2. CIRCUIT EXPLANATION

HOW EACH SECTION WORKS

We will explain operations of each section based on the block diagram.

(1) MICROPHONE (Block diagram No. 1)
An internal microphone is of unidirectional, electret condenser type.
Impedance: 1 k Ω
Sensitivity: -46 dB (1kHz, 0 dB = 1 V/1 pa)

(2) MICROPHONE AMPLIFIER (2)
The microphone amplifier uses an OP amp (M15) and amplifies the signal from the microphone capsule to the level necessary for the compressor circuit.

(3) COMPRESSOR (3)
The compander IC is SA575 (M1), and has a compressor circuitry and 2 OP amps. The compression ratio is 1/2 (logarithmic compression).

(4) PRE-EMPHASIS (4)
Pre-emphasis is carried out to improve the system's S/N ratio. Amplifier (M15) is used as an OP amp. A time constant is 50 µsec.

(5) LPF (5)
The third Butterworth type low-pass filter is constructed using the OP amp built in M1 to attenuate the audio signal components of over 15 kHz. Also, the harmonic components of the tone signal to be superimposed in the LPF circuit are attenuated by the low-pass filter.

(6) MUTE SW (7)
Using the analog switch (M2), this circuit mutes both the audio and tone signals during the periods of from the power switch-on to the commencement of signal transmission and from power switch-off to transmission termination to operate the receiver tone squelch.

(7) TONE OSC (6)
Consists of a quarts oscillator (X3) and an inverter (M10) and oscillates a signal for tone squelch (tone signal). The oscillation frequency is 32.768 kHz, and the output signal is taken out through a buffer (M11).

(8) PLL FREQUENCY SYNTHESIZER (8, 10, 11)
VCO (M3), PLL IC (M7) and LOOP FILTER make up a phase locked loop. The VCO oscillates the transmission frequency directly and divides the output. It then compares the frequency phase by means of the 25 kHz comparison frequency, and outputs a pulse corresponding to the phase difference. The pulse is applied to the VCO as a control voltage after integrated at a loop filter, and then is locked to the set transmission frequency. Both the audio and tone signals are input from the VCO's modulation terminal, and then are frequency-modulated. The modulation method is a reactance modulation system using a variable capacitance diode.

(9) RF AMP, RF POWER AMP (12,13, 14)
By amplifying the VCO's oscillation output with a transistor, these amplifiers not only make up for losses in a pad or RF LPF, but also gain the antenna power. The two-stage construction method is employed for the amplifiers to obtain sufficient buffer effects for the VCO, and about 6 dB pad is installed in the amplifier input. The output is less than 50 mW, and is adjusted by changing Q6's bias current using VR4 to change operation points.

(10) BIAS REGULATOR, BIAS SWITCH (15, 16)
By compensating for the temperature by means of a diode (D2), the bias circuit suppresses the changes of operation points due to temperature variations. When the VCO's transmission frequency becomes stable after PLL lockup completion, the switch (Q7) turns on and the bias is applied for radio signal transmission.

(11) RF LPF (17)
A 3-stage π type low-pass filter is used for the RF section's band limiting filter to suppress the spurious-

radiated signals with frequencies much different from the transmission frequency.

(12) CPU and its peripheral parts (18, 20, 21)
This section is comprised of the CPU (M5), voltage detector (M8) and crystal-controlled reference oscillator (X4). The reference oscillator is 6.0 MHz in frequency, and is oscillated by the CPU's internal inverter to operate the CPU as a clock. At the same time, the 6 MHz signal is supplied to the PLL IC as the PLL reference oscillation frequency. The oscillation frequency is adjusted by TCI so that its deviation stays within ±1 kHz. After its power switch is set to the ON position, the CPU controls the transmission frequency setting, the start of transmission, actions till voice transmission, and actions when the system is switched off. The operating procedures are stored in the CPU's mask ROM, and the control contents are as follows:

(A) The CPU reads transmission frequency setting data from the Channel setting switch, and transmits data to PLL IC for the division ratio setting.

(B) The CPU controls the bias circuitry and Q7 so that the radio signal is not transmitted until the transmission frequency becomes stable.

