TOA

D-5000 Series

Digital Wireless Microphone System







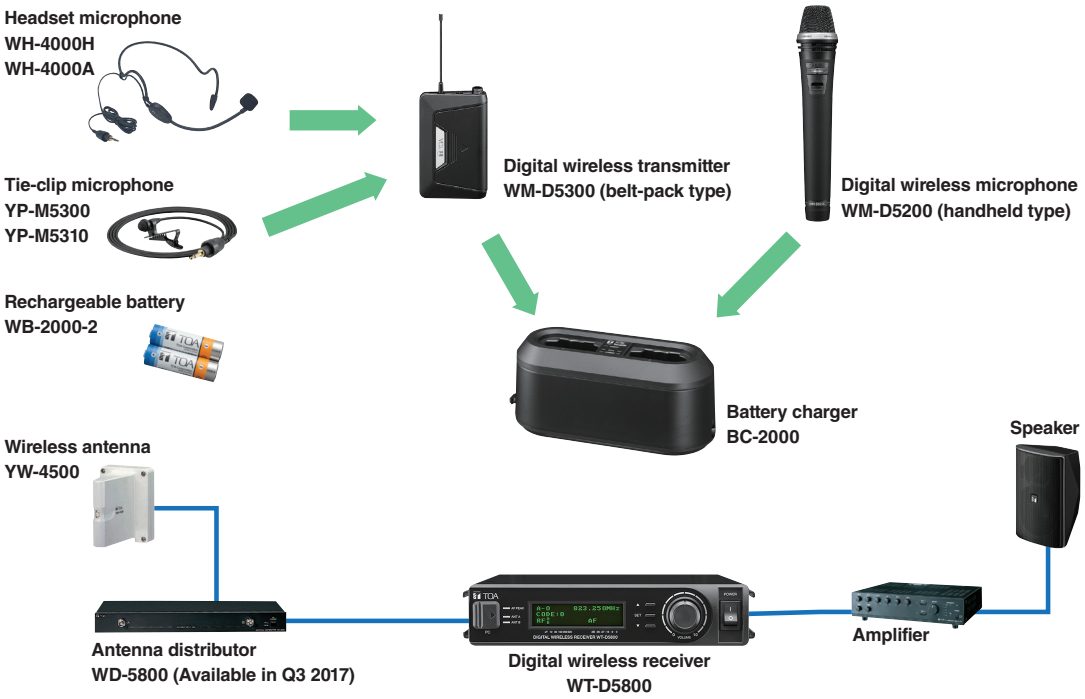


COOKBOOK

Index

System Equipment Configuration	...1
How the Digital Wireless System Works	...2
Advantages of the Digital Wireless System	...3, 4
Installation/Setting Procedures – One Room	...5
Installation/Setting Procedures – Multiple Rooms	...6
Installing and Connecting the YW-4500 Wireless Antenna	...7
Antenna Distribution	...8, 9
Frequency Table	...10, 11, 12
Procedure for Reusing the Same Frequency	...13, 14
Encryption Function Settings	...15
Interference Countermeasures	...16
Antenna Attenuator	...17
FBS Setting	...18
EQ Setting	...19
Optimizing Sound Volume	...20

System Equipment Configuration

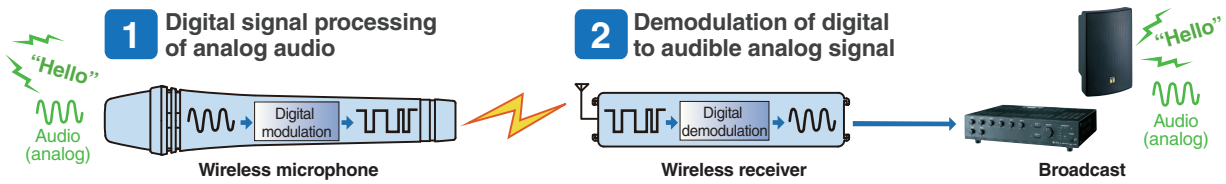


How the Digital Wireless System Works

» How the Digital Wireless System Works

Signal waveforms are used to represent sound, and the state of the sound is expressed according to the width or height of the waveform. Wireless microphones transduce the waveform of audio entering the microphone into an electrical signal and transmit that signal to a tuner over radio waves. In this event, it is an analog wireless system that processes the audio signal as it is in the waveform. On the other hand, it is a digital wireless system that digitally processes the audio signal.

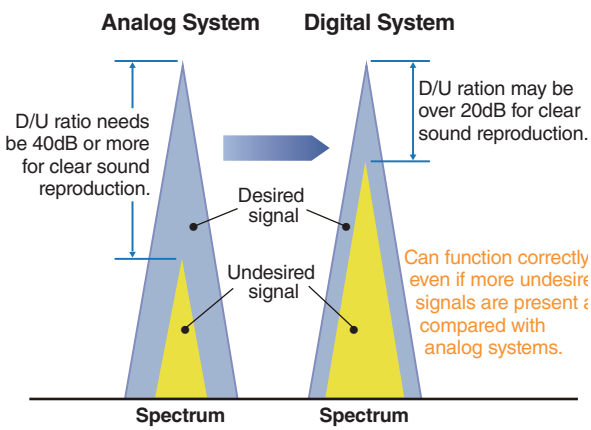
More specifically, in the digital system, after an analog signal (waveform) is transduced into a digital signal (a signal simplified by binary numbers 0 and 1) 1 and transmitted by radio, the digital signal is demodulated into an analog signal 2 and then the audio is output. By digitally processing and simplifying the audio information to be transmitted, the system can have a variety of advantages, including strong immunity to noise and maintenance of clear sound.



» Why are digital wireless systems resistant to interference signals?

Let's have a look at the "D/U ratio" of analog-to-digital wireless systems. The D/U ratio refers to the ratio of the desired (D) signal to the undesired (U) signal (unit: dB). The desired signal represents the level of that signal, while the undesired signal represents the level of signal interference, otherwise called noise. The D/U ratio decreases as the undesired signal increases. The D/U ratio can be considered to be a value necessary to maintaining clear sound in a wireless system.

If a comparison is made of the necessary D/U ratio between analog and digital wireless systems, it is 40dB for analog systems and 20dB for digital systems. From this, it can be seen that the digital wireless system has an edge over the analog wireless system by 20dB in terms of necessary D/U ratio, indicating that the digital system can maintain clear sound in circumstances where a lot of undesired signals are present.

