

REPEATER KEYING LINE CONTROL

A circuit for controlling timed functions in a repeater. The use of the new Signetics NE555 IC timers eliminates electronic and mechanical complications.

Every repeater has a need for two basic timing functions. The first is the delayed drop out. A short time delay between the release of the COR and the transmitter drop out is necessary to prevent the transmitter keying relays from chattering on a signal that is fluttering in and out of the repeater receiver. This short delay, usually approximately two seconds, will prevent the annoying chattering noise and prolong the life of the equipment.

The second function is usually called the time-out-timer or transmit-interval-timer. Occasionally someone will accidentally or

deliberately leave his transmitter keyed up on the input channel of the repeater. If the transmitter in the repeater is not rated for continuous service, it may overheat or be damaged. If for some reason, the repeater cannot be controlled under these conditions, this can cause severe anxiety for the person who must either wait for it to go away, or drive a hundred miles in the mountains at night to solve the problem.

Many repeater systems use surplus time delay relays, coffee pot trimmers, or other mechanical contrivances. These devices may be either unreliable or expensive.

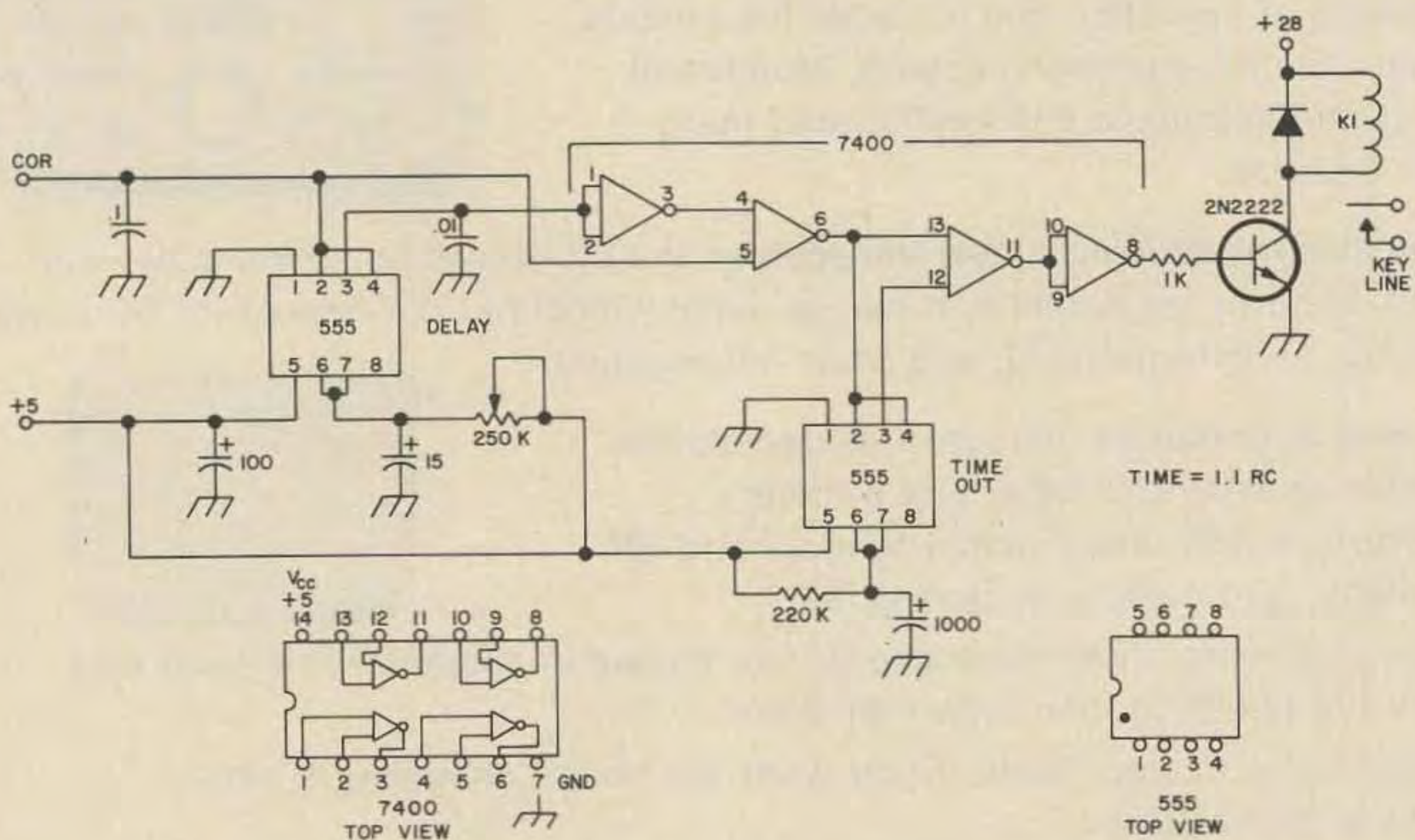


Fig. 1. Schematic diagram of the repeater control circuit using NE555 IC's.

Integrated Circuits

The device to be described in this article uses three integrated circuits that are reliable and inexpensive. A few resistors and capacitors set the time intervals for the two Signetics 555 timers. A 7400 quad dual input nand gate performs the required logic functions. A transistor is used to drive a relay in the output circuit. The completed unit is connected between the repeater receiver COR contacts and the repeater transmitter keying line.

Construction Notes

Any available method of construction can be used since the layout is not critical. A piece of perforated circuit board makes a good chassis for hand wiring. With the pins on the ICs inserted in matching holes in the boards, wires can be stuffed into the same holes alongside the IC pins for soldering. Teflon insulated wire is a must where repeated soldering and unsoldering may be necessary to correct solder bridges between pins. Making a printed circuit board is not recommended since such a one-of-a-kind project usually does not justify the trouble and expense.

The integrated circuits and data sheets for this project were obtained from Solid State Systems, Inc. Capacitors with polarity markings were electrolytic. The .1 and .01 μF capacitors can be mylar or disc ceramic. These two capacitors were necessary to prevent radiated noise from triggering the timer. Other precautions may become necessary under different conditions.

