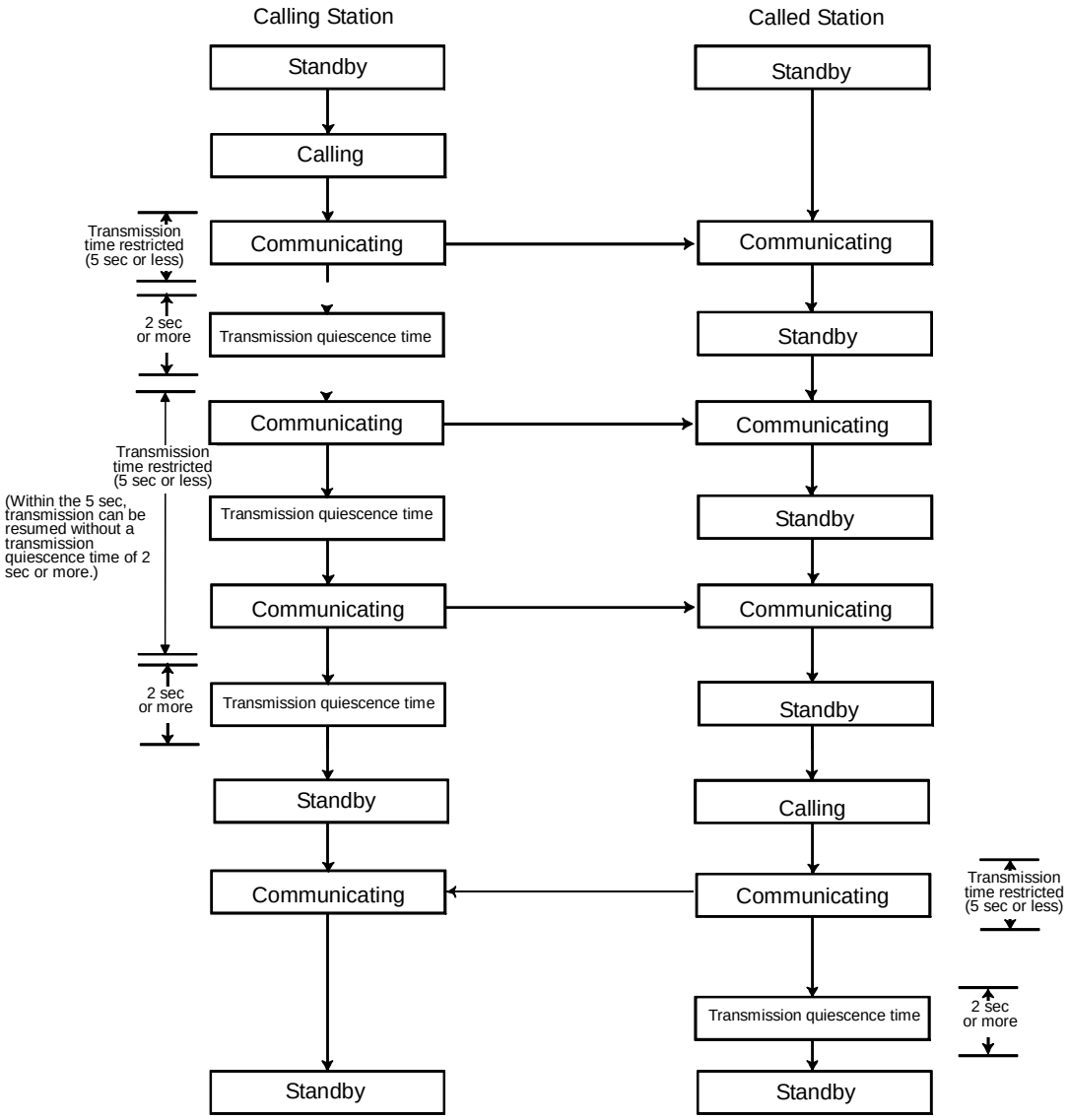

Figure 3.1 Sample Transmission Times in a Simplex Operation
(426MHz Band Telecontrol with Including the Data Transmission Annexed Thereto)

(4) Carrier sensing device (Notification: No. 49 in 1989)

Radio equipment shall be equipped with the carrier sensing device. However, radio equipment using radio waves at a frequency between 426.025 MHz and 426.1375 MHz shall not be required to be equipped with this device. When the carrier sensing device receives a radio wave from another radio station before a radio communication channel is established, it shall not radiate emissions of the same frequency (if the communication method of the carrier sensing device is duplex operation or semi-duplex operation, the transmission frequency corresponding to the receiving frequency) as that which the said radio station radiates.

