

AN IMPROVED RADIO-CONTROL DEVICE FOR REMOTELY TRIGGERING CAPTURE EQUIPMENT

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Abstract: A simple electronic device is described for radio-controlling drop nets, rocket nets, corral traps, and other equipment requiring opening or closing of a circuit. Range of the device is limited only by the voice range of the 2-way radios in use. The device is not affected by other signals and can be connected to many types of portable VHF transceivers in common use by management agencies. The device can easily be assembled from subassemblies readily available by mail order. Cost for the entire unit, exclusive of the 2 transceivers required, is less than \$150.

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Wildlife managers and researchers at times must have the capability to control capture equipment and other mechanisms from a distance. Mechanical or wire connections, although most reliable, are cumbersome, particularly over long distances. A radio signal provides an effective link when distance limits usability of mechanical or wire controls. Radio-control devices should be uncomplicated and reliable. To prevent accidental functioning (falsing) of the capture apparatus, they should function only on receipt of the correct triggering signal.

Grieb and Sheldon (1956) described a device utilizing a Citizen's Band (27 MHz) transmitter and receiver with a single 10-second signal to actuate the firing mechanism. With the recent popularity and expansion of the Citizen's Band such a system is no longer feasible because of extreme crowding and the increased likelihood of falsing. Schmidt et al. (1978), recognizing this problem, extensively modified 2 VHF transceivers and installed tone activated circuitry to eliminate the falsing problem. The device described in this report was designed by the Alaska Department of Fish and Game to capture Dall sheep (Ovis dalli). It does not suffer from falsing and most VHF transceivers would require no modifications to be used in this manner.

## METHODS

This device consists of 2 parts: a transmitter/tone encoder (TE) and a receiver/tone decoder (RD). The TE is attached to the microphone input of a VHF transceiver. The RD "listens" for the 2 tones via a connection to a VHF Handi-Talkie. Both transceivers operate on 45.04 MHz. When the proper tones are received, a relay closes in the RD, the blasting caps detonate, and the net drops.

The TE consists of a Model PE-2, 2-tone sequential encoder (Communications Specialists, 426 W. Taft Avenue, Orange, CA 92667), "arm" and "fire" switches, a "ready" light-emitting diode (LED), and a female connector for connections to the transmitter input. The RD consists of a Model SD-1, 2-tone sequential decoder (Communications Specialists), a 12-volt battery (which is also used to detonate the caps), a relay, switch, test light, binding posts for battery and blasting caps, and a connector for input from the receiver.

The PE-2 and SD-1 come pre-wired and need only be mounted in metal chassis with the appropriate switches, relays, lights, etc. The arrangement shown in Figs. 1 and 2 is only 1 possible hook-up. We used tone frequencies of 510.5 and 368.5 Hz, but other combinations can be used. Other tone encoders and decoders may be used with appropriate modifications. Any 2-way radio repairman, ham radio operator, or advanced electronics tinkerer should be able to assemble the units in an afternoon.

Most portable VHF transceivers should be usable in conjunction with the devices described here. The transceivers must operate in the AM or FM mode. Single side band (SSB) is not acceptable because of the difficulty of reproducing the correct tone frequencies on the receiving

end. Some modifications to the transmitter and receiver may be required depending on the configuration of the microphone connection on the transmitter and the receiver audio output provisions. If there is no microphone jack on the transmitter, or earphone jack on the receiver, it will be necessary to wire them in.

To test the units, connect a 12-volt battery and a receiver to the RD. Connect the TE to the transmitter. Turn the "arm" switch on. The LED should light, indicating the unit is transmitting, and will detonate the caps when the "fire" switch is depressed. The light on the RD should illuminate within a second or 2 of operating the "fire" switch.

To operate the device, follow the same procedure, but wire the blasting cap connections to the binding posts on the RD. Make sure the caps are well away when this is done.

The activation range of these units is limited to the distance over which voice communication is possible. Depending on terrain, antennas, and transmitter power, that distance could be 20 miles or more.

#### DISCUSSION

This device was field-tested in 1978. It worked as expected, but three minor problems became evident. First, operators had a tendency to leave the "arm" switch in the "on" position in their haste to get to the downed sheep. Since this switch controls the transmitter, its batteries were quickly run down. The problem can be solved by ensuring the "arm" switch is of the momentary contact variety.

The second problem was that the sheep heard the triggering tones. They were not alarmed, but could potentially be in some situations.

Some receivers may allow some bleed-through from the earphone jack to the speaker, and if this causes a problem appropriate wiring changes should solve it.

The last problem is probably more psychological than real. There is about 2 seconds of delay between operating the "fire" switch and detonation of the blasting caps. This delay has not caused the loss of any sheep, but it does cause the operator some consternation.

In 1978 the PE-2 encoder cost \$49.95 and the SD-1 decoder \$29.95. If these particular subassemblies become unavailable in the future, units that operate in a similar fashion could be substituted. Total cost for the entire package, less transmitter and receiver, was under \$150.00.

