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No. 56

The Phone Phreak like everyone else must keep pace with technology. We therefore give you The Programable Blue Box.

The Box presented here offers excellent stability with both voltage and temperature. It uses 9 IC's, all of which are readily available. And uses two ordinary 9 volt alkaline batteries. Current drain is relatively low - 24 ma. in standby, about 30 ma. sending tones.

Circuit Description

When a key is pressed, the diode matrix in fig. 1 produces a binary code on lines A through D corresponding to the key pressed. Note the code 0000 is not used here, it is reserved for 2600. Whenever a key is pressed the S line also goes high, indicating a valid code on lines A thru D.

In fig. 2, lines A thru D and S go into the 2519 - a hex 40 bit shift register. Only 5 out of the 6 shift registers are used. The input of the 6th should be grounded. The S line also goes to a debouncing circuit and schmitt trigger composed of the two inverters and associated parts. The NAND gate takes either the signal from the schmitt trigger or the system clock and generates the clock signal for the shift register. This is a negative going pulse of about 20 us. So each time a key is pressed, the data at the input to the SR is shifted in. An LED lights whenever a key is pressed to indicate this.

When all numbers are entered, and it is desired to send tones, the SEND key is pressed. This key triggers a flip-flop formed by two NOR gates, and does 4 things. It inhibits the input circuitry from the keyboard so no more numbers can be entered; It brings the recirculate line of the SR high so the data is not lost once it is sent; It enables the output circuitry by way of the EO line; And it enables the system clock to shift out the data.

When data is shifted out of the SR it appears on output lines A thru D. In fig. 3 these go into 2 groups of analog switches. Each group contains 16 switches. A binary code at the input of these switches connects the corresponding output to the Z input of the 4051's. E.g. if the code 011 is present at the input, output line 3 is connected to Z. This places the correct resistor for the desired tone in the circuit. Line 0 is used for generating the 2600 tone. Each shift of the SR thus places data at the input of the analog switches and selects the proper resistors for the 2 oscillator circuits. The outputs of the oscillators are summed through the two 3.3K resistors and sent to the telephone earpiece. The tones are gated on and off by the EO line. When all the tones are sent, the S line goes from high to low and resets the send and clear flip-flops.

The basic operation of the box has just been described. There are a few additional features that should be mentioned however.

The CLEAR key triggers its own flip-flop (formed by the other 2 NOR gates.) and does the same things as the SEND key with two exceptions: the recirculate line of the SR is held low, thus clearing memory and the two oscillators are not enabled so no tones are produced.

The DEL key is used to delimit between sequences of numbers. When pressed, it clocks the SR without placing any data on its input lines. This fools the circuitry into believing that all the tones have been sent.

The 2600 tone is generated by pressing the SEIZE key. This is the only key that does not use the common bus. When pressed, it enables the oscillators, and since the only data at the input to the analog switches is 0000 when MF tones are not being sent, the top oscillator generates 2600.

Construction

The easiest means of construction is wire wrap. With a little care the box can be built quite compactly. All IC's except the SR use only the plus 9 supply. The SR uses plus and minus 9. Both the Vss and the Vee of the 4051's should be grounded. Vdd is plus 9. The input to the one unused shift register should be grounded. DON'T DO ANYTHING TO ITS OUTPUT. The trimpots should be 10 or 20 turn cermet type construction. All resistors should be carbon film NOT carbon composition. Carbon film offer better temperature stability at the same price. The 3600 pf. capacitors associated with the oscillators must be polystyrene. The end with the band should be the grounded end. The LED may seem like a power wasting frill to some, but it is needed. At a glance it can tell you if your data has been accepted or when memory is clear.