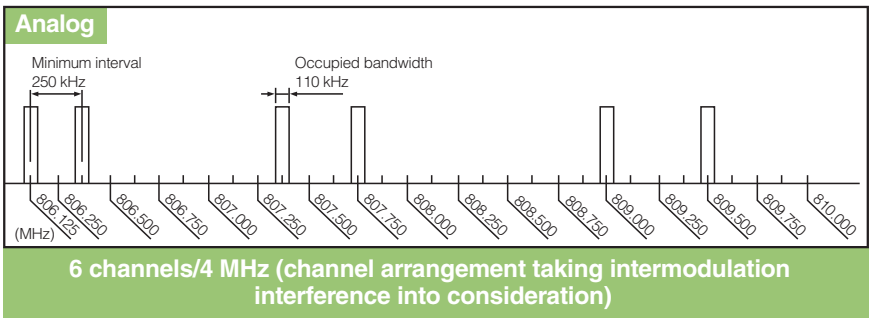


Advantages of the Digital Wireless System 1/2

Not only can the digital wireless system reduce the influence of noise, it can also maintain clear sound quality by means of digital processing. In addition to this, there are various advantages unique to the digital wireless system.

» Use of Multiple Channels in the Same Area

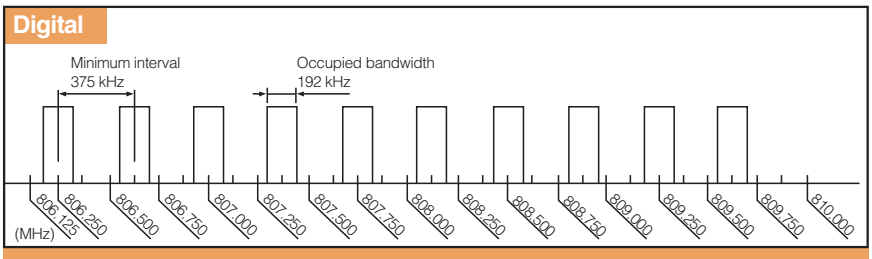
Since the wireless microphone makes itself a source of noise, when using multiple channels in the same area, channels must be arranged to avoid radio interference due to intermodulation interference. In the case of the analog wireless system, the most efficient channel arrangement is as shown in the [Analog] figure below if the intermodulation interference of radio waves is taken into consideration. In this arrangement, the simultaneous use of 6 channels is all it can handle per 4 MHz band.



6 channels/4 MHz (channel arrangement taking intermodulation interference into consideration)

* This is an example.

In the digital wireless system, however, since one of its features is being immune to the influence of noise, even when the intermodulation interference occurs, individual channels are less likely to be affected by it. As a result, equal-interval channel arrangements such as shown in the [Digital] figure below becomes possible, allowing up to 10 channels to be used simultaneously per 4 MHz band.



[10 channels/4 MHz (equal-interval channel arrangement)]

* This is an example.

» Interference Noise Muting

Analog systems are prone to generation of strange noises when exposed to radio interference. Conversely, radio interference is muted in digital systems, so strange noises are not produced.

Advantages of the Digital Wireless System 2/2

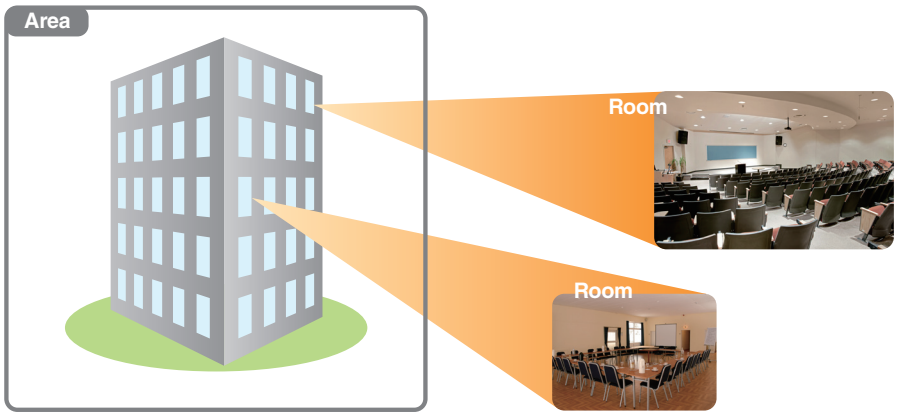
» Reuse of the Same Channel

Another advantage of the digital wireless system is that simultaneous use of multiple microphones on the same frequency in the same area can be realized more easily because of its immunity to radio interference and noise.

In the case of analog systems, the distance between microphones should be at least 100 meters when using the same frequency channel in the same area to ensure 40 dB of D/U ratio. However, in the case of digital systems, the distance can be reduced to 30 - 40 m*, making it easier to cope with even a building (area) with multiple rooms that require multiple microphones.

**This can change depending on antenna mounting conditions or room conditions, such as the thickness or material of walls.*

Area and Room



» Improved Security

Conventional analog wireless systems transmit their audio signals through FM modulation. With this method, it is possible that communications could be intercepted by general broadband receivers (FM radio, etc.), causing much anxiety in terms of security. On the other hand, with digital systems, since the audio is transmitted through digital modulation, only noise can be heard if received by a broadband receiver. This can prevent exposure of information, leading to improvements in the security of information communication.



Installation/Setting Procedures - One Room

(1) Determine the operation range.

(Horizontal coverage of antennas, Page 7)

- Use within the signal reception range of the supplied antenna. → Use the supplied antenna.
- Use within a wider range than that of the supplied antenna. → Use the YW-4500 external antenna.

(Installation of the YW-4500 Wireless antenna, Page 7)

(2) Determine the number of transmitters to use.

- Use the supplied antenna. → To Step (3)
- Use the external antenna. → Distribute antennas depending on the number of receivers.

(Antenna distribution, Page 8, 9)

(3) Perform frequency channel settings.

1) Select an arbitrary bank from Banks 1 – 4 at the receiver. *(Frequency table, Page 10, 11, 12)*
   If you need more simultaneously usable channels, then use Bank A – F.
   In this case, please switch transmitter's Transmission Output to "L (1mW)".
   * Banks A – F cannot be used when including existing analog wireless equipment in the system.
2) Check for idle channels using the channel scanning function.
3) Similarly, perform bank settings and idle channel assignments for the remaining receivers.
4) Set the transmitters for the same bank and frequency channels as the receivers.