A circuit shall be considered idle when the voltage induced in an antenna with an absolute gain of 2.14 dB is 7 μV in the 400MHz band, or 4.47 μV in the 1,200MHz band, and the response time shall be within 20 ms.

(5) Examples of channel connection procedures

Figures 3.2, 3.3 and 3.4 show examples of channel connection procedures when the frequency-switching method is of the fixed or manual type, and Figure 3.5 shows an example of a channel connection procedure when the automatic frequency-switching method is adopted.

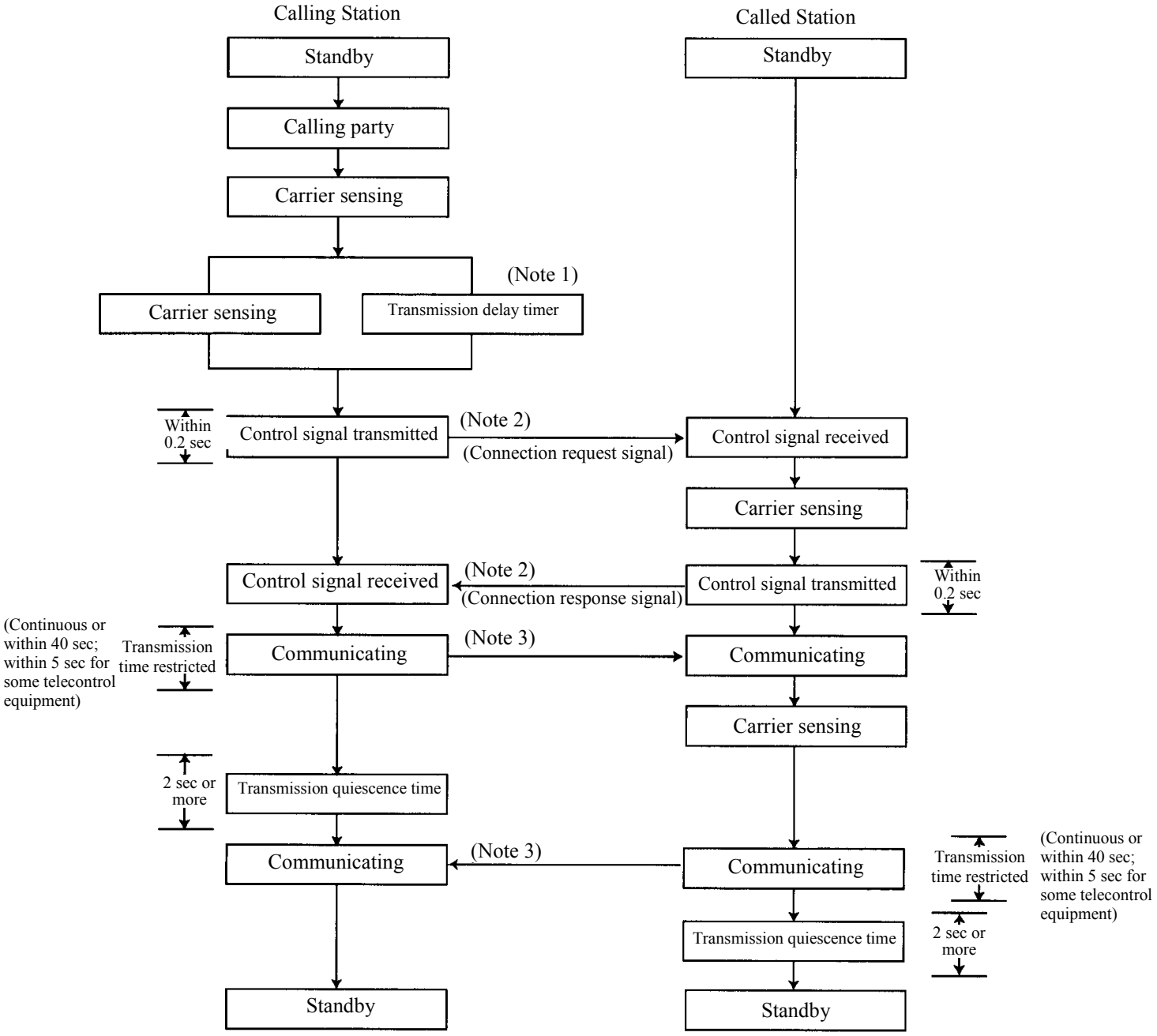

Figure 3.2 Example of the Channel Connection Procedure in a Simplex Operation (Fixed and Manual Channel Switching)