Operating frequency of the VHF transceivers is generally not critical. However, at certain times during the approximately 11-year sunspot cycle, frequencies below about 60 MHz may be less usable. At these times, signals from thousands of miles away (skip) may obscure the signal from the remote control transmitter. Falsing should not be a problem as the RD responds only to the 2 tones selected by the user and then only if received in proper sequence. To solve the skip problem, either use a more powerful transmitter or a higher frequency.

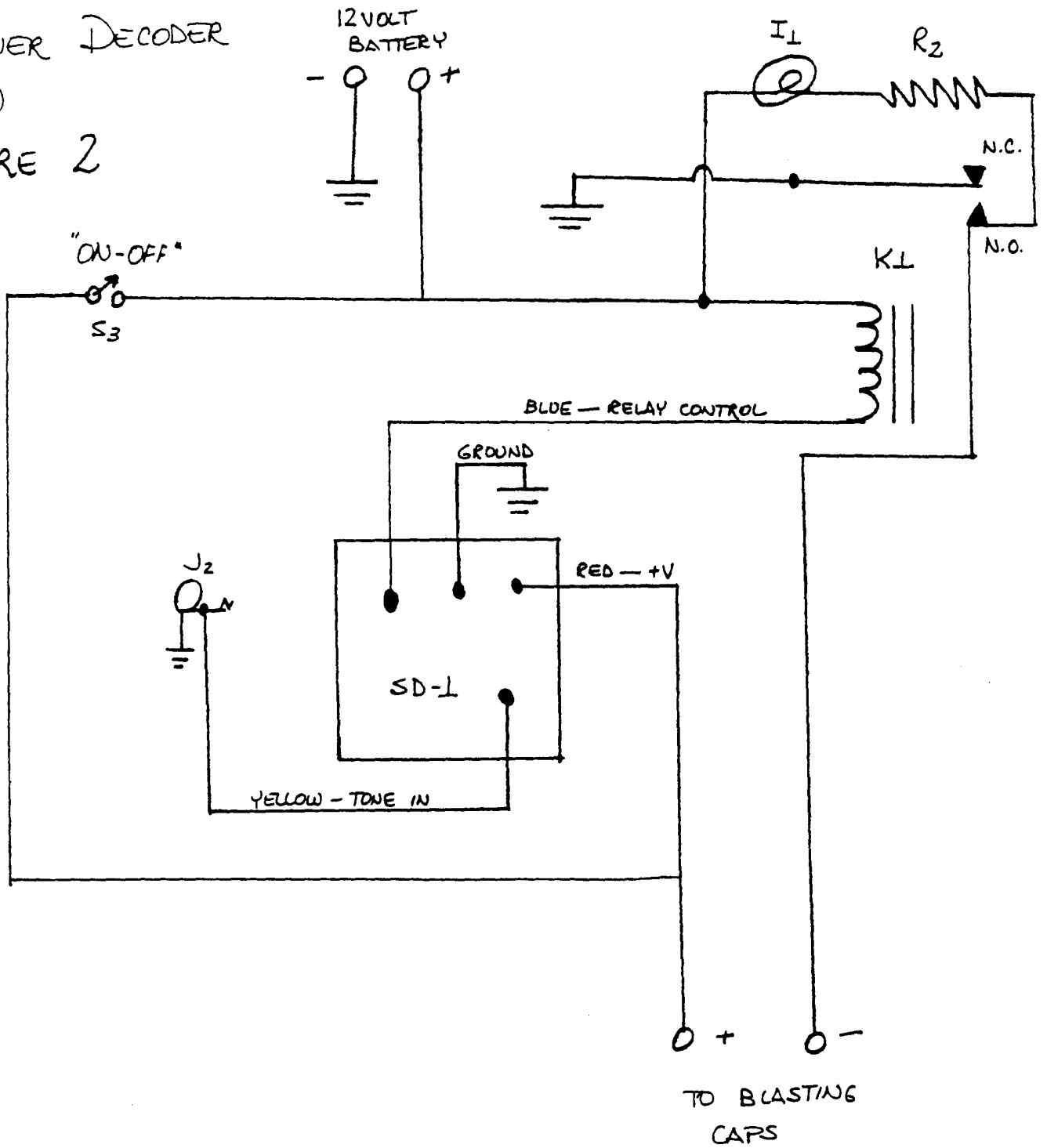
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RECEIVER DECODER  
(RD)

FIGURE 2



## MATERIALS

- S1 - spst momentary contact switch
- S2 - dpst momentary contact switch
- S3 - spst toggle switch
- J1 - 4-conductor Jones jack
- J2 - 1/4" phone jack
- K1 - 12vdc relay, spdt contacts
- D1 - light emitting diode, Archer 276-026 or equivalent
- L1 - 6vdc lamp (12vdc lamp may be used if R2 is omitted)
- R1 - 1/2 watt, 330 carbon resistor
- R2 - 1 watt, 39 carbon resistor
- SD-1 - 2-tone sequential decoder module (see text)
- PE-1 - 2-tone sequential encoder module (see text)



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