(4) Need to prevent eavesdropping?

- Perform encryption settings if it is necessary to prevent eavesdropping. *(Encryption settings, Page 15)*

(5) Conduct transmission/reception test.

- Check for the presence of radio interference
  When interference is detected *(Radio interference countermeasures, Page 17)*

(6) Optimize sound quality.

- Enable automatic suppression of acoustic feedback. *(FBS settings, Page 18)*
- Set an appropriate EQ for the microphone. *(EQ Settings, Page 19)*

(7) Optimize the sound volume.

- Adjust the transmitter sensitivity. *(Sensitivity and volume settings, Page 20)*
  Adjust the receiver output volume.

Installation/Setting Procedures - Multiple Rooms

(1) Determine the operation range. *(Horizontal coverage of antennas, Page 7)*

- Use within the signal reception range of the supplied antenna. → Use the supplied antenna.
- Use within a wider range than that of the supplied antenna. → Use the YW-4500 external antenna.

(Installation of the YW-4500 Wireless antenna, Page 7)

(2) Determine the number of transmitters to use.

- Use the supplied antenna. → To Step (3)
- Use the external antenna. → Distribute antennas depending on the number of receivers.

(Antenna distribution, Page 8, 9)

(3) Confirm the number of channels that can be simultaneously used by the frequency table. *(Frequency table, Page 10, 11, 12)*

(4) Calculate the total number of transmitters to be used simultaneously in all rooms.

- The total number of transmitters is within the number of simultaneously usable channels. → (5) Set the frequency channel.
- The total number of transmitters exceeds the number of simultaneously usable channels. → *(Setting method when using the same channel, Page 13. 14)*

(5) Set the frequency channel.

1) Select an arbitrary bank from Banks 1 – 4 at the receiver. *(Frequency table, Page 10, 11, 12)*
   If you need more simultaneously usable channels, then use Bank A – F.
   In this case, please switch transmitter's Transmission Output to "L (1mW)".
   * Banks A – F cannot be used when including existing analog wireless equipment in the system.
2) Check for idle channels using the channel scanning function.
3) Similarly, perform bank settings and idle channel assignments for the remaining receivers.
4) Set the transmitters for the same bank and frequency channels as the receivers.

(6) Need to prevent eavesdropping?

- Perform encryption settings if it is necessary to prevent eavesdropping. *(Encryption settings, Page 15)*

(7) Conduct transmission/reception test.

- Check for the presence of radio interference
  When interference is detected *(Radio interference countermeasures, Page 16, 17)*

(8) Optimi sound quality.

- Enable automatic suppression of acoustic feedback. *(FBS settings, Page 18)*
- Set an appropriate EQ for the microphone. *(EQ Settings, Page 19)*

(9) Optimize the sound volume.

- Adjust the transmitter sensitivity. *(Sensitivity and volume settings, Page 20)*
- Adjust the receiver output volume.

Installation of the YW-4500 Wireless Antenna

Important points for selecting the mounting position of diversity antennas are as follows:

Point 1

Mount the two antennas within 20 – 30m (outdoor applications: 40 – 50m) visible range from the microphone's area of intended use.

Both antennas should be within visible range from any location where the microphones are to be used. This is necessary for ensuring optimal conditions for one antenna to receive signals when the microphone my experience the other antenna's dead spot. In other words, the shape of the room does not matter provided that the above conditions are met. On a diagram of the site, use a compass to draw two circles representing a radius of 20 – 30m with each antenna as the central point. If usage locations fall within either of the two circles, such locations can be deemed to be okay.

Point 2

As a guideline, the distance between the two antennas should be 3 – 18m. Although the coverage area becomes wider as the distance between antennas increases, this degrades the diversity effect, and signal interruption will become more liable to occur.

If possible, locate one antenna in the direction that can be viewed from the position where the microphone is held, and the other antenna in the opposite direction (behind the microphone holder).

Point 3

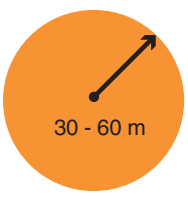
In indoor installations, as a general guideline, install antennas at a height of 2 – 4m above the floor, lest the signal be blocked by people in the room. Keep the antennas about 30cm below the ceiling. Install the antennas so they face in the specified directions. When making protectors, use resin or timber and do not use metallic materials.

- Avoid positioning antennas close to metallic objects wherever possible.
- Avoid mounting antennas inside a ceiling or wall.
- Select locations where the antenna can be protected from being hit and damaged by objects.
- Protect the antennas against rain water.