Note 1: Channel connection conditions

(1) Connection request signal transmission timing
Transmission after the elapse of a randomized transmission delay time (any of 0 sec, 0.2 sec, 0.4 sec, 0.6 sec, or 0.8 sec)

(2) Time from the elapse of the transmission delay time until the start of transmission 0.02 sec or less

Note 2: Control-signal system

(1)	Control signal	Digital system
(2)	Control-signal format	Not specified
(3)	Control-signal transmission time	0.2 sec or less
(4)	Control-signal transmission rise time and fall time	0.01 sec or less
(5)	Control-signal recycle count	One
(6)	Control-signal recycling interval	0.3 sec to 1 sec

Note 3: Execution of carrier sensing

Carrier sensing shall be executed prior to the start of communication. However, if communication is initiated by a channel connection procedure that exchanges disconnection signals, carrier sensing shall be executed only when a control signal for connection request or connection response is transmitted, and the carrier sensing may be omitted in the other phases of the communication.

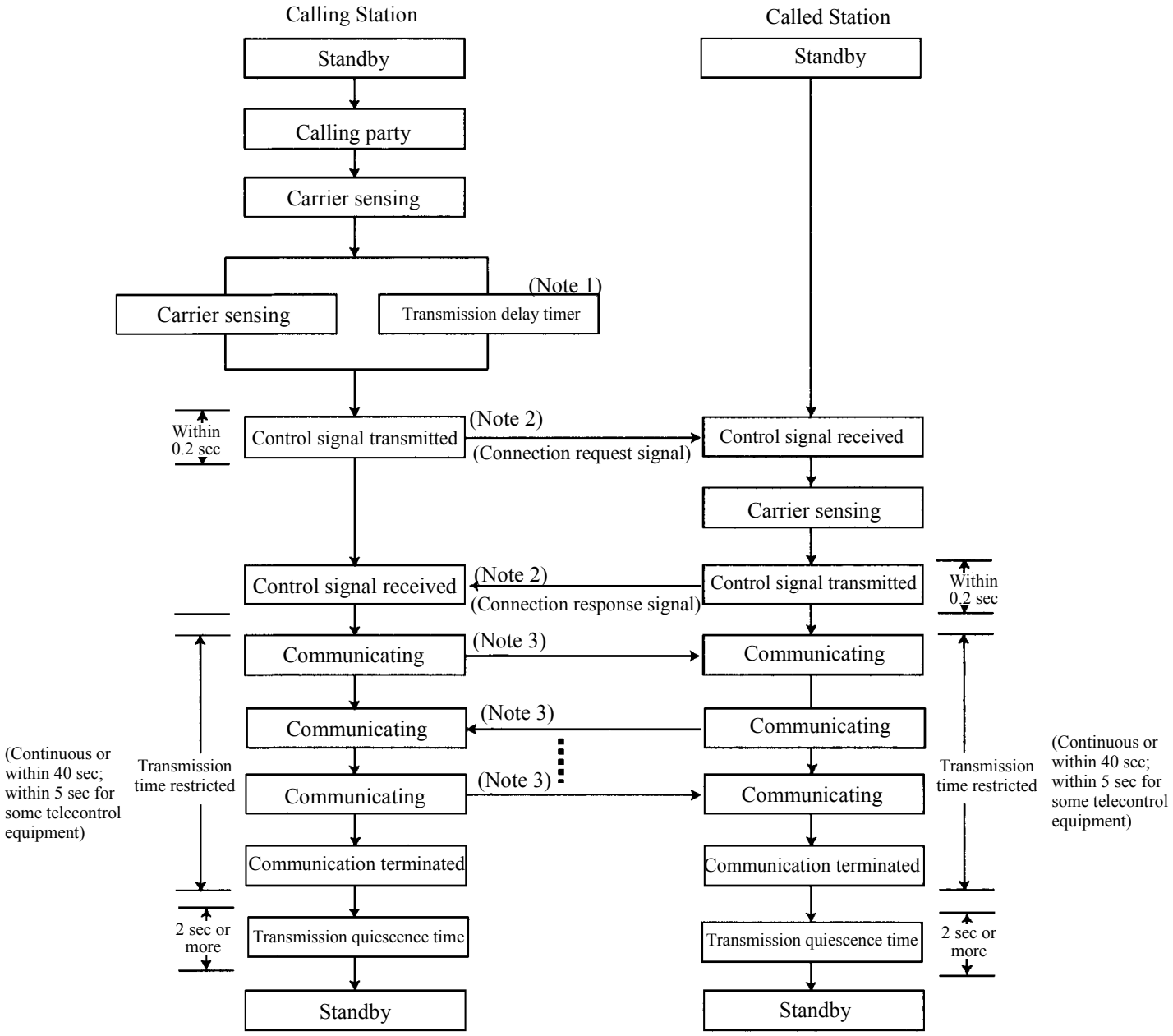

Figure 3.3 Example of the Channel Connection Procedure in a Simplex Operation
(Fixed and Manual Channel Switching)

Note 1: Channel connection conditions

(1) Connection request signal transmission timing
Transmission after the elapse of a randomized transmission delay time (any of 0 sec, 0.2 sec, 0.4 sec, 0.6 sec, or 0.8 sec)

(2) Time from the elapse of the transmission delay time until the start of transmission
0.02 sec or less

Note 2: Control-signal system

(1)	Control signal	Digital system
(2)	Control-signal format	Not specified
(3)	Control-signal transmission time	0.2 sec or less
(4)	Control-signal transmission rise time and fall time	0.01 sec or less
(5)	Control-signal recycle count	One
(6)	Control-signal recycling interval	0.3 sec to 1 sec

Note 3: Execution of carrier sensing

Carrier sensing shall be executed prior to the start of communication. However, if communication is initiated by a channel connection procedure that exchanges disconnection signals, carrier sensing shall be executed only when a control signal for connection request or connection response is transmitted, and the carrier sensing may be omitted in the other phases of the communication.

