

# KIT 21. TWO STATION INTERCOM

This Kit is a two station intercom. It uses two wires to run between each intercom unit. Each is self contained with its own battery, speaker, microphone and amplifier circuit based on the LM386. To use it you just push the switch and talk. Releasing the switch automatically turns the intercom off and leaves it in a state ready to receive input from the other station. Each intercom station is identical.

If the pads of the push-on switch are shorted together and the switch removed then one unit can act as a remote listening microphone or 'bug'. You can remove the speaker so that there is no possibility that noise interference will 'click' the speaker and give away its position. For long term use in this mode a four wire flat cable can be used so that 2 of the wires can be used to supply the battery power to the unit from the listening location.

You may download the data sheet for the LM386 from the website of National Semiconductor at

**www.nsc.com**

The kit is constructed on a single-sided printed circuit board (PCB). Protel Autotrax and Schematic were used to produce the board.

## ASSEMBLY INSTRUCTIONS

Assembly is straight forward. Make sure you get the integrated circuit, microphone and the capacitors the correct way around. The electrolytic and capacitors are polarized; they have a + or - marked on them and they must be inserted correctly into the PCB. The overlay on the PCB shows the correct way to insert them. The push-on switch is meant to point out from the PCB so that the unit can be mounted inside a box with just the cap of the switch showing. Only three of the six terminals on the switch are connected in the circuit.

The 8 ohm speaker can be connected either way. Each station is identical. To connect the two wires connect one wire from point A to point A on the other board, and the other wire from point B to point B on the other board. The electret microphone can be placed some distance from the PCB.

## CIRCUIT DESCRIPTION

Each unit is identical. The detailed circuit diagram for each unit is shown on the next page.

An LM386 audio power amplifier is used. It is widely available, used a minimum of external parts and is well suited to battery operation. It will give just over 0.5W into the 8 ohm speaker. The gain can be varied by the external components attached to pins 1 and 8. Gain can range from 20 (open circuit - pins 1 & 8 not connected) to 200 (pins 1 & 8 short circuited.)

Stability at high frequencies is set by R3, C2 & C4. C4 decouples the power supply to the intercom for low frequency stability. C5 couples the output of the unit to the speaker.

Normally both switches are in the NC (normally connected) position. The 2 speakers are directly connected together and no power is drawn from by circuit. When a push-to-talk switch is pressed the speaker in that unit is disconnected and the NO connection (normally open) is connected. This connects the negative terminal of the battery to the circuit and power is delivered to it. The voice signal picked up by the microphone is sent to the remote speaker.

If both switches are pressed at the same time then both amplifier outputs will be connected together. The internal resistance of the 9V batteries limits the peak current which may arise and the IC will not be damaged. If a power pack or higher voltage supply is substituted instead of the 9V batteries then a 47 ohm series resistor should be added to a supply lead for protection.

Modification to Remote Bug. If the switch is removed and a link is soldered into place across the NO pads then one of the units is permanently turned on. This unit can act as a 'bug'. Remove the speaker also so it does not pick up stray electrical signals and 'click'. If you use a four strand cable instead of the two strand cable supplied then you can send the 9V power supply to the remote 'bug' as well!

## WHAT TO DO IF IT DOES NOT WORK

Poor soldering is the most likely reason that the circuit does not work. Check all solder joints carefully under a good light. Next check that all components are in their correct position on the PCB. Check the IC and the capacitor orientations. Did you position the switch pointing out over the edge of the PCB? Check that there is not solder shorting out some of the IC or switch pads.

## COMPONENTS

|                                       |     |
|---------------------------------------|-----|
| Resistors 1/4W. 5%:                   |     |
| 100R (brown black brown)              | 2   |
| 10R (brown black black)               | 2   |
| 10K (brown black orange)              | 2   |
| Capacitors:                           |     |
| 10uF electrolytic                     | 2   |
| 100uF electrolytic                    | 4   |
| 47nF mylar                            | 2   |
| 100nF mylar                           | 4   |
| LM386 IC                              | 2   |
| 8 pin IC socket                       | 2   |
| Electret microphone                   | 2   |
| 8 ohm speakers                        | 2   |
| Push-on non-lock, non-shorting switch | 2   |
| Switch cap                            | 2   |
| Two strand wire                       | 10m |
| 9V battery snap                       | 2   |
| Kit 21 PCB                            | 2   |

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