Note that the top view of the pin connections for the 555 in the schematic are numbered differently from the usual convention. This numbering was given with the application information, but the normal convention was given on the data sheet. The numbering shown in the schematic was used, and the circuit operated this way.

The output circuit shows a transistor driving a relay. A 2N2222 switching transistor can be used to drive a 28 volt crystal can relay coil. The contacts of these relays will typically handle up to two amperes. A silicon power diode must be placed across the relay to protect the transistor. A 28 volt lamp can also be used for this purpose while

providing an indicator light, if the transistor can handle the extra current. Other combinations of transistor and relay may be used if the transistor has enough dc gain to be fully turned on by the IC output. The IC should be able to provide more than 10 mA, and as much as 50 mA short circuit current. A resistor is placed in the base of the transistor to limit base current to no more than what is necessary to saturate the transistor.

A plug-in relay can be used to provide for easy repair of the only probably cause of failure in the circuit.

Setting Up

Once the circuit is completed, the drop out delay time can be adjusted with the 250K variable resistor. The time-out timer is not made adjustable, but the 220K resistor or the 1000 μF capacitor can be changed to select different time constants. Longer time constants may be difficult to achieve because of the leakage resistance found in most large electrolytic capacitors. The components used resulted in a time-out delay of almost ten minutes although the theoretical time constant would be only about four minutes. This is because the leakage resistance in the capacitor counteracts the timing resistor. If the leakage is bad enough, the timer will never time out.

No power supply is shown in the schematic, but voltages can be obtained from a dropping resistor and zener diode from the repeater's 28 volt power supply. If a special separate power supply must be built, there are many integrated circuit voltage regulators that can make the project very simple.

Final Comments

The integrated circuits cost just over three dollars at the time of this writing, and prices have been decreasing steadily. The circuit gives solid state reliability with the exception of the output relay which can be made easily replaceable. Anyone who is putting up a new repeater should consider making this simple circuit a part of the control system right from the start, but if the machine is already up, its never too late for improvements.

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