CircuitWerkes ComboLok Option Board

Description

The CircuitWerkes combination lock is a separate board which mounts inside either an AD-16 telephone remote control or a DTMF remote control to provide security with over 11,000 possible combinations. The lock board is physically mounted either upside down inside the top of the case or beside the DTMF decoder if no autocoupler is present. The Combolok is connected to the DTMF decoder and/or coupler board via jumpers. This version of the combination lock must operate in conjunction with a CircuitWerkes DTMF-12 or 16 remote control board.

Setup

The combination lock, as installed at our factory, comes ready to operate with a randomly preset combination. The factory set combination is posted on a separate sheet of paper accompanying this manual or on a sticker attached to the bottom of the case. The ComboLok may be set up to operate in several configurations. If the ComboLok option was ordered with an AD-12 or AD-16, the board will normally be connected to both the AC-2 autocoupler board and the DTMF decoder. Jumper J1 selects whether the combolok is connected to a DTMF-16 or a DTMF-12 board. Jumper J2 selects the method of relocking the combination. The user may configure this jumper to reset the lock either when the autocoupler hangs up (AD-12 mode) or when an external ground is applied (stand alone DTMF mode). Jumper J3 disables the AC-2 automatic disconnect timer.

Changing the Combination:

You must start by disassembling the case. Remove the six screws which hold it together and gently pull the top half away from the bottom. If you have an AD-12 or 16, be careful not to stress the interconnecting wires to the lock board whichis mounted upside down on the top cover. On the lock board, near the LS7220 I.C. are four color coded wires which are connected to an in-line row of header pins. Each of the wires represents on digit of the combination. For instance, the red wire is the first digit of your access code. The remaining wires follow the color wheel so that orange is the second digit, yellow is the third and green is the fourth.

The wire positions on the in-line header determine the combination of your unit. Each of the header pins is an output for one of the twelve DTMF tones. The pin closest to the edge of the board is the 1 tone. The following pins, in order, are 2 thru 9, 0, *, and #. To change the combination, simply move the four wires to the appropriate header pins. For example, if the red wire is connected to the 3 pin, orange to 5, yellow to 2 and green to 8, the combination becomes 3528. If the lock is used as part of an AD-16, the combination must be received in the correct order, within about five seconds or the unit will hang up. After setting the combination and writing it down for future use, simply reassemble the two halves of the case, and you're ready to operate.

Special Note: Users who are using the stand alone DTMF decoders and are using one of the outputs from the decoder to reset the combination should not use the interlocked latching DTMF mode.

When locked, the DTMF decoder retains the last state entered. If that happens to be the lock reset command, there will be no way to unlock the combination since the lock I.C. will be constantly disabled. In this case an external reset must be used with the lock. This paragraph only applies when the DTMF decoder is operated in the interlocking-latched mode. If you need to use the DTMF-16 this way, please contact us for special decoder modification instructions.

Resetting the lock

When operated with a stand alone DTMF decoder (no AC-2 autocoupler) the combination must be externally reset. This can be done by momentarily grounding the reset pin either directly or through a transistor junction. The lock can be easily reset through any of the optocoupler outputs by tying the reset pin to the collector and grounding the emmitter.

Theory of Operation

BCD output from the SSI-202 on the DTMF board is routed to the 4514 inputs via the 2 by 4 header strip. The 4514 is operated as a four line to 12 line demultiplexer with active high outputs. Each of the decoded outputs is routed to a column of header pins where they can be individually selected for routing to the 7220 combination decoder chip. When all four tones are detected in the correct sequence, the 7220's Lock Indicator (pin 8) changes states from high to low. This output is used to disable the 7220, the 4514, and to enable the DTMF decoder board. U2b is a simple inverter which is used to drive one input of U2a. The other input of U2a is driven by the fourth DTMF tone in the unlock sequence. Capacitor C1 provides a time delay to prevent the last combination tone from instantly operating the DTMF board. As with U2b, U2d is operated as an inverter. When the unit is unlocked, Q1's base is low turning it on and pulling the 4514 inhibit pin high. This disables the 4514 until the unit is reset. Transistor Q4 is driven from the low going data valid (DV) pulse from the DTMF board. When a valid DTMF tone is detected, Q4 is on and momentarily pulls up the FOLLOW input (pin 1) of the 4514 as the DV pulse simultaneously pulls the INH pin low, causing the 4514 to operate in a momentary mode.