(C) The CPU controls AF MUTE SW, VCO SW, BIAS SW, and BATT.CHECKER.

When the circuit voltage drops below 2.6 V, the voltage detector transmits a reset signal to the CPU to stop the CPU's operation so that no radio signal is transmitted.

(13) SW CONT./SW OFF DETECT (23)
Setting the power switch (SW2) to ON turns the FET (Q15) on, thereby activating the circuit. Then, the CPU starts up and controls Q15 to keep it active.
When the power switch is set to OFF, the CPU detects it, turns off the AF MUTE SW and then stops transmitting audio and tone signals. This causes the tone squelch of the receiver to operate. Subsequently, the VCO SW and BIAS SW are turned off, which then stops transmitting the radio signal. Finally, Q15 is turned off, deactivating all circuits.

(14) DC/DC CONVERTER (24)
Consists of the oscillation control IC (M4), FET (Q14), and diode. This circuit raises the battery voltage to 3.0 V, and supplies the power to each circuit section.

(15) BATT. CHECKER
Permits the state of battery consumption to indicate by means of red and green LEDs (D8, D9) to inform whether the battery needs to be replaced.
When the battery is full, only the green LED lights. As the battery voltage decreases due to the battery drain, the green LED dims gradually and in turn the red LED starts to light. Further voltage drop causes only the red LED to light, then to extinguish with the control CPU halt.
The recommended time of battery replacement is when the red LED starts lighting; the battery voltage is 1.05 V.
An additional function is that the LED flashes when an incorrect channel is set.

(16) Frequency registration (19)
Transmission frequencies and their banks and channels are written in the EEPROM (M16), and the contents can be changed as required.

3. OPERATING INSTRUCTIONS

UHF WIRELESS MICROPHONE WM-5220

Thank you for purchasing TOA's UHF Wireless Microphone.
Please carefully follow the instructions in this manual to ensure long, trouble-free use of your equipment.

1. SAFETY PRECAUTIONS

- Be sure to read the instructions in this section carefully before use.
- Make sure to observe the instructions in this manual as the conventions of safety symbols and messages regarded as very important precautions are included.
- We also recommend you keep this instruction manual handy for future reference.

Safety Symbol and Message Conventions

Safety symbols and messages described below are used in this manual to prevent bodily injury and property damage which could result from mishandling. Before operating your product, read this manual first and understand the safety symbols and messages so you are thoroughly aware of the potential safety hazards.

⚠ **WARNING**	Indicates a potentially hazardous situation which, if mishandled, could result in death or serious personal injury.
⚠ **CAUTION**	Indicates a potentially hazardous situation which, if mishandled, could result in moderate or minor personal injury, and/or property damage.

⚠ WARNING

- To prevent the electromagnetic wave from badly influencing medical equipment, make sure to switch off the unit's power when placing it in close proximity to the medical equipment.

⚠ CAUTION

- When the unit is not in use for 10 days or more, be sure to take the battery out of the unit because battery leakage may cause personal injury or contamination of environment.

- Make sure to observe the following handling precautions so that a fire or personal injury does not result from leakage or explosion of the battery.

  - Do not short, disassemble, heat nor put the battery into a fire.
  - Never charge batteries of the type which are not rechargeable.
  - Do not solder a battery directly.
  - Be sure to use the specified type of battery.
  - Note correct polarity (positive and negative orientation) when inserting a battery in the unit.
  - Avoid locations exposed to the direct sunlight, high temperature and high humidity when storing batteries.

2. GENERAL DESCRIPTION

The TOA's WM-5220 Wireless Microphone employs an electret condenser microphone element of high sensitivity and intelligible sound quality, and is suitable for speech use.