Horizontal coverage of antennas under optimal conditions

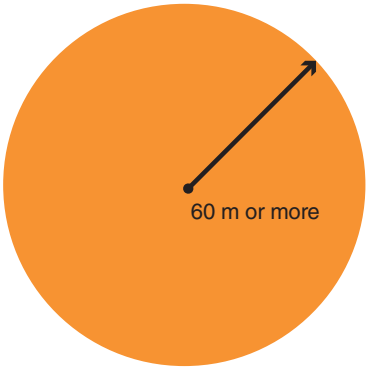
• WT-D5800 Rod Antenna





• YW-4500

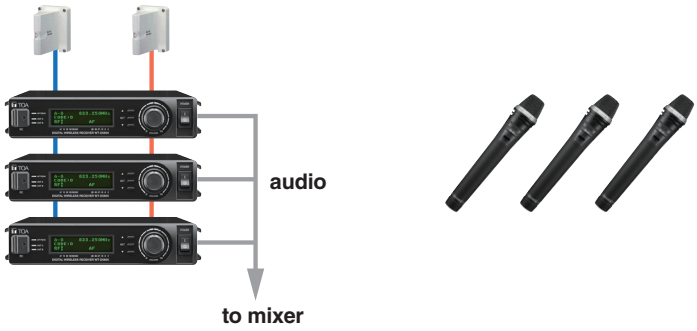




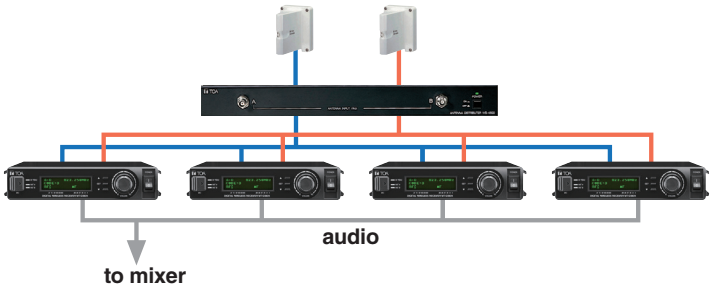
Antenna Distribution 1/2

• Using 1 - 3 channels

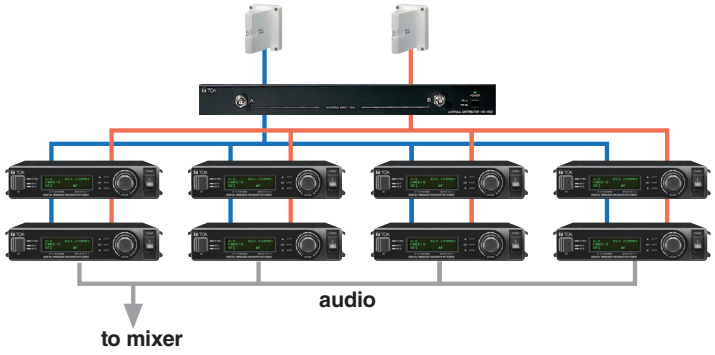
Antennas can be distributed without using the WD-5800 Antenna Distributor.



• Simultaneous use of 4 channels

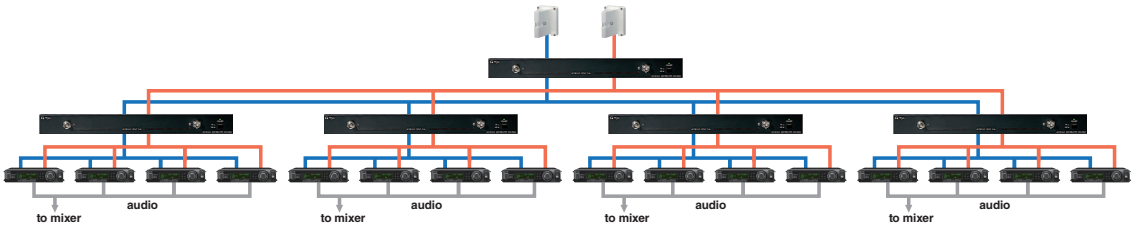


• Simultaneous use of 5 – 8 channels



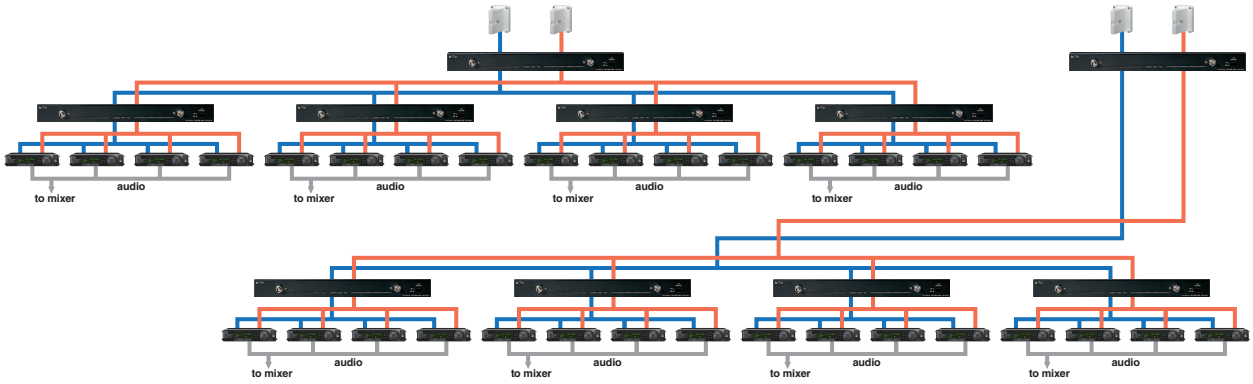
Antenna Distribution 2/2

• Simultaneous use of 9 -16 channels

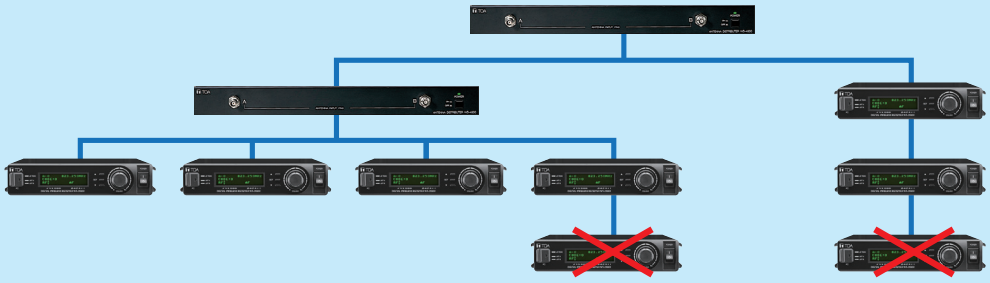


• Simultaneous use of 17 - 32 channels

Split antennas into two systems and construct a system of up to 32 channels.



[NOTE] If four or more WD-5800 (available in Q3 2017) and WT-D5800 units are connected in series, the quality of the received radio signal could deteriorate, potentially shortening transmission distances or generating noise. To avoid this, consider using a system configuration that can minimize the number of cascade-connected parts.



Frequency Table (C04 Version)

• Frequency table which can be used with 5000 Series analog wireless system

BANK / CHANNEL	1	2	3	4
0	794.250	794.300	794.350	794.400
1	794.600	794.650	794.700	794.750
2	795.050	795.100	795.150	795.200
3	795.600	795.650	795.700	795.750
4	796.500	796.550	796.600	796.650
5	797.700	797.750	797.800	797.850
6	799.250	799.300	799.350	799.400
7	800.900	800.950	801.000	801.050
8	801.600	801.650	801.700	801.750
9	803.350	803.400	803.450	803.500
A	804.450	804.500	804.550	804.600
B				
C				
D				
E				
F				

Compatible Frequency List

* WM-D5200/D5300, WT-D5800: BANK 1– 4
  WM-4200/4300/5220/5270/5320/5225/5265/5325: BANK 1– 4
  WT-4800/5800/5805: BANK 1– 4
  WM-4210/4220/4310, WT-4810/5100/5810, WTU-4800: BANK 1

• When needing more channels

*Banks A - F cannot be used when including existing analog wireless equipment in the system.

