TAP

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Milo Fonebill's Automatic Blue Box Explained

by Lavoisier

Advantages of Milo's Box

1. Can hold 5 10 digit numbers.
2. Each number is outpulsed at the proper rate at the touch of a single key.
3. The current drain is very low. When not pulsing the battery drain is only 40 microamps. A single 9 V alkaline battery will power it for a year of on time, unlike Peter Piper's programmable box (TAP # 56) which takes two 9V batteries and pulls 24ma in standby

Disadvantages of Milo's Box

1. The box is complex.
2. Because of its complexity it is bulkier than the usual manual box.

The enclosed schematic is of a working Milo Fonebill BB. It took one hell of a lot of study to figure it out from Milo's drawings. I'll describe how it works in 3 sections: 1, Number entry; 2, Playing back the numbers, or RUN; 3, Clearing the Box.

1. Number entry. Assume the box has been cleared and a 1 is in all 64 bits of each register. I'll get to the reason for this later. The switch enabling the keyboard is closed. Now assume that the KP key is pressedthen lines 1100 and 1700 go low. A "0" (0 is low, 1 is high)is placed on pin 15 (Data In) of IC 9 & 12 but the data is not entered yet. At the same timepin 4 of IC5A and pin 13 of IC4Cgo low which drives pin 11 of IC14C low. This in turn makes pin 10 of all the shift registers low through IC4A and IC16B. This puts the shift registers in data entry mode. Meanwhile charge is leaking off C3 through R14 and after about 9msQD goes high and $\overline{KD}$'goes low. This delay is to allow for contact bounce in the keyboard switches. QD high drives pin 2 (clock input) of all the shift registers high. The data present at pin 15 of all the shift registers is now entered. $\overline{KD}$' went low after 9ms which, through IC6A, IC17A-F, and IC21E &F turns on the output amplifier (LM386) giving an audible click and lights the pulsing gate indicator LED. The LED stays lit as long as any key is depressed.

Let me repeat, a 0 is entered into the 1100 and 1700 shift registers and a 1 is entered in the 700, 900, 1300, and 1500 shift registers when KP is pressed on the keyboard.

The Schmitt triggers (IC18E&F) replace the 4047 used in Milo's box.I could not get the 4047 to work in this application. Besides the 74C14 Schmitt trigger is cheaper. Note also that the P gate indicator driver should be a non-inverting buffer and not an inverting buffer as Milo shows it.

The 4031 shift register, unlike other CMOS ICs, has a large clock input capacitance (pin 2) so I play safe and drive them with 3 inverting buffers rather than 1 as Milo does. The 4031 is clocked by the positive edge of the clock and not just a high level so the clock input needs a sharply rising wave form to clock it.

2, RUN Mode. Assume that 2 ten digit numbers each with a prefix of KP and a suffix of S have been entered into the shift registers. Before going on I will describe the 1 of 2 data selector composed of the 3 NAND gates IC3B, C, & D and the inverting buffer IC16C. Two clock rates are used: 1280 Hz supplied by the oscillator IC23; 10Hz at the output (pin 3) of thedivide by 128 counter (IC20). The 1280Hz clock goes to one input of the data selector(pin 9, IC3D) and the 10Hz clock goes to the other input(pin 12, IC3C). The control signal appears at pin 4 of the NOR gate IC15B. When this control voltage is low then the output of the data selector (pin 4, IC3B) follows the high speed clock. When this pin is high then the output of the data selector follows the low speed clock.

Now, let's press the RUN key. Immediately pin 4 of IC4B goes high and stays high for 50ms (I'll explain the reason for the 50ms later) and the output of the NOR latch composed of IC13C & D (pin 10, IC13D) goes high which sends pin 3 of IC14A low. After 50ms this turns on the clock oscillator (pin 4, IC23) and drives pin 1 of IC6A high which turns on the output amplifier and the P gate indicator.

Which clock will be used by the data selector? A total of 24 digits have been entered into the shift registers. Since these are 64 bit shift registers the data is 40 bits away from appearing at the output. The 2 NAND gates IC5B and IC4D see all "1s" at the Q output (pin 6) of the shift registers. This through IC15D and IC15B selects the high speed clock. So, at a rate of 1280Hz data is stepped through the shift registers.