The wiring for the trimpots is not shown to avoid a mess. The tones are in two groups - bottom group 700, 900, 1100, 1300, 1700 - top group 900, 1100, 1300, 1500, 2600. Wiring is easy though, just wire the output line for a particular key to the corresponding pot. E.g. digit 4 is 700 and 1300. So output line 4 of the top group goes to 1300 and output line 4 of the bottom group goes to 700. Line 0 is for 2600. Wire up all used outputs this way. Also, don't try to skimp by using single turn pots or one large trimmer. The ease of tuning and insensitivity to vibration is well worth the 20 turn trimpots and the series resistors.

The hardest part to locate is probably the SR. It is available from James Electronics, 1021 Howard St., San Carlos, Ca. 94070, for \$4 at this writing. All other parts are available from several sources - shop around.

Calibration and Use

There are a few methods that can be used to calibrate this box. A DIP switch can be added to the output of the SR to pull these lines up to plus 9 volts. If this is used just set the switch to the code for the desired key. E.g. 0101 for key 5. And press the SEIZE key to enable the oscillators. You can also wire up a 16 pin plug that can be used to replace the SR. Connect the input pins to their respective outputs and substitute this plug for the SR. When a key is pressed on the keyboard and the SEIZE key is held, the desired tone will be heard.

To use the Box, first clear memory by pressing the CLEAR key. (the prototype seemed to always have a clear memory when power was first applied, but I'm not sure this will be the case with all units.) Enter your desired numbers by pressing the respective keys. The LED should light each time a key is pressed to signify acceptance of that entry.

Next, call your favorite 800 number and press the SEIZE key for about a second. When you hear the Ker-chunk press SEND. Out comes a merry little tune!

The DEL key is used when it is necessary to separate sequences of numbers, such as for overseas calls. E.g. To call 044 1 246 8000, enter KP 011 044 ST then press the DEL key and enter KP 044 1 246 8000 ST. When you press the SEND key, the first sequence will be sent then the box will halt. Press the SEND key again and the second sequence will be sent.