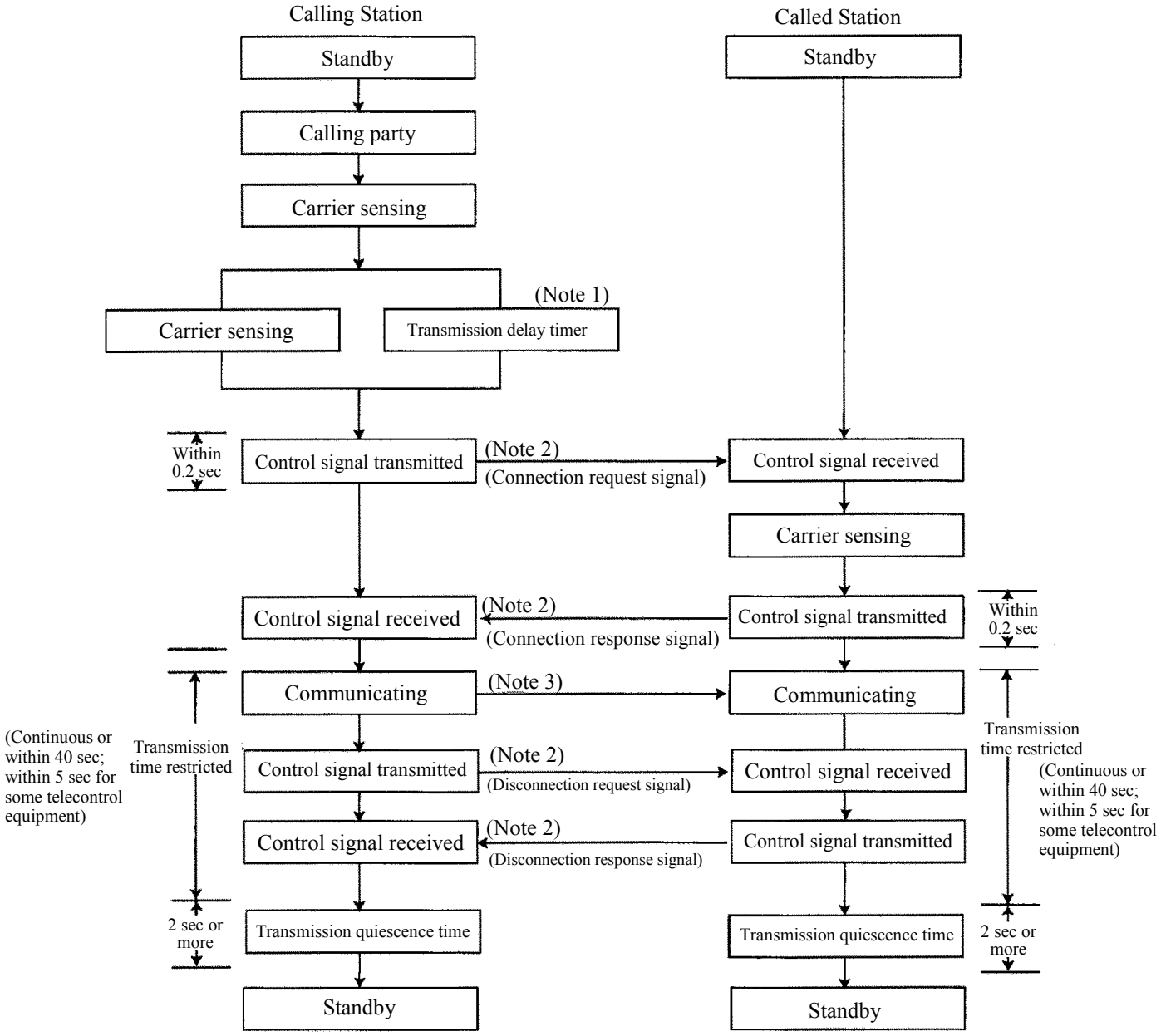

Figure 3.4 Example of the Channel Connection Procedure in Semi-duplex and Duplex Operation (Fixed and Manual Channel Switching)

Note 1: Channel connection conditions

(1) Connection request signal transmission timing
Transmission after the elapse of a randomized transmission delay time (any of 0 sec, 0.2 sec, 0.4 sec, 0.6 sec, or 0.8 sec)

(2) Time from the elapse of the transmission delay time until the start of transmission
0.02 sec or less

Note 2: Control-signal system

(1)	Control signal	Digital system
(2)	Control-signal format	Not specified
(3)	Control-signal transmission time	0.2 sec or less
(4)	Control-signal transmission rise time and fall time	0.01 sec or less
(5)	Control-signal recycle count	One
(6)	Control-signal recycling interval:	0.3 sec to 1 sec

Note 3: Execution of carrier sensing

Carrier sensing shall be executed prior to the start of communication. However, if communication is initiated by a channel connection procedure that exchanges disconnection signals, carrier sensing shall be executed only when a control signal for connection request or connection response is transmitted, and the carrier sensing may be omitted in the other phases of the communication.