BANK / CHANNEL	A	B	C	D	E	F
0	794.250	800.250	794.375	800.375	794.500	800.500
1	794.625	800.625	794.750	800.750	794.875	800.875
2	795.000	801.000	795.125	801.125	795.250	801.250
3	795.375	801.375	795.500	801.500	795.625	801.625
4	795.750	801.750	795.875	801.875	796.000	802.000
5	796.125	802.125	796.250	802.250	796.375	802.375
6	796.500	802.500	796.625	802.625	796.750	802.750
7	796.875	802.875	797.000	803.000	797.125	803.125
8	797.250	803.250	797.375	803.375	797.500	803.500
9	797.625	803.625	797.750	803.750	797.875	803.875
A	798.000	804.000	798.125	804.125	798.250	804.250
B	798.375	804.375	798.500	804.500	798.625	
C	798.750		798.875		799.000	
D	799.125		799.250		799.375	
E	799.500		799.625		799.750	
F	799.875		800.000		800.125	

Compatible Frequency List

* WM-D5200/D5300, WT-D5800

Frequency Table (C07 Version)

• Frequency table which can be used with 5000 Series analog wireless system

BANK / CHANNEL	1	2	3	4
0	823.325	824.350	823.225	798.625
1	824.525	824.950	824.825	798.975
2	824.975	826.000	826.025	799.425
3	825.875	826.750	826.625	799.975
4	826.925	828.250	828.625	800.625
5	827.675	828.700	829.625	801.525
6	829.175	829.600	831.025	802.975
7	829.775	830.800	831.825	804.725
8	823.425	824.425	823.175	806.625
9	824.625	825.025	825.175	809.275
A	825.075	826.075	825.875	810.375
B	825.975	826.825	826.775	813.125
C	827.025	828.325	828.975	816.225
D	827.775	828.775	830.075	820.425
E	829.275	829.675	831.375	822.625
F	829.875	830.875	831.875	827.475

Compatible Frequency List

* WM-D5200/D5300, WT-D5800: BANK 1– 4
  WM-4200/4300/5220/5270/5320/5225/5265/5325: BANK 1– 4
  WT-4800/5800/5805: BANK 1– 4
  WM-4210/4220/4310, WT-4810/5100/5810, WTU-4800: BANK 1

• When needing more channels

*Banks A - F cannot be used when including existing analog wireless equipment in the system.

BANK / CHANNEL	A	B	C	D	E	F
0	823.250	829.250	823.375	829.375	823.500	829.500
1	823.625	829.625	823.750	829.750	823.875	829.875
2	824.000	830.000	824.125	830.125	824.250	830.250
3	824.375	830.375	824.500	830.500	824.625	830.625
4	824.750	830.750	824.875	830.875	825.000	831.000
5	825.125	831.125	825.250	831.250	825.375	831.375
6	825.500	831.500	825.625	831.625	825.750	831.750
7	825.875	831.875	826.000		826.125	
8	826.250		826.375		826.500	
9	826.625		826.750		826.875	
A	827.000		827.125		827.250	
B	827.375		827.500		827.625	
C	827.750		827.875		828.000	
D	828.125		828.250		828.375	
E	828.500		828.625		828.750	
F	828.875		829.000		829.125	

Compatible Frequency List

* WM-D5200/D5300, WT-D5800

Frequency Table (G01 Version)

• Frequency table which can be used with 5000 Series analog wireless system

BANK / CHANNEL	1	2	3	4
0	606.725	606.750	606.775	606.800
1	824.525	824.950	824.825	798.975
2	607.725	607.750	607.775	607.800
3	608.375	608.400	608.425	608.450
4	609.125	609.150	609.175	609.200
5	610.425	610.450	610.475	610.500
6	611.275	611.300	611.325	611.350
7	613.025	613.050	613.075	613.100
8	615.275	615.300	615.325	615.350
9	616.375	616.400	616.425	616.450
A	619.475	619.500	619.525	619.550
B	621.975	622.000	622.025	622.050
C	626.275	626.300	626.325	626.350
D	630.725	630.750	630.775	630.800
E	634.175	634.200	634.225	634.250
F	635.675	635.700	635.725	635.750

Compatible Frequency List

* WM-D5200/D5300, WT-D5800: BANK 1– 4
  WM-4200/4300/5220/5270/5320/5225/5265/5325: BANK 1– 4
  WT-4800/5800/5805: BANK 1– 4
  WM-4210/4220/4310, WT-4810/5100/5810, WTU-4800: BANK 1

• When needing more channels

*Banks A - F cannot be used when including existing analog wireless equipment in the system.

BANK / CHANNEL	A	B	C	D	E
0	606.725	612.725	618.725	624.725	630.725
1	607.100	613.100	619.100	625.100	631.100
2	607.475	613.475	619.475	625.475	631.475
3	607.850	613.850	619.850	625.850	631.850
4	608.225	614.225	620.225	626.225	632.225
5	608.600	614.600	620.600	626.600	632.600
6	608.975	614.975	620.975	626.975	632.975
7	609.350	615.350	621.350	627.350	633.350
8	609.725	615.725	621.725	627.725	633.725
9	610.100	616.100	622.100	628.100	634.100
A	610.475	616.475	622.475	628.475	634.475
B	610.850	616.850	622.850	628.850	634.850
C	611.225	617.225	623.225	629.225	635.225
D	611.600	617.600	623.600	629.600	635.600
E	611.975	617.975	623.975	629.975	
F	612.350	618.350	624.350	630.350	

Compatible Frequency List

* WM-D5200/D5300, WT-D5800

Procedure for Reusing the Same Frequency 1/2

When using transmitters in numbers greater than the number of simultaneously usable channels and in close proximity to each other, microphones operating on the same frequency can be used simultaneously by utilizing their digital characteristics. ***Note, however, that the same frequency cannot be used in the same room.***

1. Make channel plans

1) Referring to the Frequency Table, select an arbitrary bank from A to F.

