

No. 19

## Single-transistor Transistor Detector Radio with IC Amplifier

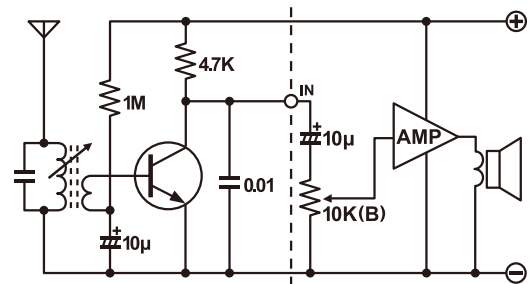
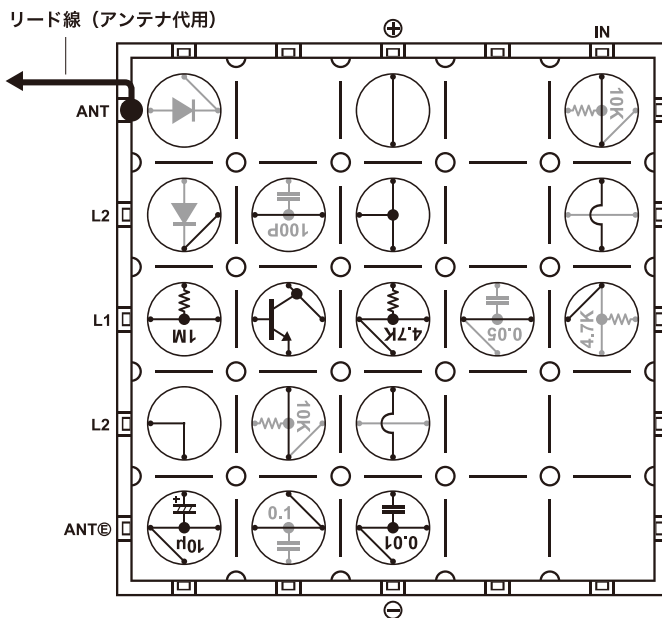
Arrange the blocks and attach a lead wire (used as an antenna) as shown in the figure. Then, turn on the main switch. Adjust the volume using the volume knob. Turn the tuning knob back and forth bit by bit until you find a radio broadcast station that you can pick up. This circuit is the same as Circuit No. 18, except without the diode. The transistor functions to both detect as well as amplify signals.

## Block Layout Diagram

\* In blocks with lighter lines, current only flows along the dark, solid lines.



## Circuit Schematic



## ●Circuit Mechanism

In this circuit, the transistor both detects and amplifies signals. In normal transistor-based amplifier circuits, the transistor turns on when the voltage across the base—emitter is 0.6 V when a base current is applied. Even if high-frequency signals happen to be input into the circuit, the signals are approximately symmetrical about the vertical axis, meaning that the top and bottom components cancel each other out, resulting in no audio signal being produced. If the base current is decreased to an extremely small amount, the high-frequency signals then become vertically asymmetric as in the figure at right. These high-frequency signals are then amplified, generating audible audio signals with the high-frequency components removed. This type of circuit mechanism in which the amplifier characteristics of the transistor are utilized to detect and amplify even the slightest base current is referred to as "transistor detection." Transistor detection is performed using a single transistor to detect and amplify signals, granting the advantage that such circuits can be formed using a small number of components. The 0.01- $\mu\text{F}$  capacitor attached across the collector—earth ground junction is there to remove high-frequency signal components.