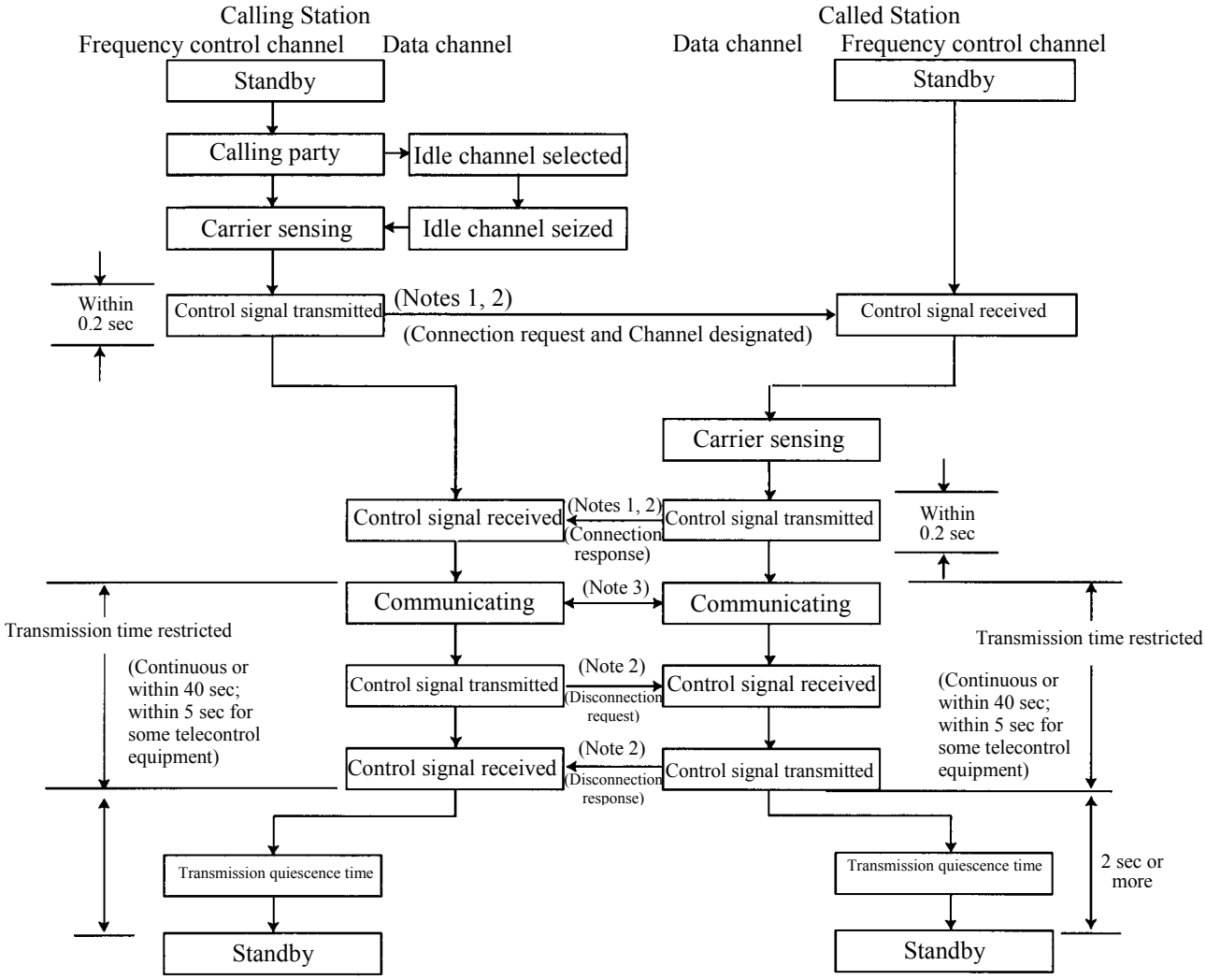

Figure 3.5 Example of the Channel Connection Procedure in Semi-duplex and Duplex Operation
(Automatic Channel Switching through the Frequency Control Channel)

Note 1: Channel connection conditions

(1) Data-channel selection
Automatic random-selection method

(2) Frequency control
By the dedicated channel control method. Alternatively, a method that sends frequency control signals on the data channel may be adopted.

(3) Sending of a connection response signal
May also be executed by a method that sends a response signal to the frequency control channel after carrier sensing is performed on that channel

Note 2: Control-signal system

(1)	Control signal	Digital system
(2)	Control-signal format	Not specified
(3)	Control-signal transmission time	0.2 sec or less
(4)	Control-signal recycle count	One
(5)	Control-signal recycling interval	0.3 sec to 1 sec
(6)	Control-signal transmission rise time and fall time	0.01 sec or less

Note 3: Execution of carrier sensing

Carrier sensing shall be executed prior to the start of communication. However, if communication is initiated by a channel connection procedure that exchanges disconnection signals, carrier sensing shall be executed only when a control signal for connection request or connection response is transmitted, and the carrier sensing may be omitted in the other phases of the communication.

3.5 Antennas

(1) Antenna structure (Equipment: Article 49.14)
Antennas shall be designed without a feeder or grounding device.

(2) Antenna gain (Equipment: Article 49.14)
(Notification: No. 314 in 2000)
The absolute gain of the transmitting antenna shall be 2.14 dB or less. However, when the equivalent isotropically radiated power is the value or less obtained by adding the antenna power of 0.01 W (for the transmitting antenna which uses emissions of a frequency in a range of higher than 413.7 MHz to 414.14375 MHz, higher than 426.025 MHz to 426.1375 MHz, higher than 454.05 MHz to 454.1937 MHz, 0.001 W) to the absolute gain of 2.14 dB of the transmitting antenna, the decrease shall be capable of being compensated for by the gain of the transmitting antenna.

(3) Division in the use of antennas
Individual antennas may be used for transmission and for reception. However, the same antenna shall be used for reception and carrier sensing.