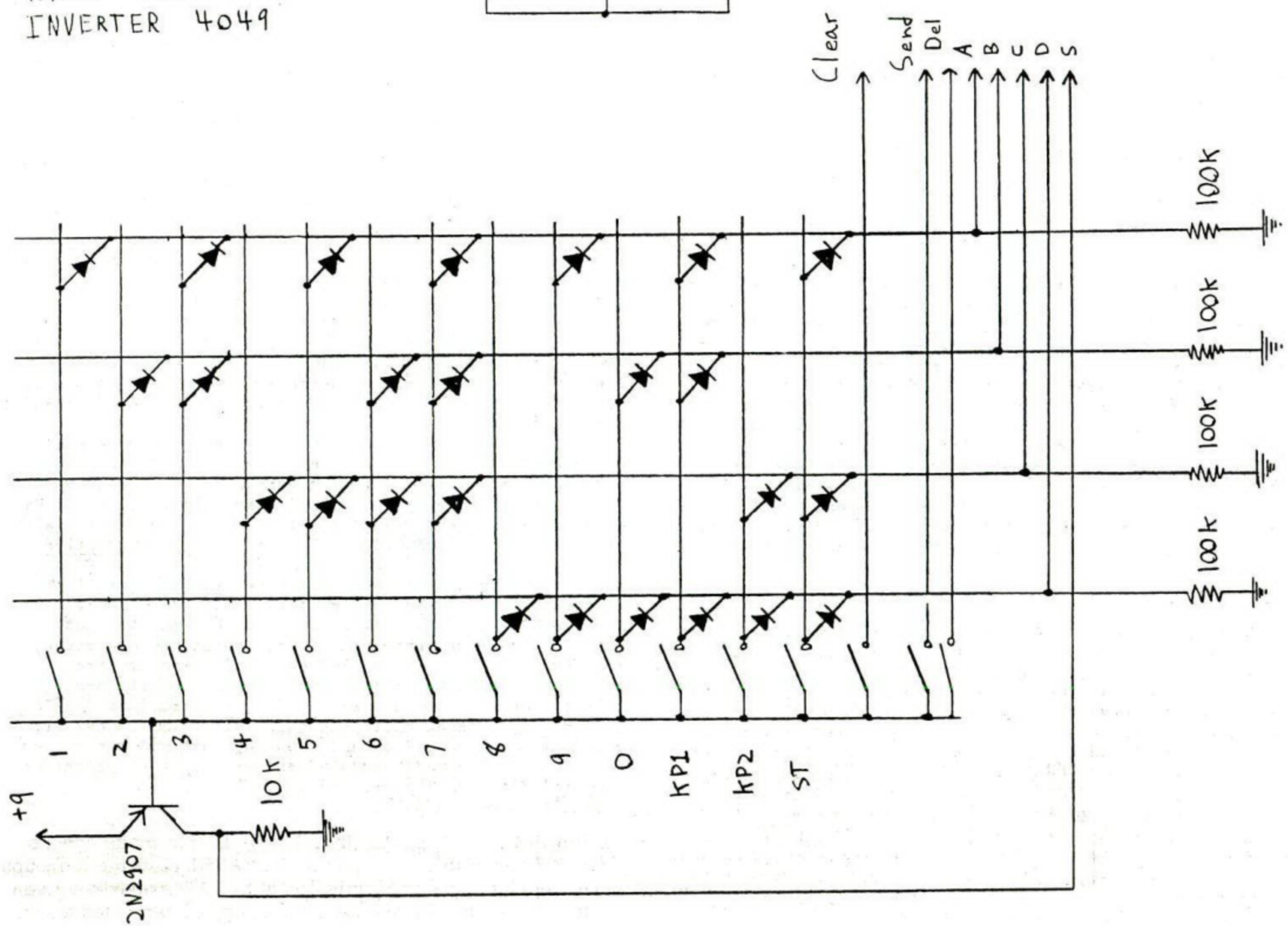
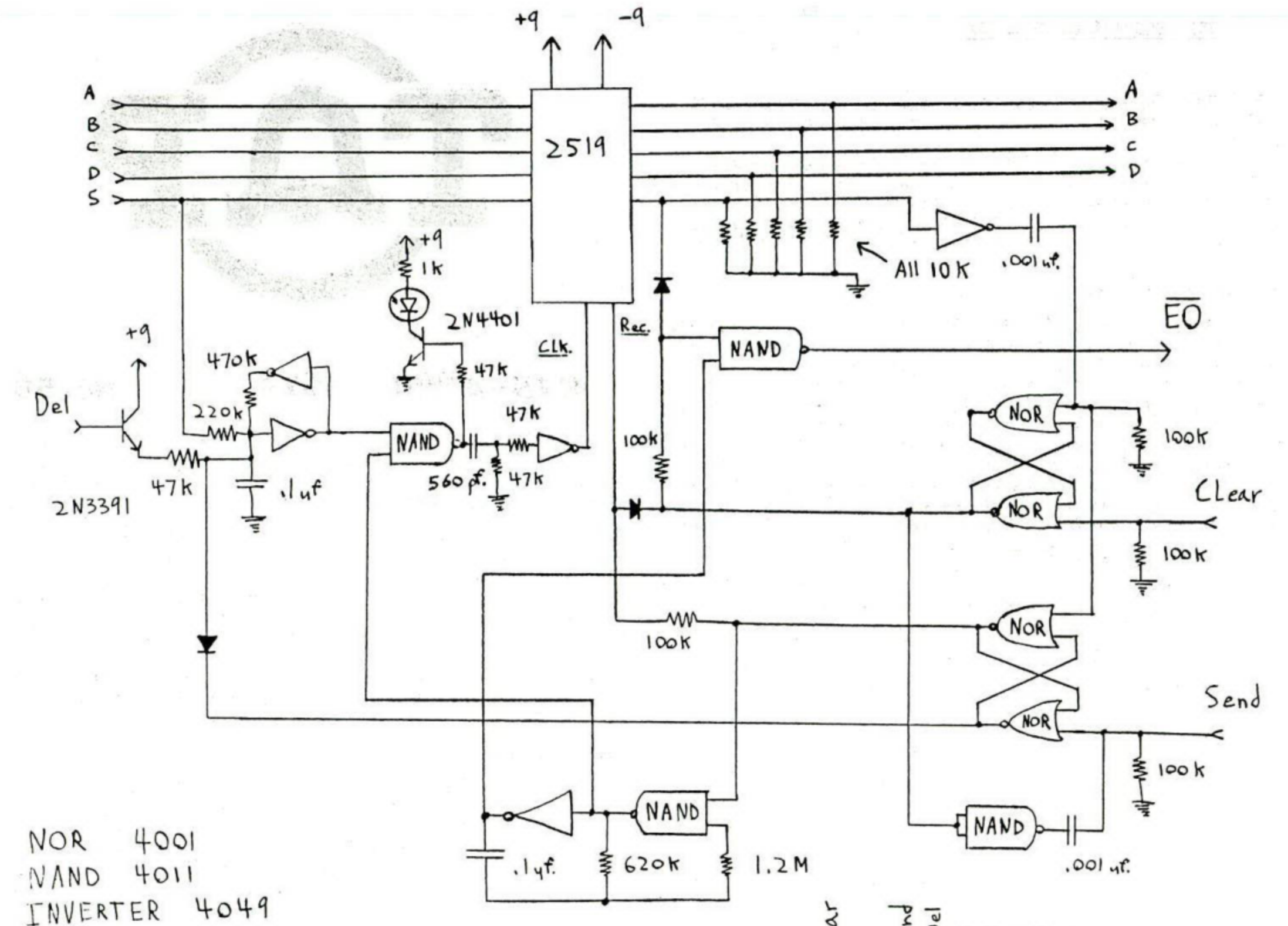
I'd like to say a word at this time about square waves and the Blue Box. For some reason some people seem to think you can't use them. A square wave is made up of a fundamental frequency and its odd harmonics. So a 900 Hz square wave is really made up of a 900 Hz fundamental with harmonics of 2700, 4500, 6300, 8100 and so on. The entire telephone network has only a bandwidth of about 3 KHz, however. A typical telephone channel starts to roll off at about 1100 Hz, and is down 4 to 18 db at 2600 Hz.