After 40 clock cycles two things happen, either of which will reset the RUN latch and turn off the clock. The "End of Register" (EOR) counter (IC19) has reached a count of 64 (it also counts when the numbers are entered) placing a high level on pin 6 of IC14B. Also the $K_1 + K_2$ detector composed of the 3 NAND gates IC2C & D and IC3A has detected KP_1 at the $\overline{Q}$ output ($\overline{Q}$= not Q) output (pin 7) of the 1100 and 1700 shift registers. This places a high level at the other input (pin 5) of the NOR gate IC14B. The negative going pulse at pin 6 of the reset generator (IC22) triggers a 2ms output pulse at pin 10. This resets the RUN latch, the EOR counter (IC19), the divide by 128 counter (IC20), and turns off the clock. All this happened in 81.25ms, 50ms delay before the clock turned on plus 31.25ms to shift 40 bits at 1280Hz.

But we still haven't played our numbers back. The next press of the RUN key gets the first number. KP of the first number is at the output of the 1100 & 1700 shift registors. The output of the $K_1 + K_2$ detector is high making the trigger input (pin 6) of the reset generator low but this doesn't do anything. The reset generator is negative edge triggered. Let's press RUN again. Again we get the 50ms delay before the clock turns on. The "No Data Detect" gates see data present at the shift registers so the data selector selects the low speed clock. Pin 13 of the NOR gate IC15C goes low and pin 12 of the same IC is also low because it takes 64 clock cycles before pin 3 of IC20 will go high. IC15C then drives one input of all the output NAND gates high (IC1A, B, C, D, IC2A & B).Pins 7 of shift registers IC9 and IC12 are also high so the output of NAND gates IC1C (1100) and IC2B (1700) go low which turns on the 1100 and 1700 tone generators. The output amplifier and the P gate indicator are also on so we have 100ms of KP as per Milo's specs. KP is 100ms because of the 50ms delay before the clock starts running. This is the reason for the 50ms delay. Therefore R2 and C2 should be chosen to give a 50ms delay.

Pin 3 of IC20 goes high 100ms after RUN is keyed. This turns off the tone generators and clocks the shift registers to the next number. After 50ms of silence pin 3 of IC20 goes low for 50ms and we get 50ms of tones for what ever number is after KP and so on for each number until KP of the next number is reached. Then the $K_1 + K_2$ detector output, which went low after KP of the first number was shifted past, again goes high triggering the reset generator which stops the clock and resets everything.

A second press of the RUN key plays the second number in the same way. After the second number is played there are 40 bits of no data so the "No Data Detect" selects the high speed clock which rapidly (31.25ms) recirculates KP of the first number to the output of the shift registers and everything stops. The box is now ready to replay the first number.

3, CLEAR. When the CLEAR key is pressed pin 1 of IC13A goes high. This is one input of the NOR latch composed of IC13A and B. This drives pin 3 of IC13A low which, through IC4A and IC16B drives low pin 10 of all the shift registers. This changes the shift registers from the recirculate mode to the data entry mode. At the same time the other output of the NOR latch (pin4, IC13B) goes high. This through IC15B causes the data selector to select the high speed clock. The shift registers are now clocked at 1280Hz with their inputs (pin 15) all high. This loads a "1" in all 64 locations of all the shift registers. Since the complement output ($\overline{Q}$) is used the shift registers are cleared. After 64 counts the EOR counter goes high (pin 3, IC19) and resets the CLEAR NOR latch. The box in now ready to accept new numbers

The Tone Generator Board

The 4017s are the oscillators and are operated at 10 times the desired output frequency. The output of each oscillator is fed into a digital sine wave generator (see Don Lancaster's "CMOS Cookbook") which gives a 10 step approximation of a sine wave at 1/10 the input frequency. Unlike a square wave whose first harmonic is the 3rd at 1/3 the power of the fundamental, the first harmonic of a 10 step sine generator is the 9th at only 1/9 the power of the fundamental. Thus none of Milo's elaborate filter network is required. Just lately I've learned (TAP of course) that square waves work as well as sine waves so the board could be simplified by operating the oscillators at the corrpct frequency and eliminating the digital sine wave generators.