2) Scan receiver channels.

• **C band:** Searches for channels in two banks including the currently-set bank and displays idle channels.

Combinations of scanned banks are as follows:

When Bank A or B is currently set a Searches for and displays idle channels in Banks A and B.

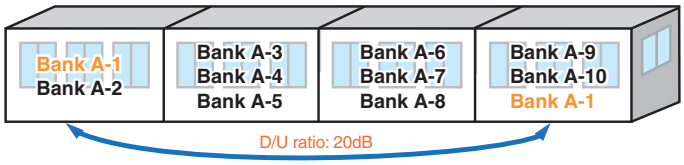
When Bank C or D is currently set a Searches for and displays idle channels in Banks C and D.

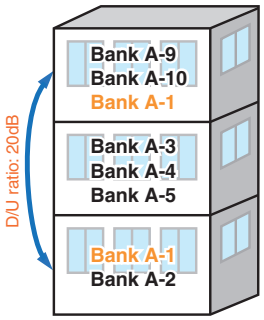
When Bank E or F is currently set a Searches for and displays idle channels in Banks E and F.

• **G band:** Searches for all bank channels in the dedicated digital plan, and displays idle channels.

3) Assign idle channels to multiple rooms as shown in the following examples to prevent channels operating on the same frequency from being too close to each other.

[Example] Same floor or same location on each floor.





- Keep channels using the same frequency as far away from each other as possible. If used on the same floor, keep them at least two rooms apart.
- Set the wireless microphone's transmission output to "L."
- Adjust the antenna attenuator.

[Example] Multiple rooms are adjacent to each other on both upper and lower floors in facilities like rental conference rooms and schools. There is a high possibility that the frequencies being used in the room ▭ may also be able to be used in rooms ▭ .



Procedure for Reusing the Same Frequency 2/2

2. Use "Code" (recommended)

This function prevents interference between channels sharing the same frequency. By performing Code settings, receivers and transmitters can be paired, muting radio signals on the same frequency that may exist in the surrounding area. Code setting is effective when the encryption function is not set.

Figure a. Even if the code is the same, if the power for both microphones is ON, radio interference will not occur. (Since the stronger radio signal takes precedence, only the microphone within the immediate area is reproduced.)

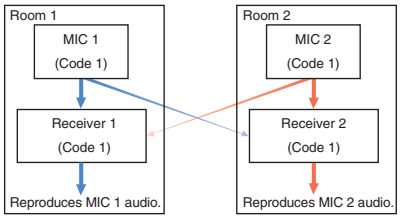
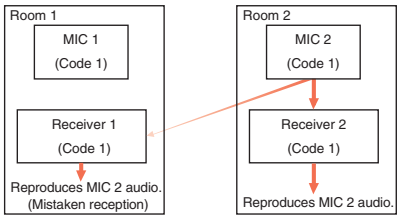
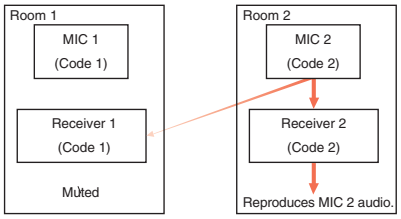


Figure b. If power to either area is turned off when Figure a conditions exist, Receiver 1 may mistakenly receive MIC 2 audio. (Since the code is the same, it would be impossible to distinguish between MIC 1 and MIC 2.)



Code settings solve these problems.

Figure c. If different codes are set in Area 1 and Area 2, mistake reception will not occur even if power to the microphone for either area is turned off. (Since microphones in both areas differ in code, audio is muted.)



» Code setting procedures

Hold down the “SET” key for 2 seconds or more.



WT-D5800

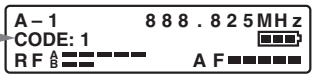
Select “CODE” and press “SET”



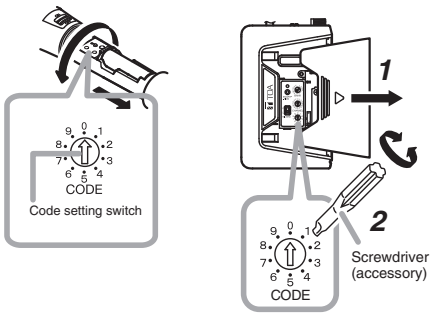
Select an arbitrary number



Selected CODE



Set the same code for the transmitter to be paired.



NOTE: Since the encryption function, which enhances security, also requires pairing of a transmitter with a receiver, code setting is unnecessary if the encryption function is used.

Encryption Function Settings

Exposure of important information can be prevented by pairing a receiver with a transmitter by TOA's proprietary security IDs.

» Engryption setting procedures

1) Enable receiver's encryption function.

Hold down the "SET" key for 2 seconds or more.



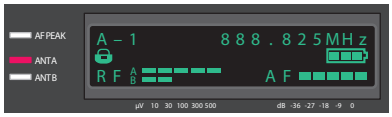
WT-D5800

Select ENCRYPTION from the menu



Select "ON"





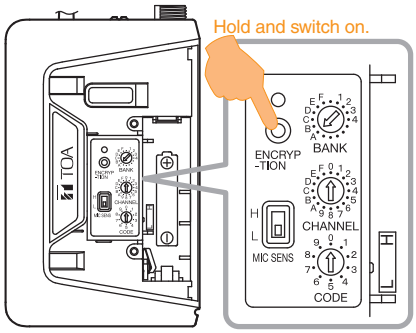
If encryption function is achieved, the "ANT A/B" indication and the lock icon lights red.

2) Pair the receiver with a transmitter.

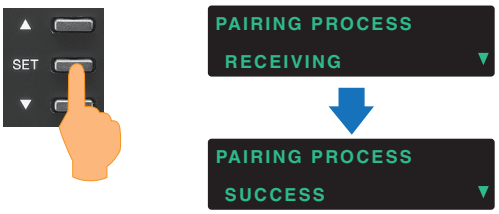
Select PAIRING from the menu



Switch on the transmitter while holding down the "Encryption" setting switch.

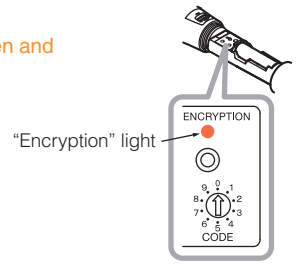


Press and hold "SET" till the "SUCCESS" is displayed.