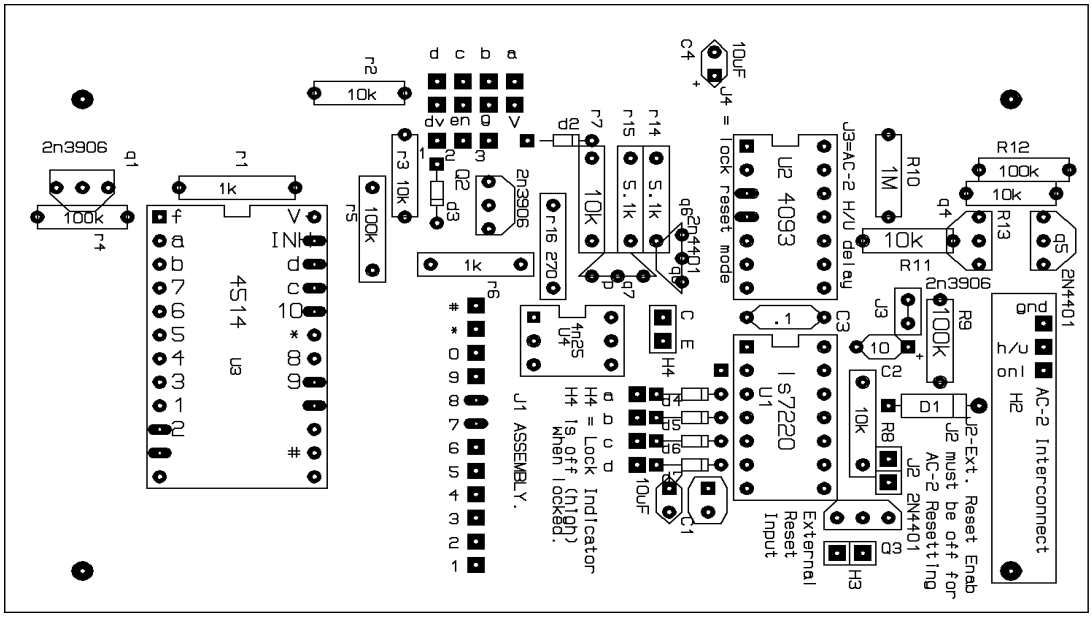
The 7220 lock I.C. has both a power on type reset and an auxiliary reset input. Each time power is applied to the unit, it resets to the locked mode. For use with the AD-12, diode D1 is connected to a ground sinking transistor on the coupler board so that each time the coupler answers, it pulls the 7220 to ground turning it on. Jumper J1 may be used to connect the auxiliary input to the circuit. A momentary ground at the reset pin pulls the base of transistor Q5 low turning it off and breaking the ground path for U1, causing it to reset. Each time the lock is turned on, C2 & R5 form a timer circuit which holds pin 8 of U2 low for approximately five seconds. If no valid combination is received, U2 pin 9 remains high. When the timer window has expired, U2 pin 8 again becomes high causing the autocoupler to hang up. When the ComboLok is used as part of a stand alone DTMF controller, C2 & R5 may prevent the lock from resetting on very short ground pulses. To eliminate the possibility of reset problems, jumper J3 should be removed to isolate that part of the circuit.

The ComboLok has several outputs available that allow it to be interfaced with various other CircuitWerkes products. Jumper J2 can be selected to use this version of the lock with either the DTMF-12 or DTMF-16 decoder boards. Any time the unit is unlocked, U2a is low, enabling the DTMF-12/16 line and turning on Q6 while turning Q7 off. Transistors Q6 operates as a source, enabling the optocoupler unlock indicator. Q7 acts as a shunt holding the DTMF decoder disable line low when locked.