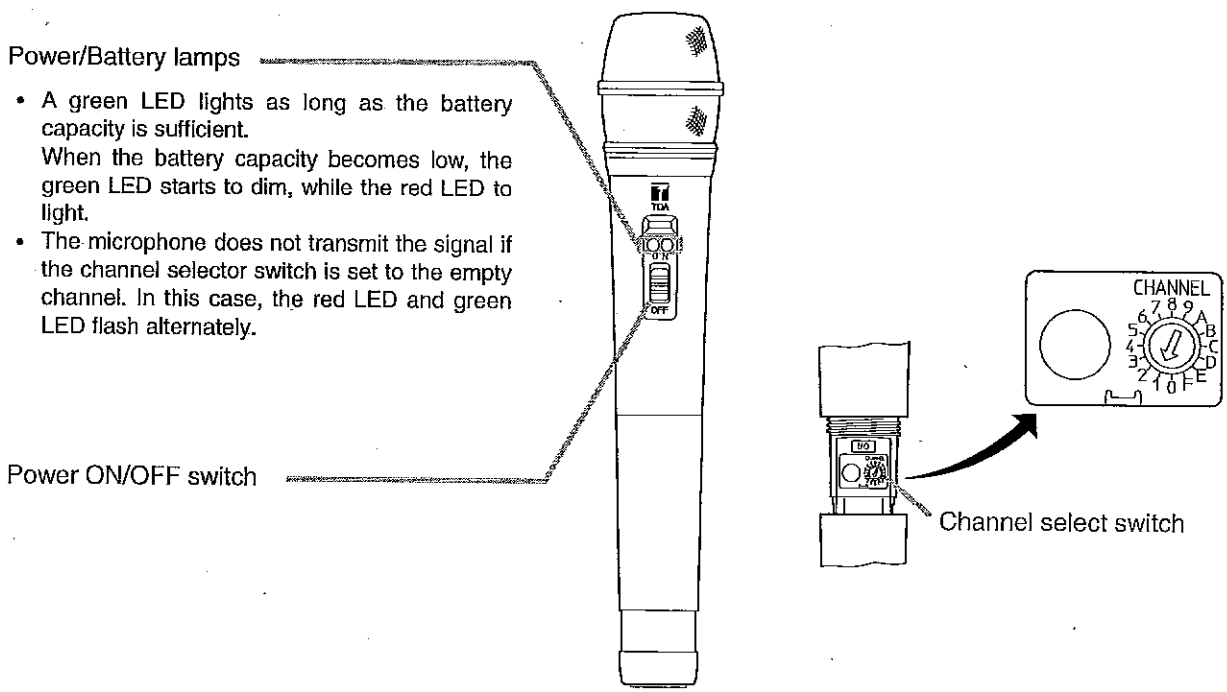
3. FEATURES

- One frequency can be selected from 16 operating frequencies of 690 – 865 MHz.
- An optimized PLL-synthesizer minimizes the oscillation frequency drift resulting from the ambient temperature or voltage fluctuation.
- Power/Battery lamps indicate battery consumption to prevent the unit from malfunctioning when the battery level remarkably decreases.
- Operates on a single AA battery.
- Employs a built-in antenna.
- The state of battery consumption can be displayed on the tuner's indicator when the unit is used in conjunction with the optional WT-5800, WT-5805 or WT-5810 Wireless Tuner.

4. HANDLING PRECAUTIONS

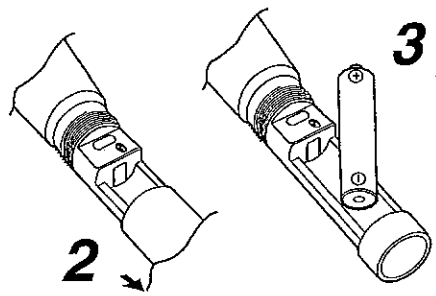
- Do not expose the unit to rain or an environment where it may be splashed by water or other liquids, as doing so may result in unit failure.
- Never open nor remove the unit case to modify the unit. Refer all servicing to your nearest TOA dealer.
- Take care not to drop the unit onto the floor nor bump it against a hard object as the unit could fail.
- Do not place the unit in locations of high temperature (ex. in a car parked in summer) or high humidity as the unit could fail.
- Do not use the unit in locations where it is exposed to seawater.
- To clean, use a dry cloth. When the unit gets very dirty, wipe lightly with a cloth damped in a dilute neutral cleanser, then wipe with a dry cloth. Never use benzine, thinner, or chemically-treated cleaning towel.
- Avoid using a mobile telephone near the wireless microphone in use. Noise could be picked up.