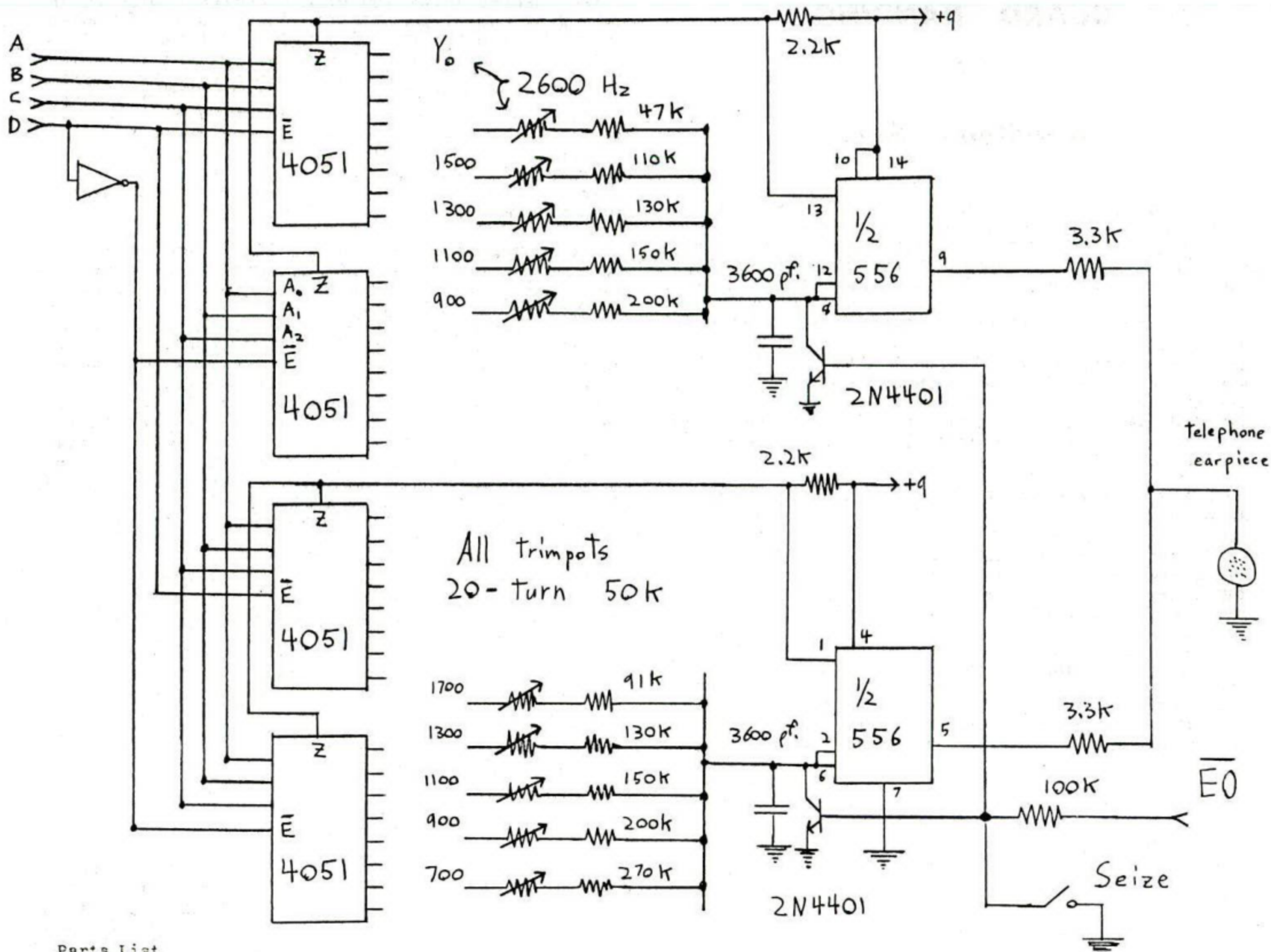
Above 3 KHz the roll off is 80 to 90 db/octave! What all this means is that even if you do send square waves, the register at the other end can't tell what you're sending. If you haven't guessed it, the oscillators in this box generate square waves, and it works just GREAT!

