

An intercom using six components

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Many electrical transducers have reversible properties: spin the shaft of an electric motor and it becomes a generator, connect a loudspeaker to the input of an amplifier and it works as a microphone. With this last example in mind it is possible to build a super simple intercom that can also be used as a baby monitor. Two piezo loudspeakers are used here as both microphone and loudspeaker, giving a total of six components for the complete circuit.

As can be witnessed from the circuit diagram the intercom does indeed contain very few components. The circuit is sensitive enough to pick up speech and any other background noise at a distance of a few metres from the microphone. The unit uses a power opamp fitted in the master unit to boost the signal, giving a maximum output power of around 0.5 W. Control of the intercom conforms the master-slave principle; the master site operator has total control over the system from switch on to talk/listen control. The remote site consists of just a simple enclosure to house the piezo loudspeaker and is connected to the master unit using two-core cable. The design is simple but quite versatile and is suitable for many applications ranging from house intercom to baby monitor.

Ignoring the power supply and the on/off switch S1 the complete circuit uses just six components. The two-pole send/listen switch S2 simply reverses the positions of X1 and X2 in the circuit. For this reason it is important that the transducers are both of the same type. Two moving-coil loudspeakers can also be used in the same basic configuration but it would be necessary to include an impedance transformer at the input to match the opamp input to the (lower) microphone impedance. The piezo transducers used here have a much higher impedance and do not need a transformer which helps keep the component count down to an absolute minimum.

Signal amplification is provided by the power opamp type LM380N (IC1). With S2 in the position shown in the diagram X2 acts as the microphone and X1 as the speaker. Operating the switch swaps the function of X1 and X2. The switches together with one of the piezo speakers (X1 or X2) are fitted into the master enclosure while the other speaker is fitted at the remote site (front door, garden shed, nursery etc.). A two core cable is all that is needed between the two units.

Both X1 and X2 should be the same type of speaker. The 2-inch tweeter type KSN1020A from Motorola is a good choice here but any similar piezo tweeter would also be suitable. It is important not to use a conventional low-impedance midrange or bass speaker fitted with a coil and magnet. During testing the circuit proved to be quite sensitive; if both speakers are in the same room you will hear the unmistakable screech of acoustic feedback. It is better to put the speakers in different rooms or alternatively for the purposes of testing only, the circuit sensitivity can be reduced by changing the value of C1.

In operation the circuit consumes around 12 mA so a 12 V stabilised mains adapter is an ideal power source but batteries could also be used and would give a reasonable life expectancy if the unit were not in continuous operation.

