Mini-Yack Iambic Keyer
Assembly Instructions

Mini-Yack is a "bare bones" Iambic keyer for embedding into QRP and home brew equipment. The keyer has the following features:

- Keying from 1-50WPM
- YACK memory Keyer IC developed by DK3LJ and AI4SV with mods by KC9ON
- 2 memories with 75+ characters each
- Beacon mode
- Iambic practice & training modes including a progressive training mode.
- Operation to as low as 2V*
- Straight key operation bypass (limited keyer functionality)
- Positive (40V) interface radio keying
- Sidetone abilities

Parts List

Section	Qty	Ref	Description	Markings
MAIN	3	C1,C3,C7	Capacitor Electrolytic .1ls 6x11mm 100uF	100uF
MAIN	4	C2,C4,C5,C6	Capacitor Mono .2ls 10% .01uF	103
MAIN	1	D1	Diode .4ls 1N4007	
MAIN	1	U2	IC Microcontroller AtTiny85	
MAIN	1	D2	LED 3mm Red	
MAIN	4	R2,R3,R4,R8	Resistor CF 250mW 5% 1K	Brown-Black-Red-Gold
MAIN	1	R7	Resistor CF 250mW 5% 2.7K	Red-Violet-Red-Gold
MAIN	2	R6	Resistor CF 250mW 5% 4.7K	Yellow-Violet-Red-Gold
MAIN	2	R1,R5	Resistor CF 250mW 5% 47K	Yellow-Violet-Orange-Gold
MAIN	1	SW1	Switch SPST Tactile 6x6mm A-5156	
MAIN	2	P1,P3	Terminal Block 2-pin_3.5mm	
MAIN	2	P2,P4	Terminal Block 3-pin_3.5mm	
MAIN	1	Q1	Transistor MOSFET 2N7000 2N7000	
MAIN	1	RV1	Trimmer 6mm Horiz 10K	104
MAIN	1	U1	Voltage Regulator 78L33	
MAIN	1	U1-REF	Socket DIP 8 pin	
MAIN	1	Rst	Header 2 pin	
MAIN	1	PCB	PCB Mini-Yack	
Buttons	1		PCB Mini-Yack Button	
Buttons	5		Switch SPST Tactile 6x6mm A-5156	
Buttons	1		Resistor CF 250mW 5% 510	Green-Brown-Brown-Gold
Buttons	1		Resistor CF 250mW 5% 560	Green-Blue-Brown-Gold
Buttons	1		Resistor CF 250mW 5% 1.8K	Brown-Grey-Red-Gold
Buttons	1		Terminal Block 3-pin_3.5mm	
Buttons	0.25		Wire 22ga strnd BLACK ft	
Buttons	0.25		Wire 22ga strnd GREEN ft	
Buttons	0.25		Wire 22ga strnd WHITE ft	

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This kit was designed using through hole components and enlarged PCB solder pads for ease of assembly. Only a few basic tools are recommended:

Pencil type soldering iron and solder.
Needle nose pliers, small surgical clamps, small vice
Magnifier Glass (if needed)
Slotted or Philips screwdriver
Digital Multi-Meter (DMM)
Oscilloscope (optional)
Power Source/supply 4.5-15V

Construction notes:

- Familiarize yourself with components using the included parts list.
  TIP: Not sure what part is what? We recommend picking up a copy of the ARRL Handbook. The GQRP web site also has several good articles on component identification.
- Some parts in this kit may have been substituted with parts of a better quality. Alternates will be shown in the parts list with "SUB".
- All parts are mounted on the top side of the PCB *except* the CMD button which can be placed on either side depending on your finall mounting configuration. For the YACK-buttons board parts can be mounted on either side depending on your mounting configuration.
- Solder and trim the excess leads after installing each component.
  TIP: Not sure how to solder? There are many excellent videos on the internet. Check out sites such as Sparkfun.com, adafruit.com, and electronics123.com

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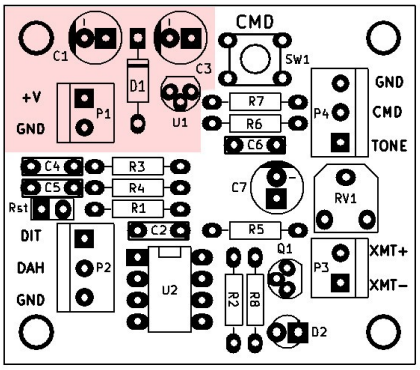
Assembly

1. ( ) Install the following components:

( ) D1	1N4007 Diode	Match the band on the diode to the silkscreen.
( ) U1	78L33 Regulator	
( ) C1	100uF Electrolytic Cap	Observe Polarity when installing
( ) C3	100uF Electrolytic Cap	Observe Polarity when installing
( ) P1	2 pin terminal block	Position the terminal block so the wire entrances are away from the board.