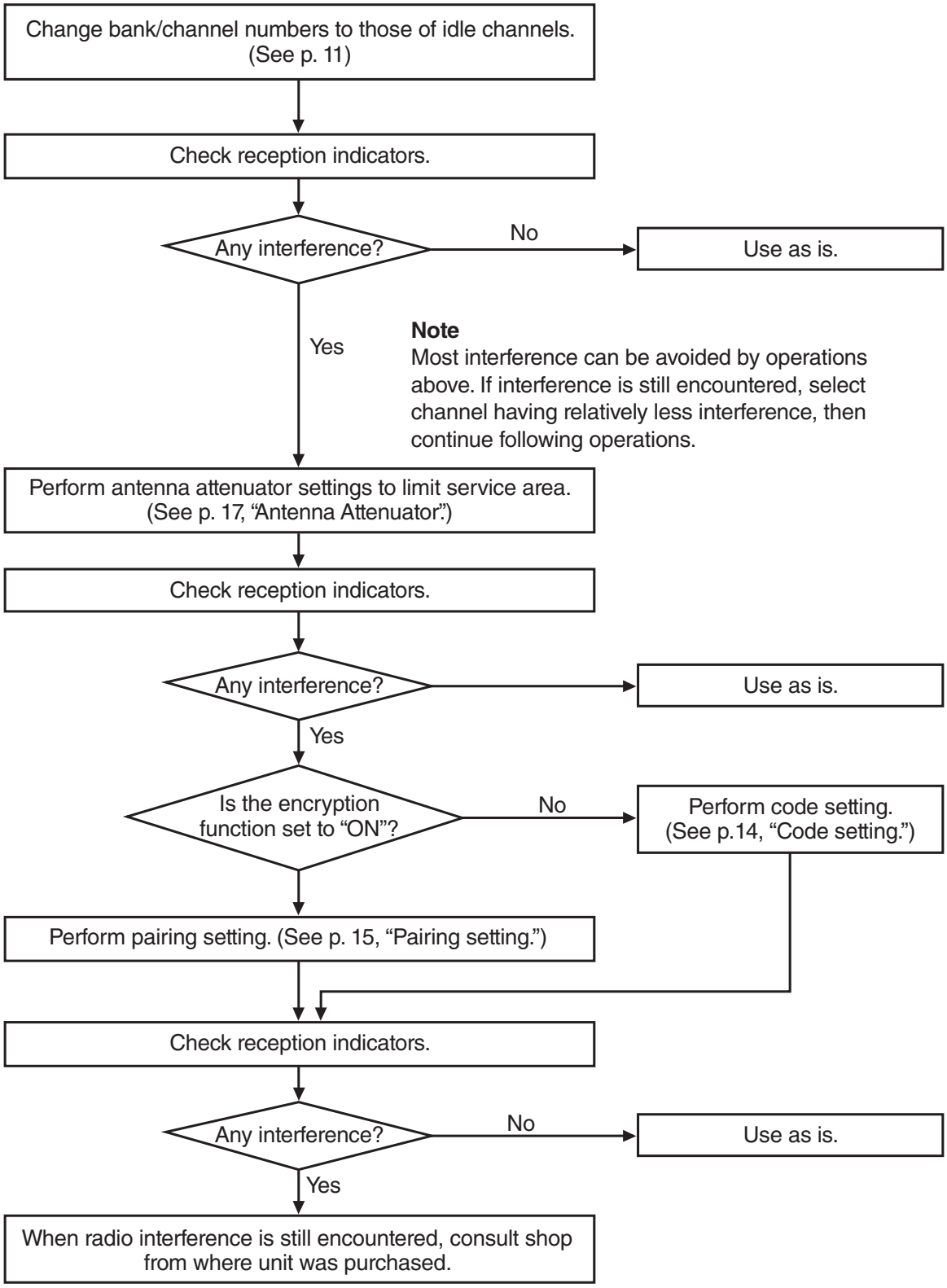


If pairing is achieved, the "ANT A/B" indication lights green and the transmitter's "Encryption" light also lights.





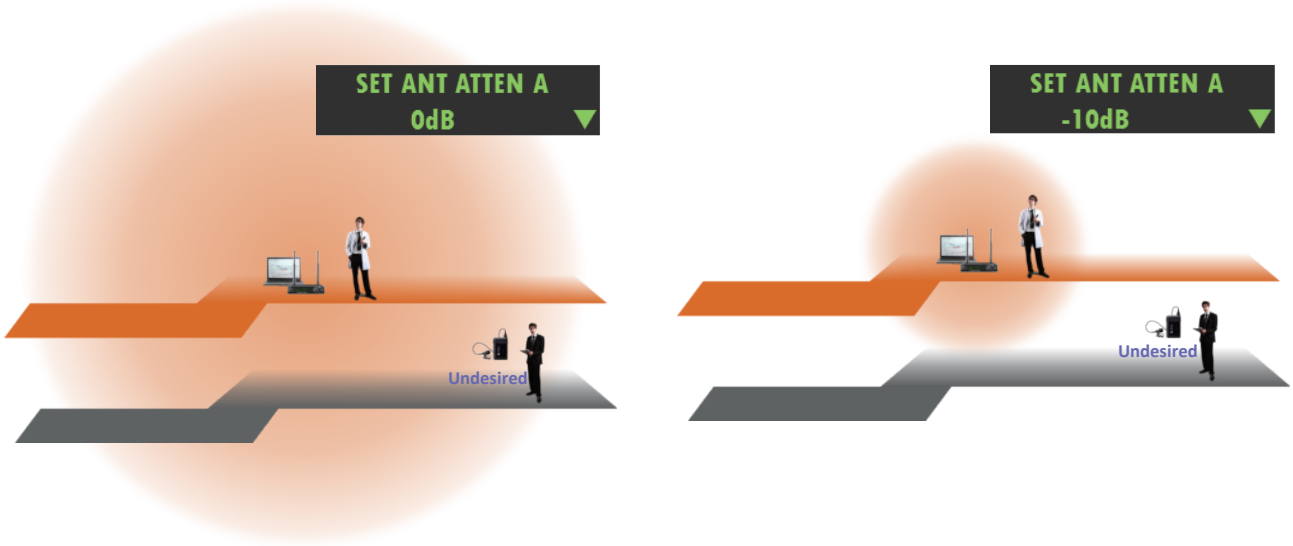
Order of Actions (Action Flowchart)



Antenna Attenuator

» Antenna Attenuator Function

This function decreases the antenna reception sensitivity so as to minimize reception of distant interference radio signals.