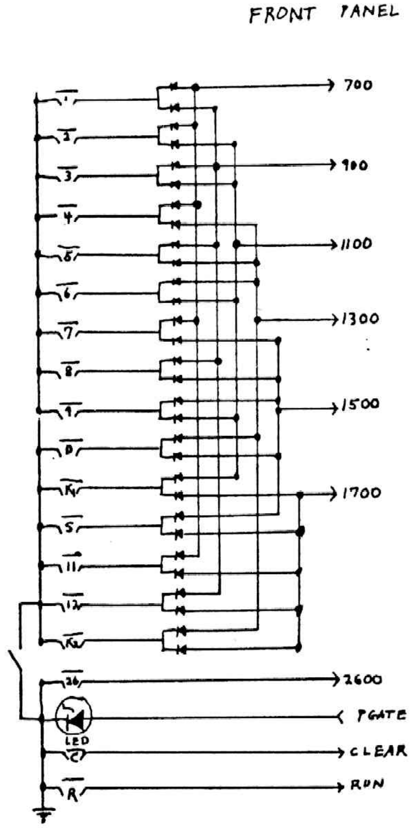
The output amplifier (LM386) is very convenient and easy to use. Its output voltage is automatically biased at ½ the supply voltage. Its output impedance is 8 ohms to match the most common speakers. It is designed for battery operation and has a low quiescent current drain.

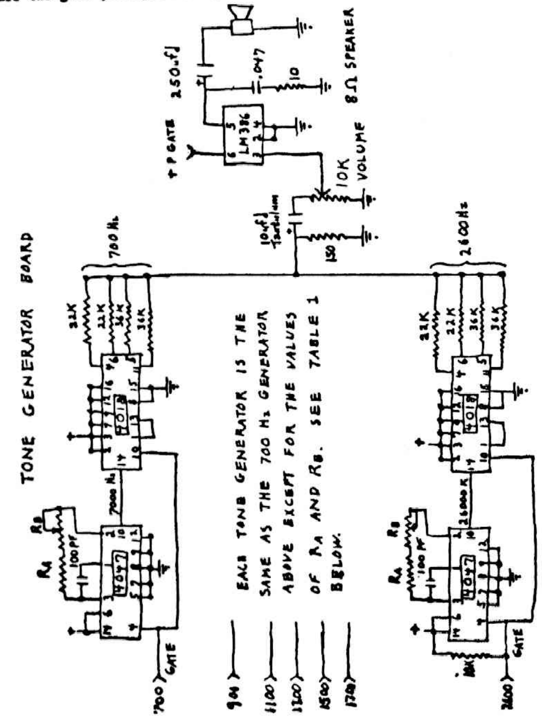
Milo's schematic did not include it, but the voltage regulator <u>is</u> required. The frequency of the 4047s is somewhat voltage dependent. Do not make any component substitutions in this regulator. It is designed for CMOS circuits and has a <u>very</u> low power drain but can still supply quite a bit of current when necessary. When the box is outpulsing for instance. You can find more about this regulator in the National Semiconductor "Linear Applications, Volume 1", AN71-7 & 8.

For the buffers on the logic board do <u>not</u> substitute the 4009 or 4010 for the 4049 or 4050. The latter 2 can supply much more output current than the first mentioned pair.

Two tips for working with CMOS circuits. First, the inputs are static sensitive. Work on a grounded surface and ground yourself through a 1 meg resistor when handling CMOS circuits. Second, the <u>inputs</u> of unused devices must go some where, either to the positive or negative supply, or tied to a functioning input. Inputs <u>cannot</u> be left floating or the device may oscillate which will pull a lot of standby current. Remember that CMOS circuits theoretically draw no current when they are not switching.

I have not shown the positive and negative supply leads on the various gates on the logic board. Just remember, all the gate packages need positive and negative supplies.