5. NOMENCLATURE



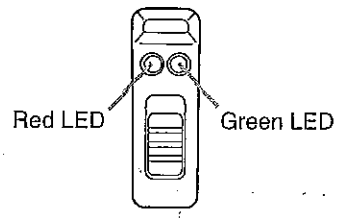
6. BATTERY INSERTION

Step 1. Turn off the power switch.
Step 2. Hold the microphone body and rotate the microphone grip counterclockwise to remove it.
Step 3. Insert an AA battery according to (+) and (–) indications on the battery compartment.
Step 4. Replace the microphone grip by sliding and rotating it clockwise.



Battery replacement

- A brand-new AA alkaline battery will continuously operate the unit for about 10 hours.
- When the battery capacity becomes low, the green LED of the Power/Battery lamps starts to dim, while the red LED to light. When only the red LED lights, replace the battery with a new one. In this condition, the unit transmits the remaining battery capacity information to the tuner, causing the tuner's BATT indicator to light.



7. OPERATION

Step 1. Confirm that the wireless microphone and the wireless tuner are identical in the channel number. If not identical, turn the power ON/OFF switch to the OFF position, then set the channel number to the same channel number as the tuner.
Step 2. Turn the Power ON/OFF switch to the ON position. Then, confirm the green LED of the Power/Battery lamps will light.
Step 3. Turn the Power ON/OFF switch to the OFF position after use.

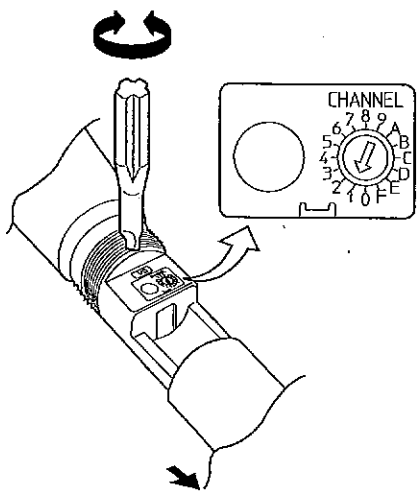
8. OPERATIONAL HINTS

- The microphone's service distance is 3 – 120 m. When the microphone user moves in a facility, signal dropouts (momentary losses of signal reception) may be encountered. These dropouts are caused by the building's architectural designs or materials which block the travel of or reflect the radio signal. If this occurs, the user needs to change locations for better signal reception.
- The proper operation of your wireless system may be interfered with by other system operating on the same frequency. In such cases, change the operating frequency of your system. (As to dealing with the interference, refer to the operating instructions of the wireless tuner.)
- Should you have any questions regarding the use or availability of TOA wireless products, please contact your local TOA dealer.

9. CHANNEL NUMBER SETTING

Step 1. Switch off the power. Rotate the microphone grip counterclockwise to remove it.
Step 2. Using the supplied screwdriver, set the Channel setting switch pointer to the desired channel number.
Step 3. Replace the microphone grip.

Note: Make sure that the wireless microphone is identical to the wireless tuner in the channel number. Should the microphone's setting differ from that of the tuner, the tuner does not receive the microphone signal.



10. SPECIFICATIONS

Microphone Element	Electret condenser type Cardioid pattern
Emission	F3E
Frequency Range	690 – 865 MHz, UHF
Selectable Channel	16 channels
RF Carrier Power	Less than 50 mW
Tone Frequency	32.768 kHz
Maximum Input Level	126 dB SPL
Maximum Deviation	±40 kHz
Audio Frequency Response	200 – 15,000 Hz
Dynamic Range (AF Circuit)	More than 95 dB (with WT-5800)
Battery	LR6 (AA)
Battery Life	More than 10 hours (alkaline)
Indicator	Power/Battery lamps
Antenna	Built-in type
Operating Temperature	–10 to +50°C
Finish	Resin, coating
Dimensions	ø43.6 x 231.5 mm
Weight	180 g (with battery)

Note: The design and specifications are subject to change without notice for improvement.

• Accessories

Microphone holder (with stand adapter) 1
Screwdriver (for setting) 1
Storage case 1

License requirement

Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.