

Microcontroller based bidirectional visitor counter



Here is a low-cost microcontroller-based visitor counter that can be used to know the number of persons at a place. All the components required are readily available in the market and the circuit is easy to build. Two IR transmitter-receiver pairs are used at the passage: one pair comprising IR transmitter IR TX1 and receiver phototransistor T1 is installed at the entry point of the passage, while the other pair comprising IR transmitter IR TX2 and phototransistor T2 is installed at the exit of the passage. The IR signals from the IR LEDs should continuously fall on the respective phototransistors, so the proper orientation of the transmitters and phototransistors is necessary. circuit description Fig. 1 shows the transmitter-receiver set-up at the entrance-cum-exit of the passage along with a block diagram. Two similar sections detect an interruption of the IR beam and generate a clock pulse for the microcontroller. The microcontroller controls counting and displays the number of persons present inside the hall. Fig. 2 shows the circuit of the microcontroller-based visitor counter, wherein the transmitter and the receiver form the IR detection circuit.

Control logic is built around transistors, operational amplifier LM324 (IC1), and flip-flop (IC2). When nobody is passing through the entry/exit point, the IR beam continuously falls on phototransistor T1. Phototransistor T1 conducts and the high voltage at its emitter drives transistor T3 into saturation, which makes pin 3 of comparator N1 low, and finally, output pin 1 of comparator N1 is high. Now if someone enters the place, first the IR beam from IR TX1 is interrupted and then the IR beam from IR TX2. When the beam from IR TX1 is interrupted, phototransistor T1 and transistor T3 cut-off and pin 3 of comparator N1 go high. A 12MHz crystal is used for providing a

clock. Ports 0, 1, and 2 are configured for 7-segment displays. Port-0 pin is externally pulled up with 10-kilo-ohm resistor network RNW1 because port0 is an 8-bit, open-drain, bidirectional, input/output (I/O) port. Port-1 and port-2 are 8-bit bidirectional I/O ports with internal pull-ups (no need for external pull-ups). Port pins 3. 0 and 3. 1 are configured to provide the set pulse to J-K flip-flop IC2(A) and IC2(B), respectively. External interrupts INT0 and INT1 receive the interrupt pulse when the person interrupts the IR beams.

Resistor R9 and capacitor C5 provide a power-on-reset pulse to the microcontroller. Switch S1 is used for manual reset. When the microcontroller is reset, the flip-flops are brought in 'set' state through the microcontroller at software run time by making their 'set' pin high for a moment. The value of the counter increments by Fig. 5: An actual-size, single-side PCB for the microcontroller-based visitor '1' when the counter (Fig. 2) including its power supply (Fig. 3) interrupt service routine for INT0 is executed. The output of the corresponding J-K flip-flop is set to 'high' again by making its 'set' input pin low through the microcontroller. The microcontroller is configured as a negative-edge-triggered interrupt sensor. Similarly, if somebody exits the place, first the IR beam from IR TX2 is interrupted and then the IR beam from IR TX1. At this moment, the high input at 'J' and 'K' pins of flip-flop IC2(B) toggle its output to low. On the other hand, the low input at 'J' and 'K' pins of IC2(A) due to clock pin 6 of IC2(B) and 'J' input (pin 4) and 'K' input (pin 16) of IC2(A) are connected to pin 7 of comparator N2. The negative-going pulse is applied to clock pin 1 of IC2(A) when the person interrupts the IR beam from IR TX1. There is no change in the output of IC2(A) flip-flop. This triggers the external interrupt

INT1 (pin 13) of microcontroller AT89C52. The value of the counter decrements by ' 1' when interrupt service routine for INT1 is executed. The output of the corresponding J-K flip-flop is set to ' high' again by making its ' set' input pin low through the microcontroller. The circuit is powered by regulated 5V. Fig. 3 shows the circuit of the power supply. The AC mains is stepped down by transformer X1 to deliver a secondary output of 7. 5V, 250mA, which is rectified by bridge rectifier BR1, filtered by capacitor C6 and regulated by IC 7805 (IC4). Capacitor C7 bypasses any ripple in the regulated output. Shown in Fig. 5 and it's component layout in Fig. 6. software The software for the visitor counter is written in ' C' language and compiled using the C51 Keil compiler.