2. ( ) Power Supply Testing. Connect a 4-15V power source to P1 observing power polarity. Screws on P1 are shipped in the fully closed position. Using a DMM measure U2 pin 8 to ground. One of the mounting holes can be used as ground as well as any GND pin. There should be approximately 3.3V at this point. Disconnect power from P1.

3. ( ) Install the following components:

( ) R3	Resistor 1K	Brown-Black-Red-Gold
( ) R4	Resistor 1K	Brown-Black-Red-Gold
( ) R1	Resistor 47K	Yellow-Violet-Orange-Gold
( ) C4	Capacitor .01uF	103
( ) C5	Capacitor .01uF	103
( ) RST	Header 2 pin	

Mini-Yack Iambic Keyer
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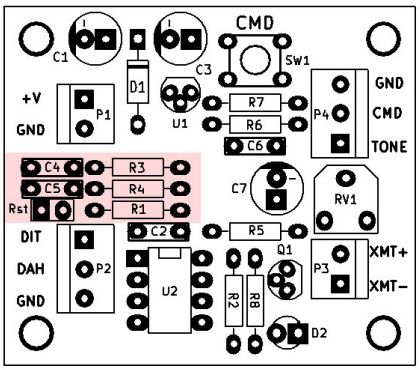
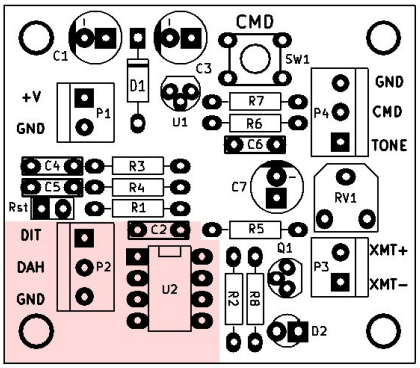


4. ( ) Install the following components:

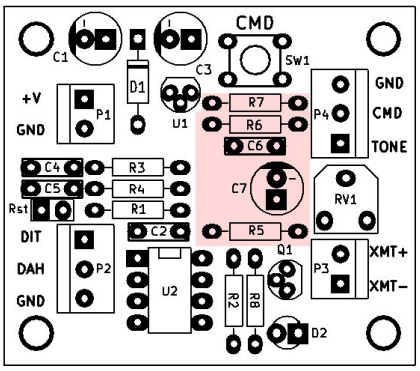
( ) C2	Capacitor .01uF	103
( ) U2	8 pin DIP socket	Align notch on socket with notch on board.
( ) P2	3 pin terminal block	Position the terminal block so the wire entrances are away from the board.



Mini-Yack Iambic Keyer
Assembly Instructions

5. ( ) Install the following components:

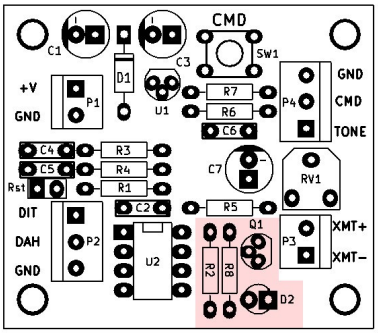
( ) R7	Resistor 2.7K	Red-Violet-Red-Gold
( ) R6	Resistor 4.7K	Yellow-Violet-Red-Gold
( ) C6	Capacitor .01uF	103
( ) C7	100uF Electrolytic Cap	Observe Polarity when installing
( ) R5	Resistor 47K*	Yellow-Violet-Orange-Gold



*__Note:__ Resistor R5 was set to inject sidetone into an existing QRP transceiver. Other resistances may be required depending on your radio's sidetone requirements. Jumpering R5 (shorting) will allow a Piezo buzzer or small speaker to be used.