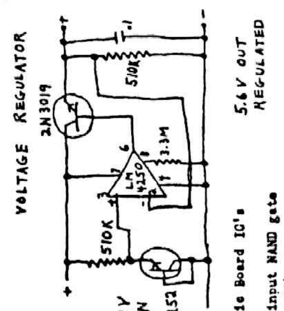
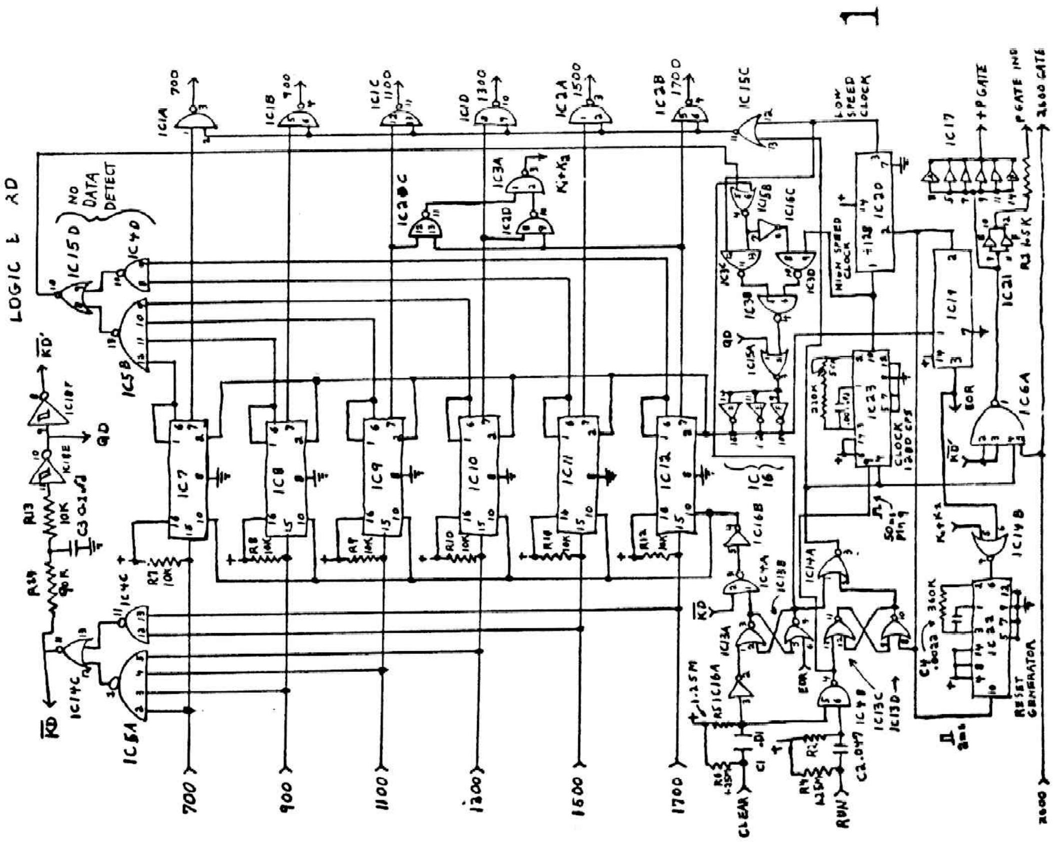


TABLE 1

Hz	R_A	R_B POT.
7000	300K	50K
9000	220K	"
11000	180K	"
13000	150K	"
15000	130K	"
17000	110K	"
26000	?5K	20K

Logic Board IC's

IC1, 2, 3, 4, 4011 Quad dual input NAND gate
IC5, 6-Dual 4 input NAND gate 4011
IC7, 8, 9, 10, 11, 12-4031 64 bit shift register
IC13, 14, 15-Quad 2 input NOR gate 4001
IC16-Hex inverting buffer 4049
IC17-4050 Hex non-inverting buffer
IC18-74C14 Hex inverting Schmitt trigger buffer
IC19, 20-4024 7 stage binary counter
IC21 4050 Hex non-inverting buffer
IC22, 23-4047 Low power Monostable/Astable multivibrator



LEGAL STONES or [illegible]

The quest for the perfect "legal high" has often been in vain. Such substances tend to be difficult or expensive to obtain, harmful to mind and body, or, in general, unimpressive in comparison to their less legal brothers.

One substance that has few if any drawbacks is ether (a.k.a., diethyl ether or just ethylether), the anaesthetic. This easily vapourizing, highly flammable liquid has quite a history as a high over the past couple of hundred years (those interested can refer to "Licit and Illicit Drugs" by Brecher) and the "ether jags" have at times been quite popular. Its advantages and virtues are that it is cheap, legal, easily available, medically safe, and, of course, an amazing buzz. Having used ether on and off for a number of years, as well as turning on a significant number of friends without any deleterious effects and enthusiastic reviews, ether has the Cl Y. Mancias Seal of Approval as a safe and effective recreational drug.