NOTE: The ComboLok can be disabled allowing unrestricted use of the AD-16 or DTMF decoder by pulling the wiring harnesses from the ComboLok board. Early (single-sided) versions of the DTMF-12 require a jumper to be placed between GND and EN pins when the ComboLok harness is removed.

External Connections (I/O)

When used with an AD-16 or DTMF-16, the ComboLok can be configured to bring the external reset and lock indicator out via the four D-37 connector pins that are normally used for tones A through D. In this configuration, there are four jumpers that will be removed to break the path from the optocoupler outputs and the D-37 pins. Connected to the outputs will be a pair of two pin connectors from the lock board. The ComboLok remote reset input is connected to pins 07 and 25. A momentary low at pin 7 (shorted to pin 25) will cause the lock to reset itself to the locked mode if J2, the external reset jumper, is on. Note that when J2 is on, the internal AC-2 reset function does not work, however, an AC-2 can reset the lock via the latching relay contact outputs, if desired.
The unlocked status indicator is an optocoupled output. The optocoupler's collector is brought out on pin 24 while pin 6 is the emitter. When the unit is UNLOCKED, the optocoupler is turned on. Note: The optocoupler in this circuit is a garden variety 4N25 or equivalent. Care should be taken not to exceed the maximum ratings of 80 ma or 25 Vdc.



ComboLok PCB Layout

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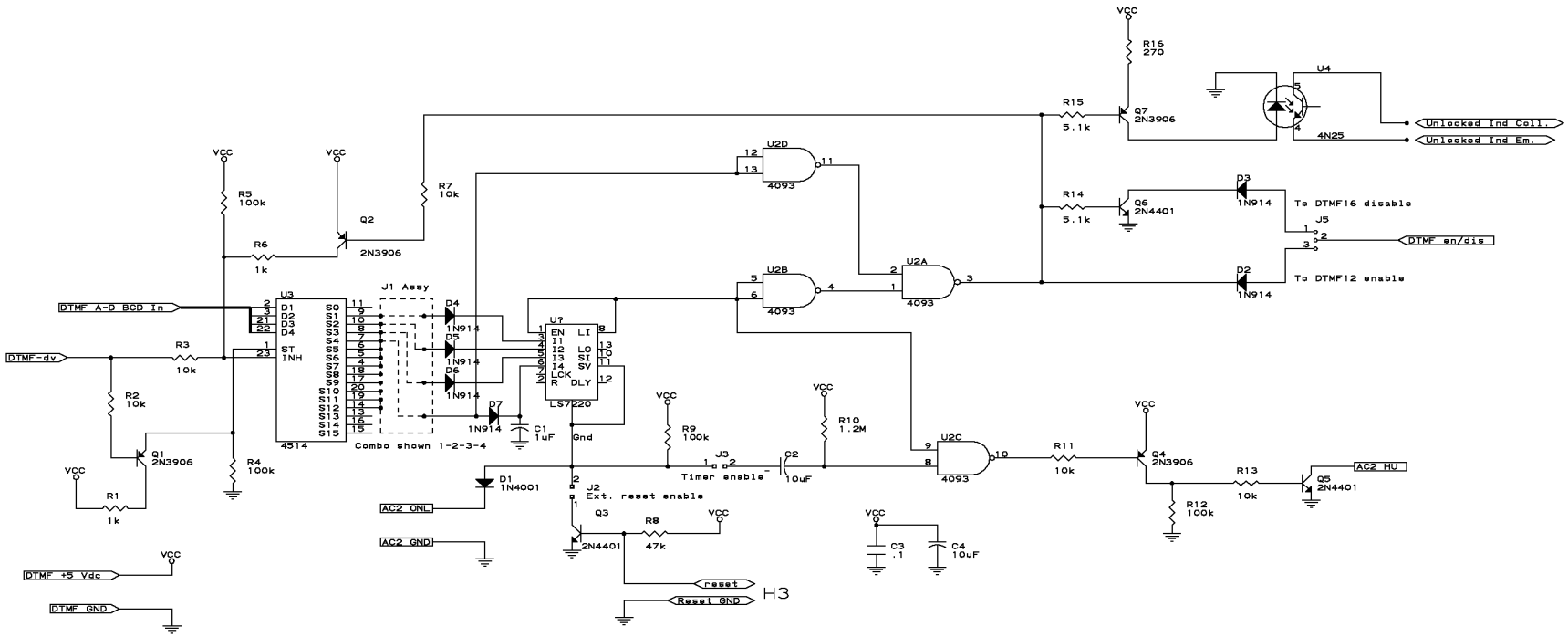
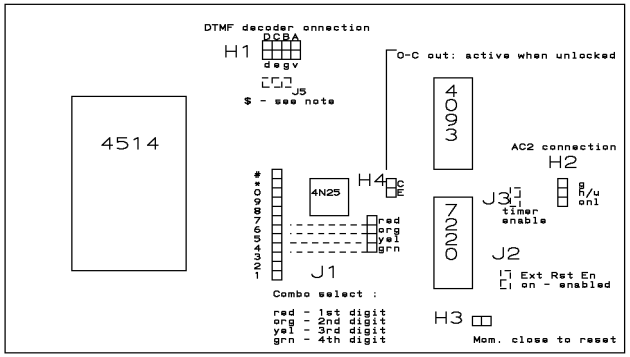
ComboLok V1.2c