6. ( ) Install the following components:

( ) Q1	Transistor 2N7000	Align case with silkscreen
( ) R8	Resistor 1K	Brown-Black-Red-Gold
( ) R2	Resistor 1K	Brown-Black-Red-Gold
( ) D2	LED	Align flat side with square pad. Square pad is also the short lead.



Mini-Yack Iambic Keyer
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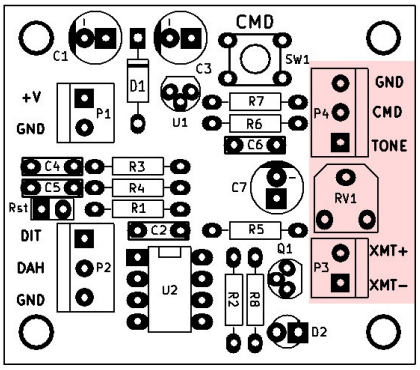
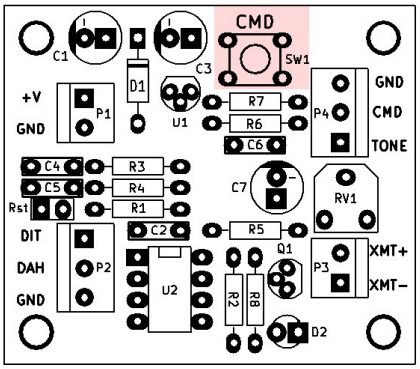
7. ( ) Install the following components:

( ) RV1	Trimmer 10K	103
( ) P3	2 pin Terminal Block	Position the terminal block so the wire entrances are away from the board.
( ) P4	3 pin Terminal Block	Position the terminal block so the wire entrances are away from the board.



8. ( ) Determine which side of the board you want the CMD button on and solder to board.



9. ( ) Place the ATTiny85 IC into the socket at U2. Align the dot on the IC (pin 1) to the square pad on the PCB. This pin is also located near the notched edge of the IC socket and PCB silkscreen.

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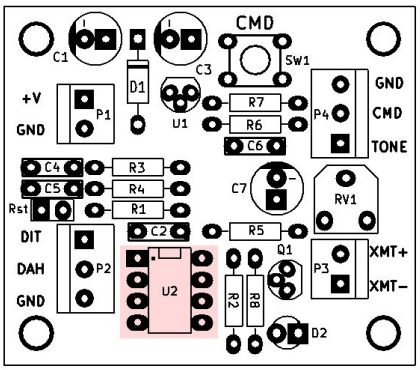
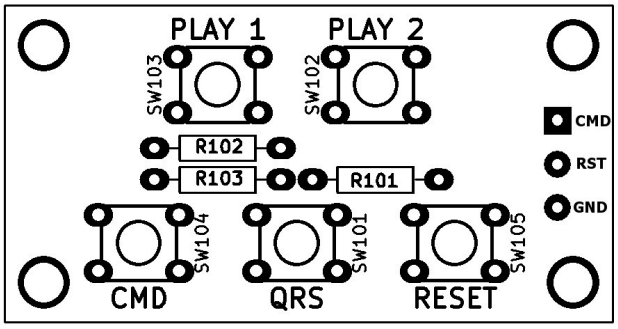


YACK-Buttons (optional) – Assemble the following on the YACK-Buttons PCB if you wish to add external buttons for Playback of memories, QRS, COMMAND, and power RESET:

10. Determine which side of the PCB you wish to mount the buttons and terminal block depending on your mounting configuration. For example you may wish to mount the switches on the top side and the terminal block on the bottom in order to mount the board on an enclosure.
11. Install the following components:

( ) R101	Resistor 510 Ohms	Green-Brown-Brown-Gold
( ) R102	Resistor 560 Ohms	Green-Blue-Brown-Gold
( ) R103	Resistor 1.8K Ohms	Brown-Grey-Red-Gold
( ) SW101-SW105	Push Switch	
( ) P1	3 pin Terminal Block	Position the terminal block so the wire entrances are away from the board.



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12. Final assembly:

( ) Connect your Iambic keyer to the DIT, DAH, and GND (common) connections of P2. If later you find the DIT and DAH requires swapping you can either swap the 2 wires DIT and DAH or use the "X" command in software.

( ) Connect your transmitter key to the P3. XMT- is also ground on the keyer board. Note that this board only works with positive keying transmiters.