This Box is capable of generating all 15 MF codes. If you want to have CODE 11 and CODE 12, just add the diodes needed to produce 1110 and 1111 and wire up the respective outputs of the analog switches.

Good luck and happy Boxing!

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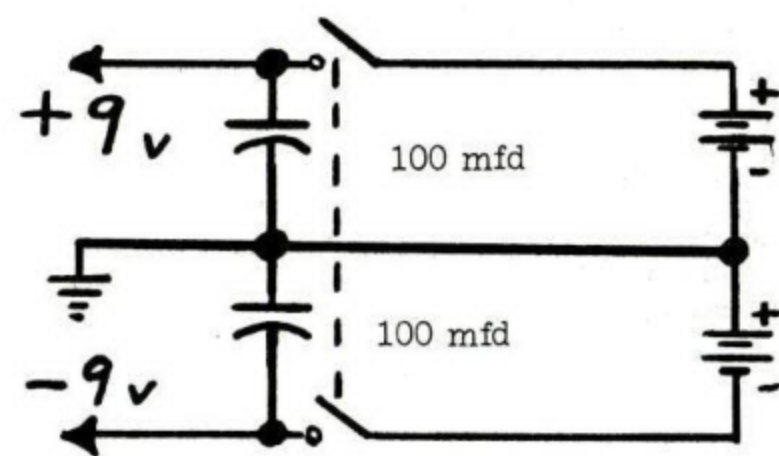
Parts List

All resistors are $\frac{1}{2}$ watt
5% carbon film

6 - 10K
10 - 100K
1 - 620K
1 - 1.2M
1 - 320K
1 - 470K
1 - 270K
2 - 200K
2 - 150K
2 - 130K
1 - 110K
1 - 91K
5 - 47K
2 - 2.2K
2 - 3.3K
1 - 1K
1 - Red LED
28 - 1N4148 signal diodes
or equiv.