Key to HEADER symbols

- Header to DTMF Decoder
- Header to AC2
- Header for misc in/out



$ - jumper 1-2 for DTMF16, 2-3 for DTMF12

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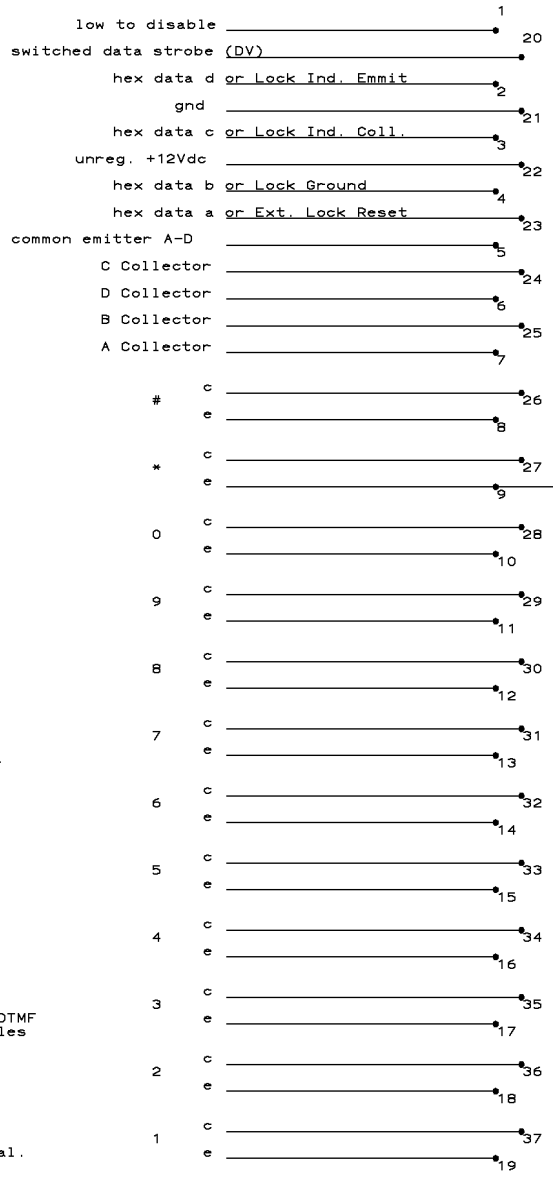
DTMF-16 Output Wiring



c = collector

e = emitter

Notes:

Unreg. DC output current should not exceed 100 mA.

ComboLok external connections are made to A through D DTMF output pins. Using the external lock connectors disables the associated DTMF outputs.

DV sinks to ground during valid tones.

Pulling the disable line to ground disables the decoder outputs. DV and hex data a-d remain operational.

Hex A-D outputs are TTL active high. Do not ground!

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