( ) Connect your 4-15V power source to P1 observing polarity. Slightly lower voltages sources can be used by jumpering the blocking diode D1. Additionally the regulator U1 can also be bypassed if the voltage is maintained between 2.7 and 5.5V. However there will no longer be reverse polarity or over voltage protection on the micro controller when bypassed.

( ) (Optional) connect the sidetone output to a pair of headphones or your receivers audio chain using the GND and TONE connections of P4. Use RV1 to control the side tone volume. Review the foot note in step #5 for further information.

( ) (Optional) Connect the YACK-Bottons board to the Mini-YACK as follows:

( ) Strip 1/4" of insulation from each end of the Black, Green, and White wires. Tin each end. Substitute you own cable for longer lengths.

( ) Connect wires as follows:

WIRE	**FROM Mini-YACK**	**TO YACK-BUTTONS**
BLACK	P4 GND	P1 Ground (Pin 3)
WHITE	P4 CMD	P1 CMD
GREEN	RST Header pin 2 (Nearest to R1) - SOLDER	P1 RST

Congradulations! Your keyer is now ready to use! See the Yack operation manual for using your Mini-Yack.

Specifications:

Supply Voltage: 4.5-15V (typical)

Current consumption:	@13.8V	4.2mA idle	6mA keyed
	@5V	3.8mA idle	5.5mA keyed
	@4.2V	3mA idle	4.3mA keyed
	@2.0V*	1.9mA Idle	2.5mA keyed

Transmitter Keying: Positive keying from to 30V 150mA max

* - Minimum usable voltage with D1 and U1 bypassed – do not exceed 5.5V! Lower current ratings may be obtained by removing LED D2.

YACK User Manual

Version 1.8j for Mini-Yack

YACK (Yet Another CW Keyer) is a universal CW keyer developed for the Atmel ATTiny processors by Jan Lategahn DK3LJ with modifications by Jack Welch AI4SV. Further modifications for Mini-Yack were developed by John Clements KC9ON.

Startup

Default Settings: The keyer initial settings on first power on is IAMBIC B at 15WPM. This can be changed to your own setting as shown below.

Power On: The keyer will respond with **HI** when powering up.

Straight Key Operation: Connect a straight key into the jack. Either a Mono jack may be used or a stereo jack with the ring (middle connection or DAH) connected to shield (ground). The keyer will automatically see the "mono" jack on power up and put the keyer into straight key mode. The optional external buttons PLAY1, PLAY2, QRS, and RESET will still function in straight key mode. However the COMMAND button will not accept commands.

Mini-Yack Buttons

COMMAND – Enters command mode. See below for command mode settings.

Optional External Buttons (not included – see buttons schematic):

Play 1 – Play back the contents of memory 1.

Play 2 – play back the contents of memory 2.

QRS – each button press will slow the speed by 5WPM. Your original WPM can be retrieved by powering the unit off and on or by pressing the reset button.

Reset - Equivalent to powering the unit off and on. This will quickly restore any presses of the QRS button back to your default WPM setting.

Speed Change

Speed can be changed by pressing and holding the **COMMAND** button while operating the **DIT** and **DAH** paddles. DIT reduces speed while DAH increases speed. The keyer plays an alternating sequence of dit and dah while changing speed without keying the transmitter.

Command mode

Pressing the command button without changing speed will switch the keyer into command mode. This will be confirmed with the '**?**' character. Another press of the same button takes the keyer back into regular keyer mode and will be confirmed by sending **OK**.

During command mode the transceiver is never keyed and side tone is always activated. Further functions can be accessed by keying one-letter commands as listed below. After 6 seconds of inactivity the keyer will return to regular mode and send **OK**.

If a command is not interpreted properly an error message of 8 dits is sent. Successful commands will typically respond with '**R**'.

It is highly recommended to perform the 0 - LOCK command after you have made your setting preferences to avoid accidentally changing them. Locking will prevent commands 1, 2, A, B, D, F, I, K, L, R, S, & X, from being changed until the 0 – UNLOCK command is given.