1 - 2N3391 or equiv.
2 - 2N4401 or equiv.
1 - 2N2907 or equiv.
1 - 4001 NOR
1 - 4011 NAND
1 - 4049 INVERTOR
1 - 2519 40 bit hex SR
4 - 4051 8 channel analog
switch
1 - 556 dual timer
2 - 100 uf. capacitors
2 - .001 uf.
2 - .1 uf. mylar 10%
2 - 3600 pf. polystyrene 5%
1 - 560 pf. polystyrene
10 - 10 or 20 turn 50K
Cermet trimpots

Keyboard, switches, IC
sockets, etc.

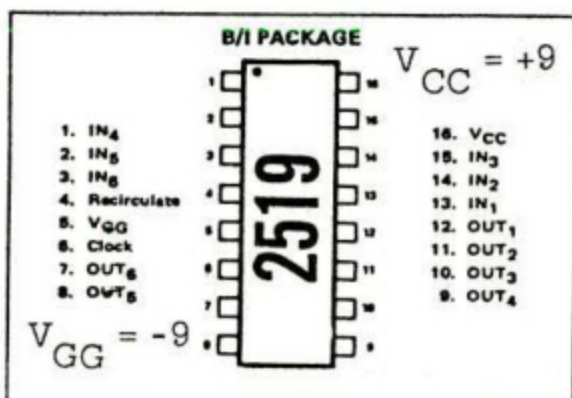


9 Volt Alkaline Batteries

'Taser' guns zapped

Pin-outs for the other IC's can be found in National's CMOS book.

PIN CONFIGURATIONS (Top View)



Hot line

CHARLESTON, S.C. (AP) — A man who tried repeatedly with no success to place a telephone call from a downtown booth today was arrested and charged with arson after trying to set fire to the telephone, police said.

Christopher John Simon, of Charleston "apparently kept getting a recording that the number was not in service and he got tired of hearing the recording," said Police Sgt. Bobby Green.

Green said Simon, in his 20s, took out his cigarette lighter and applied the flame to the plastic phone receiver. The receiver melted, said Green.

Simon was charged with arson and was to appear before a magistrate later.

It was shades of Star Wars in the State Senate yesterday.

Legislation that would outlaw the possession, manufacture and sale of the electronic "taser guns" was passed, 34-0, and sent to the Assembly yesterday.

Sen. Carmen A. Orechio (D-Essex), who sponsored the bill, said the taser gun was a dangerous weapon that generates high voltage electricity and shoots projectiles that can immobilize a person with an electric shock.

The weapon is being used more frequently within the state, Orechio said.

"It's a very dangerous weapon," he said, noting his bill would make

possession of the taser gun a misdemeanor.

The battery-powered weapon looks like a flashlight and generates enough high voltage electricity to "render a person helpless," he said.

The weapon has snag barbs on the ends that are capable of passing through a person's clothing and penetrating his body.

The weapon could be "easily fatal" to a person suffering with heart disease or high blood pressure, or could cause permanent brain damage, according to a statement accompanying the bill.

The legislation amends New Jersey's gun control law, and would be effective immediately if signed into law.

GUARD BANDING

by

Napoleon Solo

IF YOU USE A BOX, YOU PROBABLY HAVE HEARD OF GUARD BAND BUT PROBABLY DON'T KNOW EXACTLY HOW ITS USED OR WHY IT'S USED. I WILL ATTEMPT TO EXPLAIN IT'S LEGIT PURPOSE, THEN EXPLAIN HOW A BLUE BOXER CAN USE THIS KNOWLEDGE TO HIS ADVANTAGE.