The only real drawback to ether is the connotations of glue-sniffing that its use conjures up. This can be a problem since consumption causes the strong solvent smell of ether to pervade the whole area, sort of like pot smoke. Uninformed family members and friends tend to get quite concerned (and sometimes quite hostile) when they notice it. They immediately assume you are massacring your brain cells with glue, you fuckin' degenerate, you. Rest assured, however, that ether is safe and unrelated to glue, toluene and other dangerous industrial solvents.

Another point to take careful note of is that all flames __must__ be kept away from ether, its vapour and the whole general area. Ether and ether fumes are extremely flammable. This means NO smoking __at all__, no candles, matches, etc. If you choose to forget or disregard this, remember that ending up in a hospital burn ward, or more probably snuffing it in the resulting explosion of searing flames are most unpleasant ways to come down...

Ether can be purchased from a drug store or chemical company or ripped off from your local school chemistry or biology lab. Ether is ubiquitous in the organic chemistry lab, a very common lab reagent or solvent, and used to knock out flies and rats in the bio lab. If you buy ether, look straight and if asked say you need it as a cleaning solvent, or for a chemistry expt. or to knock out flies for a genetics expt. It should cost about $7.50 for a one lb. bottle or can which will last quite a long time.

Imbibe ether by poring a little on a cloth or kleenex, recapping and putting down (or passing on) the container, holding the cloth up to your nose or mouth and inhaling deeply the vapours. It smells pretty raunchy, but this disappears after a short while. The initial high wears off very quickly, therefore the bottle must be passed around continuously with a group (solitary snorting is bad for both aesthetic and safety reasons). "Bogarting" the bottle is considered poor form. Ether being an anaesthetic occassionally a real fiend will pass out and keel over. This is nothing to get excited about. The over-indulger can either be slapped up or left to his dreams. Make sure he's still breathing every now and then if you're worried.

The ether high is truly incredible. One can attain a really interesting, super-stoned, psychedelic state that is truly out of this world. You can see time stop, or the secrets of the universe unfold. As ether-head H.D.Thoreau reported, "You go beyond the furthest star." Hunter Thompson's accurate description of etheromania in his excellent "Fear & Loathing in Las Vegas" is also worth checking out.

Lastly, the smell of ether stays on your breath for a while immediately after use and it is hard to disguise and explain, so stay away from straights if possible. Use drugs wisely and in moderation and they will improve your existance.

Happy stoning and remember what the dormouse said...

Everything you always wanted to know about 1633 Hz tones but were afraid to ask

by the Magician

As many of you know, there is a fourth tone used in the Touch Tone matrix that is not included on standard Touch Tone phones. This tone is 1633 Hz and can be obtained in three ways. You can try to locate a military 16 button phone, but this is usually very difficult. The other choices are to buy a 16 button Touch Tone encoder used by ham radio operators or to modify a Bell Touch Tone phone by adding an additional switch to the unutilized tap on the toroid transformer.

Now that you know ways to generate 1633 Hz, you might wonder what it is used for. The main use of this frequency is for control signalling in AUTOVON (military and DOD AUTomatic VOice Network). The buttons in the extra column are designated Flash Override (1633 + 697 Hz), Flash (1633 + 770 Hz), Intermediate (1633 + 852 Hz), and Priority (1633 + 941 Hz), top to bottom. Each button supercedes the one below it, with Flash Override reserved for the President in the event of a "national emergency".

The other use of 1633 Hz is in Ma Bell control signalling. It can be used to setup toll-free loop-arounds, mass conference calls, and even lets YOU become the Information Operator. When you place a call for long distance information, you are routed through an ACD (Automatic Call Distributor). In about 50% of the area codes in the US, it is possible to access ACD internals via 1633 Hz (e.g. area code 305 is always phun!). To gain access to ACD, call the information operator as usual (1+305-555-1212). As the call goes through, keep the Priority button pressed; the moment the operator answers, you are thrown into ACD and you will receive a dial tone pulsed about once per second.

The functions now available to you through ACD are documented in the Ma Bell book 'Notes on Distance Dialing' as the '100 Series Test Codes'. Just use the last digit of the code (e.g. 102 would be executed by pressing 2 and will provide a 1000 Hz tone). The codes of interest to us are 6 and 7. Code 6 enters you into one side of a loop-around and since the information number is non-supervising, the call is toll-free!! Have your partner in crime access ACD and use code 7 to access the other side of the loop-around (some area codes are getting smart and passing only 1000 Hz). If the code 6 person hangs up and the code 7 person hangs on, ACD will sometimes malfunction and route all information calls to the code 7 person instead of the real information operator. Now that you are the information operator, give those folks some REAL information like the address to subscribe to TAP. This same technique provides for mass conferencing since all callers to that information number are connected together!!!