•When to use this function

Use this function when radio interference or signal interruption caused by the interference of other systems intermittently occurs.

Note: Since the use of an attenuator shortens the transmission distance and reduces the range of the usable area, ensure that the microphone can be used without signal interruption in the intended usage area after performing settings.
The attenuator can effectively reduce interference signals if they are relatively weak. The most effective results may not be obtained when interference signals are strong (i.e. when audio interference constantly occurs).

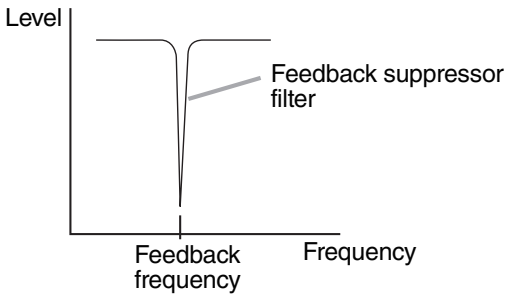
•Proper use of two attenuators

Use either the WT-D5800 or YW-4500 attenuator to attenuate the reception sensitivity by 10dB. The WT-D5800 may be more convenient as it allows settings by hand.
Since the attenuation of both the YW-4500 and WT-D5800 attenuators are added together, when wishing to attenuate reception sensitivity by at least 10dB, use both attenuators in combination. (This is a rare case, though.)

FBS Setting

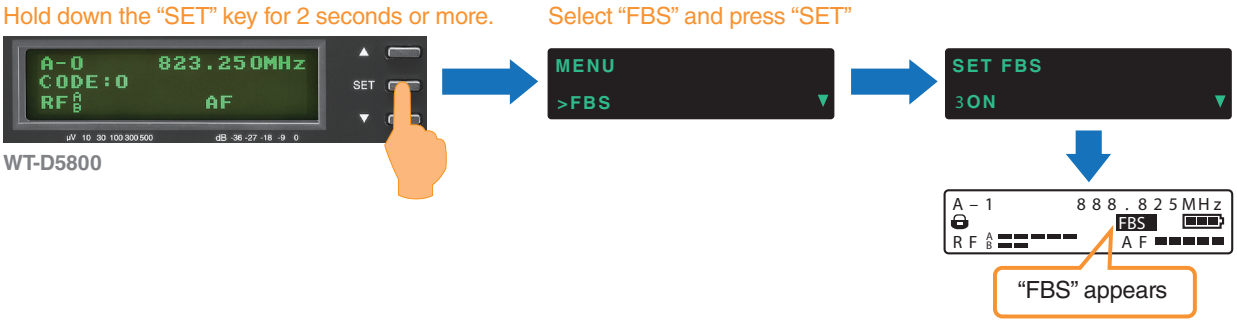
» What is the feedback suppressor function?

It is a function that the built-in feedback suppressor filter automatically works to suppress acoustic feedback when the feedback occurs.



» What is the FBS built into the WT-D5800?

Use this function when increases in the receiving wireless microphone's sound volume tend to generate acoustic feedback and reduce speech clarity or make it impossible to achieve the necessary sound volume for broadcast.



NOTE: Acoustic feedback, or howling, is generated when sound output from a speaker reenters the microphone. Before using this function, check to see if the microphone and speaker are positioned too close to each other, or if the sound volume is louder than necessary.
In circumstances where feedback is especially liable to occur, the most effective results may not be obtainable, or sound quality may vary greatly.

EQ Setting (Recommended)

» What is the microphone EQ built into the WT-D5800?

This function optimizes audio characteristics for each model of handheld wireless microphone or any microphone connected to the belt-pack transmitter.

Select the model number of the microphone to use, and perform settings in EQ setting mode.

Hold down the “SET” key for 2 seconds or more.



WT-D5800



Options



NOTE: This function is set to OFF by default.

Set the “Microphone EQ” to OFF when the corresponding model number is not shown in the display of the EQ setting mode.

Optimizing Sound Volume

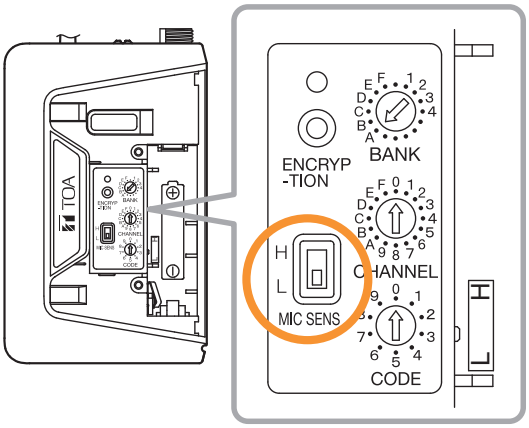
(1) Set the receiver's volume control to the 2 o'clock position.

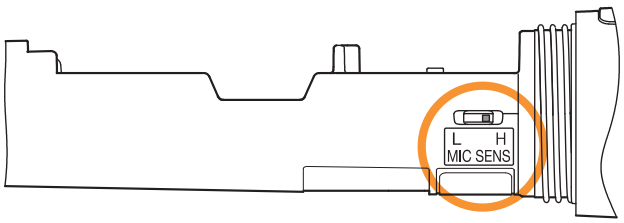
For current TOA wireless receivers with the volume control located on the front panel, the 2 o'clock position (scale 7) is the volume control position that minimizes sound distortion until the maximum input sound pressure is applied to the microphone. From that position to the maximum volume position, a gain of approximately 10dB is made available as an allowance when turning up the volume.



(2) Set the transmitter's (microphone's) sensitivity to "H" or "L" depending on whether the volume is insufficient or noise is detected at normal sound volume, or if distortion is not noticeable when speaking in a loud voice.n to the maximum volume position, a gain of approximately 10dB is made available as an allowance when turning up the volume.

Microphone sensitivity can be set to "0 dB (H)" or "-10 dB (L)".





(3) Adjust the input level of the amplifier or mixer to an appropriate sound volume for use under normal conditions.

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