GUARD BAND IS A METHOD OF PREVENTING ACCIDENTAL DISCONNECTS FROM PEOPLE TALKING OR PLAYING MUSIC INTO THE PHONE LINE. IT SIMPLY MEANS IF ANY OTHER FREQUENCIES ARE PRESENT OTHER THAN 2600 HZ TONE, THE EQUIPMENT WON'T ALLOW A DISCONNECT THUS CLEARING THE LINE DOWN FOR ANOTHER CALL. IF ONLY 2600 WAS PRESENT, THEN THE EQUIPMENT WILL CLEAR DOWN FOR ANOTHER CALL.

IN SOME OUTBACK AREAS IN THE COUNTRY MANY MILES FROM THE TOLL SWITCHING OFFICE, THE PHONE COMPANYS WILL USE A TRUNK LINE THAT IS CONTROLLED BY 2600 SO IF THE POTENTIAL BLUE BOX USER GOES AND HAPPILY TOOTS THE 2600 TONE TO CLEAR DOWN THE 800 NUMBER, THE TRUNK LINE WILL HEAR THE 2600 BEFORE THE TANDOM AND DISCONNECT YOU FROM THE CIRCUIT WITHOUT YOU GETTING A CHANCE TO "BOX" YOUR CALL. THE PHONE COMPANY ALSO KNOWS THIS, SO THEY ARE HAPPILY PUTTING IN MORE OF THESE TYPES OF CIRCUITS. NATURALLY THEY WON'T HAVE TO INSTALL THEIR SPECIAL TOLL FRAUD DETECTING GEAR. SO, BOXING FROM THESE TYPES OF AREAS ARE USUALLY MUCH SAFER. STILL I WON'T RECOMMEND DOING IT FROM HOME UNDER ANY CONDITIONS

NOW I WILL TRY TO TELL YOU EXACTLY HOW YOU KNOW YOU WILL NEED GUARDBAND. I WILL FIRST EXPLAIN IT UNDER TWO CONDITIONS: 1. CALLING FROM A PAY PHONE GOING THROUGH AN OPERATOR AND 2. CALLING FROM A DIRECTLY DIALED CALL. NATURALLY IF IT IS POSSIBLE I WOULD RECOMMEND GOING THROUGH A DIRECTLY DIALED CALL.

IN CERTAIN OUTBACK AREAS, OPERATORS HAVE BEEN KNOWN TO BE AS FAR AS 250 MILES FROM THEIR SERVING AREA. AN EXAMPLE OF THIS IS DEATH VALLEY, CALIF. I CAN WELL UNDERSTAND WHY. IN DEATH VALLEY, THE OPERATORS ARE IN SAN BERNARDINO. THIS IS A HELL OF A DISTANCE FOR NORMAL OPERATOR TRUNKS SO FOR SIMPLICITY, IT'S EASIER TO SEND CALLS OVER MICROWAVE. THIS MEANS THAT IF YOU PLACE A CALL FROM THERE, AND YOU ATTEMPT TO TOOT IT OFF WITH PURE 2600, YOU WON'T BE ABLE TO DO IT, INSTEAD, YOU WILL JUST FLASH THE OPERATOR. BY SENDING 2600, YOU ARE SIMPLY HANGING UP THE PHONE AS FAR AS THE OPERATOR IS CONCERNED.

THE SECOND THING YOU WILL EXPERIENCE WILL BE IF YOU WERE TO DIAL DIRECT CALLS WITHOUT GOING THROUGH THE OPERATOR. IF YOU TRY TO BLOW OFF CALLS DIALED DIRECT LIKE AN 800 NUMBER OR WHATEVER, YOU WILL EITHER GET DUMPED INTO SILENCE (USUALLY WHEN USING A PAYPHONE) OR A DIAL TONE (USUALLY WHEN CALLING FROM A RESIDENTIAL PHONE. ITS USUALLY AN ABRUPT CLICK AND YOUR DUMPED. SOMETIMES ON G.T.&E SYSTEMS YOU WILL GET A RE-ORDER, OR A QUICK BUSY SOUND. IF YOU ARE SUCCESSFUL, YOU WILL HEAR A "KER-CHINK" SOUND AND STILL HEAR THE SOFT HISS OF THE LONG DISTANCE NOISE.