3.6 Others

(1) Cabinet (Equipment; Article 49.14)
(Notification: No. 49 in 1989)
Radio equipment shall be housed in a single cabinet (including an antenna multicoupler employed at centralized base stations), shall not be equipped with an antenna terminal, and shall not be able to be opened easily. However, the above does not apply to the following:

a. Power-supply equipment
b. Control unit
c. Indicators for displaying the operating statuses of transmitters and receivers
d. Volume and squelch controls
e. Frequency-switching units
f. Transmission/reception switchers
g. Associated units and the equivalent

(2) Mark of technical regulations conformity certification
(Technical Conformity: Article 8)
The mark of technical regulations conformity certification shall be attached to an easily recognizable section in regulated forms on radio equipment.

(3) Interface with associated units
This standard does not provide for interfaces between radio equipment and associated units.

(4) Safety and reliability
a. Possibility of redundancy and error-detection functions into data signals shall be considered.

b. In the design and operation of a system, thorough consideration shall be given to possible crosstalk and interference.

Chapter 4. Connection to Telecommunications Circuit Facilities

The radio equipment to be connected to telecommunications circuit facilities shall be those required to be equipped with the carrier sensing device under the provisions of 3.4 (4), and shall satisfy the conditions specified below, in addition to those specified in Chapter 3.

(1) Identification sign (Notification: No. 424 in 1994)

The radio equipment shall have an identification sign (sign that is designed to identify the radio equipment and is subjected to collation during the establishment of a communication channel; normally contained in a control signal) and shall be composed of 48 bits.

(2) Conditions for interfacing with telecommunications circuit facilities

The conditions for interfacing with telecommunications circuit facilities shall conform to the technical standards set forth in the Ordinance Concerning Terminal Facilities Etc. (including the technical conditions defined by Type-I Telecommunications Carriers).

(3) Establishment of a communication channel (Notification: No. 424 in 1994)

A radio-wave frequency shall be judged to be idle when the receiver input voltage is 7 μV in the 400MHz band or 4.47 μV in the 1,200MHz band, and a communication channel shall be established only when the radio-wave frequency to be used is idle.

(4) Cabinet (Terminal: Article 9)
(Notification: No. 424 in 1994)

Radio equipment shall be housed in a single cabinet and shall not be able to be opened easily. However, the above does not apply to the following units:

a. Power-supply units
b. Operation controls, indicators, volume controls, and their equivalents
c. Squelch controls, frequency-switching units, transmission/reception switchers, associated units for data signals, and their equivalents

(5) Mark of technical conditions compliance approval of terminal equipment
(Terminal Technical Approval: Article 10)

The mark of technical conditions compliance approval of terminal equipment shall be attached to an easily recognizable section in regulated forms on radio equipment.

Chapter 5. Measurement Methods

As for the items stipulated in Ordinance Concerning Technical Regulations Conformity Certification etc. of Specified Radio Equipment Appendix table 1 item 1(3), measurement methods are specified by Ministry of Internal Affairs and Communications Notification (Note 1). For other test items, measurement methods generally used shall be applied.

Note 1:

This ordinance refers to Ministry of Internal Affairs and Communications Notification No.88 “The testing method for the characteristics examination” (January 26, 2004) as of the date of the revision of this standard version 1.1 (issued at November 30,2005). Thereafter, the latest version of Notification would be applied if this Notification or contents of this Notification would be revised.

Reference Test items in relation to Technical Regulation Conformity Certification for specified radio equipment

The test items in relation to the technical regulation conformity certification for the radio equipment of low-power radio stations are indicated below.

(1) Transmitter
Frequency
Occupied bandwidth
Intensity of spurious emission or unwanted emission ('Spurious emission intensity', until November 30, 2005)
Antenna power
Adjacent-channel leakage power

(2) Receiver
Limit on Secondary Radiated Emissions

(3) Other units
Transmission time restriction
Carrier sensing

Reference Precautions on the use of the 1,200MHz Band

Specified low-power radio equipment operating in the 1,200MHz band is likely to cause interference, as the BS/CS broadcast intermediate frequencies and GPS (L2-band) frequencies are close to those of the radio equipment, and may even be identical.

a. Study of interference with BS/CS broadcast intermediate frequencies

Most of the interference actually experienced is caused by interfering waves picked up by antenna cables laid between antennas and tuner units and by connectors, with an interference distance of less than 1 meter. In some cases in which a branching filter is used or there are other special circumstances, separation of a distance of some 8 meters must be provided to prevent crosstalk.

b. Study of interference with GPS (L2-band)

Interference with GPS receivers is likely to be produced by the direct pickup of interfering waves at their antennas. For interference tests, a separation distance of approximately 10 meters will be required if just one satellite is to be locked onto. Separation between stations of 20 meters or more will be required if four or more satellites are to be captured to enable positional measurement with only the L2 band.