COMMANDS - BASIC

H	**PLAY 1**	The stored message 1 is played back with keying enabled (if configured). A press of the command key immediately returns the keyer to keyer mode so a QSO can be started.
5	**PLAY 2**	The stored message 2 is played back with keying enabled (if configured). A press of the command key immediately returns the keyer to keyer mode so a QSO can be started.
1	**RECORD 1**	Record to internal message 1. The keyer immediately responds with "1" after which a message up to 100 characters can be keyed at current WPM speed. After 5 seconds of inactivity the message is played back once and then stored in EEPROM. Choosing "1" but not keying a new message deletes the chosen message buffer content.
2	**RECORD 2**	Record to internal message 2. The keyer immediately responds with "2" after which a message up to 100 characters can be keyed at current WPM speed. After 5 seconds of inactivity the message is played back once and then stored in EEPROM. Choosing "2" but not keying a new message deletes the chosen message buffer content.
G	**QRS -5WPM**	“Go Slower” Temporarily slows the keyer down by 5WPM. Resume current speed by issuing the Reset button, Power cycling the device, or issuing the 'F' command.
Q	**QRQ +5WPM**	Temporarily speeds the keyer up by 5WPM. Resume current speed by issuing the Reset button, Power cycling the device, or issuing the 'S' command.
W	**QUERY SPEED**	The keyer responds with the current WPM speed.
P	**PITCH**	Allows modifying the side-tone pitch to a higher or lower level. A sequence of dits will be played and the pitch can be modified with the dit and dah paddles. If no paddle is touched for 5 seconds, OK is sounded and the mode terminates, leaving the user in command mode.

U	**TUNE**	The transceiver is keyed for a duration of 20 seconds for tuning purposes. Tuning mode is aborted once either DIT or DAH paddles are touched or the control key is pressed.

COMMANDS - KEYER

A	**IAMBIC A MODE**	Sets IAMBIC A as permanent keying mode.
B	**IAMBIC B MODE**	Sets IAMBIC B as permanent keying mode.
D	**DAH PRIORITY**	In squeezed state a sequence of DAHs is sent. Some of the first generation keyers exhibited this behavior so the chip can simulate that.
L	**ULTIMATIC MODE**	Sets the keyer into ULTIMATIC mode. In Ultimatic mode always the last paddle to be touched is repeated indefinitely when paddles are squeezed
X	**PADDLE SWAP**	DIT and DAH paddles are swapped.
F	**FARNSWORTH PAUSE**	Allows setting of an extended inter-character pause in all sending modes which makes fast keying easier to understand. Note that this of course only influences RECEPTION, not TRANSMISSION. If you desire Farnsworth mode in transmission, please manually pause during characters.

COMMANDS – TRANSMITTING AND TONE

I	**TX INVERT**	This function toggles whether the "active" level on the keyer output is positive or negative. This setting is dependent on any additional attached keying circuits or radios. Normally this command is left alone.
K	**TX DISABLE**	Toggles the setting of the TX keyer output. In default state the keyer switches the output line when it is in keyer mode. Toggling this setting enables or disables that function. NOTE: Keying is always off in Command mode.
S	**SIDETONE**	The side tone oscillator setting is toggled (ON -> OFF or OFF -> ON). NOTE: This setting is only of relevance for regular

keying mode. Side tone is always on in command mode.

COMMANDS – FEATURES

C **CALLSIGN TRAINER** The keyer plays a generated 2x2 call signs (side tone only) at the current WPM setting. The call signs are then entered back using the iambic key. If it is repeated correctly, "R" is played and the next call sign is given. If a mistake was sensed, the error pro-sign (8 dots) is sounded and the current call sign is repeated again for the user to try once more. If nothing is keyed for 10 seconds, the keyer returns to command mode.

Z **ADVANCED TRAINER** Similar to the training mode above except on each successful entry the speed is increased by 1WPM. An unsuccessful entry reduces the speed by 1WPM. Pressing the command button will terminate the training, return the keyer to the original WPM speed, and give statistics of speed at end of session, number of calls sent, and number of calls correct. Do not press command mode while the keyer is sending. The last call sign sent is not counted.

N **BEACON MODE** The keyer responds with "N" after which a number between 0 and 9999 can be keyed. After a 5 second timeout the keyer responds by repeating the number and 'R'. Once the keyer returns to keyer mode, the content of message buffer 2 is repeated in intervals of the message length plus N seconds. The setting is preserved in EEPROM so the chip can be used as a fox hunt keyer. Returning to command mode and entering an interval of 0 (or none at all) stops beacon mode. Keyer will respond with 'R'.