ACD is neat and phun to experiment with as long as you don't stay on too long. I'm not sure how legal it is to mess with ACD since you're not defrauding TELCO of its lawful charges, but as soon as you connect to another person, you might qualify for arrest under wire fraud statutes (boy, aren't you lucky?!)

Please feel free to send questions, comments, etc. to The Magician, c/o TAP.

UPDATE ON MANUFACTURING SEALS by Agent MDA

RE: TAP Issue #50.8 (May-June '78). This method of manufacturing seals for birth certificates and other official documents uses a clay called "FIMO" that is made in Germany and may be difficult to purchase locally. An acceptable substitute called "Repla-Cotta" can be purchased from American Handicrafts stores. (Stock #049-3021.) A two pound block costs five dollars, and it is a sufficient amount to make at least a hundred seals. If there is no American Handicrafts store nearby, the company can be contacted by writing: American Handicrafts, Division of Tandycrafts, Inc., Ft. Worth, Texas, 76107. Also, retail prices for tools have skyrocketed, and the price of a set of 3/32" reverse letter punches is now twice the thirty three dollars quoted in TAP #50 -- $66.00!

A novel and easy method of obtaining seals has been published by Eden Press, P.O. Box 8410, Fountain Valley, CA, 92708, in The Paper Trip II, 1979 Edition, pages 88-89, price $14.95. (This book was formerly called The New Paper Trip, and the seal section has been revised, too.) Basically, the Paper Trip II method uses two or more seals -- which can be purchased at seal and rubber stamp stores -- and by cutting and filing away the unwanted parts of each seal, the seal desired can be effected by embossing them in succession, one over the other. For example, to make the seal of "Bumfugg, Maine", order a seal that says something like "Moose Club -- Bumfugg, Maine" and have an engraving put in the center portion of the seal. When the raised lettering that says "Moose Club" is filed off the seal, only the center engraving, town & state name, and the border will be embossed. Another seal is still needed to be purchased; for this one, just have "Vital Statistics" on the top and "Moose Club" on the bottom. File off the raised letters of the "Moose Club" and the seal will only emboss "Vital Statistics" and the border. The border will have to be removed from one of the seals, of course, but after the second seal is embossed over the first seal, it will read "Vital Statistics Bumfugg, Maine" with a neat engraving in the center portion which will be good enough to fool almost any bureaucrat.

In comparison to the TAP #50 method, the PT II method has two noteworthy advantages: First, it is less work because it is more of a method of getting a seal rather than a method of making a seal; a passable seal can be obtained the first time around. Second, the initial outlay of cash for one seal may be a few dollars less; on the other hand, the TAP #50 method is less expensive for a large quantity of seals. Therefore, if one needs only a seal or two, and his desire to spend hours modeling clay and plastic is low, the Paper Trip II method is ideal.

Hitchhiker Picks the Wrong Car

Milpitas, Calif. (AP) — The freedom of the open road was brief for escaped convict Roy Dean, 29. He hitched a ride that took him straight back to jail.

Lt. Pat Ruch of the Santa Clara County sheriff's office said she usually does not pick up hitchhikers, but Dean was irresistible. His pants were stenciled "County Jail."

She said Dean, in jail since August for burglary, offered no resistance. "He just looked very disappointed," she said.

"Dammit, Miss Campbell, our worldwide computer-switched satellite communications and display network was not installed for you to issue invitations to a Thank God It's Friday party."

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TAP "The Telephone, #1" artist print - $3.50. Mounting instructions for Box concealment included.
TAP "Ma Bell Is A Cheap Mother" Patch - $1.50.

MA BELL IS A CHEAP MOTHER

"Taxes are not levied for the benefit of the taxed."
Robert Heinlein.

T-eed off

ASHEBORO, N.C. (UPI) — Service station attendant Orlando McIntosh had no doubt what to do when a man walked into his station Sunday night. He followed the instructions printed on the man's T-shirt.

The shirt said "stick em up," which McIntosh did, handing over $454 to the bandit who carried a .22 caliber handgun.

The robber was last seen fleeing toward nearby Interstate 85.