

MICROCONTROLLER-BASED AUTOMATIC FLUSH SYSTEM



■ K.S. SANKAR

In manual flush systems, the user presses a button, which opens a flush valve allowing mains-pressure water to flow into the bowl, or sometimes the user presses directly a flush lever (a handle connected to a flushometer). The valve contains a pneumatic mechanism that closes it after a preset time.

Today, manual flush system has been replaced with a sensor-operated system that automatically flushes the fixture when the user departs.

The microcontroller-based automatic flush system presented here uses an infrared sensor to detect a user approaching the fixture, then it waits un-



Fig. 1: Installation of the automatic flush system

PARTS LIST

Semiconductors	
IC1	- 7805, 5V regulator
IC2	- AT89C2051 microcontroller
IC3	- CD4050 hex non-inverting buffer
T1	- BC348 npn transistor
IRRX1	- TSOP1738 IR receiver module
DI-D6	- 1N4007 rectifier diode
LED1-LED5	- 5mm LED
IR LED1, IR LED2	- IR LED
Resistors (all 1% or 5% tolerance)	
R1, R11-R14	- 330-ohm
R2	- 220-ohm
R3-R9	- 10-kilo-ohm
R9	- 4.7-kilo-ohm
R10	- 150-ohm
R15	- 1.2-kilo-ohm
Capacitors	
C1	- 1000µF, 25V electrolytic
C2, C3	- 10µF, 16V electrolytic
C4, C5	- 22pF ceramic disk
Mechanisms	
X1	- 230V AC primary to 7.5V, 300mA secondary transformer
R11	- 6V, 1C/O relay
S1, S2	- On/off switch
S3	- Push-to-on switch
BATT.	- 6V battery
	- Solenoid (operated with 6V)

til the user departs. A solenoid is used to actuate the flush from a 6V power supply with battery backup inside the unit that also powers the sensor circuit. This flush system is fully controlled by a microcontroller. It also flushes before the person departs if the person is present for more than the preset time (5 minutes).

Installation of this microcontroller-based automatic flush system is shown in Fig. 1. The IR transmitter LED and the IR receiver modules are mounted side by side such that when the user approaches the mechanism, the IR receiver module receives the IR signal reflected off the person. A solenoid-operated water valve is used in the system.

Circuit description

Fig. 2 shows the circuit of the microcontroller-based flush control system.

It is built around Atmel 89C2051 microcontroller that controls the process of automatically flushing the toilet.

The AT89C2051 is an 8-bit microcontroller with 2 kB of flash-based program memory, 128 bytes of RAM, 15 input/output lines, two 16-bit timers/counters, on-chip oscillator and clock circuitry. A 6MHz crystal is used for providing clock. Port pins P1.0 through P1.4 of the microcontroller are connected to buffers N1 through N5 of CD4050 via 10-kilo-ohm pull-up resistors, respectively.

All the input/output (I/O) pins are reset to '1' as soon as RST (pin 9) goes high on pressing switch S3. Holding the RST pin high for two machine cycles while the oscillator is running resets the device. Power-on-reset is achieved by capacitor C2 and resistor R9.

Pin 12 (P1.0) of microcontroller IC2

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