NOW I WILL EXPLAIN A LITTLE ABOUT FREQUENCY RESPONSE AND HOW THAT APPLIES WITH GUARD BANDING. THE LONG DISTANT PHONE LINES CAN ONLY TRANSMIT FREQUENCIES FROM 300 HZ TO 3000 HZ WITHOUT LOSSES AS THE FREQUENCY GOES HIGHER THAN 3000 HZ, THE VOLUME OR "LEVEL" GOES DOWN (GETS SOFTER). SO THE TRICK OF THE TRADE IS TO INSERT A 3150 OR 3200 HZ TONE MIXED WITH THE 2600 HZ TONE EXACTLY LIKE THE TONES ARE MIXED IN THE BOX. BUT IT'S VERY IMPORTANT THAT YOU MUST BE ABLE TO MIX ANY PREPORTION OF THE 3200 AND 2600 HZ TONE. LIKE 40% 2600 AND 60% 3200 OR 49% 3200 AND 51% 2600 TONES. THIS CAN BE DONE WITH A KNOB WHEN TURNED IN ONE DIRECTION THE BOX SENDS PURE 2600, THEN AS THE KNOB IS TURNED, MORE AND MORE 3200 COMES THROUGH AND LESS AND LESS 2600, THIS WAY, YOU CAN "PREPORTION" EXACTLY THE CORRECT "MIX" UNTILL YOU GET RESULTS. THE EASIEST WAY TO DO THIS IS BY SETTING THE KNOB UNTILL IT JUST WON'T CLEAR ANYTHING, THEN ADD A LITTLE MORE 2600 RELEASING THE TONE EACH TIME UNTILL YOU HEAR THE FAMILIAR "KER-CHINK" SOUND ONE HEARS WHEN "BLOWING OFF" THE 800 NUMBER OR WHATEVER YOU ARE USING. GUARD BAND IS THE METHOD WHICH IS USED FOR "STACKING TANDOMS" AS YOU PROBABLY HEARD IN SO MANY PUBLICATIONS. IT IS ALSO USED TO ACCESS AUTO-VERIFY BY COMING INTO A SWITCHING MACHINE FROM TRUNKS THAT ARE CLASS MARKED FOR AUTOVERIFY USAGE. GUARDBAND CAN ALSO BE USED TO GET INTO AUTOVON AND OTHER INTERESTING SYSTEMS. SO AT THIS TIME, I WILL LEAVE IT UP TO YOUR OWN IMAGINATION AS TO WHAT YOU CAN DO WITH IT AND HAPPY BOXING.

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Bank gave dealer too much credit

JERSEY CITY (AP) — Jersey City police are looking for a coin dealer who disappeared with \$100,000 after a computer made an error in his bank account.

Charles Walsh, 52, had only \$85 in his account at the Jersey City Commercial Trust Co., when a key-punch operator hit the wrong key and credited two \$50,000 checks which belonged in a commercial account to Walsh's account.

His account number differs by only one digit from the commercial account number.

Walsh's Dec. 21 bank statement showed his account had a balance of \$100,085 and, police said, the coin dealer began withdrawing the money. Within a month he allegedly had withdrawn all but the \$85 from the account.

It wasn't until Feb. 9 that the bank officials uncovered the error and notified police to file a fraud complaint against Walsh. Police who went to Walsh's home found the doors locked, the sidewalk unshoveled and the mailbox full of letters.

A warrant was issued for his arrest after he failed to appear in court Tuesday to answer the complaint that he defrauded the bank of \$100,000.