Table of Standard Revisions

STD Serial Number: ARIB STD-T67
Name of Standard: Telemeter, Telecontrol and Data Transmission Radio Equipment for Specified Low-Power Radio Station
Date established: July 25, 2000
<Note>
Related ministerial ordinances, notifications, etc.:
Ministry of Posts and Telecommunications Notification No. 272, 273 and 274 in 2000.

Revision Number	Date of Revision	Contents of Revision	Remarks
1.1	November 30, 2005		Determined at the 60th Standard Assembly Meeting
		– In '1.3 Conforming documents', "the Ordinance Concerning Technical Regulations Conformity Certification of Specified Radio Equipment" was revised to "the Ordinance Concerning Technical Regulations Conformity Certification etc. of Specified Radio Equipment" referred to as "Technical Conformity", "Rules Concerning the Technical Conditions Compliance Approval and the Design Authentication for Terminal Equipment" was revised to "Rules Concerning the Technical Conditions Compliance Approval etc. for Terminal Equipment" referred to as "Terminal Technical Approval", and "a Notification of the Ministry of Posts and Telecommunications" was revised to "a Notification of the Ministry of Posts and Telecommunications if issued in 2000 or earlier, and a Notification of the Ministry of Internal Affairs and Communications if issued in 2001 or later" referred to as "Notification".	– In line with the revision of titles of related rules
		– In 3.2 (11), "Permissible value of intensity of spurious emission" was revised to "Permissible value of intensity of spurious emission or unwanted emission", "a Definitions" and "b Permissible values applied after January 1, 2006" were added, and the description of permissible values used to be applied was left as "Permissible values based on the Ordinance Regulating Radio Equipment before December 31,	– In line with the partial revision of Ordinance Regulating Radio Equipment (Ordinance No. 119 of MIC in 2005)

		2005" for a transitional measure.	
		– In '3.4 (4) Carrier sensing device', "Notification: No. 49 in 2000" was revised to "Notification: No. 49 in 1989" as a conforming document.	– For error correction
		– In '3.6 (2) Mark of technical regulations conformity certification', "Technical Conformity: Article 6" was revised to "Technical Conformity: Article 8" as a conforming document.	– In line with the revision of Ordinance Concerning Technical Regulations Conformity Certification etc. of Specified Radio Equipment
		– In 'Chapter 4 (5) Mark of technical conditions compliance approval of terminal equipment', "Terminal Technical Approval: Article 7" was revised to "Terminal Technical Approval: Article 10" as a conforming document.	– In line with the revision of Rules Concerning the Technical Conditions Compliance Approval etc. for Terminal Equipment
		– Description in 'Chapter 5. Measurement Methods' was revised to "As for the items stipulated in Ordinance Concerning Technical Regulations Conformity Certification etc. of Specified Radio Equipment Appendix table 1 item 1(3)".	– For change of description to refer to a notification
		– 'Reference Test items in relation to Technical Regulation Conformity Certification for specified radio equipment' was revised to align with the test items described in a notification.	– To conform to the test items described in a notification
		– Corrections of other items, such as clerical, grammatical, or idiomatic errors	

To: Secretariat of Low Power Radio-Station working group,
Standard Assembly Meeting of the Association of Radio Industries and Businesses
FAX: +81-3-3592-1103
Nittochi Bldg. 11th Floor, 1-4-1 Kasumigaseki, Chiyoda-ku, Tokyo 100-0013, Japan

Communication Note of ARIB Standard-related Proposals, etc.

ARIB Standard Name (No.)	**Telemeter, Telecontrol and Data Transmission Radio Equipment for Specified Low-Power Radio Station (ARIB STD-T67)**

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TELEMETER, TELECONTROL
AND DATA TRANSMISSION
RADIO EQUIPMENT FOR SPECIFIED
LOW-POWER RADIO STATION

ARIB STANDARD

ARIB STD-T67 VERSION 1.1

Version 1.0 July 2000
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Nittochi Bldg. 11F
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TEL 81-3-5510-8590
FAX 81-3-3592-1103

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