COMMANDS - GENERAL

R **RESET** All settings are returned to their default values except for the stored messages in the message buffers. Restored settings include speed, Paddle Swap, TX level inversion, side tone and TX keyer settings. Speed will be reset to 15WPM in IAMBIC B mode.

V **VERSION** The keyer responds with the current keyer software version.

0 **LOCK/UNLOCK** The 0 command locks or unlocks the main configuration items but not speed and playback functions.

HARDWARE RESET

You may find you have lost control of your keyer by setting the speed too fast or accidentally issuing a command (See LOCK) which makes it act strange. The keyer may be reset to factory defaults with the following sequence:

1) Power on the unit.
2) Hold the command button down
3) Push and release the reset button
4) Release the command button

Memories will still be in tact.

YACK IC PINOUT

Pin 1 : RESET
Pin 2 : DIT
Pin 3 : DAH
Pin 4 : GND
Pin 5 : TX key line
Pin 6 : Side Tone key line
Pin 7 : ADC Input from command keys – See Mini-Yack schematic for example.
Pin 8 : +5V

YACK SOFTWARE LICENSE

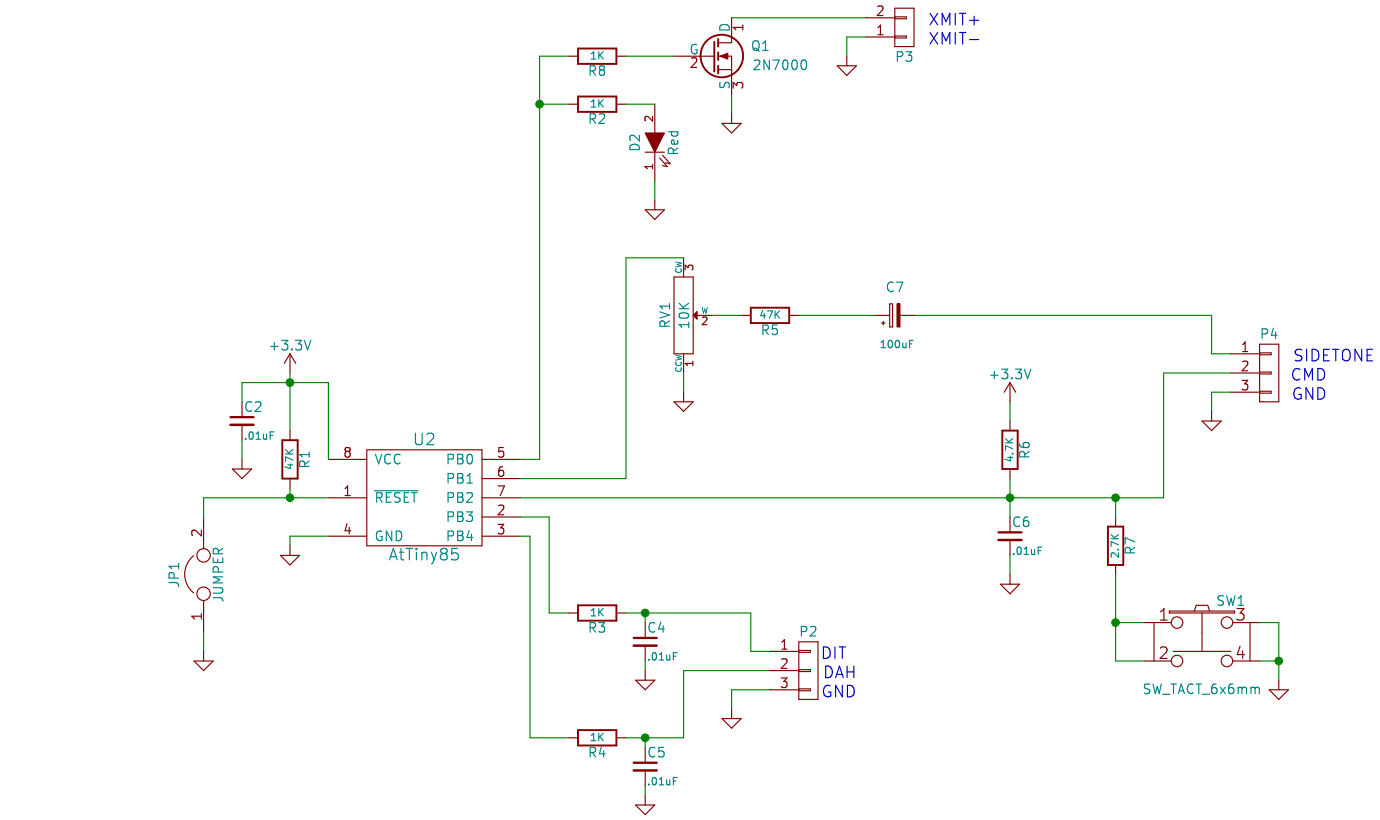
YACK INFORMATION

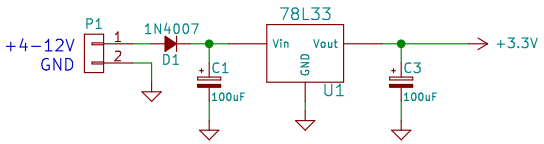
The original YACK software and instructions can be found at:
http://sourceforge.net/projects/yack/

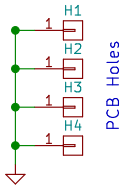
YACK User Manual
Version 1.8j for Mini-Yack

YACK QUICK REFERENCE GUIDE

BASIC		KEYER		GENERAL	
H	PLAY 1	A	IAMBIC A	R	RESET
5	PLAY 2	B	IAMBIC B	V	VERSION
1	RECORD 1	D	DAH PRIORITY	0	LOCK
2	RECORD 2	L	ULTIMATIC		
G	QRS -5WPM	X	SWAP	FEATURES	
Q	QRQ +5WPM	TRANSMIT/TONE		C	TRAINER
W	SPEED?	I	INVERT TX	Z	ADV TRAINER
P	PITCH	K	TX DISABLE	F	FARNSWORTH
U	TUNE	S	SIDETONE	N	BEACON







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kc9on

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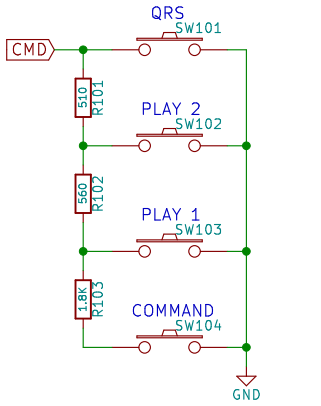
Adding extra buttons to the CMD port



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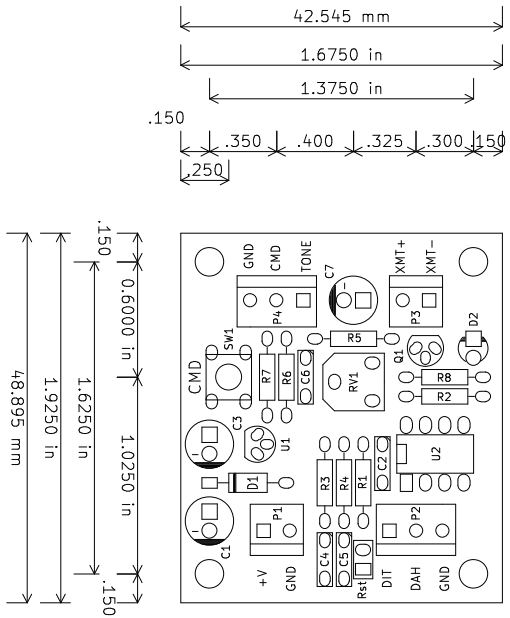

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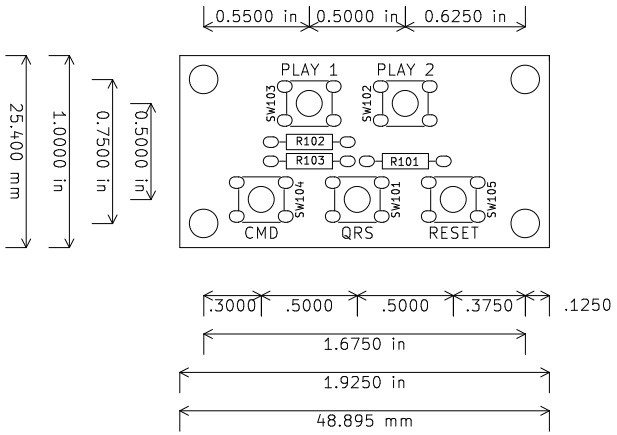

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